Change at work: a study of outcome and practice innovation in advanced nurse practitioner-led transport of sick newborn infants

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Additional Information:


Metadata Record: https://dspace.lboro.ac.uk/2134/33871

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Change at Work:
A study of outcome and practice innovation in advanced nurse practitioner led transport of sick newborn infants

by

Andrew Leslie

A Doctoral Thesis

Submitted in partial fulfilment of the requirements for the award of

Doctor of Philosophy of Loughborough University

30.11 03

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Abstract.

This study is concerned with the introduction of a new group, Advanced Neonatal Nurse Practitioners (ANNPs), into the practice of interhospital transfer of critically-ill newborn infants. These transfers have traditionally been performed by a team led by a doctor, but ANNPs may replace doctors in this setting. Diverse methodologies are brought to bear on two main questions. First, what impact do ANNPs led transfers have on outcome? Second, how can we understand the process whereby the change to ANNPs led transport was brought about?

Outcome is studied using routinely collected clinical data to evaluate the safety and practicality of using ANNPs to lead acute neonatal transfers by comparing ANNPs and doctor-led transfers (n=102). Comparison of physiological data suggests that the clinical condition on completion of transport is similar for babies transferred by ANNPs and doctor-led teams.

The process of change over time is studied using qualitative data collected using an integrated ethnomethodology over a period when two new ANNPs were prepared for transport work. The material collected includes recordings and minutes of meetings, letters and documents. Qualitative analysis of emergent issues and resources deployed to address such issues are examined in relation to two analytical frameworks. First, a proposed framework for the formation of a new community of practice (CoP) (Wenger, 1998a) is used to provide a systematic understanding of the emergence of new ways of working in relation to organisational changes. Analysis using the CoP framework demonstrates the process of change as a trajectory towards the formation of a new CoP. The implications of the CoP framework for those concerned with implementing change at work are discussed. Secondly, limitations in the use of the CoP framework are also examined using the concept of circulating reference (Latour, 1999). This is used to account for the complex interdependent connections between the immediate setting, the delivery of ANNPs-led transport and organisational, statutory and professional issues.
Acknowledgements.

Thanks to the following:

All the participants who agreed to be recorded at meetings, particularly the two new ANNPs.

Dr David Middleton, supervisor of this work.

Professor Terence Stephenson (University of Nottingham) assisted with the work presented in Chapter 2, as he has particular expertise in this area. He helped with study design and by advising on the preparation and presentation of the manuscript for submission to a journal.

Loughborough University Department of Human Sciences for a generous grant toward the cost of transcribing many hours of recorded data.

Nottingham City Hospital Neonatal Service, particularly Sara Watkin and Cath Henson, for releasing me from other commitments and generous support of course fees.

Dedication.

“Meteorologists do not just look out of the window!”

Bruno Latour.

A travel into a flatland or a critique of pure information Lecture at the Said Business School, Oxford University, 23rd October 2002.
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Chapter 1.

Introduction, literature, resources and approaches.

Introduction.

The topic of this thesis is the transport between hospitals of sick newborn infants, and in particular the introduction of advanced neonatal nurse practitioners (ANNPs) into the position of transport team leader in place of doctors. The central concern is with showing both the outcomes of this change as well as the process of mobilising the resources which made the outcomes possible. By approaching the subject matter in this way, two key questions are addressed that are of interest to practitioners in the field. First, is transport safe and practical for infants transferred by ANNП-led teams compared to teams led by Specialist Registrars (SpRs)? Secondly, for others wishing to consider the implementation of an ANNП-led transport policy, what are the issues and resources which may need to be addressed in the process of enabling ANNPs to do transport? In studying the process of change, as well as the outcome, critiques are developed both of the ways in which changes at work are studied in health settings and of the tools which may be used to study change at work.

Chapter 2 is a study of the effects on infants of being transferred by an ANNП-led team compared to infants transferred by doctor-led teams. This outcome focussed quantitative study is followed by several chapters concerned with understanding the process of change during which two new ANNPs became able to lead transfers. In this part of the study qualitative data are used to show the issues that emerged and the resources that were brought to bear on them in the change process. The change process is studied over time by tracking the trajectories of movement of the emergent issues and resources. This way of presenting the data also shows that change is a topic of concern which in turn requires the mobilisation of resources. These emergent issues are mapped onto a theoretical framework based on the work of Wenger on Communities of Practice (Wenger, 1998). This is given a theoretical extension and critical evaluation through the use of the concept of circulating reference from actor network theory, as developed by Latour (1999). These frameworks are used to demonstrate the interdependencies of individuals and settings. The aim
is to demonstrate the value of theoretical positions that allow the direct examination of how change is accomplished in complex work settings. The argument of this thesis is that outcome evaluation should be complemented with a detailed analysis of the process of change. The process evaluation is presented as a series of densely descriptive chapters which elicit the process as it happened over time and which present data from rich and varied sources.

In this chapter some background is given on why, how and by whom infants are transferred. This is followed by a review of the literature regarding ANNPs and transport. This is in turn followed by a review of the resources and approaches used in the following chapters to address the questions outlined above.

**Background**

Neonatal intensive care in the United Kingdom, in common with the rest of the developed world, is delivered in a hierarchical referral system which aims to deliver some care at local hospitals and more specialised care at a smaller number of units staffed and equipped for particular problems. No UK unit has the facilities for every kind of care or treatment an infant might require and so the problem of getting a sick infant to the right place is a common one. For example, in a three month survey undertaken in 2002, there were 272 transfers of sick infants around the Trent health region (Leslie A, Bohin S, Gibson A, Wardle S, unpublished data), though rates vary around the country (Field, 1999; Parmanum, Field et al 2000).

There is agreement among clinicians that the safest way to transfer a neonatal intensive care unit (NICU) patient is to identify before birth that intensive care may be needed and transfer before delivery, the so-called in-utero transfer (IUT). This allows the infant to be born at a unit able to offer the necessary specialist care from the time of birth. Although research has failed to show convincingly benefits of a policy of IUT, this is probably for methodological reasons (Miller, Densberger et al. 1983; Delaney-Black, Lubchenco et al. 1989), and IUT is generally preferred over post-natal transfer.
This study is concerned with the post-natal transfer of NICU patients, those for whom IUT was not possible, perhaps because the infant was born suddenly or with a problem which was undetected antenatally or acquired post-natally.

Post-natal transfer of sick newborn infants requires facilities so that intensive care that has been started in the hospital of origin may be continued during the transfer. This will commonly include the need for an incubator to support body temperature, ventilator to support breathing, infusions of drugs to provide calories, sedation, blood pressure support and more, as well as monitors to provide constant information on vital signs (Barry & Leslie, 2003, pp. 25-35). All of these must be provided in a portable form, self-sufficient in power and gas supply but also compatible with emergency vehicles (Barry & Leslie, 2003, pp. 19-24).

Patterns of where sick infants are transferred to and from are complex, but in general acute transfers are conducted up a gradient of expertise (Leslie & Middleton, 1995). In other words, babies are transferred from a hospital without particular specialist facilities to one with. In the most common transport configuration, the transport team is despatched from the specialist unit to “retrieve” the baby.

People, as well as equipment and ambulances, are required for neonatal transfer. Although subject to some local and circumstantial variation, the standard configuration of staff for the transfer of a sick baby is one nurse and one doctor. These people stabilise the baby for transfer on the originating unit, attending to the necessary tasks that aim to minimise the possibility for clinical problems in transit. They then accompany the infant during the journey, monitoring physiological signs, adjusting therapy and responding to emergencies, as required. In this standard staffing configuration the nurse will be from the NICU and may or may not have received transport training. The doctor will usually be an specialist registrar (SpR) training to become a paediatrician or neonatologist, though both more and less senior doctors are used at times. As with the nurse, this person may or may not have received transport training. This study is concerned with understanding the consequences of replacing the doctor with an ANNP whilst retaining the
existing nursing support. These consequences are studied both in terms of a standard range of post-transfer physiological functions in the infant and in terms of understanding how ANNPs-led transfer may be achieved, the sorts of organisational and personal resources required to implement the change.

In the literature review three major relevant strands of work are examined. First the body of work on the people who do neonatal transport is reviewed including research from other countries which has examined outcomes when people other than doctors lead neonatal transfers. There are no previous reports from the UK of non-doctor neonatal transport. Secondly the relevant research on ANNPs in the UK is reviewed, who they are, what they do and their impact in other, non-transport, clinical settings. Finally research which has investigated the implementation of ANNPs-delivered care is reviewed.

**Literature Review**

1. **Outcomes for infants when transport personnel are changed**

This section concentrates on research which is concerned with the impact of different policies regarding the people attending the transport of sick infants. Early reports were concerned to show that training the personnel who undertook transports was associated with improved condition for infants on completion of the journey. Several studies have examined the impact of training the staff who attend transfers to ensure they have specific transport skills.

In 1978 the Toronto team reported a study which attempted to "demonstrate the need for skilled care of sick neonates in transport" (Chance, Matthew et al. 1978). A modified randomised protocol was used to allocate newborn infants referred for transport to either be collected from the referring unit by a new Toronto-based trained team (study group) or be brought to Toronto by the referring unit (control group). The study was confined to infants under 1.5kg at birth and the groups were not significantly different for birth weight or gestation. Numbers enrolled in this study were small, totalling just 34 infants (22 study, 12 control). On completion of transfer the study group infants had significantly
higher transport incubator temperature, core body temperature, blood pressure and arterial blood pH. Poor admission temperature in the control group was significantly associated with increased mortality.

The small number of infants enrolled in this study makes it difficult to draw satisfactory conclusions. If a larger study had been performed it is possible both that differences which were demonstrated would not have remained and that differences which were not demonstrated would have been seen. There are however some striking findings which suggest that there were real differences in the practices of the groups. For example, the study group transferred infants in transport incubators set to run at a significantly higher temperature than the control group (mean 38.4°C vs. 34.5°C), and this appeared to result in warmer babies on completion of transfer.

This was followed by a larger study from North Carolina (Hood, Cross et al. 1983). In this study of 603 infants weighing 500–2500g, three hospital NICUs were compared. One of these had a transport team which collected outborn infants (study group) while the other two centres asked that units who referred patients to them brought them in (control group). This retrospective cohort study ran from 1977 to 1980 and was confined to infants with primary respiratory disorders. Condition on completion of transfer was compared between the groups and the study group were found to have a reduced incidence of hypothermia (temperature <36°C) and acidosis (arterial pH <7.2). The infants admitted to the control units were at significantly increased risk of death compared to the study group. It is of interest and note that similar problems with temperature and acid/base balance were seen in the infants transferred by untrained teams both in this study and the previous one. While this study has greater numbers of patients they were not prospectively enrolled or randomised. The differences found may be due to other factors in the systems of care at all the hospitals in the study.

In the UK, structured evaluation of staffing arrangements for transport has in the last ten years consisted only of our earlier audit study which suggested that sending a trained Transport Nurse on every transfer as expert support for the doctor was associated with improved transport outcomes (Leslie &
Stephenson, 1997). This study compared an early period (August 1991 – February 1993), when neither the doctor nor the nurse attending transfers had received specific transport training, with a later period (January 1994 - July 1995). Between the two periods a nursing transport team had been formed to ensure that on every transfer there was at least one person, the nurse, who had received transport training. The transfers in both periods were led by doctors who were specialist registrars without transport training. As with the two studies above (Chance, Matthew et al. 1978; Hood, Cross et al. 1983), the focus was on comparing the conditions of the two groups of babies on completion of transport. No differences were found in post transfer values for blood pressure, blood sugar or oxygenation. Significant differences were found between the post transfer data on blood pH and body temperature when the earlier period was compared to the later. Babies in the earlier period more frequently completed the transfer with values for these two parameters that were outside of normal limits compared to babies in the later period. This study is limited by being a comparison between two time periods, and the improvements seen may have been a consequence of a wide range of changes and improvements in the practice of neonatal care. This is the third study reviewed here which suggests that blood pH and temperature control are particularly pertinent to competent transport practice.

There are two transport research studies which examine the outcomes of replacing doctors with nurses as the team leader for neonatal transfers. The first is from Minneapolis in 1976 to 1979 and evaluated the “effectiveness of using selected, specially trained, NICU nurses as team leaders in the transport of newborn infants who require intensive care” (Thompson, 1980). This study compared two groups of infants transferred to the same centre, one by doctor-led transport teams and one group nurse-led. All transfers were also attended by a transport nurse. The neonatal nurses (n=4) who led transfers in place of doctors undertook an “eight week didactic and practical educational program in the assessment, management, stabilisation and transport of ill newborns” Allocation to groups was by availability, not randomisation, and transports were triaged such that infants who were very unwell at the time of the initial referral were allocated to doctor-led transfer. The data were collected by the author undertaking retrospective review of the notes of all transfers within 24 hours.
Probably because of the triaging of the transfers, there are differences between the groups for baseline descriptive factors, such as the incidences of primary respiratory disorder, perinatal asphyxia, congenital heart disease and for gestation. The only outcome measure examined is survival to discharge from the research NICU and similar overall survival rates are seen (81% for nurse-led, 75% for doctor-led).

There are substantial problems with this study. The most significant arise from the attempt to compare outcomes for the two groups when the pre-transfer triage has resulted in groups that are not alike. The similarity in outcome may not have been found if the nurses were also transferring the sickest infants. The other significant problem is the outcome measure chosen - survival to discharge. Since this study was published other data have shown that for transported newborn infants what happens after transport, during their period of tertiary intensive care, is more important than the transport itself in determining outcome (Harding & Morton, 1994). In other words, any hypothesised beneficial effects of competent transport are confounded for the researcher by the large number of other interventions applied in the post-transfer period. This does not mean that transport is unimportant in long-term outcome, but that it is hard to study. Short-term post-transfer data, for example the simple bio-physical measurements such as blood pH and body temperature used in the studies above, were not scrutinised in this study. While the study concluded that the nurses could "effectively assume the transport team leadership role for ill newborns" it is unclear how this conclusion is supported by the data.

The second study of nurse-led transport (Cook & Kattwinkel, 1983) was from Virginia and conducted from 1978 through to 1980. As with the previous studies, allocation to nurse or doctor-led transport was by availability, not randomisation. Fifty-five infants were transferred by the nurse-led team and a further 179 by doctor-led teams. There was no triage of transfers in this study. Descriptive and physiological data were collected prospectively on each transfer. The groups were similar for birth weight and gestation as well as for pre-transfer physiological values (temperature, blood pressure, blood sugar, arterial pH, arterial oxygen level (PaO₂) and arterial carbon dioxide level (PaCO₂)). However, one factor appears to be significantly different between the
groups, the rate of transfer of infants of birth weight <1001g. Only one of 55 (2%) infants transferred by the nurse-led team was in this category, compared to 21/141 (15%) transferred by paediatric residents.

Post transfer evaluation of the physiological variables showed no differences between the groups for blood pressure, blood sugar, arterial pH, PaO₂ and PaCO₂. These were evaluated both as comparisons of the values obtained for the groups and the frequency that the values obtained fell outside of a "normal limit" (for example, mean blood pressure <30 mmHg). A significant difference was found between the nurse and paediatric resident-led groups for incidence of temperature less than 36°C on completion of transfer (5% vs. 16% respectively). This difference remained when the data were re-analysed excluding infants <1001g. The conclusions, that neonates "in all groups demonstrated similar severity of illness before transport, showed significant improvement during transport and were in comparable condition after transport", are supported by the data. The significant problem with this study is that just one nurse did all the nurse-led transfers. This substantially limits the ability to generalise from the findings.

These last two studies are the only two which have been published which evaluate neonatal transports led by nurses. Beyond the problems with each of the studies, there are a number of further problems with generalising these to the UK neonatal setting. The professional backgrounds, preparation and training for the nurses in the studies are not analogous to UK ANNPs. In these studies experienced NICU nurses were put through quite short and locally-determined preparation programmes to prepare them for transport. In the UK the most likely minimum level of nurse who will be acceptable to lead transfers is one who has completed an ANNP programme. There may be similar differences between the medical groups. Further, the studies are old and much has changed in the provision of neonatal intensive care since the late 1970's. Improvements in antenatal care, particularly the administration of steroids when preterm delivery is threatened, and in postnatal care, for example in the delivery of exogenous surfactant to the lungs of newborn premature infants,

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1These are run by academic institutions to rigorous standards and provide generic advanced practice neonatal nursing knowledge and skills applicable to many areas, including transport
mean that the patients being transferred between NICUs now are quite different from 25 years ago.

2 ANNP effectiveness in newborn care

This research is concerned with a change in the professional backgrounds and preparation of the people who attend transfers and specifically with the replacement of doctors with ANNPs. ANNPs are a new group in UK neonatal care, though they were introduced in the USA in the 1960's (Clancy & Maguire, 1995). The first ANNP course in the UK was run in 1992. A common feature of the new job in the UK and USA was integration of medical and nursing perspectives, and in both places it appears the impetus for change was problems with medical staffing (Oliver & Allan, 1998; Redshaw, Hart et al. 1999)

Two studies have evaluated the effectiveness of UK ANNPs in clinical settings, resuscitation at birth and routine neonatal examination.

To evaluate practice in resuscitation at birth a retrospective analysis of routinely collected data (Aubrey & Yoxall, 2001) comparing infants resuscitated by ANNP and doctor-led teams in Liverpool was performed. This took place over a period (January 1998 to April 1999) when either ANNPs or doctors attended deliveries where the infant might require resuscitation, and when this allocation was based on availability. The project was confined to infants less than 33 weeks gestation. There were 76 infants in the ANNP group and 169 in the doctor group and they were not significantly different for birth weight, gestation or condition at birth (assessed from cord blood pH and Apgar scores at 1 and 5 minutes). Infants resuscitated by the doctor-led teams were significantly later to be intubated, later to receive surfactant and more likely to be hypothermic on NICU admission (temperature <35°C). There were no differences in longer-term outcomes, such as survival. The study concludes that “outcome of (preterm) infants resuscitated by ANNPs is comparable to the outcome of infants resuscitated by doctors.”
The other UK ANNP study also examined a setting where ANNPs had been introduced into routine practice (Lee, Skelton et al. 2001). This study investigated routine examination of the newborn and used the two hospitals in Hull as comparison sites. At one hospital all the newborn examinations were performed by ANNPs and at the other they were done by junior doctors. Infants were not randomised to examination by one group or the other. To elicit effectiveness, the referrals of infants to specialist follow-up clinics (orthopaedic, ophthalmic, cardiology) following the examinations were investigated. The study found that ANNPs were “more effective in detecting abnormalities during the neonatal check”.

These two studies, in common with the transport studies above, are of a workforce change that has been made and then evaluated. This has both practical and research implications. Practically, it suggests that factors other than clinical effectiveness drove these changes. Two of the papers comment that shortage of medical staff had been key (Oliver & Allan, 1998, Aubrey & Yoxall, 2001). This has influenced research methods so that without exception these evaluations have been of groups selected according to the operation of the local system of care. There are no randomised trials of ANNP or neonatal nurse-led care. One could hypothesise that design of these studies may have been systematically biased in favour of the nurse-led service, for example by selecting outcome measures that were likely to be positive for nurses or ANNPs. It may be that, while the wider adoption of such services may be influenced by research, the issues which drive the adoption of the ANNP-led resource are more complex. Many of these issues emerged during the introduction of ANNP-led transport detailed in Chapters 4-7.

3. Implementation of ANNP-delivered care

The introduction of ANNPs into the UK NICU setting since 1992 has been accompanied by other research. The next studies to be reviewed are those which have some relevance to this thesis, having content that is concerned either with transport or the process of implementing advanced practice working. Redshaw’s research has shown what ANNPs do (Redshaw & Harvey, 2002a),
how well accepted they are (Redshaw & Harvey, 2002b) and has contrasted the various ANNP training programmes (Redshaw & Harvey, 2001).

The most recent of these studies was concerned "to document the practice of a large number of NNPs¹ working in different types of unit in various parts of the country" (Redshaw & Harvey, 2002a). The data were mostly collected using a work diary completed by ANNPs over ten consecutive shifts but also by observation of practice by one of the researchers. Diaries were returned by 68/109 qualified ANNPs. The data presented describe the frequency with which technical skills (e.g. insertion of intravenous cannulae) and workplace activities (e.g. resuscitation at birth) are performed by ANNPs. These data suggest that ANNPs attended emergency transfers on 6.7% of shifts, and that 29.7% of ANNPs undertook this activity. They do not tell us if this is with or without a doctor, and it may be that these data aggregate situations where ANNPs led transfers with others where they supported doctors on transfers.

The study concludes that "how the role of the NNP has been enacted in the UK... has been shown". While the study shows what tasks ANNPs undertake, these are the results of many separate processes of practice reconstruction on many units. The study demonstrates that ANNPs are doing these things, but not how this change was made. For example, the transport data tell us that some ANNPs did some transport but not in what capacity or how they got to the point of being able to do so. In this respect the study is a useful baseline snapshot against which future data can be compared, but does not help others concerned with the issues which may emerge and the resources that may be needed to adopt ANNP-led care.

A further study published at the same time by this group (Redshaw & Harvey, 2002b), uses the skills audit reported above, along with questionnaires, to compare the views of ANNPs and senior NICU medical staff regarding what ANNPs do at work. Significantly more ANNPs than doctors considered that "taking charge of emergency transfers" (94.9% vs. 70.9%) was, or could be, part of ANNP clinical activities. This is simply a report of what ANNPs might do.

¹ Redshaw's term "NNPs" (Neonatal Nurse Practioners) is interchangeable with "ANNPs" (Advanced Neonatal Nurse Practitioners)
at work and does not tell us if they are really doing transport or what the processes involved in becoming able to do transport might be. The study includes qualitative data relating doctors comments on the utility of ANNPs in neonatal care and concludes that the "introduction of NNPs in seen positively from the perspective of clinicians working alongside them in neonatal care."

There is one final study in this section which is different in being ostensibly concerned with the process of change The study (Woods, 2000a) is concerned with a broad-based group (n=5) of nurses from a variety of settings, including adult intensive care and casualty as well as one from NICU. Woods's work is a longitudinal study of transition, focussing on the advanced nurse practitioner (ANP) education programmes undertaken by these five nurses in 1995-6, and who he followed through to 15 months post-graduation The general aim was "to investigate the experiences of a group of nurses undergoing training to prepare them for the role of advanced nurse practitioners" and followed a qualitative methodology which developed research questions during the process. This led to some further issues being elicited. These were whether the educational and clinical preparation of ANPs were considered appropriate; a consideration of the expectations of advanced practice held by ANPs and their colleagues; the personal and practice development of ANPs during role transition; identification of the ways in which the ANPs role influenced the practice of professional colleagues, and lastly understanding the factors that facilitated and/or impeded role development and performance.

Five cases were selected from 25 people enrolled on a one year, full-time masters programme in advanced nursing practice at a UK University. One nurse each was chosen from adult intensive care, casualty, neonates, gynaecology and rehabilitation Each "case", as well as the student, comprised the consultant preceptor, directorate manager, clinical nurse manager, university pathway co-ordinator, a junior doctor and a nursing colleague.

Tape recorded interviews were used extensively. Observation of clinical practice was only possible for three of the five subjects, due to problems with

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1 Advanced Nurse Practitioner is a generic term for any (neonatal or non-neonatal) nurse working at advanced practice level
"access". Three of the five cases also completed "role development diaries", but these are not extensively cited. Woods' analysis is based on Glaser and Strauss's grounded theory methods (Glaser & Strauss, 1967; Silverman, 2000), an inductive approach to data analysis. These “techniques include: the generation of codes, the reduction of data, the generation and relating of categories, and the development of analytic frameworks" (Woods, 2000b, p. 54).

Examination of practice reconstruction in this study is performed with a model constituted of seven domains (cognition, skills, behaviour, affect, identity, relationships, roles) that require to be rebuilt or restructured for the transition to ANP to be completed. However it is unclear how the seven domains were derived. Woods says that in adding the how to the picture, the domains have come to include elements such as affect and identity that are not readily constructible in behavioural objective terms (Woods, 2000c, p.76). Woods's conclusion is that new ANPs either obtained a clinical focus and delivered care or became "orchestrators" with a focus on the system of care delivery. The findings of this study were that "the orientation of practice reconstruction was in all cases uni-directional"(Woods, 2000c, p.77). All the ANPs in this study became either wholly oriented toward system of care issues with no regular clinical practice, or wholly oriented to clinical practice with no input into the wider system of care. The neonatal nurse in Woods's cohort is recorded as having moved into "a role virtually identical to that of a junior doctor in a neonatal unit"(Woods, 2000c, p. 83) and Woods marks this as an exception. The study demonstrates that educating nurses to work differently is not on its own enough to change the delivery of care. Although Woods attempts to be oriented toward process rather than outcome and aims to track process in each of the seven domains, the analysis simply shows that change has happened (or has not happened), and does not track the issues and resources that emerged during the process.

For others concerned to implement advanced practice nursing Woods's research does not explain how to orientate practice reconstruction in the desired direction. Redshaw's work similarly is concerned with the outcomes of the process of change. In order to understand what happens for individuals in a
setting making a transition, such as ANNPs moving to becoming able to lead transports, both the individuals and the setting need to be studied. Whilst Woods acknowledges that features of the employing institution profoundly affect the outcomes of practice reconstruction, what these features are is not investigated. Woods's work is not centrally concerned with the process that individuals and small groups of ANNPs, as well as their institutions, go through to become able to do the job that they do. Thus neither the work of Woods nor Redshaw makes an account of the resources required to accomplish the process of change. Furthermore, neither presents data concerning change over time. An approach is needed which elicits the issues in the transition over time in a broader and more structured framework, which reflects the fine-grained complexity of NHS organisations and the interplay of many factors, local, national, professional, clinical and legislative that are influential. This thesis addresses these issues in Chapters 4-7.

ANNPs and transport – research setting, resources and approaches

In summary, two related issues are addressed in this thesis. First, is transport safe and practical for infants transferred by ANNP-led teams compared to teams led by Specialist Registrars (SpRs)? This question is addressed in Chapter 2 using quantitative data. Secondly, for others wishing to consider the implementation of an ANNP-led transport policy, what are the issues and resources which may need to be addressed in the process of making ANNPs able to do transport? This question is addressed in the qualitative evaluation in Chapters 4-7. In common with many of the settings described above, the change to ANNP-led neonatal transport in Nottingham was already happening at the time this research was conceived and undertaken. This section makes clear the time frames for the two research strands and details the data resources and approaches used in the analyses which follow.
1. Quantitative outcomes – resources and approaches.

Chapter 2 is a quantitative evaluation which uses routinely collected data to compare transport outcomes between ANNP and doctor-led teams. This considers transfers which took place from September 1997 for four complete years. ANNP-led transport began in Nottingham in September 1997. This followed my own ANNP training in 1995 and a further period of work to consolidate this and attend to issues which would support the new service. The quantitative evaluation includes transfers led first by me, and later by two new ANNPs up to September 2001. They undertook the formal ANNP training programme in 1998 and subsequent local transport training. The key milestones for the two new ANNPs (ANNP1 and ANNP2) are illustrated in Figure 1.1.

New treatments and new options in how care is delivered are constantly being developed. In response it is appropriate for evaluation to be done. When a new drug becomes available, patient’s responses are formally compared to standard treatment. New drugs are particularly well-suited to highly-structured formalised evaluation, and the double-blind, randomised controlled trial (RCT) is generally seen as the gold-standard (Jadad & Rennie, 1998). Likewise, new techniques are evaluated, sometimes in structured studies (UK Collaborative Trial Group, 1996) but often, and particularly when the new technique is surgical, in relatively unstructured studies, perhaps as a case series or using historical controls (Mychaliska, 1997).

What all these evaluations have in common is the need to show that the new is at least as effective as the old, and that any improvements are not gained at a clinical or financial cost which is unacceptable. Where they vary is in the methods brought to the evaluation. These methods are dependent on the constraints of the type of change that is being evaluated, and to some considerable extent on regulatory frameworks. Drug evaluations are highly regulated and new drugs may not be made available until structured evaluations have been done (Medicines Control Agency, 1997), whereas changes in the staffing arrangements for the provision of a service are not so overtly regulated.
Performing an RCT to investigate ANNP and doctor-led transfers was considered in detail and rejected. In favour of a randomised study was the quality of the evidence that would be gathered. Robust trial procedures would ensure that the two groups of babies (ANNP-led and doctor-led transfers) were similar for descriptive characteristics, such as gestation, and for illness severity. Power calculations could have been performed that would guide study size so that any clinically important differences between the performance of the groups would be detected. An RCT was rejected for a number of reasons. The most important was that the central concern of the study is to demonstrate that ANNP-led transport is safe and practical, not to delineate the precise scale of any differences in the transport performance of ANNPs and doctors. Furthermore, data are collected routinely for audit purposes in Nottingham which might be used to answer many of the questions that an RCT would be concerned with, including post-transfer physiological variables. Finally, the undertaking of an RCT would require substantial resources that were not available.

The routinely collected data used for the quantitative evaluation are gathered from an audit form (Appendix 2) completed contemporaneously by the transport nurse on every acute transfer of a baby undertaken by the Nottingham Neonatal Transport Team. Completion of the form is a routine part of the work of the transport nurse. No extra tests are done beyond those which are clinically indicated. This means that not every data box is completed on every transfer. The conditions under which tests are done are not standardised, so the readings that are used in the data boxes are the ones which the team had generated and were using to make clinical decisions. The data generated are used in a number of ways in a programme of continuous quality monitoring and improvement. These forms were used as the source of data for the quantitative study. Details of the parameters studied are given in Chapter 2 and the general approach to the data is discussed in Chapter 8 where questions are raised concerning how workplace change is understood.
2. Qualitative processes – resources and approaches

The qualitative data in Chapters 4-7 are concerned with the issues and resources which were addressed in the process of facilitating ANNPs to do transport. Two new ANNPs undertook the formal ANNP training programme in 1998 and subsequent local transport training. The qualitative study in Chapters 4-7 examines the period from the end of post-training consolidation up until they were both able to lead transfers. Figure 1.1, at the end of this chapter, is a timeline illustrating the milestones for the two new ANNPs from starting ANNP training to becoming able to lead transfers.

Details of the data collected and how the data were analysed are given in Chapter 3. Both written and spoken data were collected, and all the individuals concerned gave their consent for their spoken words or written documents to be included. An integrated ethnomethodology was used to collect these data in that the work of making the change happen and the work of studying the change were not separate.

The written data comprise relevant documents arising from the NICU over the period in question. They were collected in a number of ways. Documents were collected contemporaneously, as they were produced, distributed and discussed. Further documents were collected at the end of the data collection period by searching physical and computer files for other materials with relevance to the research. These searches were repeated to gain as complete ascertainment of materials as possible.

Spoken data were collected by open recording onto tape. Any meeting or other event which might have relevance to ANNP practice was recorded. All the tapes were digitised and transcribed, and the transcriptions were carefully checked against the digitised recordings. The timing of the recorded data collection is detailed in Figure 1.1, where the timings of the meetings may be seen in the context of significant milestones in the change process. The nature of the meetings which were recorded are detailed in Chapter 3. The earliest recording is of a special meeting with the two ANNPs in August 1999 and it was following this meeting that their period of transport training commenced.
Qualitative data collection stopped in June 2001 when both ANNPs were able to lead transfers independently.

To identify and make analytic sense of the emergent issues concerning the prospective introduction of the new ANNPs in the setting studied two frameworks were used. The first concept, introduced in Chapter 4, is of "Communities of Practice", as described by Wenger (Wenger, 1998) Communities of practice provides a framework for understanding change at work by tracking the situated process of the formation of a new workplace group, a community of ANNPs concerned with the practice of inter-hospital transport. The second, "circulating reference" (Latour, 1999), is introduced in Chapter 7 and refines the understanding of workplace change given by communities of practice by accounting for how remote influences are given meaning in the local setting.

Summary

The existing literature concerned with the people who do neonatal transport comprises evaluations of changes that were already taking place. They generally purport to show that the new way of delivering transport is better than the old way, but the absence of any randomised trials means that the quality of the evidence is inadequate in terms of the RCT standard. Suggestions of improved long-term outcomes for infants under the new regimes of care are difficult to substantiate. The ANNP literature from the UK shows, however, that the absence of conclusive evidence of benefit has not stopped new groups contributing to the delivery of care. Factors other than evidence of clinical benefit appear to be driving these changes.

What follows is an examination of the introduction of ANNPs into neonatal transport which takes account of these social conditions. ANNPs are mostly not being introduced into clinical care because they deliver better care (although they might), but because they fill a gap caused by changes in the availability, numbers and working hours of junior doctors. For the NICUs concerned to implement ANNP-led care what is at issue therefore are two key questions—
first, is the change safe for patients when compared with existing arrangements and secondly, if it is safe how is the change accomplished? This thesis answers these two questions with respect to neonatal transport. The title of the thesis, change at work, reflects a deliberate ambiguity, being concerned on the one hand to understand the change that happened in the workplace and on the other to study the process of the change, the ways in which change is put to work.
Figure 1.1 - Timeline for the period over which ANNPs 1 and 2 moved to become ANNPs and then ANNPs who could do transport

Significant milestones are given (* - with footnote). Timing of recorded data are also given (☆ - Clinical supervision, ANNP1; ☼ - Clinical supervision, ANNP2; ⋄ - ANNAP strategy meeting; Δ - Transport team meeting; ☀ - Special meeting, ANNP1 and 2; Ω- ANNP1, medequate meeting; % - ANNP meeting) – see Chapter 3 for details of the nature of these meetings.

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</table>

1 ANNPs 1 and 2 start ANNP course
2 ANNPs 1 and 2 finish ANNP course
3 Post-course clinical consolidation starts
4 Finish clinical consolidation period - working on NICU
5 Transport training starts
6 ANNP1 completes transport training
7 ANNP2 completes transport training
Chapter 2.

Outcome – Is ANNP-led neonatal transport practical and safe?

Introduction

This chapter is an evaluation of outcomes associated with the change to ANNP-led neonatal transport. It addresses the category of questions that are asked first about changes in delivery of clinical care – what, if any, are the effects of the change on patients? The outcomes which are studied in this chapter are all very short-term, comprising the condition of infants during and after transfer. A slightly compressed version of this chapter, including all the data, has been published (Leslie & Stephenson, 2003).

This chapter reports the first four complete years of operating a transport service that uses ANNPs and SpRs interchangeably. ANNP-led transport became a practical possibility locally in September 1997, as shown in the timeline (Figure 1.1).

This chapter concludes by raising questions of concern to those who might wish to implement ANNP led transport in other situations. Outcome measures are central to the evaluation of any change in service provision but do not provide any basis for understanding the development of a service that supports effective outcomes. The focus and argument of this research is that it is necessary to examine in detail the processes of implementation and change in introducing ANNP-led transport systems. Change in working requires a close examination of change at work. We need to identify approaches and resources that not only describe the process of change but actually show how participants address issues and develop resources that allow change to occur in ways that make possible the successful outcomes detailed in this chapter. Subsequent chapters present and develop a qualitative understanding of the change process. Their aim is to develop a framework for understanding change that takes account of local differences but which is also capable of providing a generic framework for others who might wish to understand
what is critical to their own local circumstances in introducing ANNP-led transport. Following this chapter the focus of the thesis shifts to examination of the process of implementing ANNP-led transports and in Chapter 8 the several strands of outcome and process oriented work are placed in the context of each other to demonstrate their complementarity.

Methods

Data were collected contemporaneously on all acute transfers conducted by the Nottingham Neonatal Service (including: demographic details of the baby; the infants' problems; referral centre; timing of each stage of the transfer; equipment used during transfer; equipment problems, maximum ventilation requirements during the transfer; number and type of infusions and any medical problems with the baby during transfer). The timing data were used to derive a response time, (time from acceptance of the referral to departure from the base unit), a stabilising time (arrival at referring unit to departure from that unit) and a return journey time (departure from referring unit to arrival at base unit) for each transfer. Data were also collected on blood glucose, systolic blood pressure, blood pH, oxygenation and core body temperature at two points in time on each transfer. Pre-transfer data were collected as soon as possible after the team arrived at the referring centre, to reflect the condition of the infant before any stabilising. Post-transfer data were collected after the infant had been transferred from the transport incubator to a static incubator in Nottingham, to reflect the condition of the infant after transfer (Leslie & Stephenson, 1994; Leslie & Stephenson, 1997). Oxygenation was assessed by arterial sampling (PaO₂) where possible. As no additional tests were performed beyond those clinically indicated, an oxygen saturation value (SaO₂) was recorded if no PaO₂ was available. Core temperature was measured in the axilla using a Suretemp electronic thermometer.

A transport nurse attends every transfer. Acute transfers are attended by a second team member, either a Specialist Registrar (SpR), or an ANNP. Allocation to ANNP or SpR-led transfer is determined by availability. ANNPs are usually
scheduled to work 08.00-18 00 on the NICU, but are extra to the medical and nursing complement at that time, in order that they may attend transfers if required. Out of these hours, and when an ANNP is unavailable for any reason, transport expertise is provided by SpRs. Transfers are not triaged; that is, ANNPs attend any neonatal transfer that occurs when they are available and there is no process of filtering transfers to be either doctor or ANNP-led depending on the acuity of the referral. The same equipment is used on all transfers.

The SpRs (n=34) were all Paediatric trainees. A transport training day is organised for this group twice a year. The ANNPs (n=3) are myself and the two new ANNPs who are the individuals around whom the subsequent "process" section of this thesis is focussed. Each followed ANNP training with a period of consolidation on their base unit before starting transport training. Transport training comprised attending transfers (15-20) with experienced team leaders, SpRs or ANNPs. The clinical director of the NICU conducted a final check-off exercise, based around demonstrating clinical problem-solving skills and competence at "prescribing." I was the only ANNP undertaking transfers until August 2000 when ANNP1 became able to lead transfers. ANNP2 contributed from June 2001.

Data were analysed on all 51 retrievals of neonates less than 28 days of age at the time of transfer by ANNP-led teams into a Nottingham neonatal unit between September 1997 and September 2001. These were compared with 51 SpR-led transfers conducted over the same period, selected by taking the next consecutive SpR-led retrieval into Nottingham after each ANNP-led retrieval.

A number of factors influenced the study design. A prospective study was not possible as there were no funds available for what would have been a substantial multi-centre project. The utility of a retrospective analysis depends on the type and quality of the routine data that are collected and the Nottingham neonatal transport team has kept comprehensive audit records of transfers for many years. Only transfers into a Nottingham NICU were studied, excluding babies whose journey ended elsewhere because of the poor quality of the routine post-transfer physiological data in babies transferred to other units. Only infants under 28 days
of age at the time of transfer were included, as the ANNP transfer group included 5 babies much older than this (age at transfer 29-66 days, median 39) who made the ANNP and SpR-led groups significantly different for gestation, age and weight at transfer. When they were excluded from the analysis, and a control group formed by selecting the next consecutive SpR-led transfer after each ANNP-led transfer of babies less than 28 days of age at the time of transfer, then the baseline characteristics between the groups for these basic details were not statistically significantly different. This became the unmatched case-control study.

**Statistical methods**

For demographic data, medians and ranges are given. Mann-Whitney U-Tests and Wilcoxon's signed rank tests were used for comparisons between and within the cohorts. A significant result was deemed to be one where $P<0.05$.

**Results**

1. Details of infants transferred.

Characteristics of the infants transferred are given in Table 2.1. Referrals came from a maximum distance of 80 miles. Infants were transferred from a total of 17 units. There are no significant differences between the groups for gestation at birth, gestation at transfer, weight at transfer or age at transfer. The groups were similar for diagnosis at the time of transfer, the most common diagnosis in both groups being prematurity and respiratory distress syndrome (ANNP: 23/51; SpR: 25/51). The remaining infants had a large number of other diagnoses (ANNP, n=18; SpR, n=16), with small numbers of babies presenting with each.
Table 2.1. Characteristics of the two groups of babies (ANNP-led n=51, Doctor-led n=51). Gestations are completed weeks. There are no significant differences (p<0.05) between the groups for any category (Mann Whitney U-Test).

<table>
<thead>
<tr>
<th></th>
<th>ANNP-led Median (Range)</th>
<th>Doctor-led Median (Range)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestation at birth (weeks)</td>
<td>32 (23-41)</td>
<td>32 (23-40)</td>
<td>0.9</td>
</tr>
<tr>
<td>Gestation at transfer (weeks)</td>
<td>33 (23-41)</td>
<td>33 (23-43)</td>
<td>0.83</td>
</tr>
<tr>
<td>Weight at transfer (kg)</td>
<td>1.66 (0.53-5.1)</td>
<td>1.76 (0.56-3.91)</td>
<td>0.89</td>
</tr>
<tr>
<td>Age at transfer (days)</td>
<td>1 (0.2-28)</td>
<td>0.75 (0 2-28)</td>
<td>0.15</td>
</tr>
</tbody>
</table>

2. Times.

Time data are shown in Table 2.2. It was not possible to derive a response time for 10 ANNP-led transfers or for 7 doctor-led transfers. This was usually because the team were already committed to another transfer. The ANNP-led teams had a statistically significantly faster response time and spent significantly longer in the stabilising period. All the ANNP-led transfers started on Monday-to-Friday between 08.00 and 18.00. The SpR transfers were also predominantly Monday-to-Friday activity (n=44), but 32 started after 18.00 and before 08.00.
Table 2.2. Times. The response time is derived from the time the request for transfer was accepted to the time the team departed from the base unit. The stabilising time is derived from the time of arrival on the referring unit until the time the team departs, the return journey time is the time from departing the referring unit to arrival in Nottingham, and the total transfer time is time from departing base unit to arriving back at base unit. Differences between the groups were assessed using the Mann Whitney U-Test.

<table>
<thead>
<tr>
<th></th>
<th>ANNP-led</th>
<th>Doctor-led</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response time</strong></td>
<td>n= 41</td>
<td>n= 44</td>
<td>0.0007</td>
</tr>
<tr>
<td>(minutes)</td>
<td>Median (Range) 55 (15-285)</td>
<td>Median (Range) 79 (20-345)</td>
<td></td>
</tr>
<tr>
<td><strong>Stabilising time</strong></td>
<td>n= 50</td>
<td>n= 50</td>
<td>0.049</td>
</tr>
<tr>
<td>(minutes)</td>
<td>Median (Range) 120 (50-280)</td>
<td>Median (Range) 97.5 (30-290)</td>
<td></td>
</tr>
<tr>
<td><strong>Return journey</strong></td>
<td>n= 51</td>
<td>n= 51</td>
<td>0.32</td>
</tr>
<tr>
<td>time (minutes)</td>
<td>Median (Range) 50 (15-110)</td>
<td>Median (Range) 45 (15-110)</td>
<td></td>
</tr>
<tr>
<td><strong>Total time</strong></td>
<td>n= 51</td>
<td>n= 50</td>
<td>0.41</td>
</tr>
<tr>
<td>(hours)</td>
<td>Median (Range) 4.75 (1.5-8.5)</td>
<td>Median (Range) 4.77 (1.75-8)</td>
<td></td>
</tr>
</tbody>
</table>

3. Procedures.

A tick-list was completed contemporaneously by the transport nurse, to indicate procedures both attempted and successfully completed by the ANNP or doctor, and details are given in Table 2.3. No distinction was made in the data collection between attempting a procedure, such as umbilical arterial catheter placement, and successful completion. All infants who required first intubation or reintubation by the transport team had the procedure successfully completed. There were no differences between the groups (Mann-Whitney U-Test) for any procedure. There were non-significant trends for the ANNP-led teams to perform more first intubations (where an infant had never been intubated previously), more umbilical arterial catheters and for the doctor-led teams to perform more reintubations.
Table 2.3. Procedures attempted or completed by the transport team. These are expressed as the number of transfers (proportion of transfers) on which each procedure was attempted, except number of blood gases which shows the number of these done on each transfer. There are no statistically significant differences (p<0.05) between the groups for any category (Mann-Whitney U-Test).

<table>
<thead>
<tr>
<th></th>
<th>ANNP-led</th>
<th>Doctor-led</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral arterial catheter. n= (%)</td>
<td>5 (9.8)</td>
<td>5 (9.8)</td>
</tr>
<tr>
<td>Umbilical arterial catheter. n= (%)</td>
<td>5 (9.8)</td>
<td>2 (3.9)</td>
</tr>
<tr>
<td>Umbilical venous catheter. n= (%)</td>
<td>1 (1.9)</td>
<td>1 (1.9)</td>
</tr>
<tr>
<td>First intubation. n= (%)</td>
<td>6 (11.7)</td>
<td>1 (1.9)</td>
</tr>
<tr>
<td>Reintubation. n= (%)</td>
<td>6 (11.7)</td>
<td>11 (21.5)</td>
</tr>
<tr>
<td>Blood gases - Median done/transfer (Range)</td>
<td>2 (0-4)</td>
<td>1 (0-5)</td>
</tr>
</tbody>
</table>

4. Ventilation and other support given in transit

Details of ventilatory and other support are given in Table 2.4. Of the infants transferred by the ANNP-led teams, 34/51 (66%) were ventilated via an endotracheal tube during the journey. A further 13 (25%) were in supplemental oxygen, but not ventilated. This was not significantly different from the doctor-led group - 30/51 (59%) ventilated, 10 (19%) in supplemental oxygen. A number of babies in each group were neither ventilated nor receiving supplemental oxygen (ANNP-led: 4/51, doctor-led: 11/51). These were infants referred with a variety of gastro-intestinal surgical diagnoses. There were no significant differences between the groups in the level of ventilatory support needed or supplemental oxygen, whether ventilated or not. All the ventilated infants transferred by ANNP-led teams received intravenous opiate sedation during the journey, usually morphine or
diamorphine, and 28/30 ventilated infants transferred by the doctor-led teams were similarly appropriately sedated.

Table 2.4 - Support required in-transit. Data on maximum respiratory support refers to infants on ventilation. Data on infusion numbers, inotrope use, blood pressure monitoring and transcutaneous gas monitoring refer to percentage of all transfers. PIP=Peak Inspiratory Pressure, PEEP=Positive End Expiratory Pressure. There are no statistically significant (p<0.05) differences between the groups (Mann-Whitney U-Test).

<table>
<thead>
<tr>
<th></th>
<th>ANNP-led</th>
<th>Doctor-led</th>
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</thead>
<tbody>
<tr>
<td>Number ventilated (%)</td>
<td>34 (66.6)</td>
<td>30 (58.8)</td>
</tr>
<tr>
<td>Max. PIP, Median (Range) (cmH₂O)</td>
<td>19 (13-35)</td>
<td>20 (14-32)</td>
</tr>
<tr>
<td>Max. PEEP, Median (Range) (cmH₂O)</td>
<td>4 (2-5)</td>
<td>4 (2-6)</td>
</tr>
<tr>
<td>Max. Ventilator rate, Median (Range)</td>
<td>55 (6-90)</td>
<td>60 (15-76)</td>
</tr>
<tr>
<td>Max. FiO₂ (ventilated infants), Median (Range)</td>
<td>0.38 (0.21-1)</td>
<td>0.39 (0.21-1)</td>
</tr>
<tr>
<td>Max. FiO₂ (unventilated infants), Median (Range)</td>
<td>0.27 (0.21-0.6)</td>
<td>0.27 (0.21-0.6)</td>
</tr>
<tr>
<td>Ventilated babies receiving sedation, n (%)</td>
<td>34 (100)</td>
<td>28 (93)</td>
</tr>
<tr>
<td>Number of infusions per infant, Median (Range)</td>
<td>2 (1-5)</td>
<td>2 (1-5)</td>
</tr>
<tr>
<td>Inotropic support, n (%)</td>
<td>7 (13.7)</td>
<td>3 (5.8)</td>
</tr>
<tr>
<td>Intra-arterial BP measurement, n (%)</td>
<td>17 (33.3)</td>
<td>21 (41.1)</td>
</tr>
<tr>
<td>Transcutaneous blood gas monitoring, n (%)</td>
<td>11 (21.5)</td>
<td>5 (9.8)</td>
</tr>
</tbody>
</table>
There were no records of any transport related adverse events during any journey. These were defined as (any of) extubation, intubation, treatment for pneumothorax or administration of resuscitation drugs.

5. Clinical condition

Table 2.5 shows details of the five physiological parameters that could be recorded. These assess whether infants were significantly different pre- or post-transfer in the ANNP compared to the doctor-led group and compare the pre- and post transfer values for ANNP and doctor-led transfers, to assess the effect of stabilisation and transfer by each group on each parameter. Comparisons between the ANNP and doctor-led groups are made using the Mann-Whitney U-Test, and pre and post transfer comparisons within each group are made using the Wilcoxon signed rank test.

The pre-transfer values for pH and PaO₂ obtained for infants transferred by the doctor-led group were significantly worse than the ANNP-led transfers. Comparisons of infants post-transfer condition with their baseline pre-transfer values shows significant improvements in temperature and SaO₂ values for the ANNP-led transfers. There are no significant differences in the post transfer values obtained for any parameter when the ANNP-led transfers are compared to the doctor-led ones.
Table 2.5. Details of the five physiological parameters that were recorded. Data are shown for ANNP and doctor-led transfers and for the pre- and post transfer time points. In each case, the number of data points available are given.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-transfer</th>
<th>Post-transfer</th>
<th>p Value</th>
</tr>
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<tbody>
<tr>
<td><strong>Blood glucose (mmol/l)</strong></td>
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<tr>
<td>ANNP-led n= 49</td>
<td>4 (1.8-9.8)</td>
<td>4.2 (1.8-6.8)</td>
<td>0.8</td>
</tr>
<tr>
<td>Doctor-led n= 50</td>
<td>4.3 (1.1-15.9)</td>
<td>4.6 (2.2-11.9)</td>
<td>0.11</td>
</tr>
<tr>
<td>p Value</td>
<td>0.92</td>
<td>0.31</td>
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<tr>
<td><strong>Systolic blood pressure</strong></td>
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</tr>
<tr>
<td>ANNP-led n= 41</td>
<td>59 (27-97)</td>
<td>50 (31-112)</td>
<td>0.29</td>
</tr>
<tr>
<td>Doctor-led n= 38</td>
<td>56 (29-118)</td>
<td>56 (26-90)</td>
<td>0.42</td>
</tr>
<tr>
<td>p Value</td>
<td>0.44</td>
<td>0.85</td>
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</tr>
<tr>
<td><strong>pH</strong></td>
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<tr>
<td>ANNP-led n= 46</td>
<td>7.35 (7.04-7.5)</td>
<td>7.35 (6.82-7.49)</td>
<td>0.83</td>
</tr>
<tr>
<td>Doctor-led n= 39</td>
<td>7.31 (6.5-7.46)</td>
<td>7.38 (6.55-7.6)</td>
<td>0.1</td>
</tr>
<tr>
<td>p Value</td>
<td>0.02</td>
<td>0.97</td>
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</tr>
<tr>
<td><strong>Temperature (°C)</strong></td>
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<td></td>
</tr>
<tr>
<td>ANNP-led n= 49</td>
<td>36.8 (34-37.8)</td>
<td>37 (34.6-38)</td>
<td>0.001</td>
</tr>
<tr>
<td>Doctor-led n= 50</td>
<td>36.8 (35-37.9)</td>
<td>36.8 (35.4-37.8)</td>
<td>0.24</td>
</tr>
<tr>
<td>p Value</td>
<td>0.25</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td><strong>OXYGENATION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PaO2 (KPa)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANNP-led n= 21</td>
<td>8.7 (3.5-17)</td>
<td>8.2 (6.6-26)</td>
<td>0.92</td>
</tr>
<tr>
<td>Doctor-led n= 22</td>
<td>6.7 (2.4-13.1)</td>
<td>8.5 (1.89-17.5)</td>
<td>0.19</td>
</tr>
<tr>
<td>p Value</td>
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<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Saturation (%)</td>
<td></td>
<td></td>
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<tr>
<td>ANNP-led n= 30</td>
<td>96 (88-100)</td>
<td>98 (92-100)</td>
<td>0.01</td>
</tr>
<tr>
<td>Doctor-led n= 29</td>
<td>96 (88-100)</td>
<td>97 (92-100)</td>
<td>0.09</td>
</tr>
<tr>
<td>p Value</td>
<td>0.85</td>
<td>0.08</td>
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</tbody>
</table>
Discussion

When there is change at work this should not result in deterioration in the quality of the service to patients. An ANNП-led neonatal transport programme has not been previously evaluated in the UK. These data investigate the safety and practicality of ANNПs in leading transfers and suggest that when acute neonatal transfers are led by ANNПs, the condition of babies on completion of transport is similar to when transfers are led by SpRs. The issues in studying this are outlined below.

These conclusions are based on a range of intra-transport and immediate post-transport measurements, and not on long term survival without disability. This section discusses both the outcomes that were studied and the problems with studying more meaningful outcomes.

1. Transport outcomes – Death or disability

This study does not report mortality or morbidity for the two groups. A number of transport researchers have reported changes in mortality for transported babies following alterations in transport provision. Hood (1983) found significantly decreased mortality when babies were transferred by a trained team and earlier work from Nottingham suggested an association between improved education and transport experience for nurses and improvements in mortality (Leslie & Stephenson, 1997). However, other studies, most notably Harding and Morton’s data from New Zealand, strongly suggests that any effects of transport on mortality are confounded by the effects of the subsequent intensive care (Harding & Morton, 1994). They argue that the effects of differences in the regimes of care between units are greater than the effects of differences in transport care. This does not mean that transport may not have effects, positive or negative, on long-term outcomes but that studying the nature and scale of these effects is confounded by subsequent intensive care. For these reasons no analysis of mortality or other long-term outcome, such as development at two years of age, was undertaken.
2. Transport outcomes – Transport related adverse events

A central transport maxim is that ambulances are poor places to do any significant intervention such as resuscitation procedures, and so the preparation for transport should include stabilisation measures aimed at minimising the possibility of the need for significant intervention in the vehicle. Such interventions are recorded for audit purposes. No babies in either group were reported to have had any transport related adverse events during any journey. These were defined as (any of) extubation, intubation, treatment for pneumothorax or administration of resuscitation drugs. These incidents are extremely serious when they happen, but the rate of serious problems in transit is probably extremely low. This study revealed no transport-related adverse events in 102 transfers which suggests a substantially larger study would be needed to reliably show any difference in the incidence of these between groups.

3. Transport outcomes – Time

Two time periods are of particular interest. Firstly the response time as an indication of the extent to which the transport service is responsive to demand and secondly the stabilising time. In our service, the ANNP-led teams were able to respond significantly faster to transport requests (Table 2.2). Clearly this is not a quality intrinsic to ANNP-led teams, but is a result of the supernumerary staff being based on the neonatal unit and immediately available for transport call-outs during ‘office hours’. East Midlands Ambulance Service has staggered shift change times and therefore the differences in response times cannot be explained by the doctor-led group consistently requesting vehicles at ambulance shift changeover times. The response time does not include the time spent in transit to the referring unit which is principally dependent on distance, over which we have no influence.

The stabilising times were significantly different between the groups, with ANNPs taking longer (Table 2.2). There is no evidence that the ANNPs are doing significantly more procedures (Table 2.3), and the data available do not allow
other explanations to be investigated. It may simply be the case that ANNPs are slower in attending to the necessary tasks. One could also hypothesise that the time is spent on a thorough approach to transport, such as completing notes or talking to families, that might be measurable in other ways. It would be possible, for example to undertake a blinded retrospective evaluation of clinical notes made by ANN and SpR-led teams looking for whether attention was given to transferring all the information necessary about the baby. Qualitative work could be undertaken with parents of transported babies, looking for what type of contact they had with the transport team, to evaluate whether ANN and SpR-led teams approached parents differently.

The similarity in the return journey times between the groups, suggests that any differences seen in physiological variables are not simply a consequence of longer transit times for one group.

4. Transport outcomes – Physiological variables

Physiological values of key parameters are used as transport outcome measures, principally because of the confounding variables which are problematic in studying longer term outcomes. Until prospective studies demonstrate a causal link between mortality and post transfer physiological values, for example temperature, researchers in the field are able only to suggest that normal values are by definition more desirable than abnormal, and clinicians should strive to achieve homeostasis for their patients.

The significant pre-transfer differences between the groups for arterial oxygen level and pH suggest that the SpR-led transfers were more unwell when the team first assessed them, compared to the ANN-led group. This raises problems in the comparability of the groups which may not be disentangled without a randomised study. We can speculate that the SpR-led group may be genuinely sicker, reflected in their need to be transferred out-of-hours, or that their condition reflects being cared for on the referring unit at a time of day when most units have fewer staff. However, it may also be the case that the worse arterial oxygen level and pH
are consequent on a feature of the SpR-led team, such as the longer response time. We cannot distinguish between these possibilities from our data.

Comparisons of pre-and post transfer physiological data suggest that both teams were maintaining or improving infants' conditions over the stabilising and transfer periods, and this is congruent with our earlier findings (Leslie & Stephenson, 1994). Although the SpR-led transfers had worse acid-base status pre-transfer, the groups were similar post-transfer. The ANNP-led group had improved temperature values post-transfer, and although this is similar to other ANNP assessment projects (Aubrey & Yoxall, 2001) the magnitude of the difference seen is of limited clinical significance.

For all the values collected for this purpose, sampling technique is a substantial issue. Temperature in premature babies is affected by the type of thermometer used and the site of measurement (Bailey & Rose, 2001). Blood pressure is also substantially dependent on the measurement device, with intra-arterial direct measurement more reliable than oscillometric cuff readings (Low, Panagiotopoulos et al. 1995). Blood gases are most reliably measured from an indwelling arterial line, but samples may also be taken of capillary blood. Capillary values are highly dependent on the technique of the sampler (Rennie & Roberton, 1999), and while they may give useful information on blood pH and carbon dioxide level they cannot be used for information on oxygenation. When there is no arterial access, a common clinical compromise is to use capillary blood sampling to estimate blood pH and carbon dioxide and a non-invasive technique such as pulse oximetry to estimate oxygenation. Pulse oximetry, or oxygen saturation (SaO2) monitoring, is not directly translatable into arterial oxygen tension data, the value obtained in arterial blood gas analysis, due to unpredictable physiological variables. Blood glucose is commonly measured by bedside reagent sticks, and these may differ from laboratory values (Papp & Sharief, 2001; Meric, Kilicaslan et al. 2002). The value obtained for any of these by any technique may also affect by the time of sampling. For example, oxygenation values may be affected by a recent suction of the airway (Woodgate & Flenady, 2001). Additionally, in the collection of routine data on which these analyses are based there was no
procedure to check the reliability of the data that were collected. For example, post-transfer oxygenation was often recorded as a saturation value. Oxygen saturations in sick newborn infants are highly dynamic, altering up and down often second-to-second and so the value recorded on the audit form is a momentary snapshot. It is likely that issues in data collection occurred equally in both groups, however, and so may not be the source of systematic bias.

**Conclusion**

This chapter presents evidence to show that ANNP-led neonatal transport is a practical possibility and appears to be as safe for babies as SpR-led transfer. The future configuration of neonatal services in the UK is currently under review (Department of Health, 2003). These data suggest that transport is an area where ANNPs may contribute to service provision.

Many obstacles had to be overcome for the service to become operational. To take an experienced neonatal nurse through ANNP training, subsequent consolidation and transport training takes two years or more. The outcome study presented above used methods that are widely applied in health settings to evaluate change at work. For other interested neonatal centres, the news that ANNPs may be able to lead transfers will be followed by more questions:

a) What issues might emerge in our institution during the change? What must we attend to in our centre to make this possible?

b) Who should be involved in making this change happen? What facilitates the processes of this change?

c) What kind of robust structures will support people involved in the process?

d) How should we educate people for this new challenge? How do we support new ANNPs to become competent in transport?

The next chapters address these issues. In order to understand the process of preparing ANNPs for leading neonatal transfers the Nottingham NICU setting was
observed over the period when two new ANNPs trained for transport. The data are all qualitative and are used to determine the issues which emerged over the period of change and the resources which emerged in response to the issues. In Chapter 8 the quantitative and qualitative evaluations are brought together to demonstrate the broad understanding gained of ANNP-led neonatal transport in particular and change at work in general. It will be seen that the answers to the questions above may not be in the category of prescriptive lists for action, but in a form that recognises the locally complex ways in which different settings account for change at work.
Chapter 3.

Process, not outcome - how was ANNP-led transport achieved?

Introduction.

The previous chapter presented data which address the first category of question which might be asked when a new way of working is introduced – is it safe for patients? The argument of this thesis is that it is not sufficient to study the outcome of the workplace place without also studying the process of the change, the ways in which change is put to work.

This chapter introduces Chapters 4-7 which address this second category of question - for others wishing to consider the implementation of an ANNP-led transport policy, what are the issues and resources which may need to be addressed in the process of enabling ANNPs to do transport? However, in order to understand the processes of change a suitable range of theoretical resources are required. In order to introduce these chapters, the next sections describe the data used in subsequent chapters, the analytical tools brought to bear on the data and the theoretical frameworks around which an account of change at work is constructed.

To identify and make analytic sense of the emergent issues concerning the prospective introduction of the new ANNPs in the setting studied two frameworks are used. First, “Communities of Practice”, as described by Wenger (1998) and secondly, the concept of “circulating reference” (Latour, 1999). These are introduced in chapters four and seven, respectively.
Data collection and analysis

1. What was collected?

The data collection for this analysis is outlined in Chapter 1, the general introduction. In summary, both recorded and written data were collected over the period from the start to the end of transport training for two new ANNP.s. The timing of the recorded data is further summarised in Figure 1.1.

Written data comprise all the documents, such as letters, discussion papers, drugs protocols and memoranda, which were produced by individuals or groups in or associated with the Nottingham NICU over the period in question. Some written data sources were produced before the research period, and are included because they were in some way a topic of concern during the data collection.

Recorded data are included from a number of different meetings. The various categories of meeting were:

1. Special meeting - a one-off meeting in August 1999 arranged by the two new ANNP.s.
2. Clinical supervision meetings. There are recordings of thirteen of these. In each case these were one to one meetings between one of the new ANNP.s and me. A clinical supervision meeting was arranged whenever one of the new ANNP.s had one or more recent transfers to discuss. These were transfers attended in a learner capacity with an established team leader and the purpose of the meetings was to reflect on and discuss clinical issues arising from the transfer.
3. ANNP meetings. There are recordings of all six of these. These were informal meetings attended by the two new ANNP.s, a Consultant Neonatologist and me. They were arranged to discuss issues in the implementation of the project.
4. There were two NICU ANNP planning meetings. These had a wider invitation list, including other consultants, the nurse manager and the NICU
business manager These meetings were concerned to develop future ANNP strategy for the NICU

5. One transport team meeting was recorded. The nursing transport team met monthly to discuss recent transfers.

6. The Medequate\(^1\) preparation meeting was a one to one session between me and ANNP1 in which ANNP1 reflected on the components and responsibilities of her job prior to an interview which would establish future pay scale.

The timing of these meetings is also shown in Figure 1.1.

The written and recorded data each have a file comprising a name and an indication of the date the data source was created. For most of the written data this is given as a four-digit date code for month and year. For example, a memorandum concerning ANNP drug initiation dated July 4\(^{th}\) 1998 has the file name “drug memo 0798”. Exceptions are the files of drugs protocols where the date given refers only to the year of production (e.g. Drugs 00) and files comprising minutes of a meeting, where the whole meeting date is given. The recorded data, from the categories of meeting detailed above, each have the date of the recording attached.

The data are analysed in two main blocks Chapter 4 is concerned with the baseline issues pertaining at the time that the period of transition to being able to lead transfers for the two new ANNPs began. The data sources used in Chapter 4 are shown in Table 3.1. Chapters 5, 6 and 7 are concerned with issues and resources which arose during the period of transition. The data sources used in these chapters are shown in Table 3.2.

\(^1\) Medequate is a tool used by the hospital human resources department to assess the level that a job should be paid at
Table 3.1 – Data sources for Chapter 4. “CRM Comm” is a letter to the hospital clinical risk management committee.

<table>
<thead>
<tr>
<th>Written data</th>
<th>Recorded data</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRM Comm 0397</td>
<td>Special meeting, ANNP1 &amp; ANNP2, 17.8.99</td>
</tr>
<tr>
<td>Drug memo 0298</td>
<td></td>
</tr>
<tr>
<td>Drug memo 0698</td>
<td></td>
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<tr>
<td>Drug memo 0798</td>
<td></td>
</tr>
<tr>
<td>Drug letter 0798</td>
<td></td>
</tr>
<tr>
<td>Drugs 99</td>
<td></td>
</tr>
<tr>
<td>Labour ward 0399</td>
<td></td>
</tr>
<tr>
<td>Drug memo 0899</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.2 – Data sources for Chapters 5, 6 and 7.

<table>
<thead>
<tr>
<th>Written Data</th>
<th>Recorded data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drug-initiation</strong></td>
<td><strong>Clinical supervision</strong></td>
</tr>
<tr>
<td>Drug protocols 99</td>
<td>(ANNP1) 13.10.99</td>
</tr>
<tr>
<td>Drug memo 0899</td>
<td>(ANNP1) 23.11.99</td>
</tr>
<tr>
<td>Drug minutes 6.12.99</td>
<td>(ANNP2) 9.12.99</td>
</tr>
<tr>
<td>Drug minutes 10.1.00</td>
<td>(ANNP2) 23.12 99</td>
</tr>
<tr>
<td>Drug protocols 0400</td>
<td>(ANNP1) 13.1.00</td>
</tr>
<tr>
<td>Drug minutes 13.4.00</td>
<td>(ANNP2) 23.3.00</td>
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<td>Drug minutes 7.8.00</td>
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</tr>
<tr>
<td>Patient group directions training 0700</td>
<td>(ANNP2) 2.11.00</td>
</tr>
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<td>Drug letter, 0700</td>
<td>(ANNP2) 28.11.00</td>
</tr>
<tr>
<td>Drug letter 1100</td>
<td>(ANNP2) 29.12.00</td>
</tr>
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<td>Controlled drugs stickies 1200</td>
<td>(ANNP2) 6 6 01</td>
</tr>
<tr>
<td>Drug letter 1200</td>
<td>(ANNP2) 19 6 01</td>
</tr>
<tr>
<td>Drug letter 1001</td>
<td>(ANNP2) 21 6.01</td>
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<tr>
<td>Drug phone survey 1101</td>
<td><strong>ANNP meetings</strong></td>
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<tr>
<td></td>
<td>Inaugural meeting 28.9.00</td>
</tr>
<tr>
<td></td>
<td>ANNP 5.10.00</td>
</tr>
<tr>
<td></td>
<td>ANNP 12 10 00</td>
</tr>
<tr>
<td></td>
<td>ANNP 19.10 00</td>
</tr>
<tr>
<td></td>
<td>ANNP 17.4.01</td>
</tr>
<tr>
<td></td>
<td>ANNP 24.4.01</td>
</tr>
<tr>
<td><strong>Other written data</strong></td>
<td><strong>Other recorded meetings</strong></td>
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<td>Proposal for a new nurse-led service 0100</td>
<td>NICU ANNP planning meeting 18.8.00</td>
</tr>
<tr>
<td>Minutes of ANNP planning meetings 18.8.00 and 12.9.00</td>
<td>NICU ANNP planning meeting 12.9 00</td>
</tr>
<tr>
<td>Letter to clinical risk management committee 0100</td>
<td>Transport team meeting 3.10.00</td>
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<tr>
<td>ANNP future service structure discussion paper 0501</td>
<td>(ANNP1) medequate preparation</td>
</tr>
<tr>
<td>Business case for developing ANNPs 1101</td>
<td>18.6.01</td>
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</tbody>
</table>
Data analysis was undertaken using ATLAS/ti qualitative data analysis software (Scientific Software Development, Berlin, version 4.1 for Windows 95), running under Virtual PC (version 4.0, Connectix Corp.). Each data source in Tables 3.1 and 3.2 was dropped into the ATLAS file. ATLAS allows for easy handling of large quantities of text data, and was used in this research for data coding and retrieval. ATLAS makes it straightforward to find related topics in the data. The process involves reading the data and assigning codes to passages. Codes may be newly generated or chosen from a list of previously used codes. Each data source was repeatedly re-read and coded. ATLAS then allows retrieval and inspection of passages by code. For example, any passage concerned with controlled drugs was assigned the code “controlled drugs”. This then allowed all the related passages to be readily retrieved and scrutinised for evidence of topics of concern. Multiple codes may be assigned to the same passage.

**Introduction to Chapters 4-7.**

In order to understand the processes that led to resolution of the practical problem of ANNP s in leading transfers, we need to make visible how change was accomplished. In particular we need to examine what resources were set in place and what resources were mobilised as solutions to emergent issues over the process of change. A central argument of these chapters is that change occurs both for individuals and in the setting in which those individuals are working, and these two are interdependent - change for individuals cannot take place without the setting adapting, and institutions cannot change without change from individuals (Engestrom, Engestrom et al, 1995; Shaiken, 1996). As the mode of participation in the organisation changes for individuals, so there is emergent change in organisational form. The qualitative section attempts to answer questions about process and change that take account of both people and the setting that they are in

The term "resources" is used to encompass a broad range of strategies and solutions that are brought to bear on the issues that emerge. In some instances
these are purely material resources, such as money that is made available to support study leave. In other instances the resource may be a less tangible one, such as the communicative resource deployed in response to the emergence of the issue of the new ANNPs feeling unclear about which aspects of their new job to concentrate on in the presence of multiple and confusing demands. The resource that was mobilised was simply a clear statement from senior staff that transport was to be the focus of their job over the coming period. This statement thus became a resource which made clear both to the ANNPs and, through them, the workplace that other potential demands on their time were lower priority than transport.

In this part of the study qualitative data are used to show the issues that emerged and the resources that were brought to bear on them in the change process. These emergent issues are mapped onto a theoretical framework based on the work of Wenger on Communities of Practice (Wenger, 1998). This is given a theoretical extension and critical evaluation through the use of the concept of circulating reference from actor network theory, as developed by Latour (1999).

The data were coded in ATLAS in two complementary ways. First the data were repeatedly read and contemporaneously coded in ATLAS for emergent issues and resources. These codes were generated during the reading and coding process, so that the emergent issues and resources presented arose from the data. ATLAS allows for passages to be assigned multiple codes and so all the emergent issues and resources found were coded. Secondly the data were coded for elements described by Wenger as important in the formation of a new community of practice. ATLAS facilitates the easy retrieval of coded data so that emergent issues and resources could be readily mapped onto communities of practice elements. These data are presented in the next four chapters.

Appendix 1 is a glossary of the abbreviations used for the identities of the speakers in the data, as well as other frequently used abbreviations.
Chapter 4 contains a summary of Wenger's work followed by data which show the baseline issues and resources in place at the start of the period of training for ANNP-led transport. At the end of the chapter the emergent issues and resources are linked to the communities of practice (CoP) theoretical framework. Issues and resources emerged that were attended to so that both the institution and the individuals were ready for transport training to start in August 1999.

While Chapter 4 is a picture taken of a slice across time of baseline issues, Chapters 5-7 present data from a slice along time where a key concern is to show change over time in the issues and resources elicited. Chapters 5-7 follow similar structures. Each is centrally concerned to present a set of emergent issues and resources, to track their movement over time and each chapter finishes by linking these to the CoP framework. Chapter 5 does this for a set of issues that are characterised as related to individuals becoming clinically competent. These are termed "proximal" issues because they are located in the need for the two ANNP to achieve and maintain a trajectory towards being able to do transport in their particular work setting. Chapter 6 does the same for issues that emerged for the organisation over the period under consideration and which were recorded in the data. These issues and resources, related to the system of care in the institution are grouped together as "distal" issues Chapter 7 examines issues arising from ANNP drug initiation where the proximal and the distal are tightly bound together. The terms "proximal" and "distal" are used to differentiate apparent zones of influence that were important in the process whilst at the same time retaining a sense of the connectedness of these influences to the setting with which the study is concerned. In this chapter a further analytical tool is introduced in the concept of circulating reference (Latour, 1999). This adds value to the CoP analysis by providing a way of conceptualising how knowledge circulates within and between settings.

The earlier part of the study presented in Chapter 4 can be characterised as a snapshot looking for evidence of resources in place at the time the transition period started. The later part of the study presented in the subsequent chapters is concerned with a period of transition and so the data may be expected to
show change over time as issues emerge and resources are put in place to deal with them. In the presentation of the data both the emergent issue and the trajectory of movement of that issue are shown, so that the trajectory of change may be tracked over time. This way of presenting the data shows that change is also the topic of concern which in turn requires the mobilisation of resources.

Chapter 8 draws together all the quantitative and qualitative research strands from the thesis. This includes examining the CoP model in detail to investigate its utility for others aiming to implement similar change programmes. The data from the previous three chapters are integrated to determine if all the features of starting a new CoP according to Wenger’s model were attended to. In addition, the data are examined for emergent issues and resources that were important in the process but which the CoP model failed to predict a need for. The significance of the concept of “circulating reference” for both the quantitative and qualitative sections is discussed and conclusions are drawn.
Chapter 4.

Becoming an ANNP in neonatal transport: Baseline issues and resources for a Community of Practice.

Introduction.

This chapter contains a summary of Wenger's work followed by data which show the baseline issues and resources in place at the start of the period of training for ANNP-led transport. By incorporating the theoretical introduction with data the intention is to answer questions about Wenger's work – how is it useful? How may we ask questions with and about the work? At the end of the chapter the emergent issues and resources are linked to the communities of practice (CoP) theoretical framework. Issues and resources emerged that were attended to so that both the institution and the individuals were ready for transport training to start in August 1999.

The two novice ANNPs studied had moved over time from being neonatal nurses to being advanced neonatal nurse practitioners. They then moved from being ANNPs who could not lead transfers to being ANNPs who could. A range of predicted and unpredicted issues for both the individuals and the institution emerged during these changes. Attending to these emergent issues can be seen as the work of engaging with the change process. The concern is to identify and discuss what resources are brought to bear on the emergent issues, so that the endpoints defined as relevant by both individuals and their institutions could be achieved.

The timeline for the process (Figure 1.1) illustrates the chronology of the process of change and some important milestones. It shows when key events in the process happened, for example when the two new nurse practitioners completed their period of formal training. Without these points being achieved, the process could not have continued. The figure also shows when key transitions were completed, for example, when each became able to do unaccompanied transfers. Over time, it is clear that the these key transitions really happened. This is demonstrated in Chapter 2 which investigates the outcomes for babies of the change to ANNP-led transport. Chapter 2 has
similarities to some of Redshaw's data, for example in showing the practical procedures undertaken by ANNPs on transports (Redshaw & Harvey, 2002a). The present and subsequent chapters aim to expand the understanding of the process of change for ANNPs beyond both individual perspectives and skills audit. Neither Redshaw nor Woods (2000a) tracked the emergence of issues and resources as they applied to their settings. Understanding these transitions involves more than simple skills audit or demonstrating that practice has, in Woods terms, been reconstructed. These chapters examine the fine-grained detail of complex change. Change was not inevitable, even though the institution and the individuals involved supported the proposed change. Rather, a set of issues emerged that had to be attended to both by individuals and groups which facilitated the overall transitions. The answer to the questions about how ANNP-led transfer was brought-about lie in these emergent issues and the resources brought to bear in dealing with them.

This chapter is structured as follows. First the concept of communities of practice is reviewed. Examples from neonatal practice are used to illustrate the key theoretical and structural points. Next the features of CoP that will be used in the data analysis are extracted, and this is followed by the data. The data analysis starts in this chapter by examining the resources that were in place at the start of the change process. Subsequent chapters will track the trajectories of change of the emergent issues and resources over the period of transport training for the new ANNPs.

**Communities of practice (Wenger, 1998a)**

Wenger's work provides an ideal starting point and framework for discussing and identifying learning and change in the workplace. Of particular significance is that it recognises the interdependencies of the individual and the institutional in development and change. Wenger's work is centrally concerned with learning and his view of learning in the workplace is that it is a situated activity. In other words, that the work of learning to do a job is more than the transmission and acquisition of skills. We need to understand how we learn to participate in the settings in which work happens. He emphasises a focus on
participation, and suggests this has broad implications for how we understand and support learning. Wenger emphasises that, while for individuals "learning is an issue of engaging in and contributing to the practices of their communities", he also points-out that the other side of the coin is that, for communities "learning is an issue of refining their practice and ensuring new generations of members" (Wenger, 1998a, p. 7). Wenger sees getting students on trajectories of learning that they can identify with as important parts of learning. This study is concerned with a slightly different situation, that of the formation of a new community of practice. There was just one ANNP doing transport when the two new ANNPs embarked on that road, so there was no existing CoP that was concerned about generational continuity. Instead our focus should be on the formation of a new CoP and the resources required to accomplish its creation and maintenance. The latter half of this chapter will present baseline data on the contemporary issues and resources at the time that transport training started for the new ANNPs and Chapters 5-7 will elicit the movement in these and other new issues and resources over the training period. Wenger outlines factors contributing to the development of new communities of practice and indicators that they have formed. These are used in this chapter to inform analysis of the emergent issues. This makes it possible to track the emergence of membership and identity in a community of practice over time. By bringing the focus of communities of practice to bear on the topic, we are able to track change that was neither inevitable nor self-evident, and to do this for both individuals and the institution in which they worked.

In this section the major issues in communities of practice are introduced and outlined, before moving on to the substantive work:

**Background**

Wenger’s initial interests in artificial intelligence (Wenger, 1987) led to a concern with what knowledge is, how it is acquired and used, and particularly how these issues apply in the workplace. In addition, Wenger’s early work in the field of workplace learning attempted to revisit and update notions of apprenticeship (Lave & Wenger, 1991), positing the concept of “legitimate
peripheral participation" as a way of understanding how people in workplaces move from novice to knowledgeable worker. This preceded his central text (Wenger, 1998a) which moved from this earlier work to a unified model of workplace learning. He has recently expanded on some of his concepts (Wenger, McDermott et al, 2002) His ideas are based on observational studies of workplace settings, largely unrelated to health-care.

Communities of practice provides an established framework for studying workplace transitions that takes account of people in the wider setting (Roth, 1998; Teigland, 2000). It is an inclusive conceptual framework which embraces the complexity of the setting. It very clearly asserts that personal, professional or institutional changes do not happen following just the isolated application of an intervention, say an education programme. For change to occur not only will the individuals involved have to learn and adjust, but they do so in the context of a wider constellation of subtle and not-so-subtle changes and adjustments that occur in the wider institution, and beyond. The data in this and the subsequent chapters elicits these changes as they unfolded in the ANNP-led transport setting.

What are communities of practice?

At its simplest, a community of practice is a "community created over time by the sustained pursuit of a shared enterprise" (Wenger, 1998a, p. 45). Wenger (1998a) defines communities of practice as a "midlevel" unit of analysis (p. 124) - it is neither a specific or narrow activity nor a broadly-defined aggregate, so a community of practice is more than the work of one person in isolation, and less than the work of an intensive care unit or hospital. This contrasts with Woods's work, which was concerned with individuals and was not broadly inclusive of the setting. Wenger (1998a, p. 127) uses the term "constellations of practice" for settings that contain many communities of practice.
What do communities of practice comprise of?

Wenger and McDermott (2002, p. 27) suggest that communities of practice comprise of three fundamental elements:

1. A domain of knowledge.
2. A community of people who care about this domain
3. Shared practice these people are developing in order to be effective in this domain.

For example, in my setting, one could hypothesise that the Consultant neonatal medical staff are a community of practice - their knowledge domain is neonatal medicine and there is a community of people who have cared enough to train to provide treatment to this group of patients. They meet, formally and informally, to discuss the care and treatment of specific individual patients and to formulate broad joint plans and protocols for treating groups of patients. Both "practice" and "community" are key factors in whether a community of practice exists, and it is in the interplay of the two that the entity comes into being. Not all communities are communities of practice and not all practices give rise to communities.

What does Wenger mean by "practice"?

At work, practices are what the individual in communities of practice and communities of practice do to make jobs possible in the context of disjunctions between institutional demands and realities of actual situations. Wenger (1998a, p.47) says that practice is:

...doing in a historical sense and social context... it includes language, tools, documents, images, symbols, well-defined roles, specified criteria, codified procedures, regulations and contracts (but) ...also all the implicit relations, tacit conventions, subtle cues, untold rules of thumb, recognisable intuitions, specific perceptions, well-tuned sensitivities, embodied understandings, underlying assumptions and shared world views.
Wenger (1998a, p. 51) further suggests that practice is: "first and foremost, a process by which we can experience the world and our engagement with it as meaningful." This very broad definition of practice as not just professional or clinical practice, is important in its link with meaning. Wenger argues that meaning is negotiated in practice in two processes, participation and reification.

Wenger uses participation very much in a dictionary sense - it "combines doing talking, thinking, feeling and belonging" (Wenger, 1998a, p. 56) These are all features of the process of (becoming a becoming a person who is engaged in) doing the work. Participation is broadly used, so it is not a synonym for collaboration. It is all kinds of relations he is aiming to capture the "profoundly social character of our experience of life", suggesting that participation (in social life) takes many forms and does not always involve the physical presence of others.

Although participation is a reasonably clear and familiar term (and Wenger largely uses the word in these ways), "reification" is not. It means "making into a thing" and Wenger uses it very generally to describe the process of giving form to our experience by producing objects that congeal this experience into "thingness". These may not be concrete things, but actually a wide range of processes such as making, designing, perceiving and interpreting. In this he is extending the dictionary definition, while trying to retain a sense of the solidity of the objects formed. These objects, Wenger (1998a, p. 58) suggests, are "tokens of vast expanses of human meanings"

Wenger (1998a, p.54) makes a case for the centrality of reification, insisting that all communities of practice produce "abstractions, tools, symbols, stories...", and in this setting these might include transport guidelines produced by the nursing team that guide transport practice. Reification can be both a process and its product. Moreover, reification does not always originate in design. Reified outputs, for example a letter from the Home Office regarding controlled drugs, may be emergent issues to be dealt with in the change process. At other times the creation of reified outputs, such as a drugs protocol, may be an emergent resource.
Wenger also points out that reification can be problematic because the outputs of reification, such as protocols or guidelines, may be so powerful, actors may come to overendow them with relative importance.

Wenger insists that both participation and reification are essential in the constitution of communities of practice and their later internal and external development. In particular, he is keen to emphasise that they are not opposites, but two parts of a duality - if one is present, then it is legitimate to look for the other. Participation makes up for the inherent limitations of reification, for example by new transport staff participating in accompanied transfers, as well as learning from books and other written documents. Likewise, reification makes up for the inherent limitations of participation, perhaps by providing written guidance that people learning about the setting can refer to for help. Examples of participation and reification are frequent in the data which follow.

What does Wenger mean by “Community”?

Three dimensions describe the relation of practice to communities - mutual engagement, joint enterprise and a shared repertoire:

**Mutual engagement** is a characteristic of practice which is a source of coherence to a community. “Practice does not exist in the abstract. It exists because people are engaged in actions whose meanings they negotiate with one another” (Wenger, 1998a, p. 73) Wenger is keen to dissociate his new term, community of practice, from potentially similar commonplace terms, such as group or team. He suggests that membership of a community of practice depends on more than a job title, and that the communities are defined by more than merely who talks to who in an information network. He suggests that engagement has to be enabled - "being included in what matters is a requirement for being engaged in a community’s practice” (Wenger, 1998a, p. 74). This is not to suggest that membership of a community of practice is wholly to be manipulated by adjusting levels of inclusion, and hence mutual engagement. What it takes for a community of practice to cohere can be subtle
and delicate factors where it may as important for the participants to know the latest gossip as to have memorised protocols. Complementary and overlapping competencies within communities of practice make it important for members to know how to give and receive help.

**Joint enterprise**, the second factor that Wenger argues describes the relation of practice to communities, is more than just a stated goal or mission statement. Rather, the enterprise is reflected from the complexity of mutual engagement that is a result of the collective process of negotiation. The participants negotiated response to their situation is a definition of their enterprise which belongs to them. Wenger (1998a, p. 78) suggests that the "enterprises reflected in our practices are as complex as we are," and that these are negotiated enterprises. The daily practice of new ANNPs learning to do transport of sick babies involves not just the clinical work of transport but also in making the job habitable for themselves. This makes daily practice a mixture of submission and assertion and is a "complex, collectively-negotiated response to what they understand to be their situation". The enterprise is truly "joint" in that it is never fully defined by any individual, by outside mandate or by prescription from above acting alone.

A **shared repertoire** is the final factor in this series. Wenger uses "repertoire" as the name for a communities set of shared resources to indicate that they are based on a history of mutual engagement and that they remain inherently ambiguous in the future. This inherent ambiguity will tend to make the process of co-ordination in continual need of repair, due to the dynamic, open-ended nature of the system. The data collected in this study may show the ways in which the system required repair in order to respond to changed and changing circumstances. The shared repertoire of a community of practice may combine reificative and participative aspects, including routines, words, tools, ways of doing things, actions and concepts. For the new ANNPs joining or helping to form a new community of practice, acquiring and contributing to this shared repertoire may be part of the process.
Boundaries are a key to understanding how communities of practice operate in the workplace (Wenger, 1998b). Wenger's view of boundaries has connections with Cooper's 1986 essay (Cooper, 1986) (though this is not acknowledged), being concerned with the boundary as a structure that both separates and is the point of contact. Star and Griesemer (1989) defined the concept of boundary objects and this is expanded by Wenger who reframes the connection/disconnection tension in terms of participation and reification. Wenger (1998, p. 105) suggests that the "products of reification can cross boundaries" (and be called "boundary objects") and that people can cross boundaries by participating in multiple communities of practice (and be called "brokers"). A view of the importance of boundaries which emphasises the need for both people and objects to bridge boundaries is found in the research of others, including Engestrom (Engestrom, Engestrom et al., 1995) and Star (1988).

Boundary objects "serve to co-ordinate the perspectives of various constituencies for the same purpose" (Wenger 1998a, p. 106). For example, on a transfer of a sick baby one could represent the situation on the referring unit as the transport team arrives as one where two (or more) communities of practice, the transport team and the local team, meet and where the baby is the boundary object over whom the transfer is negotiated. Another example might be the Referral Form completed by the Transport Nurse when a request for transfer has been accepted. This co-ordinates the perspectives of the receiving team, the transport team and the referring unit at the time that a transfer is planned. In its blank state it is the reified output of the transport team, and serves to remind team members what are the important issues to ask about at the time that a baby is referred. In turn, by asking the questions that the form requires to be asked the team are imposing an evaluative and treatment framework on the unit currently caring for the baby. As the data on the form are completed, so the output of the community of practice at the referring unit crosses to the transport team who use it to co-ordinate their pre-departure activities.
**Brokering** is the other process by which Wenger (1998a, p. 109) argues communities of practice interact with the outside. Brokering is done by people, not objects. "Brokers are able to make new connections across communities of practice, enable co-ordination and.. open new possibilities for meanings". The legitimacy of the broker is at issue, as this person will fail if they cannot influence practice development, address conflicting interests and mobilise attention. An example might be the need for a member of the pharmacy community of practice to interact with members of a neonatal community of practice to produce an acceptable framework for ANNPs to perform a prescribing-like activity.

As participation and reification are complementary, so are brokering (participative connections) and boundary objects (reificative connections). There are strengths and weaknesses of each that the other helps to transcend. Reificative connections are good at bridging time and distance readily, but if not accompanied by people can risk divergent interpretation. Participative connections have the real character of the thing, but are weakened by exposure to just a fraction of the practice of the community of practice and by the subjectivity of the moment. An example is in the handover of information at the end of a transfer of a baby. When the resident clinical team comes to review the new admission they may be able to ascertain the pertinent history and clinical issues from the written notes (reificative connection) completed by the transport team. Written notes, however, are always potentially misunderstood, and having the person who did the transfer and wrote the notes on hand to present them (participative connection) is likely to overcome some of those problems and allow for the lived experience of the transfer to be passed-on. Likewise, the person doing the handover in person may be less effective without a written note to serve as aide-memoire and repository of detail. Examples of participation, reification, boundary objects and brokers are found often in the data in this and subsequent chapters.

Finally, communities of practice may not follow institutional boundaries, as institutional boundaries may not outline a CoP. The institution may have many communities of practice or none, if they have not developed to that point.
How is a new community of practice created?

Wenger argues that communities of practice may come together, exist and then dissolve without any active work on the part of participants and that forming them is not a simple managerial task like creating a team of employees. Participants can act to create the conditions that will facilitate communities of practice forming, but that is the limit of the influence (Wenger, McDermott et al, 2002). The formation of CoPs is facilitated by supporting engagement. Wenger (1998a, pp.237-8) suggests this is accomplished by supporting an infrastructure of mutuality, competence and continuity:

Figure 4.1 The formation of communities of practice is facilitated by supporting engagement with an infrastructure of mutuality, competence and continuity:

"Mutuality

1. interactional facilities: physical (and virtual) spaces; interactive technologies and communication facilities that extend mutual access in time and space; time for interaction and travel budgets
2. joint tasks: things to do together, availability for help
3. peripherality: boundary encounters; ways of belonging to various degrees, peripheral participation, entry points; observation, casual encounters, open houses

Competence

1. initiative and knowledgeability activities that bring about the knowledgeability of engagement, occasions for applying skills, devising solutions and making decisions, problems that engage energy, creativity and inventiveness
2. accountability: occasions for exercising judgement and for mutual evaluation; recognisable style, negotiation of joint enterprises
3. tools: artifacts that support competence; discourses, terms and concepts; delegation facilities

Continuity

1. reificative memory: repositories of information, documentation, and tracking; retrieval mechanisms
2. participative memory: generational encounters, apprenticeship systems; paradigmatic trajectories; storytelling."
Wenger says that the work of engagement is "basically the work of forming communities of practice (Wenger, 1998a, p. 184). It involves such work as shown in Figure 4.2:

Figure 4.2 The work of engagement in forming communities of practice.

1. "The definition of a common enterprise in the process of pursuing it in concert with others.
2. mutual engagement in shared activities
3. the accumulation of a history of shared experience
4. the production of a local regime of competence
5. the development of interpersonal relationships
6. a sense of interacting trajectories that shape identities in relation to one another
7. the management of boundaries
8. the opening of peripheries that allow for various degrees of engagement"

Wenger (1998a, p. 238) suggests that whilst engagement is critical to learning it can be narrow, and so imagination is needed to deal with the broader contexts. He suggests that an infrastructure of imagination would include orientation, reflection and exploration:

Figure 4.3 Infrastructure of imagination.

"Orientation

1. location in space: reification of constellations, maps and other visualisation tools, open spaces.
2. location in time: long term trajectories, lore, museums
3. location in meaning: explanations, stories, examples
4. location in power: organisational charts, process, transparency

Reflection – models and representations of patterns; facilities for comparisons with other practices; retreats, time off, conversations, sabbaticals and other breaks in rhythm
Exploration – opportunities and tools for trying things out; envisioning possible futures and possible trajectories; creating alternative scenarios, pushing boundaries, prototypes; play and simulations."

Wenger argues that this proposed infrastructure of imagination is a key part of how CoPs function once they have formed. For example, a new individual in a CoP may imagine a longer term trajectory for his or her place in the CoP, based on the paradigmatic trajectories of “old hands” in the CoP.

Finally Wenger (1998a, pp. 238-9) proposes that an infrastructure of alignment be supported to build on both imagination and engagement by “connecting learning to broader enterprises”. This would “include facilities of convergence, coordination and jurisdiction”.

The issues in the formation of CoPs outlined above will be central to the analysis of the data which follows below and in the next chapters. Emphasis is placed on eliciting the extent to which Wenger’s CoP formation factors outlined above were attended to in the research setting and whether therefore the CoP model provides a robust framework for both implementation and research in workplace change. Both of the latter two infrastructures proposed by Wenger (imagination and alignment) are substantially concerned with how CoPs function once formed, and so are of less use in this analysis than the infrastructure of engagement. They will be referred to where appropriate to do so, but are not major components of the analysis.

How do you know if a community of practice has formed?

Wenger (1998a, p. 125) lists some indicators that a community of practice has formed, as shown in Figure 4.4. He suggests that these indicate the presence of mutual engagement, negotiated enterprise and a repertoire of negotiable resources. The explanatory brackets are added later (Nickols, 2000).
"Sustained mutual relationships - harmonious or conflictual (i.e., regular, work-related interactions, rough or smooth)

Shared ways of engaging in doing things together (i.e., common practices and beliefs about best practices)

The rapid flow of information and the propagation of innovation (e.g. a really effective "grapevine"; e.g. rapid transfer of best practices)

Absence of introductory preambles, as if conversations and interactions were merely the continuation of an ongoing process (i.e., no lengthy lead ins)

Very quick setup of a problem to be discussed (i.e., a common understanding of the milieu in which they which they all operate)

Substantial overlap in participants descriptions of who belongs

Knowing what others know, what they can do, and how they can contribute to an enterprise

Mutually defining identities

The ability to assess the appropriateness of actions and products

Specific tools, representations and other artifacts

Local lore, shared stories, inside jokes, knowing laughter (e.g., extensive use of "war" stories to communicate lessons learned)

Jargon and shortcuts to communication as well as the ease of producing new ones (e.g., shortcuts such as acronyms)

Certain styles recognised as displaying membership (Behaviour patterns that signify membership, e.g., gestures, posture, even seating patterns in the cafeteria)

A shared discourse reflecting a certain perspective on the world (e.g., shared analogies, examples, explanations, etc.)"

As this research is concerned with the start-up period of a potential new CoP it is unlikely that many signs would be found indicating that one had formed, particularly as the data collection stopped as soon as both ANNPBs became able to lead transfers. However, the data were scrutinised for these indicators
as well as for CoP formation factors and they are presented in the data alongside the presence of start-up factors wherever they are found.

The models and frameworks of CoP start-up conditions and post start-up characteristics provide a complex set of issues and resources which are tracked in the data.

In order to understand the process of movement from unable to able to do ANNP-led transport, a conceptual framework is developed that seeks to elicit transitional processes for both individuals and the setting in which they work. The analytical use of the CoP framework is introduced in the next section which examines the issues and resources contemporary with the start of the period of transport training. This is a snapshot across time intended to establish a baseline. Chapters 5-7 will track the trajectories of change over time of these issues, and other issues that emerged, whilst continuing to link these to the CoP framework.

Baseline issues and resources – analysis of data contemporary with the start of the period of transport training.

Studying communities of practice in the ANNP/transport setting

The subsequent chapters track the transitions over time of the ANNPs as they move to being able to lead transfers. This section will lay foundations for this by investigating the emergent issues and resources which were contemporary at the time that the process started. As change is always happening it is not possible to identify a moment when the change which is the focus started. Instead this chapter examines the documents and recordings that are contemporary with the ANNPs completing their post ANNP training consolidation in order to give insight into the issues which had already emerged and the resources which were in place. These resources and emergent issues are linked to the communities of practice framework during this section, and discussed in more depth at the end of the section. The
process of coding and retrieval of the qualitative data in the ATLAS software supported this linkage, as the data were coded for both emergent issues/resources and for the CoP elements given in Figures 4.1 to 4.4.

In order to identify the resources that were put in place to support the transitions of the two new ANNPs, data collected up to end of August 1999, when transport training started, were examined. These are substantially text-based data, comprising letters, memoranda and other documents that were produced and circulated that referred to or had relevance to ANNPs at that time. Data sources used in this chapter are given in Table 3.1.

As the file-names in Table 3.1 suggest, most of the data refer to issues in drug initiation. These data suggest this topic was the subject of considerable work and discussion over this period, and it is discussed further below. One further text-based data item is a file relating to labour ward practice (Labour ward 0399). There is one piece of audio-recorded data, a transcription of a meeting in August 1998 (Special meeting, ANNP1 & ANNP2, 0899) The file “CRM Comm 0397” is a letter to the hospital clinical risk management committee from the NICU consultants seeking approval for the operation of the ANNP-led transfer service.

As drug initiation issues are apparently significant in this period, this section starts with a brief background to these, before moving on to the drug initiation data. This is followed by other emergent issues and resources elicited in the data. In each case the emergent issues and resources are, where relevant and possible, mapped onto factors from Wenger’s frameworks for the formation of a new CoP. The data concludes with Table 4.1 which summarises the issues and resources along with the CoP formation factors onto which they were mapped. The first two columns indicate the emergent issue and associated resources. The third column summarises the CoP factors that are identified in the text below as having congruence with the emergent issues and resources. This is the first step in assessing the utility of the CoP framework for both guiding and researching change at work.
Drug initiation issues and resources – Background.

A range of therapies is appropriate for sick babies, depending on the clinical circumstances. For an ANNP to work effectively while out on a transfer it is necessary to be able to thoroughly assess the medical needs of the baby and initiate appropriate care. This will often include the administration of drugs.

Drug prescription is controlled by the Medicines Act of 1963. This is legislation by prohibition and exception, in that the Act forbids anyone to give any medicines to anyone, and then elaborates on the exceptions to this prohibition.

The intention of the Act when it was written was to limit prescribing powers to doctors, dentists and veterinary practitioners. However, the Act is ambiguous in places, and has been interpreted as permitting absolutely anyone to prescribe, so long as they do so with the agreement of the Consultant caring for the patient and under agreed protocols. It was this apparent loophole that was identified by those concerned with advanced practice issues in nursing as providing a way to facilitate prescribing-like activity by ANNPs. A transcript of discussions between the Deputy Chief Pharmacist at the Department of Health (DH) and representatives of ANNP courses was circulated in 1995, and this indicated the willingness of the DH to recognise and support this change. It is clear in this, however, that the DH was uncomfortable with the notion of the word "prescribing" being applied to an activity undertaken by a person other than a doctor and so the concept of "initiation of drugs under protocol" was conceived. In this discussion the term "drug initiation" is used as shorthand for the prescribing-like activity undertaken by ANNPs.

This concept, supported by the DH, appeared to enable ANNPs to initiate drug therapies independently from medical practitioners so long as they did so under an agreed protocol. The activity ANNPs performed in practice appeared identical to prescribing - they examined the baby, took a history from colleagues and wrote-up drugs on a standard prescription chart. The difference was that they had no discretion over choice of drug or dose, except whatever limited discretionary powers were given in the protocol.
The documents produced to support this activity came to be known as "patient group directions" (PGDs).

**Drug initiation issues and resources in the data – infrastructures of competence.**

Considerable work was done in a period prior to this study, up to September 1997, to produce protocols (PGDs) for Nottingham that matched the guidelines of DH and which were acceptable to the NICU and the hospital. The protocols that were agreed in September 1997 came with a one-year review date, and so at the time with which this chapter is concerned, the drugs protocols were being reviewed. The output of this review is in the data as "Drugs 99", which is the reviewed versions of the protocols.

A significant issue for the new ANNPs is being able to initiate drug therapies. Independent transport practice will not be possible until they are sanctioned to do this. In the context of the constraints outlined above, bearing in mind both the absolute necessity of drug initiation for transport practice and the potentially significant legal issues, it is perhaps unsurprising that the institution had considered the issues as they applied at that time and put some resources in place which were focussed on enabling the ANNPs to accomplish drug initiation.

In the data which follow it will be seen that significant issues at this time were where ANNPs could practice drugs initiation, what would be the process for training the new ANNPs in drugs initiation, and maintaining the PGD documents according to regulatory guidance.

Evidence of previous and contemporary work on some of these issues and emergent resources for their solution are available in the data. "Drug Memo 0298" is a memorandum from senior NICU staff to the hospital Drugs and Therapeutics Committee asking for approval of a classification to the 1997 drugs protocols. In this memo a significant resource for the new ANNPs is sought (Box 4.1). Specifically the memo covers sites where ANNPs may practice. The
1997 documents were highly specific to transport, for example in making clear that the range of drugs covered by the protocols was determined by their applicability to transport practice. The memo seeks to clarify that it was always the intention of the documents that ANNPs would be able to initiate the drugs on their base unit as well. The rationale for this is stated as:

Box 4.1 — Sites of ANNP practice clarified (from: Drug Memo 0298).

The availability of transport is sporadic and unpredictable, and ANNPs will practice on the neonatal unit when not required for transport.

A foundation for good practice in initiation and administration of drugs is frequent performance of the skills involved, particularly in an environment where support and advice are available.

It is anomalous to trust ANNPs to perform this aspect of their role to a high standard when operating without direct support and advice when away from their base unit, and not to allow them to do the same, and with the same restrictions, when not on a transfer.

By clarifying this issue the NICU institution is doing a number of things. It is attending to a significant medico-legal issue - when the original drugs protocols were approved by the hospital board in September 1997 the Hospital Chief Pharmacist had been left with a clear impression that the protocols were for transport use. The issue of drugs initiation on the NICU was not an explicit part of the discussions. There was some discussion of this issue between the Hospital Chief Pharmacist and senior NICU staff, and the reified output of those discussions is the memorandum quoted above. The Chief Pharmacist is sufficiently persuaded by the case outlined to add her name to the memorandum (Box 4.1) to the hospital board. The significant issue being attended to here is the provision of a site for new ANNPs to gain skills. Transport can be a isolated working environment, where the simple fact of the care being delivered in a vehicle moving between hospitals ensures it is difficult for the institution to both supervise transport practice for its safety and provide competent educational supervision. The memorandum is ensuring that an anomalous situation does not arise wherein ANNPs are only able to practice drug initiation while out on transfers. Additionally the provision of the NICU as a site of practice is also a resource for the ANNPs, as it makes available a site of practice which allows for the potential for competent educational supervision. This attends to both the interests of the institution, in allowing supervision of
trainees on the NICU so that good practice may be taught and assessed, and the trainees in providing a practice milieu where they can repeat drug initiation skills often in a relatively protected environment.

From a communities of practice perspective this may be seen as supporting learning with an infrastructure of competence by sanctioning and facilitating activities that bring about the knowledgeability of engagement. By making the NICU available as a site of practice, so the new ANNPs may engage with learning drug initiation as part of their daily practice. Mutuality is also being supported by making available a working and learning milieu where help is available. Further it appears that this proposal will provide an opportunity for a tool, the drugs protocols, to be tried out in a relatively well-supervised environment and Wenger suggests that this is a mature CoP activity which supports an infrastructure of imagination.

"Drug memo 0798" started the process of reviewing the 1997 drugs group protocols. The annual review of the original documents, although started in good time, took until August 1999 to complete. "Drug memo 0798" explicitly raises concerns regarding the two new ANNPs, along with other issues. The memo is from me to others involved in producing the drugs protocols and it includes the extract in Box 4.2

Box 4.2 – Process for entry to approved drug-initiation personnel list (from: Drug memo 0798)

<table>
<thead>
<tr>
<th>Practising personnel (Appendix One)</th>
</tr>
</thead>
<tbody>
<tr>
<td>... What should we do about (ANNP1) and (ANNP2)? Should we put them in, but with a deferred start date?</td>
</tr>
</tbody>
</table>

The issue is raised that the two ANNPs needed to be provided with the resources for learning to initiate drugs and recognises that there are some institutional hurdles to be surmounted, in this case that their names will need to be added to an approved list. The approved list is contained in the larger drugs protocols documents as an appendix (Box 4.2) The question recognises that at the time of writing the ANNPs are not eligible to be placed on the list, and suggests an alternative. The process by which they will become eligible to be
on the list is by completing an in-house drugs assessment, and this is raised in
the last of the drugs-related documents from this time, "Drug memo0899", as
the extract in Box 4.3 shows. This memorandum was from me to others
involved in creating these documents.

Box 4.3 – Training programme to facilitate entry to the approved list of
personnel who may initiate drugs (from: Drug memo0899).

I have indicated that a new appendix four should be the assessment
procedure which we agree on, though that is not included as yet.

This memorandum, from me to senior NICU and Pharmacy staff, suggests that
an assessment document and procedure will be produced, but it is not available
yet. This extract indicates that the key individuals involved in this process agree
that a training programme is required so that the two ANNPs may be placed on
a list of approved personnel. At issue is that the new ANNPs have not been
significantly part of producing the drugs protocols and so may be unfamiliar with
the detail of how they work in practice, and in particular with where are the limits
and boundaries on what they can do. To address this issue a resource in the
form of a training programme is to be produced.

Further work was also needed over this period to keep the drugs protocols in a
state of good repair in the light of guidance documents issued by the
government. "Drug memo 0698" attends to an issue in ensuring the 1997
protocols under review are congruent with the latest Department of Health (DH)
advice (Crown, 1998). This extract (Box 4.4) shows that documents issued from
the DH were scrutinised when they arrived at the NICU and local practice and
documents were re-assessed in the light of the latest advice. This memorandum
was from me to others involved in creating and maintaining the drugs
documents.

Box 4.4 – Keeping drug initiation protocols up to date (from: Drug memo 0698).

Overall, I think that we have largely complied with the recommendations of
this document, certainly in terms of the broad thrust of their suggestions. I
have spotted one or two minor areas where we don't meet their specific
requirements, such as the need for each drug at issue to have its' legal
status (POM, P, etc) identified on the protocol, but nothing too terrible.
The extract shows that even an apparently trivial issue, such as identifying the legal status of all the drugs in the protocols (POM: prescription only medicine; P: pharmacy medicine), was considered worthy of highlighting. Subsequent versions of the protocols included the legal status of each drug, indicating a desire to be congruent with the DH advice. This is reiterated in the following extract from "Drug memo 0899". This extract suggests that additionally the issue of “exclusions” to the drugs protocols had been raised as one which required explicit attention. The key exclusion raised is that the drugs protocols do not apply to transfers of older infants on behalf of the children’s intensive care unit, and so this is not activity in which the ANNPs will be participating. Although at this time the neonatal transport service did a number of transfers of paediatric intensive care unit (PICU) infants, those who weighed less than five kilograms, it was never the intention of the ANNPs that the ANNPs would undertake these transfers. This extract indicates the ongoing rigorous approach to maintaining a set of documents which addressed the issues of the time in a thorough fashion.

Box 4.5 – Exclusions to drugs protocols (from: Drug memo 0899).

| There were a few areas I thought we could be more particular with, in line with the Crown Report on Group protocols; specifically these were listing the legal status of each drug and exclusions to treatment protocols. I have made a general statement about exclusions, indicating that transfers on behalf of the Children's Unit are not included, but have not got into more detail of clinical exclusions for each drug, as we have generally put these in the “adverse effects/precautions section.” |

The long gap (over a year) between these two documents (Boxes 4.4 and 4.5) indicates that the review process moved slowly. In subsequent versions of the documents a biennial instead of annual review was proposed.

Important CoP formation work is being done in the activities around the production of acceptable drugs protocols. While the drugs protocol documents form a reificative memory of the work done in their production and are further a local representation of documents produced by the Department of Health, the senior staff who produced them are also aware of the need for the new ANNPs to have a participative connection to the documents. It is for this reason that the two ANNPs are not merely issued with the drugs protocols, but are told they will...
have to complete a training programme where they will encounter the
generation who produced the documents as a resource to address the
emergent issues. Once on the approved list then ANNPs will have partially
satisfied one of Wenger's indicators that a CoP has formed, in "substantial
overlap in participants descriptions of who belongs". Boundaries are managed
in the exclusions to the drugs protocols. CoP issues in the drugs training and
assessment programme are discussed in Chapter 7.

These data suggest that drug initiation had been recognised as a significant
issue, that substantial work had been done by stakeholders in this area and that
there was more to do. Issues at stake in the data above are where ANNPs may
practice prescribing (both in terms of what sorts of transfer and unit-based
practice), drugs initiation training and production of a supporting infrastructure
which is congruent with DH advice. In each case resources are being proposed
or produced which address these emergent issues. The trajectories of the
progress of these is tracked over the transition period of transport training of the
ANNPs in Chapter 7.

Drug initiation was not the only emergent issue in these baseline data, and the
rest of the data in this chapter are concerned with the other issues elicited.

Other emergent issues and resources

A "special meeting" was instigated by the two new ANNPs and held on 17.8.99
to discuss unspecified concerns. At this stage on the timeline the new ANNPs
are 11 months on from finishing the ANNP course, and are 4-5 months on from
finishing a period of supernumerary post-course consolidation. They have not
done any transfers. No planning meetings about their transition to being able to
do transport had been held at this point. The following extracts are based on
themes which emerged at that meeting, and so represent a baseline set of
issues and resources.

The people speaking in the following extracts are represented by a set of
initials. What these initials stand for is given in appendix one
1. Multiple and confusing demands on their time – defining the common enterprise

The two new ANNPs came to the meeting with a range of issues that they represented as troublesome. Boxes 4.6 and 4.7 outline these.

Box 4.6 - Multiple and confusing demands on their time (from: Special meeting 17.8.99).

ANNP2. I think it came about because me & (ANNP1) both feel, I think, we both feel tired is the word, I think...and just feel a bit bombarded really with what's going on with our role and talking to (educator) she feels we've both felt a bit overloaded...was the word that came out I think with demands not just from the expanded role but from nursing staff on the floor, transport team, SHOs,

ANPP1: ...trying to jump through too many hoops.

ANPP2: Trying to do too much really...

Later they indicate.

Box 4.7- Multiple and confusing demands on their time (from: Special meeting 17.8.99).

ANNP1: On a daily sort of basis...so we'll be looking at our babies and you'll just be thinking..."mmm, a plan of care..." and somebody will come up and say "I need to use the computer, I can't get it to start"...was what happened to me...um...so I then had to go and show them how to get the x-ray computer started and up and running...

CN: But is this not because they are very new

ANPP1: No this was a registrar...um... ............ .......

ANPP2: This goes on all the time....everyday while....you've got four babies to see between nine and eleven o'clock & get interrupted all the time by medical staff, nursing staff,...which is good, 'cos we're in demand, but it's just getting to the point now when we're like...you can't concentrate on what you're doing can you

At this stage the issue of learning to do transport is not raised. Instead they describe a working pattern on the NICU where they feel pulled in many
directions, where they do not have clear focus, and others do not have a clear impression of what may be expected from them. During the opening of this session they indicate many activities and responsibilities that different groups on the NICU expect them to help and be involved with:

- Helping doctors use computers
- Acting as registrar without any notice, in the absence of the allocated registrar
- Breast-feeding advisor
- Contraception advisor
- Nursing resource person
- Sorting out equipment problems
- Informally supervising new nursing staff
- Developing expanded roles for nurses
- Standing-in for the Transport Nurse
- Transport education

The new ANNPs recognise that all of these are potentially areas that they could be involved in, but that the demands en-masse feel unrealistic in the context of their core work, as Box 4.8 suggests.

Box 4.8 – ANNPs cannot attend to core work because of other demands (from: Special meeting 17.8.99).

ANNP2: And you are get moved away from your work again, so when you add everything up together in the morning you can be called away from what you are trying to do, your four babies, whatever, umpteen times in the morning....

The extracts above show the two new ANNPs dissatisfaction with the many demands on their time, suggesting these demands are interfering with their ability to do the job - "you can't concentrate on what you're doing" (Box 4.7).

A resource, that the two new ANNPs should focus on becoming competent in transport, emerges at the meeting in response to this issue. This focus on transport is reintroduced into the discussion later on, after discussing labour ward practice and research activity (Box 4.9).
Box 4.9 – Transport emphasised as focus and priority (from: Special meeting 17.8.99).

<table>
<thead>
<tr>
<th>CN</th>
<th>The priority at this moment in time ultimately is to get you out on transport, that’s why we sent you off to become nurse practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANNP2: Mmm</td>
<td>CN: Come two years down the line, you feel very competent, or relatively competent at transport and your clinical work then perhaps that is more the time when you are actually able to take on other responsibilities as well, like perhaps doing more research or spending time doing other projects, when this in a way becomes easier to do because you are used to doing it all the time. You’ve got to just...I mean we all have to in our roles, prioritise what’s important, not just...partially for ourselves, but also for the service as well. And in a way our priority from a service point of view was to get you competent enough to do transport, and perhaps that’s what we’ve got to focus on at this stage. And things like...I think going to labour suite for resuscitation are important bits of that because they actually help you with transport, they actually get you much more competent at resuscitation. And the drugs thing is important for that...um........</td>
</tr>
</tbody>
</table>

This makes very clear the views of key local stakeholders on where the priorities should lie for the ANNPs, and raises the possibility that other activities that the ANNPs might be involved in should be judged according to their potential contribution to supporting learning to do transport. So in the extract above the activity of going to labour ward for resuscitation of babies at birth is sanctioned as one that may broadly support transport learning.

The doing of transports has been brought in as a resource at a point where the new ANNPs are struggling for focus and appear unsure about how to respond to other demands. Although transport was the proposed focus of ANNPs from before the time these two ANNPs were appointed for training, this suggests that faced with a crisis from the two new ANNPs this focus is re-mobilised as a resource to enable them to deal with other demands on their time.

Transport is not discussed again until much later in the meeting (Box 4.10), when one of the ANNPs asks again about the difficulties of dealing with many demands and expectations. Again the response is one which reinforces the message about the centrality of transport:
Box 4.10 - Transport emphasised as focus and priority (from: Special meeting 17.8.99)

ANNP2: The other thing is we want to know what nurses, doctors, managers, consultants, educators, what they want from us

AJL: "Don't get too hung up on that" is probably my message

ANNP2: ...how they see us

ANNP1: Yeah, I think that was more from the point of view of what they're expecting of us, and then we can turn round and say "yeah, but that's not what you're gonna get"

CN: You know, at this minute in time, at a very basic level, what they expect from you is to become capable of doing nurse-led transport... and all this, in a way, is the lead-up to that... getting you into that role... and that is our main expectation of you

AJL: I second that... entirely. Everything else is making you competent to do that

Prior to this meeting the two new ANNPs had not been going out on supervised transfers, the next step in becoming able to lead transfers independently. Only at the very end of the meeting is transport training and exposure raised as an issue for discussion and then only briefly, almost as a throwaway comment:

Box 4.11 – Transport training for the new ANNPs to begin (from: Special meeting 17.8.99).

AJL: I think you should keep a record of each transfer that you do

CN: .. and what were the issues that came up for you. Not necessarily with the answers, but what things do you think you need to either learn from or consider in more detail, and then that would be helpful for us when we're trying to reflect on...

ANNP1: Mmm

CN: I think it would be really good to go out on transport now

ANNP2: Mmm

The two senior people present (CN & AJL) are sanctioning the two ANNPs starting attending transports, and this happens in practice shortly thereafter. This represents a change in the roadmap for the journey of the two new ANNPs, as it had been assumed before this meeting that they should be able
to "prescribe" before going out on transfers. The transport discussion was preceded by a discussion about facilities for prescribing. Prescribing is a recurrent and substantial issue which is discussed in more detail above, but at this meeting it is raised as an issue that needs attending to for transport to be possible for the two new ANNPs. A piece of work has to be done to facilitate the ANNPs in a prescribing-like activity and this is presented as an obstacle that may be bypassed (and revisited later) for the purposes of starting on the job transport training. The senior staff at the meeting thus provide a bypass around "prescribing" so that training in transport can proceed, so that in turn a clear focus on transport as the key issue may be demonstrated, both to the new ANNPs and to the wider NICU community. The emphasis on transport as the focus for the new ANNPs was important CoP activity also. This defined the nature of the common enterprise that was to be the key activity of the new CoP and also gave the new ANNPs a clearer picture of the trajectory that they were on. Long term trajectories are part of Wenger's infrastructure of imagination, facilitating orientation for the individual by locating them in the project timing. Providing transport training out of the planned sequence in this way is therefore a resource, addressing the issues of the dissatisfactions expressed by the new ANNPs:

Box 4.12 – Transport training to begin before prescribing training package available (from: Special meeting 17 8.99).

| CN: ...(AJL)’s going to write a package, based on a package written by somebody else, and hopefully because we’ve already got most of the information ..maybe...I know we said we’d do it in the first week of September but in all fairness...(AJL)...we’re not meeting till the end of September, are we? |
| AJL: It’s a little while...we’ll get you out on transfers anyway... |
| CN Yeah, that’s not a problem...I don’t think you’ll see this as a big issue, it’s just really about showing that, in the future, you’ve gone through a proper process of being allowed to prescribe, which actually will be better for you in the long term. You’ll feel more secure in terms of doing a procedure which may not be totally within the law or whatever... |

Other solutions to the issues of the dissatisfactions raised by the ANNPs had already been rejected during the meeting. The two ANNPs had been asked for their solutions to the problems they were experiencing and they raised the
issue of non-clinical time where they have time to read, reflect on clinical practice or go the library. The consultant neonatologist proposed that time for these activities should be found from within the clinical day, as the extract in Box 4.13 shows.

Box 4.13 – Non-clinical reading time not supported at this stage (from: Special meeting 17.8.99).

"CN: I think reading's very important, I think you need to be directed in what you read... but, you know, it's probably easier to go and read around things... but I still think on a day to day basis you can usually go and come down here for fifteen minutes and look things up... not necessarily going off for two hours to the library but I think, you know, there are a lot of good books around and perhaps rather than sitting at the nursing station waiting for the next lot of work to come, then you need to come down here and look for things”

The data above show that at the juncture represented by this meeting the two new ANNPs are at a cusp between NICU practice and learning to do transports. Multiple and confusing demands on their time emerged as an issue at this time, and resources were mobilised to respond to that. Centrally the two new ANNPs were given a clear message that transport was to be the focus of their development activity in the coming period and that the senior staff of the NICU would contribute to facilitating this, for example by working to produce an acceptable drug initiation training package.

From the CoP perspective, this section shows that a common enterprise was being defined in relation to transport. This was being defined both by the new ANNPs and by senior staff (CN), so that the common enterprise was shaping identities in relation to one another. Further, the infrastructure of imagination was being supported by defining long term trajectories.

The issue of what ANNPs should do with their time recurs as a substantial theme in the data over the subsequent period of transition (Chapters 5-7). At these points the nature of discussion will change to reflect altered circumstances. Once the ANNPs are on a clear trajectory towards independent transport practice both they and the senior NICU staff are able revisit these issues without the need to use transport focus as a resource to deal with workplace difficulties.
2. Opening access to activities that may support the transition to transport – mutuality, peripherality and ways of belonging to various degrees

In Box 4.9 the consultant neonatologist suggests the two new ANNPs begin attending labour ward, and that this will have benefits for their transition into attending transports. The nature of the educational resource for transport that is available in labour ward practice is neither discussed nor challenged. The document "Labour ward 0399" is a risk management table produced to support the activity of ANNPs attending labour ward (Box 4.14). Risk management exercises are completed when there is an actual or proposed change in service delivery as a way of making visible the potential risks and benefits of the change. Key participants must agree that risks are appropriately managed. This suggests that new issues were having to be dealt with so that arenas for practice for ANNPs could be created and sanctioned. The potential introduction of ANNPs into transport sets up a range of implications that have the potential for reordering not only their own work but that of the NICU and its relations with a range activities within the hospital. This risk management table was discussed and agreed with senior labour ward staff.

The risk management table makes clear that the key issue is the change in professional background and preparation of staff attending deliveries ("Non-medically qualified staff undertaking previously medical functions") and a range of resources are given in the control and action columns which are proposed as appropriate to deal with the emergent issue.

Whilst the features of labour ward practice that were felt to be helpful for ANNPs preparing for transport were not discussed, one could speculate that these might include exposure to resuscitation situations, critical decision making and working in isolation. Similarities between labour ward and transport practice could be a topic for further investigation. Whatever the nature of the similarities, it appears that some congruence between the two areas was accepted and uncontroversial, albeit unspoken. In this light it is likely therefore
<table>
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<tr>
<th>RISK</th>
<th>CONTROL</th>
<th>ACTION</th>
<th>PERFORMANCE MEASURES</th>
<th>RESIDUAL RISK</th>
</tr>
</thead>
</table>
| 1. Non-medically qualified staff undertaking previously medical functions. | The ANNP will have direct access to advice from the registrar on-call at Nottingham City Hospital, or in the case of difficulty, the Consultant-in-charge. Successful completion of ENB A19 (ANNP) training is essential for this role, and includes:  
  - Assessment by Consultant Neonatologist during training.  
  - Supervised, structured and assessed training in procedures  
  - Maintenance of clinical skills by practice in the ANNP role on the neonatal unit  
  Attendance on resuscitation training day annually. | On-going training  
Regular update | Review of personal profiles.  
Assessment of performance during training day. | Human error |
that making labour ward practice possible for the ANNPs was opening a periphery that allowed for limited engagement in some transport-like activity but in a context where there was the possibility of readily available support and help. This concept of peripherality is a key part of the CoP formation framework. Further, as a clinical setting labour ward is a place where ANNPs may apply initiative and knowledgeability and also exercise judgement and these activities are part of engaging with an infrastructure of competence.

3. Access to clinical experience – managing boundaries and opening peripheries

The issue of access to clinical experience emerged at the special meeting on 17.8.99, as the unit was quiet at the time with some beds closed because of staff shortages. The consultant neonatologist has to balance the needs for exposure to clinical cases of various groups of staff, in this case ANNPs and junior doctors. At this time the ANNPs are treated as equally important to junior doctors in this respect:

Box 4.15 – Equality of access to clinical experience for ANNPs (from Special meeting 17 8.99).

| CN: I think you should split the workload...I personally think at least split the workload equally, in other words, I don't think you should have the whole of room 3, 'cos that, I think, is unfair on the SHOs, five out of six of whom are career neonatologists, and who need the experience |

Exposure to clinical practice situations is a predictable resource which will be needed to facilitate the workplace learning of the new ANNPs and the emergent issue here is how that exposure should be divided between groups. Before there were any ANNPs all of the exposure to this resource was given to junior doctors, but now ANNPs are recognised as sufficiently important for it to be worth reducing the exposure of the junior doctors. The consultant neonatologist is recognising that this is a resource that needs to distributed to make various competing endpoints achievable, and complex decisions are being made that shift exposure to those situations. The gatekeepers of this access are the consultant medical staff, who appear able to regulate the
degree of access available. This extract raises the possibility that the consultants could also deny access, should a development be one which was not supported by that group, and without access the nursing role may not be able to develop. This is congruent with Woods (2000c) finding that for nurse practitioners who reconstructed their practice into non-clinical directions, access was a significant issue.

In this extract the consultant is explicitly managing boundaries to allow for an opportunity for engagement with the available clinical experiences for the competing groups, including the ANNPs. The boundaries are being manipulated to allow the ANNPs to engage with real clinical problems in a setting where this will build competence. This section, which shows the ANNPs being dealt a fair hand in comparison with other groups, also builds the infrastructure of imagination that comes from clearly locating the ANNP group at a specific locus of power. The CoP infrastructure of mutuality is being supported by managing the peripheral access to practice for the new ANNPs. This management of boundaries facilitates their peripheral participation. The infrastructure of imagination is supported by making clear to the ANNPs that their needs are important and the organisation will take steps to ensure those needs are met.

This issue was to have continuing resonance in the subsequent period of transition, as the two new ANNPs and senior NICU staff dealt with issues that emerged in the availability of transfers (Chapter 5), procedures (Chapter 5), working patterns (Chapter 6) and junior doctors hours (Chapter 6).

4. Educational support for transport training – mutuality and interactional facilities

Another resource put in place from the beginning to support transition was what came to be known as the clinical supervision meetings, opportunities for the two new ANNPs to reflect back on transfers that they had undertaken as accompanied trainees. These are set up at the initial meeting on 17.8.99:
Box 4.16 – Clinical supervision meetings are planned to support transport training (from: Special meeting 17.8.99).

AJL: Do we need to talk, not necessarily now, but do we need to talk more about transport training? Do you think there are other...about how...or is that just such a straightforward topic that we don't need to discuss it further...you're going to go out on some transfers with people...I think we should do some sort of supervision meeting, a bit like the transport team meeting.

CN: What might be nice is some sort of feedback session to actually discuss it...

AJL: Yeah

CN: I think it would be good because not all transports that you're going to go are you going to think that they were done necessarily medically right, or whatever, particularly going with...but some sort of opportunity to sit down and reflect.

AJL: Sit down, with the notes...

ANNP1: And scenarios as well.

AJL: Sure, that's easy to do.

This extract shows that the resource of clinical supervision meetings was offered, and Chapters 5-7 will show that it was to be much-used. We can see from the above example that what became known as clinical supervision meetings emerged from a tentative suggestion for “some sort of supervision meeting”. The extract shows the interactive emergence of the basis for some form of meeting that is beyond the type of meetings currently held yet similar to other ways in which the NICU conducts its practice. The concept of “clinical supervision” as a formalised tool for reflection on practice was emerging in nursing at this time (United Kingdom Central Council for Nursing, 1995), and this was probably influential in the final form of meeting chosen. In the sequential unfolding of the conversation the form and substance of what was to become the clinical supervision meeting is mapped out – “What might be nice is some sort of feedback session to actually discuss it...”; grounds are provided for the type of issues that might be discussed – deviant cases – “because not all transports that you're going to go are you going to think that they were done necessarily medically right”; concrete suggestions for materials that might resource such meetings are made – “sit down with notes”; and
"scenarios" Thus the emergent issue of training to do transport has a different type of resource applied to those reported earlier, which were substantially concerned with facilitating access to relevant settings.

This section shows the application of a resource which supports the formation of a CoP in the possibility for generational encounter, where those who are experienced in a skill are able to meet, support and guide the next generation. It provides for this in what is to become a regular, semi-formal framework where a new ANNP attends for a clinical supervision session after one or more supervised transfers. This is supporting an infrastructure of mutuality by making space for interaction. All of these factors support engagement, in Wenger’s terms, and this is the key work of forming communities of practice. Additionally the infrastructure of imagination is supported by facilitating reflection on practices. As these sessions unfold in subsequent chapters further value will be seen to flow from them.

5. Money to support study opportunities – Mutuality and travel budgets

Another resource raised at the meeting on 17.8.99 is money for study opportunities. The consultant neonatologist announces that a special budget has been agreed to support education and clinical updates for ANNPs.

Box 4.17 – Money has been made available to support ANNP clinical education and update (from: Special meeting 17.8.99).

CN: The other thing in terms of learning needs, I told one of you, I know, we agreed at the directorate that we would put...that there would be a special fund for advanced neonatal nurse practitioners for study leave...But you have to come and ask me for it, 'cos you can't go on it unless somebody asks, so, I know, (ANNP2), you've talked about. talked about your Open University...thing, which we've kind of put on one side until you came for your IPR...but you know if there are, for example there's an excellent course in two and a half weeks time, um, the Reason Conference in Warwick...it's not too expensive...it's not too expensive compared to how much money we gave you for study leave, but unless you come and ask and apply for it you can't go on it. There's another course I've just got the stuff from through today at the Hammersmith in November...really, mainly for Consultants to some extent, but again it would be good, just a one day course...there are lots of things around...Serono do a lot of good stuff
This is important in CoP terms as Wenger argues that “time for interaction and travel budgets” is part of the infrastructure of mutuality which supports engagement. This resource apparently emerged in the absence of a specific issue to drive it. What appears to have happened is that a need for money for study leave for the ANNPs was predicted. Funds from the budget were subsequently secured for this. The extract shows that the issue of financial support was “agreed at the directorate” but the reason for the raising of the issue is not known. Clear direction is being given to the ANNPs in the extract on the type of conferences, meetings or educational opportunity they should consider, and all are clinical medico-technical update meetings where experts in their field present practice and research.

Study leave will emerge as an issue requiring attention during the subsequent transport training period (Chapter 6), where it is clear that other issues, particularly organisational ones, need attention so that study leave becomes an available resource. However, the money which has been secured to support ANNPs study leave is not raised again as an issue, suggesting that the presence of the money has made at least the financial part of study leave unproblematic.

Summary.

“Communities of practice” was not used as a tool during the period of the research data collection. The CoP framework was not introduced as a research tool until after data collection was completed. The CoP framework is being assessed from two perspectives. First, is it a research tool which adds useful structure to evaluation of workplace change in the neonatal transport setting and secondly is it an explanatory paradigm that could be used by future implementers of neonatal transport changes to guide the implementation of change?

This chapter has summarised the issues and resources in the data that were in place to support learning and transition at the outset of the process. These are summarised in Table 4.1, below. The first two columns indicate the emergent
issue and associated resources. The third column summarises the CoP factors that are identified in the text above as having congruence with the emergent issues and resources. This is the first step in the exercise of assessing the goodness of fit of the CoP framework to the process that unfolded in the setting. This format will persist across Chapters 5-7 so that in Chapter 8 it is possible to ascertain the extent to which the CoP framework may be of use to others in similar settings. These data suggest that some, but not all, CoP formation factors had been attended to in some degree prior to commencing transport training.

The next chapters follow the ensuing period of transition, using the data to track the issues and resources that emerged over the period of transport training. The next chapter is specifically concerned with issues and resources that emerged which were concerned with the ANNPs achieving clinical competence. Links will again be made to CoP formation factors so that a picture starts to be built of the utility of the CoP framework.
Table 4.1 – Summary of the issues and resources elicited from the data associated with the period when the new ANNPs were commencing transport training. Elements of the framework for the start-up of a new CoP found to be associated with the issues and resources are also summarised.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Resource</th>
<th>CoP element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug initiation</td>
<td>Sites of practice were clarified, to allow drug initiation on the base NICU.</td>
<td>Infrastructures of competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competence – activities that bring about the knowledgeability of engagement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mutuality – availability for help</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imagination and exploration – opportunities for trying things out.</td>
</tr>
<tr>
<td></td>
<td>Process for entry to approved personnel list and the need for a drugs initiation training programme to facilitate this</td>
<td>Substantial overlap in participants descriptions of who belongs</td>
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<td></td>
<td></td>
<td>Continuity – reificative and participative memory</td>
</tr>
<tr>
<td></td>
<td>Exclusions to drugs protocols</td>
<td>Management of boundaries</td>
</tr>
<tr>
<td>Multiple and confusing demands on</td>
<td>Transport was emphasised as the focus</td>
<td>Defining the common enterprise</td>
</tr>
<tr>
<td>the new ANNPs</td>
<td></td>
<td>The definition of a common enterprise in the process of pursuing it in concert with others</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A sense of interacting trajectories that shape identities in relation to one another</td>
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<td></td>
<td></td>
<td>Imagination - long term trajectories</td>
</tr>
<tr>
<td>Issue</td>
<td>Resource</td>
<td>CoP element</td>
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<tr>
<td>Opening access to activities that may support the transition to transport.</td>
<td>Access to labour ward practice enabled</td>
<td><strong>Mutuality, peripherality and ways of belonging to various degrees.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mutuality – peripherality, boundary encounters. The opening of peripheries that allow for various degrees of engagement</td>
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<tr>
<td></td>
<td></td>
<td>Mutuality - joint tasks: things to do together, availability for help</td>
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<td></td>
<td></td>
<td>Competence - Initiative and knowledgeability. activities that bring about the knowledgeability of engagement</td>
</tr>
<tr>
<td>Access to clinical experience</td>
<td>Work patterns and allocations for ANNPs and junior doctors renegotiated</td>
<td><strong>Managing boundaries and opening peripheries</strong></td>
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<td></td>
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<td>Mutuality – peripherality, boundary encounters</td>
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<td>Peripherality. boundary encounters; ways of belonging to various degrees, peripheral participation</td>
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<td>Imagination – location in power</td>
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<td>Management of boundaries</td>
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<td>Issue</td>
<td>Resource</td>
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<tr>
<td>Educational support for transport training</td>
<td>Clinical supervision meetings</td>
<td><strong>Mutuality and interactional facilities</strong></td>
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<tr>
<td>is envisaged</td>
<td>planned</td>
<td>Mutuality – interactional facilities, physical spaces; time for interaction.</td>
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<td>Sustained mutual relationships Mutual engagement in shared activities</td>
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<td>Continuity – generational encounters</td>
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<td>Imagination – reflection on practices</td>
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<td>Financial support for clinical update</td>
<td>Money made available</td>
<td><strong>Mutuality and travel budgets</strong></td>
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<td>envisaged</td>
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<td>Mutuality - Time for interaction and travel budgets</td>
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Chapter 5.
Becoming an ANNP: proximal issues.

Introduction.

The concern of this chapter is to develop the argument introduced in Chapter 4. Just what are the process and resources that led to the two new ANNP's being able to do transports as team leaders? This chapter elicits the issues which may be important for individuals undergoing the transition to ANNP-led transport. This will be of use to others wishing to undertake the process and may shed light on the change process as it is situated in neonatal intensive care. The data will continue to be presented as emergent issues and resources with links to factors which may promote the formation of a community of practice. In summary, Wenger (1998a) argues that the work of forming a CoP is accomplished by supporting infrastructures of mutuality, competence and continuity (Figure 4.1). Broader structures may be supported via an infrastructure of imagination (Figure 4.3)

The issues and resources that are the subject of this chapter are those that emerged under the broad theme of achieving clinical competence for the two ANNP's. These are characterised as proximal issues as they are situated in the learning and concerns of the two new ANNP's in contrast to the more widely distributed or distal issues and resources in the next chapter.

Wenger does not use the proximal.distal model for issues and resources, preferring the terms "local" and "global" to distinguish what he argues are levels of influence on the local setting which are conceptualised in terms of scale. He discusses the local and global where "local" is largely the community of practice and the "global" is the world beyond. Using "proximal" and "distal" is part of ensuring that all the issues and resources in both chapters are seen as connected to the setting.

In contrast to Chapter 4, where the data were characterised as representing a slice across time, the data in this and the next two chapters track the trajectories of emergent issues and resources as they change over time. These
proximal issues include many of the issues in clinical competence, such as learning to do clinical procedures, which are often seen as the most important elements of change at work. The collection of data over the prolonged period of this change allows the emergence of competence to be tracked over time. The CoP framework allows the emergence of these competencies to be located in their broader contexts, so that it will be seen that competence is more than simply the proper performance of a procedure and includes the need to locate the procedure in wider clinical contexts. The CoP framework assists us to make the emergence of these wider contexts systematically visible, and to track the trajectories of these over time. The emergent issues and resources along with their associated CoP elements are summarised in Table 5.2, at the end of the chapter. This contributes to a central objective of this thesis in assessing whether the CoP framework is a tool which may be of use to others concerned to implement or research change at work. The timescale for this is a prolonged one (Figure 1.1). The data in these chapters are from materials gathered immediately following the start of transport training (August 1999) up until both ANNPs had completed transport training (June 2001) (Figure 1.1) The fine-grained detail of change at work over time has not previously been investigated for ANNPs.

Many of the issues which follow in this chapter were ones that might have been predicted to be relevant. This chapter shows how they emerge and are attended to over time, and how they contribute to the dynamic of the formation of a new community of practice

Emergent issues and resources – analysis of data over the period of transport training

This chapter is concerned with the issues and resources that emerged under the broad theme of achieving clinical competence for the two ANNPs. In the presentation of the data both the emergent issue and/or resource and the trajectory of movement of that issue or resource are shown, so that the process of change may be tracked over time. The data that are used to track issues and the resources that are brought to bear on them are from tape-recorded and
written sources, and these are detailed in Table 3.2. As in the previous chapter links are made to issues in the formation of a new CoP as this framework may give structure to our understanding of the change process. These data are summarised at the end of the chapter in Table 5 2

The following emergent issues, their associated resources, the trajectories of their movement and contribution to forming a new community of practice are discussed in this section:

- Procedures, including:
  - Becoming technically competent at procedures
  - Performing procedures in context
- Note and record-keeping
- Availability of transfers
- Condition of babies on completion of transfer
- Equipment

Much of the data in this section is drawn from recordings of clinical supervision meetings. These were ad-hoc meetings between the individual new ANNPs and a clinical supervisor and were always one-to-one. How they came to put in place is shown in Chapter 4. They were arranged whenever one of the new ANNPs wanted to discuss recent transfers that she had attended in a learning capacity. They were informal meetings, without terms of reference or agenda, but with the specific intention of providing supervision of the learning to do transport.

In each meeting one or more transfers were discussed. In most cases the supervisor was not aware of the detail of the transfer(s) to be discussed, and so presenting the history of the patient and the clinical issues was a necessary starting point. Wenger (1998a) makes clear that he sees participative and reificative connections as equally important in this situation. The participative connection with the transfer scenario is present in the person of the ANNP and the clinical notes and audit record were often also present, forming a reificative connection. These two forms of connection are seen to be important as complementary in the data which follow.
1. Procedures

Competence at a range of advanced clinical procedures, such as intubation and vascular access, is a fundamental aspect of being able to lead transfers. While the procedures that ANNPs do on the NICU has been studied (Redshaw & Harvey, 2002a), any additional contingencies consequent on acting in isolation on transfer have not. On a large tertiary NICU if an ANNP is unable to complete a procedure there is always another person who can be asked to help. On transport this is not the case.

A comprehensive range of clinical procedures are discussed in the data, indicating the range of procedures that may need to be part of the toolkit of situated skills available to practitioners that attend transfers. Procedures discussed in the data are listed in Table 5.1.

<table>
<thead>
<tr>
<th>Table 5.1 - Procedures discussed in the recorded data</th>
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<tbody>
<tr>
<td>Peripheral venous cannulation</td>
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<tr>
<td>Umbilical arterial cannulation (UAC)</td>
</tr>
<tr>
<td>Umbilical venous cannulation (UVC)</td>
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<tr>
<td>Intra-osseous line placement</td>
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<tr>
<td>Peripheral arterial cannulation</td>
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<tr>
<td>Tracheal intubation</td>
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<tr>
<td>Chest drain placement</td>
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<td>Abdominal drain placement</td>
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<td>Lumbar puncture</td>
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</table>

The purpose of this section of the study is not to count procedures in a skills-audit fashion, but to track the extent to which procedures emerged as issues and resources for the new ANNPs. One issue is simply the gaining of competence in procedures and the ANNPs may be on trajectories from being unable to being able to do the procedures. Competence in procedures in the
context of the job for which the new ANNPs are being prepared however, involves more than technician-level engagement. The ANNPs are not simply attending the patient at the request of a doctor in order to do a procedure. Competence for transport also involves a wider context of recognising that a procedural intervention is needed and deciding precisely when and how that thing should be done. The data below track these two emergent issues in the resources that are raised to address them. The first section examines becoming competent in the technical aspects of the procedure, and the second examines the emergence of context as a resource.

There are many procedures listed above, and it may be that each individual procedure followed a discrete timescale and trajectory for establishing competence. For the purpose of investigating the emergence of competent transport practitioners "procedures" are treated as a generic category which includes all of the above. Becoming simply competent to do the procedure is mostly activity undertaken on the base unit, and so the data, being focussed on transport, does not track this issue comprehensively. Putting procedures in context for transport is, however, learning that is specifically engaged with becoming competent to do transfer, and is seen more thoroughly in these data and given context through location in the CoP framework.

There is much use of abbreviation and jargon in the talk in this chapter, and the reader is referred to Appendix 1 (glossary) or to footnotes.

Issue 1: Becoming technically competent – peripheral participation, the knowledgeability of engagement and generational encounters.

The data in this section show that there are a number of issues in attaining technical competence. Access has to be granted and expert supervision has to be available. In CoP terms it is necessary to be technically competent for membership of the community to be granted. Peripheries have to be opened for practice situations to be available for the new ANNPs to engage with, supported by existing experts.
The first resource that emerged to support competence in procedures was the availability of supervision, coupled with the possibility of being able to have a go. In Box 5.1, from the clinical supervision meeting on 13.10 99, ANNP1 tells how she had the opportunity to insert both a UAC and UVC in an infant being stabilised for transfer.

**Box 5.1 – Availability of supervision (ANNP1 13.10.99).**

AJL: OK good(.) so you put in a single-lumen UVC?

ANNP1: Yeah(.) Identified the vessels and got (SpR) to say which one she thought it was and I thought she was agreeing with me um, so I put in my UAC which bled back(.) I couldn't see it pulsating

AJL: Right

ANNP1: And then (SpR) said "oh I thought that was the vein"

AJL: Example number 2 on this transfer of people talking at cross-purposes

ANNP1: Yeah, so um I took the(.) I took that out(.) Could only initially find a size 8, put that in and put the one into the other side and then we drew the blood back and the one that I thought was originally the artery was pulsating

AJL: (laughs)

ANNP1: It was one of those transfers! So having finally managed to get this size 8 UVC in the artery

AJL: Right

ANNP1: Yeah, don't think about it too much I then had to take both the lines out again and swap them over and finally we got an arterial gas

On this occasion the supervision episode appears to have been confused, leading to vascular lines being placed and replaced. Despite this ANNP1 completes both procedures.

Most procedures are not performed so frequently that gaining competence can be assured merely by attending the NICU over a period of time. In Box 5.2 ANNP2 at the clinical supervision meeting on 19.6.01 reflects back on how experience in procedures becomes available, and makes clear the sporadic and unpredictable nature of this ("fluke").
Box 5.2 – Sporadic availability of opportunities to practice (from: ANNP2 19601).

ANNP2: ... And things like arterial lines and chest drains just fluke on the unit really aren't they?

AJL: Absolutely

ANNP2: They come in in dribs and drabs as well

AJL: It must be a year since I've put a chest drain in

To make up for this shortcoming another resource emerged on the neonatal unit, the use of simulated procedures. As Box 5.2 indicates, one of the more rare procedures is placing chest drains, and Box 5.3, from the ANNP meeting on 17.4.01 illustrates a response to that:

Box 5.3 – Simulated procedures (from: ANNP meeting, 17.4.01).

CN: are any of you here on Friday?

ANNP1: Yes, I'm on

CN: I'm putting chest drains in rabbits - three of us could do that

AJL: Oh man

CN: I might not even turn up. Haven't got any rabbits yet!

In this simulation butchered rabbits are used as a model to familiarise individuals with the technical and motor skills needed to place chest drains. Both of the new ANNPs undertook this simulation.

During the course of the period of transport training for the new ANNPs their proficiency in the full range of procedures emerges as a topic in their clinical supervision meetings, in progress monitoring terms. At the clinical supervision meeting on 2.11.00 ANNP2 talks about procedures:
Box 5.4 – The need for opportunities to practice procedures (from: ANNP2 2.11.00)

AJL: So we were talking about exposure to transfer and that it’s been a bit difficult

ANNP2: Umm

AJL: I think we’ll stick with the plan for the time being (.) what do you think?

ANNP2: Yes I need to get arterial line practice in (.) I’ve done most things since I came back (.) did an LP at the weekend done most things it’s just the arterial line really, done UAC’s, UVC’s

AJL: Right

ANNP2: Just the arterial line (.) just practising I think

The availability of transfers for practice also emerged as an issue, and this may be seen below. Simulation of a different kind is seen at that time, when simulated transfers are raised as a possible solution (Box 5.31).

Such is the level of exposure to critical procedures that the need for practice apparently never goes away. At her clinical supervision session on 19 6 01 ANNP2 continues to express these needs, despite now being an ANNP who has completed transport training.

Box 5.5 – Ongoing need for opportunities to practice procedures (from: ANNP2 19 6 01)

ANNP2: So the main things I think (.) I’ve still got to do things with (CN) (.) arterial-lines I’ve still got to do (.) I’ve had a few goes and sometimes I can do an artemal stab more than an arterial-line

AJL: Yes

ANNP2: Chest drains I need practice with but you only do them now and again don’t you? I’ve done them; I’ve done two or three now

AJL: Sure

ANNP2: But again it’s more than six months ago

These extracts suggest that there are a number of issues in simply becoming technically competent at procedures. Access has to be granted and supported,
and expert supervision is needed for some procedures. The rarity with which some procedures are performed creates an additional obstacle to competence, and means that there may be a continuing cycle of learning and deskillng which may need intermittent attention. Rare procedures such as chest drains may be particularly worrying in such a cycle, as they are emergency procedures that save life. Experience on simulated models may be part of a programme that addresses a learning/deskillng cycle. For other procedures, such as arterial line placement, there is no readily available dummy or simulator, and these were supported in the process described above by recognising that there is an issue and encouraging the learner to persist.

In CoP terms it is necessary to be technically competent for membership of the community to be granted. Peripheries had to be opened for practice situations to be available, but as with the opening of peripheries to attending transfers, there appears to be more to facilitating access than simply decreeing that ANNPs may do procedures. In this case the possibility of simulated peripherality emerged as a resource and may have had some utility. The key resource was the availability of an infrastructure of continuity, in the form of existing technically competent supervisors. This is the participative memory that is passed-on in the generational encounters of apprenticeship systems.

Issue 2: Performing procedures in context – creating an infrastructure of competence.

The more complex procedure-related concern for the new ANNPs in becoming competent to lead transfers is performing procedures in the wider clinical context. In this section, elements of Wenger’s (1998a) infrastructure of competence (Figure 4.1) are the main CoP factors elicited. While the section above shows the importance of peripheral participation and generational encounter, this section shows the need for “activities that bring about the knowledgeability of engagement,” and “occasions for applying skills, devising solutions and making decisions.” These in turn become “problems that engage energy, creativity and inventiveness”.

Performing procedures in context involves considering a clinical problem and formulating a response to it. If the response includes a procedure, there may be a choice of procedure or technique. For example, a diagnosis of pneumothorax\(^1\) leads to a choice between evacuating the trapped air with a needle and/or placing a chest drain. There may be decisions in how to do the procedure, for example an arterial line may be sited via the umbilical artery which is a slow but durable option, or via a peripheral artery, which is quicker but less durable. There may also be a decision regarding when to do the procedure. Whilst some procedures, like treating a pneumothorax, require a prompt response others may be fitted into a broader treatment plan and be timed according to other factors such as the infants temperature. The section demonstrates that competence in clinical procedures is situated in the wider clinical context and shows that simple procedural competence is not enough to do the job or to be part of the community of practice.

Being competent at transport therefore involves much more than technical ability with procedures. ANNPs need to be able to recognise that a procedure is needed, make choices between procedural variants and determine the right time to perform the procedure. This section shows that learning these skills requires peripheral access to supervised situations where complex and subtle factors are calculated in decision making. These illustrates the situated nature of learning to become an ANNP who is able to do transport. This supports the view of Roth (1998, p. 13) and others, that the “community of practice view sets up learning environments in which students learn explicit and implicit knowledge”. The data which follow are divided into three sections: deciding that a procedure is needed; deciding which procedure is needed; deciding when to do the procedure.

*Deciding that a procedure is needed*

The first extract, from the clinical supervision meeting with ANNP2 on 12.4.00 is long, and illustrates the complexity of the decision-making in deciding whether a procedure is needed and illustrates the situated nature of competence. In this extract ANNP2 is reflecting back on a training transfer she did with an SpR. The transfer was a short distance, just the few miles between

\[^1\] Pneumothorax is a collection of air in the chest leading to collapse of a lung.
the two Nottingham NICUs. When ANNP2 arrived with the baby she found that
the infant had recently removed her breathing tube herself. In the extract in Box
5.6 ANNP2 reviews the issues in deciding whether the breathing tube should
be replaced before the transfer. The extract shows the profound extent of the
contextuality of competence. Simply being technically competent to insert
different kinds of tube is not a sufficient resource for dealing with the many
complex factors that influence how treatment is delivered.

Box 5.6 – Situated competence in dealing with complex clinical decisions which
involve the performance of procedures (from: ANNP2 12.4.00).

| ANNP2: then the decision was then was whether to re reintubate\(^1\) her again
| AJL: Yes
| ANNP2: when she was thrashing around and quite lively
| AJL: Yes
| ANNP2: Which was a shame or just put a prong down\(^2\) and see how she coped
| AJL: So what were the things that guided your decision?
| ANNP2: The thing then was she was getting transferred out like I was
| saying can’t they transfer another baby out instead? But someone had
| made the decision that this one was getting transferred and that was it I
| think there was so much chaos on the unit that that was it
| AJL: So the baby was definitely going
| ANNP2: going (.) The Queens was a short
| journey
| AJL: Yes
| ANNP2: Not a long journey
| AJL: So that would tend to make you think she could stay off if she had
done well?
| ANNP2: Yes and so I thought I’d try a prong first of all and that

\(^1\) Re-insert a tube into the trachea through which to deliver respiratory support
\(^2\) “put a prong down” – a simple and mid-level means of supporting breathing that falls between
the patient breathing for him or herself and the top-level intervention of inserting a tube into the
trachea to support respiration,
AJL: Hang on before you get to the plan what are the things that

ANNP2: Oh sorry because but seeing as it was a short journey

AJL: were guiding your decision?

ANNP2: er it's a thirty seven weeker a big baby as well

AJL: Okay

ANNP2: And the gas before was excellent

AJL: So things had got better quickly in the child's lungs? Right

ANNP2: And diamorphine 30 mikes¹

AJL: Yes on the plus side of staying off then it was a short journey (.) good gas (.) the baby's got better quickly er (.) what else did you see?

ANNP2: Active and pink

AJL: Active and pink yes

ANNP2: Very active

AJL: On the negative side there's

ANNP2: diamorphine

AJL: got better quickly maybe isn't going to stay off that quickly and 30 micrograms of diamorphine been given (.) all right (.) It's difficult (.) I'm not going to sit here and tell you there's a right answer in this situation you'll be relieved to hear

ANNP2: Hmm that's nice

AJL: So what did you (.) so okay so tell me what you were thinking of doing then (.) What your potential plan was?

ANNP2: I know it was difficult then because like I said she was going to Queens but normally you would take her off and see how she went or assess her in the unit or try her on a nasal CPAP driver² if she needed it but obviously on transport you can't

¹ Diamorphine is used as an intravenous infusion for sedation of infants needing respiratory support. "30 mikes" is shorthand for "30 micrograms/kg/hour", the dose used

² Nasal CPAP: Mid-level respiratory support modality similar to the "prong" above (CPAP=Continuous Positive Airways Pressure)
AJL: Hmm

ANNP2: And then she’d already been out (.) she’d extubated\(^1\) herself twice so that was another scenario so obviously it was fair to say she didn’t want to be ventilated she wanted to be ( ) off well there’s lots of things that were going through my mind so I thought well we’ll try her off and we’ll see how we get (.) how we get on

AJL: Try her off on the basis that it’s going to be a little while till you went on the transfer so it was

ANNP2: it would sort of pay to

AJL: sort of try her off for a little while

ANNP2: so

AJL: Okay so that’s airway in this instance your initial assessment and your initial plan for that as well so that’s airway and I guess you thought about breathing because you’d done a gas and your examination once you’d taken her off was that her breathing was (.) she wasn’t apnoic\(^2\) or tachycardic – sorry tachypnoeic or recessing massively\(^3\) any of those things because I guess any of those would have made you put her back on?

ANNP2: Yes although she did go bradycardic\(^4\) but then I thought it was the diamorphine then (SpR) helped (.) she just happened to walk in and she suggested that maybe we should give her some narcan\(^5\) to counteract the diamorphine that she’d already had

AJL: And you left her on the 30 mikes at that stage or

ANNP2: well as soon as she self-extubated we switched it off

AJL: Right

ANNP2: but obviously it was about half an hour till it (whispers) give her some Narcan which has a dramatic effect

AJL: Okay what was the dramatic effect?

ANNP2: Oh she’d gone apnoeic and desaturated and then wasn’t pink and perky again I think so

\(^1\) Self-extubation is, in this context, removal of a breathing tube inadvertently by the patient
\(^2\) Apnoic Not breathing
\(^3\) Tachypnoea (fast respirations) and recession (the chest wall being sucked inwards during inspiration) are two signs of breathing difficulty
\(^4\) Bradycardia slow heart rate, a sign that breathing problems may have become serious
\(^5\) Narcan (naloxone) is an antagonist to opioid drugs, reversing the respiratory depression they may cause
AJL: So that's (. ) why would you worry about the narcan in that situation?

ANNP2: It's short acting (. ) I mean it was given IV\(^1\) as well

AJL: Yes

ANNP2: I was suggesting giving it IM\(^2\) (inaudible) (. ) (inaudible) so then (SpR) had to write it up so she wasn't happy to give that IM (whispers)

AJL: Right so you gave one dose IV and then another dose IM is that what

ANNP2: No

AJL: had happened?

ANNP2: I think we just gave another two doses I think IV I think in the end

AJL: Good so you were really quite convinced that narcan was going to keep her off the ventilator

ANNP2: (laughs)

The extract above lays bare the complexity of an apparently straightforward clinical decision of whether or not to put a breathing tube in, and illustrates the extent to which skills in making a finely balanced situated judgement may be more difficult to acquire than learning to actually place a breathing tube. Many factors were considered in the discussion about the decision. ANNP2 indicates first considering whether another infant could be transferred instead, and then the length of the journey. This is relevant, and is discussed further below. The maturity of the baby ("thirty seven weeker") is raised, as the more immature the baby is the more likely is an ongoing need for respiratory support in response to a lung disease which will get worse initially. Being 37 weeks gestation is a positive sign in this regard which might have supported a non-intervention approach. The "gas before was excellent" and "the baby's got better quickly" indicate that ANNP2 had considered the output of the blood gas machine as well as the apparent clinical trajectory of the infant and these too had been supportive of non-intervention.

\(^1\) IV - intravenous.
\(^2\) IM - intramuscular
This had to be weighed against the diamorphine the infant had received as sedation while the old breathing tube was in. A side effect of this is suppression of respiration, and it appeared that the infant was intermittently stopping breathing.

ANNP2 decided on a course of action: "so I thought well we'll try her off and we'll see how we get (.) how we get on", but it appears the apnoea and consequent bradycardia persisted. The respiratory depression caused by diamorphine may be reversed by administering narcan (naloxone), and it appears that this, in several doses, is the solution which ANNP2 and the supporting SpR decided to use. In CoP terms this is activity which is rich in elements of an infrastructure of competence (Figure 4 1), including "activities that bring about the knowledgeability of engagement", and "problems that engage energy, creativity and inventiveness".

A complex situated judgement was being weighed-up. A key transport objective is to prevent as far as possible the need for clinical intervention in transit. Infants with breathing difficulties may need respiratory support, and infants with breathing difficulties who are being transferred may need that respiratory support starting earlier than non-transferred infants so that they are safe for a journey. This lower threshold for starting respiratory support for transfer raises the possibility that some infants will receive invasive procedures and powerful drugs that would never have needed if not transferred. It is this balance, between doing enough to keep the baby safe for transfer, and not doing more than is strictly necessary, that ANNP2 is grappling with in the excerpt.

Later in the meeting I raise the possibility of an alteration in just one of the factors influencing the decision. Instead of the transfer being a short one, I ask how the equation changes if the journey is to be much longer.
Box 5.7 - Situated competence in dealing with complex clinical decisions (from: ANNP2 12.4.00).

<table>
<thead>
<tr>
<th>AJL:</th>
<th>Right (.) How would you manage things differently if you’d been taking her to Liverpool if that was the only bed available?</th>
</tr>
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<tbody>
<tr>
<td>ANNP2:</td>
<td>I would have had to have intubated her and ( ) or I think probably then we would have fought to keep her here actually</td>
</tr>
<tr>
<td>AJL:</td>
<td>Okay sure I think that’s worth thinking about but if such was the dreadful situation that she was going to Liverpool no arguments what</td>
</tr>
<tr>
<td>ANNP2:</td>
<td>(inaudible) paralysed and sedated significantly (whispers) deliver</td>
</tr>
<tr>
<td>AJL:</td>
<td>Absolutely</td>
</tr>
</tbody>
</table>

ANNP2 makes clear in the extract above that a change in a single factor such as distance of journey makes the decision-making about whether the procedure is necessary much more straightforward. The longer journey mandates taking definitive measures to prevent respiratory deterioration in transit, and ANNP2 mentions intubation, paralysis (pharmacological muscle relaxation) and sedation. By changing this factor ANNP2 is given simulated access to an alternative version of the setting, so that “energy, creativity and inventiveness” (Figure 4.1) are brought to bear on the engagement with the problem.

In this section the emergent issue is deciding whether a procedure is needed. The resource which emerges to deal with this is experience of a range of factors which might be influential. ANNP2 asks questions which may be generally applicable in such situations in the future. How long is the journey? Is the baby getting better or worse?

In CoP terms an infrastructure of competence is being explicitly described in a situation where ANNP2 is engaged in activities that “bring about the knowledgeability of engagement”, where she has “occasions for applying skills, devising solutions and making decisions” (Figure 4.1)
Deciding which procedure is needed

In the next extract, from a clinical supervision meeting, ANNP1 reflects back on her first solo transfer and specifically on decisions regarding choices between procedural options. On this transfer there were concerns about the blood pressure (BP) of the infant. ANNP1 treated this with extra intravenous fluids and discusses the case with the Nottingham Neonatal Consultant.

Box 5.8 - Deciding which procedure is needed (from: ANNP1 5.10 00)

ANNP1: ... BP mean was twenty one so we gave a further (.) dropped back down again (.) it had normalised when we got there the BP and it dropped again so we gave another dose of plasma. And having (.) in the time of giving the plasma I actually at that point made a phone call to (consultant in Nottingham) and just updated him on where we were (.) the findings and the fact that I was giving another dose of plasma for this BP and how his feelings were about Dopamine and at which point he (.) he gave back some very clear guidelines as to what he would want which was don't (.) not to leave until the BP mean was above twenty four. Looked at fluids and the IV had very good access for that (.) but the concern here was I looked at the access that we'd got. We'd got an arterial access though the UAC and one IV access. They had tried to put in a UVC and had had several attempts and failed (.) by this point we'd got her into the transport system because we wanted continuous arterial monitoring of the blood pressure whereas they'd just been using a cuff. And I thought if we're giving plasma for that hypotension and querying Dopamine that we needed reliable arterial monitoring so I did try putting in another IV cannula thinking that if we were going to use Dopamine (.) but this one in his hand did seem extremely good. I wasn't able to get another IV in and I considered putting in (.) having a go at UVC but having said that I was aware that they'd had a few attempts and failed and the cannula in this hand was extremely good. I decided that if the very worst came to the very worst I had at least also got an arterial access (.) it's not that I'd put the Dopamine through that but I could give glucose

CN: UAC isn't it?

ANNP1: yes (.) through a UAC so it was (.) well not ideal but I thought if the worst came to the worst on the journey back then at least I had a fall back position although I would have preferred not to have had to have done that.

The next step after giving additional fluids to infants with low BP is often to give inotropic drugs, such as dopamine. These powerful drugs are given as a continuous intravenous infusion and mostly have to be given into a large central vein. The infant in question does not have suitable intravenous (IV) access at present. ANNP1 is discussing the issues, showing that she
considered attempting to place an umbilical venous catheter (UVC), and a peripheral IV. She discusses the complex factors that influenced procedure choice, including the infant’s blood pressure, the previous attempts at procedures that had been undertaken by the referring team and the other vascular access already in place. The issue is unresolved at the end of this extract, and as the discussion diverts to other subjects it remains unresolved, but with the caveat that she had at least got a "fall back position" for transfer. Access to the infant’s veins and arteries is the issue of concern here, and the extract illustrates the situated complexity of the decisions to be made. ANNP2 is “applying skills, devising solutions and making decisions” (Figure 4.1).

The next extract, from the clinical supervision meeting with ANNP2 on 6.6.01, also shows discussion of an issue in which procedure to do, but in a different sense.

Box 5.9 – Deciding on technique variants within procedures (from: ANNP2 6601).

ANNP2: I think I would have just left him on CPAP to sort himself out but obviously for the journey he needed to be intubated didn’t he?
AJL: Yes he did

ANNP2: I don’t know (.) Well the ET tube was good( ) looking at the x-rays and whatever to assess the ET tube (.) that was good experience
AJL: Oh yes sure that was the measuring the
ANNP2: um
AJL: Measuring how long it was on the previous films and using that to guide putting it in
ANNP2: Yes that was good

Here the discussion is concerned with the subtle variation within, rather than between, procedures ANNP2 is discussing an infant who needed intubating for a transfer. The procedural issue being discussed is deciding how long to cut the breathing tube before it is inserted. If it is cut too short it will not go in far enough, too long and it may go in so far that it only ventilates one lung.
Although there are standard guidelines on tube length, based on the weight or gestation of the infant, these do not take account of biometric differences between individuals which are often sufficient to render a tube too long or too short. In Box 5.9 ANNP2 is discussing learning another technique for deciding tube length, based on previously used tubes in the child in question and assessment of the position of those tubes on x-ray. By performing the procedure in this way, rather than by placing the tube and then waiting for an x-ray to confirm position, the transfer for a timed investigation was able to proceed without missing the appointment. In this way the need to be ready for the transfer emerged as the issue which determined procedure choice.

The emergent issue here was how to get the detail of the procedure right first time (the tube length), and the resource brought to bear on it was the presence of a senior person who could show ANNP2 another way of making this decision to those she already knew. This is another example of a CoP being built through the legitimising of peripheral participation, in this case with the added continuity of the presence of a member of a senior generation.

Deciding when to do the procedure
The third factor in putting procedures in context is doing the procedure at the right time. Babies who are being stabilised for transfer have a "stabilising period" when the goal of the transport team is to prepare the infant for transfer. In Chapter 2 there are data that indicate that this period is often several hours in length (Table 2.2). Procedures may be part of the work of this period, and competence at transport includes being able to decide when in the process the procedures should be undertaken.

The clinical supervision session with ANNP2 on 28.11.00 includes substantial discussion of these issues, and excerpts from this are in Boxes 5.10 to 5.13. These extracts are ANNP2 reflecting on a transfer that we did together. The infant in question was a newborn 23 week gestation baby who weighed 640g. Two procedure-related issues emerged during the stabilising period on the referring unit, and in both cases the need for transfer emerges as the issue determining the trajectory of action. The first was the size of breathing tube that the infant had in when the team arrived. The tube was 2.0mm diameter, the
smallest routinely available but too small for good airway management as it would not allow a suction catheter to be passed down it in the event of the tube becoming blocked. Although the infant was ventilating adequately through the tube the team were concerned to change it for a larger (2.5mm) one before transfer. The second significant procedure issue was the UVC the infant had in situ, which was in too far and so would need pulling out a bit, or replacing.

For very small infants a significant additional constraint on procedures is the need to maintain body temperature. Tiny babies lose heat very quickly, and any procedure such as changing the breathing tube that involves opening the incubator for more than a few seconds runs the risk of making the baby hypothermic.

In Box 5.10 ANNP2 reflects on the transfer, indicating that it was difficult. In this extract she indicates that she was too focussed on the breathing tube ("ET tube"), at the expense of "the baby as a whole".

Box 5.10 – Planning when to do procedures (from: ANNP2 28.11.00)

| ANNP2. I think that’s when the transport went wrong there (.) because I think they were trying to focus too much on these ET tube bit while if they had taken a step back and reflected on the whole (. ) the baby as a whole |
| AJL: Expand on that a bit more though (. ) You (. ) do you think your transport went wrong? |
| ANNP2: Well not went wrong ( ) I think I didn’t plan ( . ) I didn’t make a proper plan I don’t think (. ) I think I just focus on the ET tube and things that were happening at the time rather than taking a step back and trying to get an overall impression and doing a proper plan I think |

In Box 5.11 ANNP2 identifies some reasons for this perceived problem.

Box 5.11 – The difficult nature of deciding when to do procedures (from: ANNP2 28.11 00)

| ANNP2: It’s difficult isn’t it because I don’t know (. ) I’m trying to ( . ) I set myself back but once things are happening at the time ( . ) you’ve got this size 2 ET tube down the right bronchus and you’re right to pull it back and ( . ) I don’t know (. ) I suppose I should have been more certain and just ( . ) I don’t know ( ) walk away from the situation and sit down and you know ( . ) and just think what you’re doing ( . ) But it’s hard when everyone’s like |
AJL: from you? expecting action

ANNP2: Exactly yes

AJL: Absolutely (.) yes

ANNP2: It's just that I found it quite difficult I think (.) but as this is the first one I've done I think there's been quite a lot to think about

AJL: Yes (.) it was a challenging transfer (.) absolutely

ANNP2: Hmm (.) so it's difficult

AJL: But going back to my question then (.) if you (.) acknowledging that it's difficult ( .) if you could have that bit of time over again how would your plan have looked?

ANNP2: The plan or the ET tube scenario? The problem with the size 2 ET tube thinking about it as well is that you probably would have to take it out because you have to suture it in (.) wouldn't you (.) and I think if you suture a tube in you can't put a suction catheter down in (.) So we managed it well because it wasn't sutured in (.) it was clipped in (.) wasn't it?

AJL: This was the sort of debate you were having at the time?

ANNP2: Yes yes

AJL: And which ( .) this was the debate that you were saying to me kind of got in the way of you stepping back from the situation

ANNP2: that's true

These extracts reveal a range of factors that ANNP2 identifies as impacting on her ability to respond appropriately to a difficult clinical scenario. She identifies an expectation that she will act as being one pressure. Another issue emerges in the latter half of the extract (from "The plan or the ET tube...). ANNP2 responds to a question about her clinical plan by focussing again on the issue of what to do about the breathing tube, and then goes on to acknowledge that it was exactly this set of issues that had got in the way of her "stepping back from the situation" and making a plan on the transfer. It appears that the issues in how to do the procedure, and the subtle variants of precisely which procedure to do were and are a preoccupation which interferes with consideration of when to do the procedure, in the context of a wider clinical
plan. The clinical supervision meeting discussion is doing the CoP work of providing “occasions for exercising judgement and for mutual evaluation”. (Figure 4.1)

The next two extracts explore the frameworks that might be brought to bear in the setting on the problem of when to do procedures. In the first extract ANNP2 responds to a question about general jobs that need doing during the stabilising period to make the baby ready for transfer. Her response follows a sequence of issues from airway to breathing to circulation. This is the standard approach to all resuscitation, the so-called "ABC" system. Under this approach the establishing and maintenance of a clear airway is the priority, and only when that is achieved is attention given to breathing. Only once adequate respiration is established is attention given to the circulation. Whilst this approach is taught ubiquitously for the resuscitation of collapsed people requiring emergency resuscitation, it has been widely adopted by critical care personnel as a helpful framework for dealing with all manner of clinical scenarios, including transport (Resuscitation Council, 2001). For transport however these frameworks provide a checklist of issues that need to be considered, rather than an unchangeable sequence of action. In this case the airway needed consideration, as the breathing tube is too small, but as the infant is being ventilated adequately through it, it does not necessarily mandate immediate action. In Box 5 12 I review the issue of when to do a procedure, with ANNP2

Box 5 12 - The difficult nature of deciding when to do procedures (from: ANNP2 28 11.00)

| AJL: | Trying to take all ( ) because there are a lot of complex factors that needed taking into account ( ) weren't there? There was ( ) there was the ET ( ) well ( ) what were the factors that needed taking into account for the stabilising? Once you got in you got handover and you knew what was going on ( ) and you'd got this period of time stretching ahead of you at the end of which you've got to have the baby in the transport system ( ) stable and ready to go and in between there's some stuff that you're going to decide needs doing |
| ANNP2: Airway ( ) the ET tube |

| AJL: | Yes |
ANNP2: giving second dose of Curosurf which I thought had been given but it hadn't when we got there because we asked them before we left. Ventilation and gases, breathing, you know. Circulation of UVC and UAC with the UVC pulling it back I wasn't sure if we could have just left it for the journey and dealt with it later on anyway because baby was already cold. Trying to think of anything else because I know the baby was cold.

AJL: Temperature is a big factor.

The next extract in Box 5.13 makes clear that ANNP2 is applying an ABC approach.

Box 5.13 – Using the ABC framework to help decide when to do procedures
(from: ANNP2 28.11.00)

AJL: So you're saying the first bit of your plan then was airway but adjusting the airway at least so that you could give the Curosurf so

ANNP2: And are you looking at A B C D and everything like that so you have to respect

AJL: Say that again?

ANNP2: I'd use my A B C D

AJL: You would or you

ANNP2: I would now I think but at the time I yes

AJL: I mean don't don't be confused by your A B C D in the sense that just because A comes first that doesn't mean you've got to change the tube first

ANNP2: Oh no

AJL: That's doesn't mean changing the tube is your first job it just means is the airway secure

ANNP2: Hmm

AJL: And the airway was secure at least at that moment. It wasn't secure enough for transfer but it was okay

ANNP2: Hmm

AJL: You know you could come back to airway later on.
In this extract ANNP2 makes clear that she was indeed applying an ABC framework to stabilising for transport, and suggests that she considered the framework as being a prescription for the order that tasks should be undertaken. ANNP2 has taken a tool which is used widely in other settings, such as resuscitation, and applied it without amendment to the transport setting. The use of tools as "artifacts that support competence", such as the ABC approach, is part of the infrastructure of competence proposed by Wenger (Figure 4.1). Learning to use the tools in the manner of the CoP will be part of becoming a member of the CoP, and this is learned in this instance through generational encounter.

Extracts 5.6 – 5.13 suggest that a significant part of being competent to do transports is being able to recognise the need for a procedural intervention and make decisions regarding which procedure to do and when to do it. The need to transport the baby emerges as an issue which has to be attended to in a very short-term trajectory of future action covering the pre-transfer stabilising period. The infant is being prepared for a transfer and the transport personnel are focussed on making the baby as stable and safe as possible before departing in the vehicle for the journey. The data suggest that many factors are all potentially significant in decision making on procedures for transfer. The data also suggest that putting these decisions together into a coherent plan for pre-transfer stabilisation is more complex than simply a stepwise progression through the ABC of resuscitation. The ABC approach appropriately emerges as a resource to guide pre-transfer action, but how the resource is interpreted becomes an issue in learning to be competent at transport.

Where the participant's concerns with technical competence at procedures for ANNPs are congruent with features of the CoP framework that support apprenticeship-style learning (peripheral participation, generational encounters) the learning to do procedures in context is more associated with elements of Wenger's infrastructure of competence. Peripheries had to be opened to allow engagement with transport and with procedures, but once the ANNP has gained access then there are other issues to be attended to. Getting to grips with the fine-grained detail of complex decisions regarding whether to do a
procedure, which procedure to do and when to do it are "activities that bring about the knowledgeability of engagement," they are "occasions for applying skills, devising solutions and making decisions" and they are "problems that engage energy, creativity and inventiveness" (Wenger, 1998e) (pp237-8).

The next sections of this chapter are concerned with other proximal issues which emerged in the data. These are concerned with the keeping of competent clinical notes, making transfers available for learning, the condition of infants on completion of transfer and learning to use and deploy equipment. These further issues are also grounded in relevant sections of the CoP framework. This is allowing a structured picture to be built of how change was accomplished.

2. Notes and record-keeping – Participation and reification

The keeping of clinical notes emerged as an issue early in the clinical supervision meetings. Producing accurate and useful clinical notes is an important part of becoming competent to do transport. As well as being a legal record of the care and treatment given to the patient, they are the key reificative component of the transfer from one regime of care to another. When an infant is transferring into the NICU from another hospital for specialised care then it is necessary not just for the patient to be transferred. Competent transfer also includes effective transfer of information (Leslie and Middleton, 1995). The clinical history of a neonatal patient at the time of a transfer may be quite short if the infant is newborn or has a problem which is not complex, but may extend to several months of care and notes when infants are referred later in life.

In CoP terms the clinical notes are a reification of the transfer that is brought to the clinical supervision meetings by the person who completed the notes. In this way there is both a participative connection to the transfer present at the meeting, in the person of the ANNP, and a reificative connection. This section shows that as well as being the reificative connection to the transfer, and used to raise clinical issues, the clinical notes are also themselves the topic of
concern Completing clinical notes that meet the demands of legal record keeping and continuity of care is part of being a competent practitioner.

At the beginning of one of the first clinical supervision meetings notes are raised as an issue that is going to be discussed:

Box 5.14 – Learning to make good clinical records (from ANNP1 23.11.99).

| AJL: | ... well from my point of view the things that I thought would be interesting to look at are the sort of general care and treatment of the baby as you've got documented in the notes um (.) but we could look at the notes as well in terms of whether they are good adequate record of the transfer |
| ANNP1: | Yeah |
| AJL: | I think that would be interesting because I just think it would be nice to have a counsel of perfection on the notes |
| ANNP1: | Yeah |
| AJL: | Um (.) not that I'm suggesting that my notes are perfect but (.) but that there are common mistakes that people make in notes that are worth trying to (.) trying to pick up at this stage(.) And trying to think about um |

The response from ANNP1 to the suggestion of "counsel of perfection" had been muted, and so the assessment that is offered is down-graded to trying to pick up "common mistakes". In this way the potential for criticism is reduced. The meeting proceeds and includes the "common mistakes" assessment of the quality of the notes. Two problems are identified during the discussion as the next two extracts show, first the presence of unexplained blank spaces in the records and second the requirement for the signature for all notes entries to be followed by the name printed.

Box 5.15 – Learning to make good clinical records: unexplained blank spaces in the records (from ANNP1 23.11.99)

| AJL: | ... you've left a space there like there was something significant you were going to write |
| ANNP1: | No there wasn't |
| AJL: | Okay um |
ANNP1: It was just the way this SHO went through the notes you see.

AJL: He thought there might be more?

ANNP1: Um (.) and she kept coming out with these odd gems and I had to (. ) to write down the odd gems as they were coming.

A blank space in the record suggests incompleteness or an event that was going to be documented which never was. In either case, the resultant clinical notes do not meet the requirements for legal and complete records. Being able to produce such records will be part of achieving the reificative competencies necessary to be in the CoP. Similar legal requirements pertain to the need for a signature and a printed name:

Box 5.16 - Learning to make good clinical records: signatures and printed names (from ANNP1 23.11.99).

AJL: um ( . ) the only other bit of nit picking I found was um ( . ) there was an illegible version of your signature after each entry so a scrawl but

ANNP1: No that’s fine (. ) I know what you’re saying.

The data in these two boxes show issues being raised on simple mechanistic points of how the notes are kept. The next extract is concerned with guidance on content of notes, and why particular contents might be important, in this case in the context of writing about contact with parents. This is presented as a necessary part of having a defensible position in the event of a later legal challenge:

Box 5.17 – The importance of good clinical records (from ANNP1 23.11.99).

AJL: Be very careful with your documentation about parents at the time of transfer um ( . ) because it’s one of those things where potentially people can come back and say well ( . ) these people came and took my baby and I never heard from them I never saw them they just took my baby away and just ( . ) try to just you know ( . ) try to have a go at us for those sort of things so I ( . ) I’m not great at filling them in on the unit anymore but I’m pretty strict about filling them in when I see the parents on transfer um ( . )
The data in this box show emphasis being placed on ensuring that members of the new CoP understand the reasons that records are meticulously kept.

The problem of being able to summarise a long and complex pre-transfer history is raised by ANNP 2 at her second clinical supervision session:

Box 5.18 – The difficulty of summarising long histories (ANNP2 23.12.99).

**ANNP2:** So the main problem with transfers today while I was trying to get through the notes

**AJL:** Yeah that's a really good point because um (.) you know I've been there and done it where the baby's had a long complicated sort of er (.) period of care and um (.) and they're nightmares for doing the transfer because you're organising your...

Guidance is given on a general approach to infants with long histories:

Box 5.19 – Approach to summarising long histories (ANNP2 23.12.99).

**AJL:** My feeling with these long histories is a problem list is as much as you want but then (.) but after that you've got to try and sort out (.) think what's the reason that people need that information in Nottingham?

**ANNP2:** Try and figure out what's happened (inaudible)

**AJL:** And then especially their eyes as well (.) It's important to have some information about those so that the care carries on (.) so I guess what I'm getting at is (.) is to some extent it doesn't matter if say (.) for example if we're choosing Cambridge from day two to day five she needed dopamine (.) you know

**ANNP2:** Yeah to prioritise

**AJL:** Do you see what I mean (.) well it's even ( ) it's different from prioritising it's er (.) the things that are important are the things that will help take the care forward now ( ) Do you see what I mean?

The emergent issue in this extract is the problem of summarising the notes of babies who have long histories, and the resource which I suggest be brought to bear on the problem is “what's the reason that people need that information in Nottingham”. On completion of transfer the Nottingham team need to take forward the care of the infant, and they need key information to do this I give some examples of information that should (“their eyes” – whether the infant has been screened for eye problems) and should not (“from day two to day five she
needed dopamine”) be transferred. The former is necessary as it has ongoing care implications for the child, while the latter is not necessary as it is simply detail which is now redundant in an infant who is many weeks of age. A key skill in summing up records for transfer is being able to briefly note issues that are no longer active whilst taking more comprehensive details of issues relevant to the problem in hand.

A number of issues in the formation of new communities of practice are being attended to here. The data show that the two main uses to which the notes will be put (legal record and continuity of care) were mobilised as key competencies for the ANNP s to gain, and the records themselves form the reificative resource for this learning. Some components of a local regime of competence are being built, for example when prioritising what to put in notes is raised as “things that will help take the care forward now”. Additionally competence for becoming part of a new transport CoP is being supported by using relevant tools, in this case notes, that support learning. Use of this tool will be a part of what it is to be a competent ANNP who can lead transfers.

Further guidance is given to ANNP 2 on note keeping. In this case advice is offered which aims to help ANNP2 be clear in her documentation regarding what she was thinking about a patient at the time of transfer. The tool suggested is that at the end of her written clinical assessment she writes an overall “impression” of the infant’s condition:

Box 5.20 – How to write notes which make clear what the author was thinking at the time (from: ANNP2 23 3.00).

AJL: . . . I’ve got into the habit particularly on transfers where I’m likely to be the primary person of writing my impression before I go onto a plan (.) so in other words just trying to make it very clear what I’m thinking

ANNP2: Oh right

AJL: So I might have written something here like “impression er (.) this is a premature baby er (.) with”

ANNP2: Hmm

AJL: “Acute abdomen er (.) he doesn’t appear to be perforated at the
moment and he is he’s currently compensating well ( ) however he clearly needs urgent transfer”

ANNP2: Right yes

AJL. “to Queens for surgical (.) surgical consideration”

ANNP2: Hmm

In box 5.20 a hypothetical example of the kind of content that an impression section would have is given to illustrate clearly the brevity and action-oriented nature of these. By 12.4.00, less than a month later, ANNP2 had reflected on this, but not incorporated an impression into her clinical notes:

Box 5 21 – Including an “impression” in the notes (from: ANNP2 12.4.00)

AJL: ...So I think you’ll agree it’s even more essential that you signed there

ANNP2: Yes

AJL: okay good

ANNP2: Well I suppose that well (.) like you said about putting in impression would be quite good as well you know because they could put an impression in there couldn’t they?

AJL: Yes

By 29.12.00 an impression was incorporated into ANNP2’s notes:

Box 5.22 – Including an “impression” in the notes (from: ANNP2 29.12.00).

ANNP2: And then my impression at the end was that he looked well but I thought the results reflected there was still sepsis along the lines somewhere because the CRP was 53

AJL: Oh

ANNP2: But clinically he looked quite well enough for transfer

Boxes 5.20, 5 21 and 5.22 show a clear trajectory of change from being unaware of a useful writing tool (the “impression”), through to incorporating it into practice. By participating in talk about practice with an established practitioner ANNP2 has changed the way she documents her practice. In this example the presence of the reificative memory in the form of the notes is
complementing the participative memory of the individual. In CoP terms this generational encounter is building an infrastructure of continuity. By the end of the transition to being able to do transfers the talk about notes and record keeping is quite different, as the next extract shows.

Box 5.23 – Keeping competent notes (from: ANNP2 19.6.01).

AJL: Right plan (.) put on CPAP put into transport incubator, check the gas ( ) gave some caffeine (.) get some fluids up and um transport plan by system so that’s really (.) that looks really good (.) So for airway “transfer back on short prong” (.) cut at 4.5 (.) breathing you are going to give the caffeine (.) check the gas (.) circulation (.) capillary return alright, Hb alright so there was no plan

ANNP2: I think there’s a page missing ( ) oh no there it is

AJL: So then you note that you phoned (consultant)

ANNP2: Yes because again that gas isn’t that bad to give bicarb as well

AJL: No it must be under 7.25

ANNP2: Yes (.) (inaudible - speaks very low)

AJL (inaudible due to background noise) !V. resited, yeah, and then ( ) Journey over (.) query dislodged prong

ANNP2: Sally had warned me before that (laughs)

AJL: And noted all its obs during the transfer which is great (.) No bradycardias or desats ( ) And then arrived at Lincoln (.) They were fantastic notes and you’ll find (.) I would use (.) your notes keeping has just changed out of all recognition from what it was like a year ago (.) its so much more organised now

ANNP2: Yes it is better isn’t it?

AJL: You know you could really (.) really get a feel there for what you

ANNP2: what I was thinking

AJL: what you were thinking at each stage

ANNP2: Yes

AJL: And what you really did to make the baby ready for transport

ANNP2: Um

AJL: So I think you can’t ask for more from some notes
This extract is from the penultimate clinical supervision for this ANNP and highlights a necessary transition that has happened. The section where I am reading from the notes written by ANNP2 ("AJL: Right plan (.) put on CPAP put into transport incubator, check the gas (.) gave some caffeine (.) get some fluids up and um transport plan by system so that's really (.) that looks really good") indicates that ANNP2 has done a transport plan in a coherent systems-oriented way.

The notes now are attending to several important issues in a competent way. They are a good legal record of what happened on the transfers and they are organised ("your notes keeping has just changed out of all recognition from what it was like a year ago (.) its so much more organised now"). This is further evidence of the infrastructure of continuity being built over time from the bringing together of participative and reificative memories with an established team member in a generational encounter.

They show in the discussion about whether the infants pH was low enough to phone the consultant that ANNP2 is attending to the additional notekeeping requirements imposed by the drug initiation framework. Being a competent note-writer as an ANNP has some additional factors beyond those that apply to other groups, mostly imposed by the drug initiation framework (see below and Chapter 7).

The next two extracts are text-based data from the documentation that supported ANNP drug initiation (Drugs 00). They illustrate the comment in Box 5.23 which indicates that ANNP2 had written a note documenting a drugs-protocol driven telephone call ("so then you note that you phoned (consultant)"). Boxes 5.24 and 5.25 show the stipulations from the drugs protocols that ANNP2 was following:
Box 5.24 – Requirements for documentation of drugs initiated by ANNPs (from the general introduction to Drugs Protocols 0400).

| The initiation of any of these must be documented on the drug chart and in the medical notes of the baby. The indication for commencing any drug, the name of the individual responsible for instigating the therapy (e.g. ANNP, registrar, staff grade, consultant) and the name of the individual writing on the prescription chart must be recorded in the medical notes. |

ANNP2 has demonstrated competence with this section of the drugs protocols by what she has written in the notes, indicating that she discussed the case with a named consultant. There is also congruence between the talk about the use of sodium bicarbonate in Box 5.23 ("ANNP2: Yes because again that gas isn’t that bad for me to give bicarb as well. AJL: No it must be under 7.25") and the sodium bicarbonate group protocol in Box 5 25, indicating that ANNP2 was aware of the restrictions imposed on her use of sodium bicarbonate.

Box 5.25 – Restrictions on the use by ANNPs of Sodium Bicarbonate (from Sodium Bicarbonate group protocol in Drugs Protocols 0400).

| INDICATIONS: |
| • During resuscitation for cardiac arrest prior to the second dose of I.V. epinephrine (policy 3.2) |
| • Metabolic acidosis - base excess > -6 and pH <7.25. |

NOTE. Sodium bicarbonate may only be initiated for metabolic acidosis after discussion with the Nottingham neonatal consultant, following consideration of renal bicarbonate losses and other underlying causes, e.g. TPN.

From the CoP perspective notes are important as reificative connections. When the new ANNPs attend for a post-transfer clinical supervision they bring with them a participative connection to the events of the transfer in their story of the lived experience. The notes bring added value from their reificative connection.

These examples illustrate the importance of both participative and reificative connections to the event as tools for learning in settings where the core activity occurs remotely. In transport and retrieval settings the core activity happens away from the base unit and the scrutiny of colleagues and so ensuring that
both participative and reificative connections are available may help provide a rounded reflection of events.

The data in this section show that there was a change over time in the abilities of the ANNPs to complete a record of a transfer. Because a transfer record is the reificative repository of transport practice, this also indicates a shift in the status of the ANNPs in the context of transport. The emergent issue in this section was the need for competent transport ANNPs to keep full and accurate clinical records. In addition, the key resource to emerge was the clinical supervision meeting with a structure that mobilised both participative and reificative memory.

3. Availability of transfers - mutuality

To learn to be able to do transfers as the team leader necessitates exposure to the clinical situation. The gatekeepers to this experience are the consultant neonatologists, as the person providing medical care to infants in transit is doing so under the delegated auspices of this group. Data presented in the Chapter 4 have shown that one key step had already been attended to in making this arena available to the new ANNPs when they were told that transport was their priority. The message at that time was therefore that the new ANNPs were to go on transport when that was available rather than do other clinical work.

A function of the distributed provision of neonatal transport in the UK is that many units do transport and that most do it infrequently. Nottingham does 150-170 acute transfers per year, all of which need a doctor or ANNP as well as a transport nurse. A further 20-30 routine transfers are done that need a doctor or ANNP to be present, but where they are probably not going to be needed. Thus the pool of transfers available for training new ANNPs averages 3-4 per week. The availability of transport is however sporadic and unpredictable, and an individual who works 37.5 hours out of a total of 168 hours in a week may not intersect with transfers as they happen.
Both the new ANNPs had substantial transport experience from their pre-ANNP period, when both were transport nurses, and both ANNPs went on over the period under discussion to do 15-20 accompanied transfers. ANNP1 found exposure to transport to be reasonably unproblematic and was able to attend sufficient transfers from August 1999 to August 2000 to complete transport training.

ANNP2 started transport training in August 1999, at the same time as ANNP1, but did not complete until June 2001. There was a three-month period of sabbatical leave during this time when ANNP2 was not available for transport training, but it was nonetheless an extended period of training compared to ANNP1. The issue which emerged was that ANNP2 was not gaining ready exposure to transport in the way she wanted. Boxes 5.26 to 5.37 chart the trajectory of this issue and the resources that were brought to bear on it. These resources include simply waiting a bit longer, simulated transfers and finally a period of round-the-clock transport availability, linked to protected time supernumerary from the duty rota.

An infrastructure of mutuality is being supported in this section by taking steps to make peripheral participation and interaction with transport possible.

By 5.10.00, two months after ANNP1 has completed transport training, the exposure of ANNP2 to transport is a topic for discussion at the ANNP meeting:

Box 5.26 – Poor opportunities for ANNP2 to attend transfers (from: ANNP meeting 5.10.00)

| CN: stop (. ) we should stop but can I just ask (ANNP2) a question? Have you done any transports? |
| ANNP2: Well I’ve been on this week |
| CN: You mean no? |
| ANNP2: No |
| CN: We should give (. ) let’s give it a little bit longer still |
| AJL: it’ll happen |
ANNP2: It'll happen one day

CN: It will all in one go (laughs) there were loads last weekend(.) well actually there probably weren't that many actually

AJL: However whenever there's loads in the previous period when (ANNP2) isn't around it's (.) I can tell you from experience it's really annoying to have people say there were loads when you weren't here (all laugh) there's nothing more irritating (laughs)

CN there was lots of cardiology

AJL: Yes

CN: and you probably didn't want to do them

ANNP2: oh the transport meeting yes (.) there was wasn't there? I went through the reports the other day

CN: Sorry they were all important. Is there (.) do you think as long as you’re in over the weekend you could do (.) if it’s quiet you should go (.) if there was transport you should do it shouldn’t you? You should (.) I mean yes still your priority is to get your transport experience if it’s

ANNP2: Oh yes yes

CN: but if you can go with someone you should do that and I think you should do that

ANNP2: All right

This extract occurs toward the end of a meeting, and the issue is raised by the consultant neonatologist. It appears that ANNP2 has not done transfers recently, and that this is despite a number of transfers happening ("CN: there was lots of cardiology"). It appears the problem is that ANNP2 has simply not been on duty at the same time as transfers have been happening. I have been in this situation many times with nurses training to be transport nurses, and so am reassuring ("AJL: It'll happen") but ANNP2 expresses doubt ("ANNP2: It'll happen one day").

A resource to deal with the issue is raised in this extract, when weekend work is discussed. Previously weekend ANNP work had not been seen as time when ANNPs should do transfers. The medical staffing of the unit was quite different between weekdays, when ANNPs would automatically attend transfers, and
weekends. At this stage ANNP2 has been a qualified ANNP since September 1998, and so working weekends on the NICU as part of an ANNP rota is part of her work commitment. The reduced medical staffing of the NICU at weekends combined with a weekend medical on-call rota for transport, where there is a doctor at home available for transfers, has apparently led to an expectation that ANNP2 will not attend transfers that occur while she is on duty at a weekend. At this meeting that advice is modified ("CN: do you think as long as you're in over the weekend you could do (.), if it's quiet you should go (.), if there was transport you should do it shouldn't you?"). A caveat regarding NICU workload was built in to this sentence ("if it's quiet"), but nonetheless transfers that occur during weekend work are being made available by a person with the authority to do so. This appears to be the first resource put in place to respond to the emergent issue of poor exposure to transport.

Further resource is offered in advice regarding what kinds of transfer to go on. Transfers vary in acuity as infants are transferred for many reasons. For example, an infant born with a blockage in the bowel due to maldevelopment of the gut may be quite well at the time of transfer for surgery. Many others are critically-ill patients requiring the full panoply of intensive care on the move, and between the two extremes is a spectrum of acuity. There may be an assumption that only the transfers of critically ill infants are worth attending, and I make the following suggestion:

Box 5.27 — Resources for making transfers available — ANNP2 should not pick and choose transfers (from: ANNP meeting 5.10.00).

| AJL: As I say broadly I'd go on everything that comes up. Don't make a judgement like (.), oh no it's (.), whether it's going to be terribly interesting or not because it's (.), even if you just get used to writing notes on the transported babies and stuff I think that's all to the good |

This is encouraging ANNP2 to attend all the transfers that she can, and not to make judgements on whether to attend based on a guess about how "interesting" the transfer is going to be. I suggest that there is value in every transfer, "even if you just get used to writing notes". The second resource to be mobilised therefore is the notion that all transfers may incorporate some learning and ANNP2 should not pick and choose.
Transport availability remains an issue a month later at the clinical supervision session with ANNP2 on 2.11.00:

Box 5 28 – Poor opportunities for ANNP2 to attend transfers (from: ANNP2 2.11.00).

<table>
<thead>
<tr>
<th>AJL: So where do you think you are overall with this process?</th>
</tr>
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<tbody>
<tr>
<td>ANNP2: This is the only one I've done since I came back so hopefully I'll do one tomorrow that's a bit of a shame really</td>
</tr>
<tr>
<td>AJL: Yeah (.) yeah (.) I'm about to sneeze! Excuse me</td>
</tr>
<tr>
<td>ANNP2: I still haven't done an arterial line yet</td>
</tr>
<tr>
<td>AJL: Oh right</td>
</tr>
<tr>
<td>ANNP2: Another thing I've got to do</td>
</tr>
<tr>
<td>AJL: Yes (.) well we'll have to keep seeing how it goes I guess with getting you out on transfers and if the worst comes to the worst we'll have to think about doing something like putting you in the transport team and getting you some concentrated experience somehow</td>
</tr>
</tbody>
</table>

At this session the possibility is raised of mobilising a different resource to get ANNP2 out on transfers. ("AJL:...putting you in the transport team and getting you some concentrated experience somehow"). This refers to a tried and tested technique used for ensuring that new transport nurses are reliably able to attend enough transfers for training. This involves the trainee spending a period of several weeks on-call for transfers, rather than attending the NICU for scheduled duties This is an adaptive transport training response to the sporadic and unpredictable availability of transfers. Over this period the trainee agrees to be flexibly available for transport, whenever it happens day or night, and the NICU agrees that they do not have to attend for scheduled duties This is variously referred-to as "supernumerary" and "on-call." However, at this stage it is agreed not to take further measures, and to simply wait and see.
By the end of the month this issue has solidified a little, as the discussion at the clinical supervision meeting shows:

Box 5.29 - Resources for making transfers available – supernumerary on-call period (from: ANNP meeting 28.11.00).

AJL: Yes and it would have been better if you'd had a good run of transfers.

ANNP2: That's right.

AJL: and er (.) anything else we can do (.) do you think (.) to help?

ANNP2: Well I'll leave it until after Christmas then at Christmas it's a bit complicated and then I'd like to do on-calls when I come back again and (.) but at the minute it's complicated isn't it?

ANNP2 raises the possibility of "on-calls" as a solution. This is another way of phrasing the possibility for a period of supernumerary concentrated availability. The resource is solidifying in that it is now spoken about in terms of when, as opposed to if, it will happen.

The issue is discussed in similar terms on 29.12.00 at ANNP2's clinical supervision meeting, but with the additional factor of concentrating the exposure.

Box 5.30 – The need for resources for making a number of transfers available over a concentrated period of time (from: ANNP 29.12.00).

ANNP2: I think I need to do a lot (.) I think I need to have a group altogether now rather than bitting and bobbing.

This suggests that a part of opening peripheries to new CoP members is ensuring that the experience is available sufficiently regularly to allow exposure at an acceptable level for the learning of the individual.

The issue is not discussed again until the ANNP meeting on 17.4.01. This meeting starts with a discussion of the problem of access to transports for ANNP2. The first resource raised is the possibility of simulated transfers:
Box 5.31 - Resources for making transfers available – simulated transfers
(from: ANNP meeting 17.4.01).

| CN: I mean can you do ( ) is there something that can be done with just some sort of simulated transport |
| ANNP2: That would be good |
| CN: I mean I know we’ve done simulated transports when we were looking at prescribing but its not been looking at perhaps |
| ANNP2: issues and presenting stories |
| CN: it’s a real scenario (.) say well how are you going to manage it ( ) I don’t know whether that’s helpful or not helpful |

This suggestion, for simulated peripherality, is not discussed further. This is probably because shortly afterwards at the same meeting the subject of a supernumerary on-call period is raised and agreed. Taking this substantial step that makes participation in the real practice a possibility may have negated the value of simulated practice.

Box 5.32 - Resources for making transfers available – supernumerary on-call period (from: ANNP meeting 17.4.01).

| CN: What do you think about doing supernumerary period (.) do you think that’s a good idea or a bad idea? |
| ANNP2: Looking at ( ) erm (new transport nurse’s) call-outs all her’s were night times or evenings (.) well I (inaudible) |
| AJL: Um |
| ANNP2: I didn’t have a call-out |
| CN: How long has she been a supernumerary? |
| ANNP2: three weeks |
| CN: And is that a realistic (whispers) |
| AJL: Its realistic in a sense that that’s (.) if things fall well you can get plenty of transport in in that time in terms of the unit there’s not much alternative but to shrug and say the three weeks that (ANNP2) should have been on the unit she’s not going to be there |
| CN: But it has to be done ( ) |
Supernumerary status has now emerged as a practical resource and by the end of the exchange it is agreed as the next step in facilitating the concentrated peripheral participation of ANNP2. The length of the period is debated against the yardstick of a three week period used by transport nurses who are training. There is a balance to be achieved for individual and NICU so that the trainee has long enough to have a realistic chance of achieving the objective and the NICU is not without the contribution of the individual for a period that is longer than necessary. The sporadic and unpredictable availability of transfers remains an issue ("AJL: if things fall well you can get plenty of transport in in that time"), but the recent experience of a new transport nurse getting lots of transfers, albeit "night times or evenings" in a three week period is seen as encouraging.

Another resource is raised for maximising transport availability in the next extract, from the same meeting:

Box 5.33 - Resources for making transfers available – go on PICU transfers (from: ANNP meeting 17.4 01).

| AJL | And there would be no reason not to go on the PICU transfers (.). |
| ANNP2: | for experience |
| AJL: | Absolutely, it's the same issues (.). yes absolutely (.). go out on everything (.). do it all etc. (.). I think that's a good plan |

The neonatal transport service does a number of transfers each year on behalf of the paediatric intensive care unit (PICU). Because the PICU transfers are of patients who are under the care of consultants other than the NICU consultants, it will not be possible for PICU transfers to be led by the ANNP's once they are trained. However, the PICU transfers that are done by the neonatal team are of patients who are often similar in illness and treatment to NICU patients. In addition, while ANNP2 is training any PICU transfer she attends will be with a member of the medical team authorised to lead such transfers. I encourage ANNP2 to attend these transfers while she is learning and wants exposure to transport, suggesting "it's the same issues."
Before a period of supernumerary work can be agreed there are further issues that emerge to impact on the timing of the period, from both NICU managerial and ANNP perspectives and in both cases resources need to be mobilised to help the plan proceed.

First, for the NICU medical manager the timing of the ANNP supernumerary period has to be balanced against periods when the expertise of medical staff is lower, and so ANNPs are more in demand:

Box 5.34 – Timing of a supernumerary on-call period – when is the right time for the NICU? (from: ANNP meeting 17.4.01).

CN: But it has to be done (.) it has to be done during a period when the SHO’s are relatively well established

The Senior House Officers (SHOs) work for the NICU for six months, starting either in February or August. In February and August most established members of the NICU team work extra clinical hours supervising the new SHOs to get them quickly to a point where they can practice safely. This meeting is taking place in mid-April, so the expectation is that the supernumerary period could happen soon, but should not be delayed until August, when ANNP2’s expertise will be needed again for supervising new junior doctors.

The issue which emerged was the need for ANNPs to be available for clinical work when the SHO’s are new and the resource brought to bear on that was recognising the potential issue and clearly bracketing when the period could be taken.

For the individual the emergent issue is matching the requirement for flexible availability, and therefore limitations on non-work activities, with social and other personal plans. There is a lengthy discussion of possible dates, of which Box 5.35 gives a snapshot.
Box 5.35 – Timing of a supernumerary on-call period – when is the right time for ANNP2? (from: ANNP meeting 17.4.01).

AJL: But the key issue is making it work which we’ve learnt from the transport nurses over the years is that this stands or falls on your (.) on the flexibility and the availability of the individual so the more flexible and available you are the more it can work for you.

ANNP2: the only free weekends I’ve got

CN: Or may be you just need to look briefly at those because I mean I’ve kind of said not to happen until you’re back from holiday but (.) you know if you find that every single one of those weekends you’ve got something planned then it’s not the ideal time.

There has already been some discussion of possible dates, but in each case other personal issues have emerged, such as annual leave and going to friend’s weddings, that have stopped final resolution of the dates. In this extract I make clear that flexible availability is key to making the supernumerary period work, and this is echoed by the consultant neonatologist. Other resources are suggested, such as splitting-up the three weeks into shorter blocks that avoid the sticking points, but the issue is left unresolved. It is suggested that ANNP2 attempt to marry the demand for three weeks supernumerary to the two emergent issues (to get it done before August; to avoid personal pain in social life), and come-up with a proposal.

ANNP2 attends for a clinical supervision session on 6.6.01, at which point it is clear that she has done many more transfers during a supernumerary period. The meeting starts thus:

Box 5.36 – Successful exposure to a number of transfers during a supernumerary on-call period (from: ANNP2 6.6.01).

AJL: So what have we got to look at?

ANNP2: I’ve just got lists of the transports

AJL: I was going to say since the last time that we spoke you’d done a number haven’t you?

ANNP2: I’ve done a number

AJL: Go on then
ANNP2: So I've had one, two, three, four, five, six transports

AJL: Right

ANNP2: So that was quite good I thought and in that space

AJL: Yes. This is during your erm

ANNP2: that's during my supernumerary. So the major run was on the last week really

This shows that a supernumerary period was agreed, taken and led to an outcome that was viewed as successful by ANNP2, in terms of numbers of transfers undertaken.

By the clinical supervision meeting of 19 6.01 ANNP2 had reflected on the supernumerary period, thus:

Box 5.37 – Positive outcome of the supernumerary on-call period (from: ANNP2 19 6 01).

ANNP2: no not really just that I suppose the only thing that I can say is that erm supernumerary period was really good that's when I got my confidence up because I had a run of doing things together that definitely worked and having

AJL: so how many it is you do in the supernumerary period?

ANNP2: Six in total erm the varying amounts of stopping with a (inaudible) baby erm five of them were ventilated babies but I think just the continuity of doing them altogether

AJL: Yes

ANNP2: Rather than doing one one week then three weeks of not doing anything at all gets you in to a method of doing things really I think

AJL: That's a really important message and you know I think we must do that in future

This final extract completes a trajectory of emergent issue and resource. In summary, the data show that the availability of transfers emerged as an issue for one of the ANNP's and a period of supernumerary working emerged as a solution to that issue. However, bringing this successful resource to bear on
the issue followed several resource applications that failed, such as simulated transfers and making weekend working available. The success of the emergent resource is finally projected towards future trajectories of action and the potential for this tool to be used again ("AJL: ... I think we must do that in future") (Box 5 37).

Several CoP issues were attended to in this process. To be part of a potentially emerging CoP of ANNP’s engaged in transport, ANNP2 has to be engaged in that activity (mutual engagement in shared activities). Mutuality is supported, according to the CoP framework in a number of ways, and one is by facilitating peripheral participation. This is the possibility for new CoP members to participate to various degrees in the work of the CoP. In order for this to happen peripheries have to be opened and in this case this has happened by making transport the clear focus of the job and adapting working patterns to allow participation. In this case the problem of the availability of legitimised peripheral participation is what is at issue.

Learning to do a complex clinical activity involves developing competence. The CoP framework suggests that this is supported with "activities that bring about the knowledgeability of engagement" and by giving "occasions for exercising judgement". Both of these factors are attended to by creating a work environment where the possibility for engaging in transport is maximised. Both the NICU and ANNP2 have had to adapt to make possible the mutual engagement of ANNP2 in the shared activity of the potential new CoP. Opening peripheries is a necessary part of situated learning and the data suggest that in this setting there may be more to making peripheral participation possible than an administrative "door-opening" exercise. Whilst the door was opened for ANNP2 by the legitimising support of the consultant neonatologist, this was not enough to make the peripheral participation happen. Further work was needed to attend to the contingencies of the setting, and to keep ANNP2 on a trajectory toward achieving the goal of being able to lead transfers.
4. Condition of babies on completion of transfer – Infrastructure of competence

Chapter 2 was concerned with comparing the condition on completion of transport of infants transferred by ANNP and doctor-led teams. That part of the study aggregated data from transfers performed by trained ANNPs, using routinely collected audit data (Appendix 2) to interrogate infants physiological status. Because every acute transfer is audited in this way a routine part of the discourse about the success of an individual transfer are the five physiological variables collected after transfer. For the two new ANNPs becoming able to do ANNP-led transport will involve giving attention to the condition of infants on completion of their training transfers and reflecting on the factors that may have influenced this positively or negatively. In this way a routinely used tool which is embedded in the daily practice of the transport team is used not only in the way that was envisaged for it, as an audit tool, but is also an emergent resource for the learning of new practitioners. This can be seen in the data. These extracts are from a clinical supervision session with ANNP1 on 23.11.99.

A review of the condition of the infant on completion of the transfer, using the audit data, leads to a discussion of how to respond to changes in oxygen requirement in transit:

Box 5.38 – Achieving good post-transfer physiological data for babies as an indication of the competent conduct of the transfer (from ANNP1 23.11.99).

ANNP1: The minute we er (.) you could see she was trying to fidget a bit um oxygen was climbing as soon as we actually came off that road there and came into here and started slowing down and less movement she specifically settled down and I think that was how we got here without really um quite good

AJL: But looking at the audit record (.) it looks good as well (.) blood sugar of 4.9 (.) systolic pressure 79 (.) pH 7.29 unfortunately one hundredth of a pH unit dropped that lost you a point. Oxygen 7.8 Temp 36.8 (.) I think um

ANNP1: If I’d have been going on a longer journey this was something I wanted to ask you because I mean I had the TINA1 on well (.) and the CO₂ remained virtually unchanged but if you were going on a much longer

1 The nature of the TINA monitor is explained below
journey and I knew we've had longer journeys and its oxygen requirement carried on going up

AJL: Hmm

ANNP1: Would you actually put the pressures up?

In this extract the audit record is used to scrutinise the condition of the infant on completion of transfer, as crude shorthand for the competence or success of the transfer process. I suggest that "it looks good.. ", but this is in the context of ANNP1 raising concerns about the increased level of supplementary oxygen the infant was needing. A discussion about sedation during transfer follows, and then the discussion comes back to the specific issue of rising oxygen requirement:

Box 5.39 - Achieving good post-transfer physiological data for babies – how to respond to changes in the support required during the journey (from ANNP1 23.11.99).

AJL: I think it’s a really good question what would you do if the oxygen requirement was going up on a longer journey um (.) and er (.) I suppose it depends a lot on the clinical circumstances doesn’t it because (.) because something I’m very aware of is really easy to sit here and say "oxygen requirement up - pressure up" but in fact the clinical situation may be quite different you know is the baby sort of moving around a lot? So the key intervention might just be travelling a bit slower or you know

ANNP1: Hmm

AJL: Just some (.) some other fairly simple thing like (.) like that (.) all other things being equal I (.) I would definitely be guided by the TINA in such situations(.) the ventilation getting harder(.) the CO2 is going up or the oxygen is going down because that’s kind of helping you to decide if that’s all again (inaudible) I would certainly change the ventilation in transit. That was what the paper from the States showed really nicely about the use of TINAs in transit. I think they only looked at CO2 they don’t look at the oxygen but they show that you can measure the...

In Boxes 5.38 and 5.39 the reificative and participative memories of the transfer are mobilised to bring rich detail to the discussion which is centred around achieving good end of transfer physiological values for the baby. Achieving these will be key competencies for ANNP-led transport. A specific clinical problem is discussed and a direct question asked ("ANNP1: Would you actually put the pressures up?") which is used to move the discussion to a
general debate about how to manage respiratory support in transit. The practical transport problem at issue is that in the back of an ambulance one is remote from the normal clinical support that would be called upon on the NICU.

In these exchanges (Boxes 5.38 and 5.39) the condition of the infant on completion of the transfer has emerged as an issue which is used as a resource for imagining different but related future situations. A significant issue in transport practice is length of journey with a sick infant, the longer the journey the more difficult it may be. In this case ANNPI is recognising that despite the journey being a very short one (15 minute transfer) the infant was showing early signs of instability at the end of the journey, as the oxygen requirement was raised and the pH had dropped. This scenario is used to facilitate discussion of what resources might be used with a similar infant on a longer journey in the future.

The response (Box 5.39) is to first note that clinical situations during transport are subject to the extra contingencies of transport that do not apply to infants on the NICU. An underlying assumption of the transport training programme that the ANNPs are doing at this time is that there is more to transporting babies successfully than merely doing what you do on the NICU, but in the back of an ambulance. For example, a transport response to an increasing oxygen requirement may be to drive the ambulance more slowly. The second part of the response is based around the knowledge base that helps neonatal transport practitioners make good clinical decisions while they are away from the wider facilities, such as blood gas and x-ray machines that are available on the NICU. I refer to a research paper (O'Connor and Grueber, 1998) which investigated the TINA monitor for transported newborns and which suggests that this monitor assists transport practitioners in making good clinical decisions which improve the condition of infants on completion of transfer. The mobilising of relevant research is an emergent resource responding to a specific clinical question. In CoP terms this is supporting an infrastructure of imagination by orienting new ANNPs to a location in meaning (the relevant research).
The “black box” status\(^1\) of the machinery available in transit is a matter for debate (Latour and Woolgar, 1986). On the NICU if one is unsure about whether the right level of respiratory help is being given to a baby a blood gas test may readily be done, using a machine located on the NICU. Presuming that a good blood sample is obtained for this test, then the output of the machine is regarded as entirely secure and will be used to guide action. In this sense the blood gas analyser is a black box. In transit however blood gas machines are (mostly) not available and transport practitioners have to rely on clinical assessment and the output of machinery whose black box status is less secure. One such machine is the TINA monitor (Radiometer, Copenhagen). This is a transcutaneous blood gas analyser which works by attaching a heated probe to the skin. This measures the level of oxygen and carbon dioxide in the skin which may be used as a guide to levels of these in the blood. The nature of these monitors, where an indirect measure is being used to estimate the value we are really interested in, means that they do not have the black box status of a blood gas machine. This means that the outputs from a TINA monitor are always up for debate about whether the values given indicate real physiological change or a problem with the technique.

This clinical discussion closes with very positive commentary from me on the condition of this baby on completion of transfer, emphasising that this is the metric against which the success of transport will be evaluated:

Box 5 40 – Post transfer physiological data as an indication of competent transport practice (from: ANNP1 23.11.99).

AJL: Okay good er (.) and I think it's a triumph if you (. ) in general if one can bring in babies at such extremes of gestation and um (. ) such good numbers on the face of it (. ) and there's good temperature and um pH 7.29 you lose a point for but it's hardly a disaster and all (. ) all the other numbers are within normal limits (. ) that's (. ) you should keep sight of the fact that that's an exceptional achievement er ( )

A number of CoP formation factors have been attended to in this section. A common enterprise is being defined which is distinctive, in this case focussed

\(^1\) A “black-box” in this context is a machine which delivers a result that may be relied on, as long as the sample put in to the machine was properly obtained. Latour calls machines such as blood gas analysers “black-boxes” as users don't need to understand what happens inside them in the translation of blood sample to numbers on a slip of paper.
on what are the specific transport resources that help transfer infants in a way that maximises their physiological stability. Similarly, a local regime of competence is being worked-up in the components of the toolkit of transport resources, such as the TINA monitor, that ANNPs will take on transfers with them. An infrastructure of competence is being built by having occasions where judgement may be exercised in a situation where accountability is key. By having to account for the condition of the infant on completion of transfer the new ANNPs are developing a shared discourse, including jargon and shortcuts, as well as a competent engagement with the work of infant transport.

5. Equipment – Infrastructure of continuity

The two new ANNPs had come from a background of being transport nurses, and so it was unlikely that they would have significant issues with learning to use transport equipment in their transitions to being able to lead transfers. Transport nurse training and practice involves a high level of familiarity and competence with the transport equipment.

In the transition to becoming transport team leaders one could hypothesise that the two new ANNPs might need to learn to use equipment differently. For example transport nurses are responsible for setting the transport ventilator for use, but the team leader is responsible for deciding what the ventilator settings should be and ensuring that these are being given properly.

In fact, equipment was not a frequent or substantial issue in the data. Only one item of transport equipment, the TINA monitor (see above), emerges as an issue on several occasions. The other system used during transport to measure blood gases is oxygen saturation monitoring. Saturation monitoring has the advantage of very quick and easy set-up and great familiarity, as the system is ubiquitous on the NICU. In contrast the TINA system is relatively laborious to set up, can be technically demanding in use and is used less on the NICU. The TINA system gives information about two areas that saturation monitoring does not. First it estimates blood carbon dioxide levels and second it may detect abnormally high levels of blood oxygen, for which saturation
monitoring is poor. On the NICU this may be less important, as there will be a blood gas analyser available which will give a more complete picture of blood gas status based on a blood sample from the infant. Because blood gas monitoring is not readily available for transported infants, the TINA monitor may give important additive information to that obtained from saturation monitoring. The following data (Boxes 5.41 to 5.47) show movement from TINA monitoring not being routinely applied to it being part of ANNP transport practice. The progression over time shows the influences of generational encounter with an established transport practitioner and of the notion of paradigmatic trajectory, that being part of the new CoP will include the display of certain skills or attributes.

At a clinical supervision session, ANNP2 says:


ANNP2: I want to try and use the TINA as well because I don’t think (transport nurse) thought about the TINA that much I don’t think but I would like after having been on one transfer with you I was like the TINA would be good but I couldn’t get it to calibrate

Later in the session ANNP2 suggests some of the transport nurses are reluctant to use the TiNA monitor:


ANNP2: And I get more confident with the TINA you don’t always use it some of the transport nurses the other day were like “oh no”
AJL: Right
ANNP2: And I’ve seen it used twice
AJL: Yes
ANNP2: With good effect

This extract suggests ANNP2 would like to use the TINA monitor more often, following a good experience with it on a transfer with me, but that the transport nurse was reluctant and calibration of the machine was problematic. This
suggests that use of the TINA monitor was not embedded in the routine practice of the new ANNP.s at these early stages of their transition to transport team leaders

On 3.10.00 the Transport Nurses express doubts about the use of the TINA monitor at their routine meeting, confirming the impression of ANNP2:

Box 5.43 – Transport nurses reluctant to use TINA monitor (from: Transport team meeting 3.10.00).

| TN1: | I haven’t got a great confidence in TINAs |
| TN2: | If they read accurately |
| TN1: | Obviously in that situation it went all right yes (.) |
| AJL: | Well that’s why I think it’s important to calibrate it to a blood gas and that’s specifically what the (.) what the audit forms are probably asking you for now when it says gas cal ABG cal or something like that |
| TN2: | Right |

This suggests a reluctance to use the TINA in the transport nursing team, and a reluctance that the new ANNP.s were aware of. However ANNP2 suggests (Box 5.42) that she has seen it used with good effect on two occasions. Positive experience with a technique may be powerful in reinforcing use. Wenger suggests that the knowledgeability that comes from engagement is key in producing competence.

By 28.11.00 at a clinical supervision session ANNP2 was including use of the TINA in her routine talk about stabilising for transfer:

Box 5.44 - Learning to use specific tools (from: ANNP2, 28.11.00).

| AJL: | and the blood pressure then (.) all of those things together (.) what (.) what might your plan have looked like (.) having assessed those as being the problems that needed attending to or at least thinking about in terms of the journey |
| ANNP2: | I would secure the ET tube |
| AJL: | Sure |
ANNP2: Give a good suction out
AJL: Uhuh

ANNP2: Ventilation as appropriate for him
AJL: Uhuh

ANNP2: And then what I'd want to do is put him in an incubator and then put the TINA on then calibrate it
AJL: Yes

At the same meeting ANNP2 reviews a transfer that has gone well, and expresses satisfaction that the blood gas was good on completion of transfer. The good post-transfer gas is seen as consequent on the ventilation settings being weaned during the transfer in line with readings from the TINA monitor.

Box 5.45 – Evidence of the use of the TINA monitor (from: ANNP2, 28.11.00).

ANNP2: Weaned down (.) the ventilation with the TINA went very well and that was good experience because I'm sure that most of the registrars would not do that so that was really good so it was definitely the transport was viewed rather than the registrar sort of end of things really
AJL: Yes good (.) good
ANNP2: And er (.) and the gas was spot on (.) when we got back
AJL: Yes¹

ANNP2: Which was good wasn't it?

This extract makes clear that there are apparent distinctive ANNP transport practices that ANNP2 has identified with ("I'm sure that most of the registrars would not do that"). Use of the TINA monitor is migrating into the situated knowledgeability of the new ANNP transport CoP.

By the time ANNP2 is about to complete the transition to being able to lead transfers the TINA monitor has become a tool which she uses routinely and which she is happy to rely on sufficiently to allow ventilator setting changes to be made in response to TINA monitor readings (Box 5.46).
Box 5.46 – Routine use of the TINA monitor (from: ANNP2 21 6 01).

ANNP2: So I was assertive then because (SpR) was like (. ) "yes chest moving (. ) air entry is good and chest movement is good" And I was no but and the TINA was very good because the TINA was reading CO₂ coming down on that as well

AJL: Right

ANNP2: So I felt happier

AJL: Okay

ANNP2: So that was good as well ( ) And coming back we weaned the rate down and not the pressures because we felt it was pressure sensitive ( . ) 75 and I weaned it down to 60

AJL: Great because the CO₂ had been falling on the TINA?

ANNP2: Uh uh

AJL: TINA's great when it works isn't it?

ANNP2: It is and it definitely worked really well because by the time we got here the TC CO₂ was reading 5 ( . ) erm PO₂ was reading 7.9 (. ) saturation was 93 and oxygen requirement was 37% oxygen

AJL: 37%? Triumph!

The TINA monitor also became a routine part of the transport considerations of ANNP1, as this extract from the ANNP meeting on 5.10.00 shows. By this time ANNP1 was attending transfers as team leader, and here she is reviewing how one of her first transfers had proceeded. Although she was unable to use the monitor on this occasion, it was clearly part of her considerations:

Box 5.47 – Routine use of the TINA monitor (from: ANNP Meeting 5.10.00).

ANNP1: Okay (. ) and the breathing seemed satisfactory (. ) it was mildly over ventilated but not to the point where it was on the upper end of normal rather than er (. ) dangerously over ventilated and all I noted here is that the TINA monitor was burning the skin after thirty minutes of use so we actually had to stop using the TINA monitoring.

There is no sustained discussion of other items of equipment in the data. This suggests that the transport equipment was mostly a known quantity and uncontroversial for the new ANNPs. The TINA monitor emerged as an issue and early extracts show that the new ANNPs were unsure about when and how
to use it. Two resources are brought to bear on this issue. First the relevant research which supports the use of the TINA monitor for transport of babies was reviewed, and secondly the monitor was used in practice on real transfers. Of these two resources the second appears the more influential. In Box 5.42 ANNP2 talks about two occasions when she has seen the monitor used to good effect. In subsequent extracts it appears that using the monitor has become a routine part of her transport practice.

A substantial part of the movement to being users of the TINA monitor is, in CoP terms, one of generational encounter and paradigmatic trajectory. Generational encounter is a key way that CoPs ensure future members are competent, by engaging in practice with “old hands.” Paradigmatic trajectories are the progression which is offered to new CoP members by observation of the practices of those who have gone before. Wenger (1998d, p. 156) argues that “it is members…who create the set of possibilities to which newcomers are exposed as they negotiate their own trajectories. No matter what is said, taught, prescribed, recommended, or tested, newcomers are no fools: once they have actual access to the practice, they soon find out what counts”.

Creating a CoP involves recognising the styles and behaviours that signify membership, and using the TINA monitor may be one of these in the sense of being a specific tool used distinctively by the ANNP group. In this sense it is then also part of the shared discourse of that group, with its attendant jargon and shortcuts. The monitor has to be genuinely useful, and the extracts show the effect of attending transfers where the monitor had real utility. This is gaining the knowledgeability that comes from engagement, a key part of gaining competence in an activity to which peripheral participation has been granted. The clinical supervision meetings where use of the monitor is discussed also help build competence by offering occasions where mutual evaluation is possible, in this case of monitor use. When use of the monitor can be associated with a signifier of competent practice, such as good condition of infants on completion of transfer (Boxes 5.42 & 5.46), then there is likely to be a trajectory of learning oriented toward being a competent user of the monitoring system.
Summary

This chapter presents data that illustrate the complex situated issues in gaining clinical competence. The data on making transport available and on technical competence at rarely performed procedures suggest that the opening of peripheries for new groups of staff is not always simply an administrative exercise. Creative resources were brought to bear on this issue, such as the period of flexible availability for one ANNP and the simulated model for chest drain placement, to ensure that access to learning situations was facilitated. Where one emergent resource proves inadequate, such as making weekend working available to ANNPs for doing transport, then the approach has to be re-evaluated and further resources applied. Placing procedures in their broader transport context requires the weighing up of many inter-related factors to arrive at a complex decision. Placing new ANNPs in situations where their learning is supported by an infrastructure which emphasises the need for engagement with real problems and where there is both participative contemporaneous support and reification-driven retrospective support from people skilled in the area appeared to facilitate the development of competence.

Becoming able to write a competent clinical notes record of a transfer appeared to be an activity requiring detailed guidance at the clinical supervision meetings. The availability of notes (reificative connection) as well as the ANNP (participative connection) at post-transfer clinical supervision meetings allowed for different perspectives on the transfer in question to be reflected upon. Notes and other documentation helped the ANNP remember detail, helped the supervisor probe other issues and contributed to supervising the ANNPs learning to make notes according to the local regime of competence.

In this study, where the two new ANNPs already had transport experience, learning to use equipment was not a substantial concern. There were still equipment issues that were attended to in the clinical supervision meetings, concentrating on equipment that supported advanced clinical decision making relevant to the new job. Research pertinent to the equipment in question was a
significant resource in changing practice, as was paradigmatic trajectory, and deploying these supported an infrastructure of competence.

The issues and resources that have been elicited in this chapter are summarised in Table 5.2, and are linked to the facets of the formation of a new community of practice that were similarly elicited. The table shows in the first column each of the issues that emerged, in the order presented above. The second column summarises the resources that were brought to bear on the issue. The third column lists the elements Wenger suggests are important in the formation of new communities of practice (Figures 4.1-4.3) to which links were made with the data pertaining to each emergent issue. These are headlined by the most important element(s). A similar process is undertaken in the next chapter for distal issues and in the chapter after for issues in drug initiation. In Chapter 8 the communities of practice issues are more fully discussed.

The complementarity of participation and reification have been strongly emphasised by the data. Participation has been seen to be important both in the ANNPs attending clinical situations and in the clinical supervision meetings where they were able to talk about their clinical engagement. Reificative connections formed the other half of Wenger’s symmetrical infrastructure of continuity. This was seen particularly in the added value conferred by bringing the written representations of engagement in practice, such as clinical notes and audit records, to the clinical supervision meetings. There was found to be particular value in the records of condition of infants on completion of transfer as a tool which facilitates discussion of the conduct of the transfer which is oriented towards positive outcomes for infants. These routinely collected data are reified in two quite different ways in this chapter and in Chapter 2. In this chapter the data for each individual transfer are used as a resource that represents key aspects of that individual transfer. There is rich detail available here as is seen in the extracts, giving opportunity for in depth discussion of individual incidents and opportunity for learning for those engaged in peripheral participation (Lave and Wenger, 1991). Facilitating peripherality for the ANNPs is part of building the CoP infrastructure of mutuality. The reification of the data in aggregated form in Chapter 2 as representation of the safety and practicality
of a service loses the fine-grained detail in the need to represent many transfers in a digestible form. Nonetheless, both are examples of reificative connection. Both reifications are derived from the same pieces of paper, the transport audit forms (Appendix 2), and the same data are used in the reification. The purpose to which the data will be bent determines the nature of the reificative output.

Wenger's CoP framework has appeared helpful and robust in this chapter which has been predominantly located in some highly localised settings where the gaining of clinical competence has been supported substantially with proximal resources (for example Boxes 5.44 – 5.47). It has been straightforward in this chapter to describe the influences on the issues and resources affecting the ANNP's in terms of generational encounters and participation in practice, and so the data have been readily locatable in the CoP framework. CoPs are midlevel structures (Wenger, 1998)(pp124), and this is the level to which our gaze has been turned in this chapter. The next chapter is concerned with distal influences on the process of change, and it is here that it becomes apparent that the CoP framework has problems when influences beyond the midlevel are examined.
Table 5.2. Summary of the emergent issues and resources in Chapter 5, with proposed links to factors that support the formation of a new community of practice (see Figures 4.1 to 4.3)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Resource</th>
<th>CoP element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical competence at clinical procedures</td>
<td>Repeated practice</td>
<td>Peripheral participation, the knowledgeability of engagement and generational encounters</td>
</tr>
<tr>
<td></td>
<td>Practice rare procedures on models</td>
<td>Mutuality - opening of peripheries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competence - activities that bring about the knowledgeability of engagement, occasions for applying skills, devising solutions and making decisions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuity - participative memory, generational encounters, apprenticeship systems</td>
</tr>
<tr>
<td>Performing procedures in context</td>
<td>Attending transfers</td>
<td>Creating an infrastructure of competence</td>
</tr>
<tr>
<td></td>
<td>Clinical supervision meetings</td>
<td>Competence - initiative and knowledgeability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mutuality – peripheral participation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuity - Generational encounter</td>
</tr>
<tr>
<td>Note and record-keeping</td>
<td>Clinical supervision meetings</td>
<td>Participation and reification</td>
</tr>
<tr>
<td></td>
<td>Notes of transfers</td>
<td>Continuity - Participative and reificative memory and generational encounter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local regime of competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use of specific tools</td>
</tr>
<tr>
<td>Issue</td>
<td>Resource</td>
<td>CoP element</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Availability of transfers</td>
<td>Simply waiting</td>
<td>Mutuality</td>
</tr>
<tr>
<td></td>
<td>Weekends made available</td>
<td>Mutuality - interactional facilities</td>
</tr>
<tr>
<td></td>
<td>PICU and other transfers made</td>
<td>Mutuality – peripheral participation</td>
</tr>
<tr>
<td></td>
<td>available</td>
<td>Opening of peripheries</td>
</tr>
<tr>
<td></td>
<td>Simulated transfer</td>
<td>Competence - initiative and knowledgeability. Activities that bring about the</td>
</tr>
<tr>
<td></td>
<td>Supernumerary time for transport</td>
<td>knowledgeability of engagement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competence – accountability. occasions for exercising judgement.</td>
</tr>
<tr>
<td>Condition of babies on completion of</td>
<td>Clinical supervision meetings</td>
<td>Infrastructure of competence</td>
</tr>
<tr>
<td>transfer</td>
<td>Notes of transfers</td>
<td>Definition of a common enterprise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuity - Participative and reflexive memory and generational encounter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local regime of competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competence – accountability and occasions for exercising judgement.</td>
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<td></td>
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<td>Developing a recognisable style - jargon and shortcuts</td>
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<td></td>
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<td>Shared discourse</td>
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<td></td>
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<td>Imagination – location in meaning</td>
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<td></td>
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<td>Specific tools</td>
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<tr>
<td>Equipment</td>
<td>Clinical supervision meetings</td>
<td>Infrastructure of continuity</td>
</tr>
<tr>
<td></td>
<td>Research</td>
<td>Continuity - Generational encounter and paradigmatic trajectory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competence - Activities that bring about the knowledgeability of engagement</td>
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<tr>
<td></td>
<td></td>
<td>Competence – Mutual evaluation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Developing a recognisable style - jargon and shortcuts.</td>
</tr>
</tbody>
</table>
Chapter 6.

Becoming an ANNP: distal issues

Introduction

In this chapter another set of issues and resources which emerged during the period of transport training for the two new ANNPs are examined. The objective is to build a better understanding of the change process as it unfolded in the setting in ways that extend beyond the immediacy of situated competencies and the other proximal issues. This chapter complements the concern of the previous one with achievement of situated clinical competence by showing emergent issues and resources related to the “system of care.” Woods (2000a, p. 61) characterises the “system of care delivery” as a domain of practice related to the delivery of direct care but concerned with aspects of how the system works, organisational roles, nursing relationships and organisational needs/responsibilities. While the research has thus far been centrally concerned with the new ANNPs, this chapter is concerned to show that the move towards locating them in a CoP where they are in a position to lead transfers was associated with a range of other changes. Where the concerns of the previous chapter were characterised as proximal, this chapter is concerned with distal issues. This term is used to distinguish the range of sources of the emergent issues and resources while at the same time retaining ANNP-led neonatal transport as the setting in which the issues and resources are situated. Distal issues are concerned with the impact of the introduction of ANNPs in respect to organisational issues. The dynamic of situated competence extends beyond the immediacy of the local context of transfer and clinical performance.

In Chapter 4 we saw that Wenger (1998c, p. 124) defines communities of practice as a "midlevel" unit of analysis, neither a specific or narrow activity nor a broadly-defined aggregate. It was straightforward in Chapter 5 to describe the influences on the issues and resources affecting the ANNPs in terms of generational encounters, participation in practice and other CoP elements, and so the data were readily locatable in the CoP framework. As with Chapter 5, this part of the study is concerned with a period of transition...
and so the data may be expected to show change over time as issues emerge and resources are put in place to deal with them. The data will continue to be presented as emergent issues and resources with links to factors which may promote the formation of a community of practice (Figures 4.1–4.3). The data that are used to track issues and the resources that are brought to bear on them are from tape-recorded and written sources, and these are detailed in Table 3.2. The issues and resources which are discussed in this chapter represent the broad range of concerns of participants in this change process. The emergent issues and resources along with their associated CoP elements are summarised in Table 6.1, at the end of the chapter. This contributes to a central objective of this thesis in assessing whether the CoP framework is a tool which may be of use to others concerned to implement or research change at work. Where the previous chapter was rooted in the concerns of the new ANNPs, which were substantially clinical, this chapter is oriented towards contemporary issues in how the system of care on the NICU is organised and delivered. This chapter is concerned with distal influences on the process of change, and it is here that it becomes apparent that the CoP framework has problems when influences beyond the midlevel are examined.

**Distal Issues**

The process of change for the new ANNPs occurred in step with other more remote processes. Some of these issues arose in the NICU setting, whilst others were rooted in national NHS changes and government policy (Department of Health, 2003, Department of Health, 2000). It will not be possible to understand the transition to ANNP led transport without an examination of these emergent contextual issues and resources. Wenger does not give us a ready tool with which to get to grips with these. As outlined in Chapter 5, Wenger formulates the proximal/distal issue in terms of the "local" and the "global." He suggests that connections between the local and global are mediated by multimembership of CoPs and by participative and reificative connections and should be understood in the context of constellations of practice (Wenger, 1998a, p, 247). In this situated research we have no direct access to constellations of practice, only to their influences on the setting.
The following emergent issues, their associated resources and the trajectories of their movement are discussed in this section:

1. Working pattern
2. How will the institution use ANNPs?
3. Junior doctor changes
4. Organisational structure (Hierarchy and accountability of ANNPs)
5. Retention of staff
6. Audit
7. Study leave

As the previous chapter did, so will this chapter consider whether the emergent issues and resources found in the data are congruent with factors proposed as contributing to the formation of a new community of practice (CoP). The issues and resources, along with their proposed CoP associations, are summarised at the end of the chapter in Table 6.1. Problems found with the CoP model are raised at the end of this chapter and these are reviewed and addressed in Chapter 7.

1. Working pattern – infrastructure of imagination and long term trajectories

The ANNPs are a new group on the NICU and they have been superimposed on existing structures, rather than explicitly used to replace any departing group or groups of doctors or nurses. The data in Chapter 5 showed that the two new ANNPs had been given clear guidance that transport was to be the focus of their training and subsequent job. The demand for transport is sporadic and mostly unpredictable, and so for trained transport personnel more time may be spent being available for transfers than in actually doing them. The time spent not doing transport must be used productively - resources will not allow ANNPs to simply stand-by for transfers. This issue is discussed in the data over the period of transport training. During this period the two new ANNPs are quite properly regarded as fully trained and functional ANNPs in respect of NICU work, as they have completed both ANNP training and post-
course consolidation Thus the issue of their deployment on the NICU can be discussed in definitive terms, but taking into account their future focus on transport. In CoP formation terms Wenger argues that it is important that an infrastructure of imagination is supported in respect to long term trajectories (Table 4.3), and in this section the discussion of working patterns is defining the common enterprise of the CoP in terms of projections of how work will be in the future. A baseline for these discussions is set at the beginning of the first ANNP planning meeting on 18.8.00 when the results of a programme of visits and telephone discussions with other NICUs using ANNPs are presented.

Box 6.1 – Working patterns of ANNPs on other NICUs (from: ANNP planning meeting 18.8.00)

| ANNP1: ... However (.) I say the team in *(large city NICU)* six of them at present (.) they are working a 40 hour week (.) they have their own pay scale aside from the nursing pay scale (.) they do a 40 hour week and work 8.30 to 6.30 which I thought was interesting because I work 8.00 to 6.00 and only do a 37.5 hour week |
| CN: it depends whether you count your lunch break or not (.) doesn’t it (.) so if you don’t count lunch breaks ( ) but I don’t know |
| ANNP1: It was just a little aside |
| CN: Well we’ve had lots of asides already (.) I’m tweaking them all out |
| ANNP1: Now they do a system whereby they do two weeks in intensive care (.) they then have a week off the floor so they do a six week rotation I should say (.) perhaps when I started off (.) two weeks in intensive care; one week where that is non-clinical or flexi-cover or whatever (.) so if they have suddenly got three lots of 24 week quads then maybe they’ll be working in high but otherwise its just meant to be non-clinical (.) They have one week where they actually now (.) and this apparently is a recent thing ( ) provide evening cover |

This suggests a range of emerging issues including times of the week to be covered, hours worked and where in the NICU work may be done. Other centres working patterns are also discussed, also in terms of shift times, sites of practice (intensive care, other areas), and non-clinical time. This leads to a discussion of the scale of the service that the local NICU is proposing to offer (Box 6.2).
The emerging issue is the hours of the working week that ANNPs could or should cover, and in particular the extent to which weekends and nights might be included. In this exchange it is clear that junior doctors are a central issue, and this is discussed in more detail below. This extract suggests that there is much still to be negotiated and decided in the future configuration of ANNP and other services, that the die is not cast. Later in the meeting the group decides to rate aspects of the ANNP role on a short scale from unimportant (zero) to essential (three). In order to do this the group quickly worked-up a list of issues which needed to be discussed under this broad theme. These were written on a white-board and each was discussed in turn. One issue for discussion was "duration of cover" which was shorthand for issues in how many hours of each
day and night, and how many days of the week ANNPs should be available to the NICU. Box 6.3 is the transcription of the discussion around the theme of duration of cover.

Box 6.3 – When will ANNPs be available to the NICU (duration of cover) (from: ANNPs planning meeting 18.8.00)

AJL: Duration of cover? These are quite mechanistic issues and things to do with duration of cover and they depend on what happens to doctor’s hours and so on don’t they?

CN: Yes because I think in reality if you’ve still got a doctor role you won’t have nurse practitioners 24 hours a day because there are quite (.) it’s not a good way to sustain you in your role for a long time if you are working nights unless it’s necessary (.) I think that comes with time so we can leave that

BM: Do we need (inaudible) Monday to Friday or seven days on and so on?

CN: I think we definitely seven days I mean we’re pretty much in agreement with that already aren’t we? We’ve moved out of Monday to Friday to seven days (.) but not unless you’re 24 hours

BM: So that’s a 3?

CN: Yes

BM: So are 24 hours desirable?

AJL: It only becomes desirable in the context of what happens to other groups isn’t it?

ANNP1: So it’s not important at the moment

These data indicate that working pattern for the ANNPs is an emerging issue for the institution which is not resolved. A long term rota pattern cannot be determined until there is agreement on what hours of the day are to be covered by ANNPs. A number of resources have been raised that might influence a decision, including what other units have done, the ways in which cover for neonatal units has traditionally been arranged, the need to supervise junior doctors and changes in junior doctors working and training arrangements. These issues appear to need to stabilise before they become resources out of which plans can be solidified. For example, 24 hour ANNPs coverage only becomes desirable “in the context of what happens to other groups,” (Box 6.3) a reference to potential changes in the availability, working hours and training
status of junior doctors. This is discussed further below. In the meantime, for the new ANNPs there is an expectation that seven day coverage on the NICU is a desirable goal. This shows the projected trajectory of change over time to be oriented toward seven day ANNP coverage for the NICU.

Several CoP issues are being attended to in the data above as the senior staff of the unit debate some fundamental issues. By discussing working patterns, with the associated but as yet unknown issues of how many ANNPs the NICU might need, they are defining what may be the common enterprise of a transport CoP with ANNPs as a key resource. The discussion of issues in working patterns provided an opportunity for resources to emerge, such as reference to what other units do and projected junior doctor changes, which allowed the future trajectories of change to be imagined. Further, by projecting medium and longer term future working patterns, and relating these to wider NICU staffing issues, an infrastructure of imagination is being supported by locating the new ANNPs in long term trajectories.

How the working patterns of ANNPs on other NICUs are brought to the meeting (Box 6 1) is of interest and concern to the analysis of the utility of the CoP framework. ANNP1 brings this information in the form of notes made as the result of visits to some units and telephone calls to others. ANNP1 might in CoP terms be construed as acting a broker, as an agent who crosses boundaries between (geographically dispersed) CoPs. Wenger argues that in order to understand or study that other setting we need to “zoom-out” to see the bigger picture. In fact, in the discussions above what is happening is that the meaning of the information carried by ANNP1 is being assembled in the local context. The issue of how the CoP framework deals with issues of scale is significant, and is discussed further below.

The discussions below regarding the impact of changes in junior doctor availability and tasks that ANNPs can potentially attend to are closely linked to this discussion of working hours.
2. How will the NICU use ANNPs? Infrastructure of imagination and long term interacting trajectories.

Material in this section is drawn substantially from the NICU ANNPs planning meeting on 18.8.00. At these meetings senior staff of the NICU came together with ANNPs to make plans for ANNP deployment. The first meeting began with a discussion of the pressures, particularly junior doctors hours, which were driving the process. This issue is explored in Section 3, below. The discussion then moved on to what should happen locally with ANNPs.

Box 6.4 – The future professional orientation of ANNPs (from: ANNP planning meeting 18.8.00).

CN: So I suppose what I'm asking at this (...) thinking at this stage was would we like to start thinking about the way we move forward by just saying we are going to put a nurse practitioner into a doctors role or try to develop a totally new role? Not necessarily a new role but it's a new system (...) you know it's a system of working isn't it?

ANNP1 I think my gut reaction having seen and spoken and listened and read about it has got to be a completely new role because you're taking (...) you're looking to take nurses from nursing but they will remain nurses and they have different outlooks and different perspectives and to just pick them up and put them in to a doctor role (...) from places that have tried it it hasn't worked

CN: I mean the other clear message that's coming through is that everybody else is giving people something else to do and in all fairness (...) rightly or wrongly (...) you do have something else to do (...) It may not be that (...) and (AJL) has something else to do (...) and yet the poor person who has nothing else just gets total is (ANNP2) and we need to think about that and I suppose we also need to think about what you do in that spare time like something like the appropriate thing but that can come as we go through the discussion (...)
The consultant neonatologist picks up on a different theme she has detected in the feedback from the survey, that other units are facilitating non-clinical time for ANNPs ("something else to do"), and that at present ANNP2 does not have any non-clinical time. She suggests this is given further thought, and these non-clinical activities are part of the next exercise the group undertakes. They move on to "brainstorm" potential ANNP activities in order to produce a list of ways in which ANNPs could contribute to the work of the unit. It is of note that this brainstorming activity is of all the activities to which ANNPs could contribute, and this shows a willingness to think beyond the transport boundary. A small illustrative fragment of this discussion is in Box 6.5. This is the discussion which produced the list of ANNP "roles" which were then rated on a zero to three scale, as shown in Box 6.3 above and Boxes 6.6 and 6.7 below.

Box 6.5 – Producing a list of ways in which ANNPs might contribute to the work of the NICU (from: ANNP planning meeting 18.8.00).

<table>
<thead>
<tr>
<th>AJL: Things that nurse practitioners could do include labour ward</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN: I think we should put everything in even if we don't really want it so we could do baby checks ( ) you know</td>
</tr>
<tr>
<td>AJL: yes (.) absolutely that's what I'm thinking (.)</td>
</tr>
<tr>
<td>CN: Holistic care</td>
</tr>
<tr>
<td>AJL: Yes</td>
</tr>
<tr>
<td>ANNP1: Low dependency management and obviously level one and level two as well</td>
</tr>
<tr>
<td>AJL: Clinics</td>
</tr>
<tr>
<td>ANNP1: Discharge care</td>
</tr>
</tbody>
</table>

In this way a list of jobs that could be attended to by ANNPs is worked-up.

Having produced the list the group discussed what to do with it. The next step taken in the same meeting is to negotiate a score for each activity, based on a short scale from zero to three (unimportant to essential). Box 6.6 shows how the "transport" category was negotiated. This extract shows that key NICU staff have moved to a position where transport is a negotiable part of projected
ANNP work. At the beginning of the extract the group have reached the point where “transport” is the next category to be discussed and given a rating

Box 6.6 – The place of transport in the activities which ANNPs might do (from: ANN planning meeting 18.8.00).

<table>
<thead>
<tr>
<th>AJL:</th>
<th>Well you know where my vote goes for the next one</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM:</td>
<td>Zero</td>
</tr>
<tr>
<td>AJL: (laughs)</td>
<td></td>
</tr>
<tr>
<td>CN:</td>
<td>I just think (.). tell me if I’m wrong here (.). I don’t think you should necessarily put that as essential because I think in the long term that you could use transport as one of your career progression things so it’s a desirable thing but that you could say that you don’t have to have a nurse practitioner to do transport but that is part of their (.). you know (.). come in at a certain level two years down the line that new opportunity comes and you are now at the registrar level of the nurse practitioner as opposed to the SHO</td>
</tr>
<tr>
<td>ANN1:</td>
<td>I have to agree with that and I think that was one of the things that I took away from talking to the girl who trained with me with her not being able to intubate because it just demonstrated that there really is a career step and the other thing is that some of the other girls out there at (DGH NICU) (.). if I was going to (DGH NICU) they would be expecting me to come and bail them out of the situation that they are in but we both have the same qualifications at the end of the day</td>
</tr>
<tr>
<td>BM:</td>
<td>The transport (inaudible - in the background) pretty secure down the road (inaudible)</td>
</tr>
<tr>
<td>ANN1:</td>
<td>Yes well they do at the moment (.). or try to</td>
</tr>
<tr>
<td>CN:</td>
<td>I’m not trying to say that transport is not important</td>
</tr>
<tr>
<td>AJL:</td>
<td>it doesn’t bail them out because we go to centres that have got registrars where I am going to take the baby from them and I’m not going to sort out their cock-ups or do things that they couldn’t do (.). I’m going because I’m the transport person that’s all</td>
</tr>
<tr>
<td>ANN1:</td>
<td>No you’ve misunderstood what I think</td>
</tr>
<tr>
<td>CN:</td>
<td>I support what</td>
</tr>
<tr>
<td>AJL:</td>
<td>I can see what you’re all getting at</td>
</tr>
<tr>
<td>CN</td>
<td>We’re not saying that transport is not important (.). what we’re just saying</td>
</tr>
</tbody>
</table>
BM: lots of other people

AJL: well okay let me argue it this way then (.) I can see that what you’re saying is correct which is that transport will be a progression and that it will be something that people won’t come to do to start off with but I think its essential that we’ve got progression (.) you know

ANNP1: yes

AJL: and from that point of view I guess my argument would be that transport becomes essential on the basis that it’s there and it must be an opportunity that is open to people

CN: And in the long term we would need it for service if we are going to develop nurse practitioners because there’s going to be change in doctors we can’t have nurse practitioners who can do transport

AJL: We can’t train ten nurse practitioners and have nine of them decide they don’t want to do transport

CN: Okay (.) Put it as essential then but we know where we are coming from

At the beginning of this extract CN and ANNP1 make a case for transport being non-essential ANNP activity on the basis that transport competence involves a higher level of clinical skill than that required in other clinical settings. The key word which unlocks the debate is “progression”, as this appears to satisfy everyone’s conception of the place of transport in the ANNP workplace canon. The meeting agrees that “progression to transport” is essential ANNP activity, both on the basis that the possibility of doing transport must be open to new ANNPs and that the NICU organisation will need experienced ANNPs to make this progression. From a CoP perspective the key negotiation which is taking place is in the infrastructure of imagination, in terms of long term trajectories which all concerned share a vision of.

The negotiation of a score proceeded in a similar way for each activity raised in the earlier brainstorming session The results of this are preserved in reified form in the minutes of the meeting as a table as reproduced in Box 6.7. In the table may be seen all the “clinical and non-clinical roles for ANNPs” generated in the brainstorming session along with the scores allocated to each. For example, the discussion in Box 6.6 is seen to have solidified out into a category
called "Progression to transport", which was rated as an essential part (score = 3) of ANNP activity by the meeting.

Box 6.7 – Table produced from discussion of workplace possibilities for ANNPs and the importance for the NICU of each activity (from: ANNP planning meeting minutes 18.8.00).

Clinical and non-clinical roles for ANNPs, with grading of desirability:
0: undesirable, 1: not important, 2: desirable, 3: essential

<table>
<thead>
<tr>
<th>Clinical roles</th>
<th>Score</th>
<th>Non-clinical roles</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour ward</td>
<td>3</td>
<td>Audit</td>
<td>3</td>
</tr>
<tr>
<td>Baby checks</td>
<td>1</td>
<td>Research</td>
<td>3</td>
</tr>
<tr>
<td>Progression to transport</td>
<td>3</td>
<td>Education (of whole multidisc. Team)</td>
<td>3</td>
</tr>
<tr>
<td>Holistic care</td>
<td>1</td>
<td>Professional development</td>
<td>3</td>
</tr>
<tr>
<td>Intensive care</td>
<td>3</td>
<td>Management</td>
<td>2-3</td>
</tr>
<tr>
<td>High dependency care</td>
<td>3</td>
<td>Guideline production</td>
<td>3</td>
</tr>
<tr>
<td>Special care</td>
<td>3</td>
<td>Clinical governance</td>
<td>3</td>
</tr>
<tr>
<td>Out-patients clinics</td>
<td>0</td>
<td>Strategic development</td>
<td>3</td>
</tr>
<tr>
<td>Post-discharge/family care</td>
<td>0</td>
<td>National work</td>
<td>3</td>
</tr>
<tr>
<td>Transitional care</td>
<td>1</td>
<td>Networking</td>
<td>3</td>
</tr>
<tr>
<td>Seven-day cover</td>
<td>3*</td>
<td>Supervision</td>
<td>3</td>
</tr>
<tr>
<td>24-hour cover</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-call</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ante-natal</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*may change with workforce planning.

The table in Box 6.7 summarises the views of the senior NICU staff at this time and shows that some clinical activities, including attending labour ward and working in intensive care, are deemed essential, while others such as ante-natal care and out-patient clinics are regarded as unimportant. This table therefore reflects the discussions of the definition of the common ANNP enterprise and in so doing co-ordinates the perspectives of the participants.

These extracts show the extent to which the views of the senior NICU staff have moved on from ANNPs as just transport clinicians. Clinical work in intensive, high dependency and special care are all awarded "essential" status, and there was debate about whether transport is a necessary feature of ANNP work. A compromise is achieved by adding "progression to..." to the transport category. This recognises that transport represents an additional level of skills
beyond NICU work, and that the NICU staffing issues will probably mandate ANNPs making this progressive move.

The right-hand column in the table in Box 6.7 rates the importance of non-clinical activities and almost all are designated "essential". The discussion at the meeting clarifies these issues as shown in Box 6.8.

Box 6.8 – The importance of non-clinical ANNP activities (from: ANNP planning meeting 18.8.00).

| CN: | I mean what I was going to make a comment (.) I was going to make a comment that you could put all these together and put a 3 by them all but not everybody should be expected to do everything (.) in other words (.) All these things |
| ANNP1. | grouped as a 3 |
| CN: | as a group (.) as a group of nurse practitioners all these things are an essential part of a nurse practitioner group but I do strongly believe that you can't do everything and therefore (.) and I really mean this (.) you can't write the guidelines (.) do the clinical governance (.) do the audit (.) do everything (.) you've got to decide as a group and as an individual which things you want to do and develop |

The consultant neonatologist clarifies that, whilst all the activities listed may be essential activities for ANNPs to be involved in as part of the institution's work, it is not essential that every ANNP is always contributing to all these things.

The data in this section show how the senior staff of the NICU, including all the ANNPs, assembled a collaborative picture of how the NICU will use ANNPs. The new ANNPs, who were engaged at the time in the process of becoming able to do transport, have contributed to the debate and agreed with the negotiated outputs.

The NICU senior staff, by providing a workplace milieu which supports the ANNPs transport-oriented goal, have serendipitously created a setting which has allowed for observation of ANNP practice. Having observed that setting and seen effective working they are now concerned with broader and longer term issues in how ANNPs are deployed. These are driven in part by the issues of junior doctor changes discussed below. This supports the suggestion
that the NICU senior staff are actively redefining the (common) enterprise for the emerging CoP to be different from that which the two new ANNPs joined to do. All the ANNPs are involved in this debate regarding the nature of the common enterprise and there is substantial agreement on future directions. How activity of the community of practice is represented may be evolving over time, from being tightly transport oriented to having a broader NICU base which includes transport.

This section has shown active work being done in the definition of a common enterprise for an emerging CoP, particularly by assigning weighting to different kinds of ANNP activity. This discussion also had a future-projection element which contributes to an infrastructure of imagination.

3. Junior Doctor Changes – defining the common enterprise

Material in Section 1, above (Box 6.3) suggests that actual and potential changes in the availability, nature and status of junior doctors appeared to be a contributing factor to the discussions regarding working patterns for the new ANNPs. The issue of junior doctors and these potential changes is also raised as an issue in the data independently of discussion about working patterns for ANNPs, and illustrates the extent to which these concerns are a resource which is both driving and being used to drive a process. From a CoP perspective, in these extracts we can see people in the setting responding to projected future changes by coming together to define what the common ANNP enterprise will be. The earliest examples occur at the NICU ANNP planning meeting on 18.8.00. The reason for calling these meetings was stated at the beginning of the first one by the consultant neonatologist:

Box 6.9 – Reason for convening the ANNP planning meeting (from: ANNP planning meeting 18.8.00).

CN: The purpose of this meeting is if you’ve all had the letter (.) is to try and develop a business case for the expansion of nurse practitioner roles within the service and I think what I’d like to do in a minute is give you a little bit (.) from a directorate perspective sort of background to that is why we feel we need to develop a business plan in the first place...
The issues that have emerged to drive the process are expanded upon a little later:

Box 6.10 – Changes in the numbers of junior doctors are raised as an issue which is influencing perspectives on ANNPs (from: ANNP planning meeting 18.8.00).

CN: So (.) erm just talk a little a bit about what the neonatal directorate’s plan is in terms of nurse practitioners (.) I think it would be fair to say if you look back (.) not even probably not much more than a year ago the directorate was very clear that we would train three nurse practitioners and having trained those three nurse practitioners there wouldn’t be any immediate further expansion (.) I think we are all very clear that that’s what we decide up to and that the three of you (.) the purpose of developing your role would be to improve the quality of transports that we do in mid-Trent and there were specific issues where we thought problems with transport were during the day (.) that issue was a big one (.) there are now issues about weekends (.) particularly when the Queens are on at weekends (.) When we wrote our business plan for this year in December there were two big issues that were new as it were (.) the first was the (.) the plan SpR numbers would reduce from 1,250 to 750 over the next three years so that is a significant reduction in SpR numbers and that would have a potentially major effect for running (.) not just any transport service ( ) but also actually running any hospital and any neonatal service (.) Issues at all sorts of levels (.) on-call issues ( ) number of middle grade staff around but also in the longer term it means there will be less SHOs so there is no doubt that in December there will seem to be ( ) it would seem that there will be a major change in junior medical workforce in paediatrics in this country (.) We have had to start looking about how we might address that and one of the ways the service felt that that could be addressed would be to use nurse practitioners in a more medical type role (.) but that wouldn’t be the only answer there would have to be lots more other things but I think you have to assume that if that goes ahead there will be no second on at all (.) there would be no second on rota in Nottingham (.) that will go (.) full stop and there are also other issues of daytime cover at the neonatal unit (.) there may not be any registrars or there may only be four SHOs (.) So we’ve provisionally looked at the idea that over the next five years we might need to increase nurse practitioner numbers up to perhaps ten nurse practitioners across the service in Nottingham but we didn’t particularly look at the detail of that role...

The hospital is organised into divisions which are further sub-divided into directorates, of which the neonatal service is one. The directorate is run by a management team chaired by a clinical director, who in this extract is also the consultant neonatologist (CN). The extract summanses “what the neonatal directorate’s plan is in terms of nurse practitioners”. The account offered by CN is her perspective on discussions held by the directorate management team.
The extract illustrates the highly dynamic nature of the external influences. The consultant neonatologist suggests that as little as a year earlier the NICU had no plans to expand the ANNP workforce beyond the existing numbers. There are now new concerns about proposed changes in junior doctor numbers which are altering the perspective on ANNPs and recasting the role of ANNPs in terms of NICU, as opposed to transport, work.

The potential emergent issues in the extract require a little explanation. CN says "there are now issues about weekends (.) particularly when the Queens are on at weekends", referring to the cover for neonatal transport at weekends. This has been provided by a Specialist Registrar (SpR) who is on-call from home. A recent change at QMC has been to upgrade the SpR cover for the hospital at weekends by bringing in to the hospital the SpR who was previously on-call for transport at home. This has lead to "QMC weekends" being problematic for transport, as the previously available SpR is now committed to hospital work. Secondly CN suggests that "SpR numbers would reduce from 1,250 to 750 over the next three years." This is a national change in numbers of doctors being trained in paediatrics, and will reduce the number available for cover at each centre. This, together with unspecified changes in Senior House Officer (SHO) numbers are proposed as challenges to the proper staffing of the NICU to which ANNPs may be part of the solution. These lead to the raising of several potential resources including to "use nurse practitioners in a more medical type role (.) but that wouldn't be the only answer there would have to be lots more other things" and "increase nurse practitioner numbers up to perhaps ten".

Transport remains an issue however, as the next extract shows. Box 6.11 is feedback to the same meeting from another meeting where registrar availability has been discussed. It shows that, in terms of institutional perspective, the ANNPs are clearly seen to have a continuing and possibly expanding contribution to make to transport. In this extract "second-on rota" refers to the medical on-call system which includes a second SpR on-call in paediatrics, and who may be able to support transports in this capacity.
Box 6.11 – Projected future changes in the availability of junior doctors (from: ANNP planning meeting 18.8.00).

AJL: .. (CN2)'s take on the second-on rota was that it isn't going to vanish overnight in terms of how things are at the moment and there will be some pressure on it which she thinks will be cope-able with some (.) erm ( ) with some juggling about of the hours of the City and Queens Registrars and the proportions of the cover that are done by each of those (.) So at least in the short-term (.) the short to medium term (.) there will continue to be a second-on rota which will continue to provide this cover (.) The change as it happens will be gradual so we won't suddenly lose (.) you know (.) one week in two of the second-on rota (.) what will happen is we will just find we just haven't quite got enough hours to cover the things that are necessary and so (CN2) asked this meeting to consider including in our thoughts the notion that nurse practitioners would cover (.) for example (.) one night a week in the first instance (.) you know (.) we'll say every Wednesday night is a nurse practitioner second-on night and on those nights this service (.) well this meeting will work out a way whereby we have enough nurse practitioners and a system in place whereby that can happen (.)

This feedback is reporting similar issues to Box 6.10, but from another source. The emergent issue of diminishing junior doctor numbers is slightly recast to represent the likely impact as gradual rather than sudden. An additional emergent resource raised is the possibility the ANNPs might contribute to the night-time coverage for transport and that “this meeting will work out a way whereby we have enough nurse practitioners and a system in place whereby that can happen.”

However, the messages reaching front-line clinicians from government appear to be contradictory, as Box 6.12 shows.

Box 6.12 – Contradictory message from government about changes in numbers of doctors (from: ANNP planning meeting 18 8 00).

CN:...What I don't know and I have to say I don't know the answer to this and I have not seen anything (.) you know with the new Government National Plan and how we are going to increase doctors now by thousands (.) has this all now gone out of the window and you know (.) do we now (.) can we now forget that SpR numbers are going to be halved (.) so has a time already changed but I think we do still have to assume...

The consultant neonatologist is outlining the tension between the changes in junior doctors working and training arrangements, which were possibly going to lead to less hours available for clinical duties, and the latest announcements in
the NHS National Plan (Department of Health, 2000) that many more doctors were to be recruited to the NHS. This uncertainty is discussed again on 12.9.00:

Box 6.13 – Uncertainty in projections of future availability of doctors (from: ANNP planning meeting 12.9.00).

AJL: So it's really difficult to plan for five years hence if we're planning on the basis of absence of middle grades (.), because we don't know if they're going to be absent (.) the same or better than they are now

CN: Yes, no idea at all

AJL: And so I don't see an adequate way of planning for that. We can plan on the basis of what we want in terms of nurse practitioners

This exchange suggests that the NICU management team is in an apparently impossible position from a planning perspective. The resource of junior doctors hours has been raised to help deal with the difficult planning decisions in deciding how many ANNP's are needed, how they should work, the importance or otherwise of transport in any proposal and has been found to be unhelpful. Box 6.9 suggested that the purpose of the meeting was to plan for expansion of the ANNP grade, but these issues cast doubt on whether there is a need for such an expansion when that is raised in terms of junior doctor changes. Instead I raise (Box 6.13) the alternative possibility that planning be based on "what we want in terms of nurse practitioners." This notion is partially picked-up later in the meeting, as illustrated in Box 6.14.

Box 6.14 – Other reasons the NICU might benefit from ANNP's (from: ANNP planning meeting 12.9.00).

CN: Do you remember what we said at the first meeting? The reason why we're thinking about looking for more nurse practitioners is because of potentially losing junior doctors so we can't just say this is purely for transport but we're also doing it to better the care of babies ultimately better (.) and there's no doubt and I strongly believe that the care of babies is better having you and (ANNP2) and (AJL) because it provides some continuity in the longer term and when we have new doctors for example we're going to educate them and help them and it's very obvious that the difference in support here from for example the Queens
This extract shows the possibility of other issues emerging that will influence the policy of the NICU toward the introduction of ANNPs, in this case the possibility that the care given to infants on the NICU is better when ANNPs are involved. It shows that an unintended and unforeseen effect of introducing ANNPs to the NICU for transport has been to raise the bar in terms of the local regime of competence. (“I strongly believe that the care of babies is better…”)

In other words, they have been seen to contribute to the delivery of "better" care for infants on the NICU. In this way the training of the new ANNPs for transport is feeding-back into how the institution considers how to plan for the future. If there were no ANNPs training to do transport then the NICU would not have had the opportunity to spot a possibility for changes in the pattern of the delivery of care for the better on the NICU. The common enterprise of the proposed CoP is clearly a topic for discussion, as several possibilities have now been discussed including transport (Box 6.11), making up junior doctor shortfall (Box 6.10) and generally improving care for babies (Box 6.14).

By 2001, at the ANNP meeting on 17th April these issues are still on the agenda, but the ways in which the junior doctor hours issues are being raised as a resource has changed, as Box 6.15 shows.

Box 6.15 – Further concerns about the availability of doctors for the NICU; GP trainees and training status of SHOs (from: ANNP 17.4.01).

CN: We know that SHO numbers (.) although they won’t halve (.) like half of SHO jobs will have to go to GP trainees and GP trainees don’t want to do neonates so we will potentially lose SHO’s that way (.) Probably don’t need to because its not part of their training and (.) erm and the Government said that neonatal intensive care can only be delivered by trained individuals so SHO’s aren’t regarded as trained (.) they are down for training but nurse practitioners are trained so the whole system will change (.)

Now the issues have changed to include two new factors. First is the possibility that some of the SHOs on the NICU will be doctors in training to be general practitioners. Although not stated explicitly, the NICU senior staff would regard this as a problem, as GP trainees are unlikely to be interested in or committed to learning about neonatal intensive care. Second is a possibility of a demand from the government that NICU care be delivered only by "trained" personnel. SHOs will not be regarded as trained for these purposes, but ANNPs will
These issues are solidified further in the documents of the NICU in a business case produced in 2001 and finalised in November which bid for funding for more ANNPs. Business cases are produced in the NHS to support bids for new funding on top of what a service already receives. It is common practice to produce business cases for initiatives that a service might like to implement, even in the absence of a pot of money to bid for, so that if a potential funding source is identified the documentation to support a bid is "on-the-shelf." The extract in Box 6.16 is from that document.

Box 6.16 – The concerns regarding the availability and status of junior doctors are reified in the written outputs of the NICU (from: Business case for developing ANNPs 1101).

A number of government directives make it imperative that health providers address the way neonatal services are delivered in this country. These include reduction in junior doctor's hours and reduction in SpR numbers. Additionally the current drive within the NHS to ensure that care is provided by trained individuals rather than trainees means that we should re-evaluate the role and provision of ANNPs and of "expanded" nursing practice.

The business case document includes reference to all the pressures on medical staffing - reductions in hours and numbers of junior doctors and the demand for care delivery by trained personnel – despite the uncertain nature of some of the proposals (Box 6 13). It appears that a pragmatic approach is being taken which is dealing with the uncertainty in various policy strands by simply folding all the potential influences together and concluding that more ANNPs are likely to be needed.

This section shows that junior doctors hours of work were a significant factor to emerge during the period under examination. The period of transition to being able to do transport for the two new ANNPs was one which entailed their scheduled presence on the NICU, waiting for transport calls and honing clinical skills on non-transported infants. In the process of so doing, their presence emerged as a resource that shaped how the senior NICU staff viewed options for future working patterns for the whole unit. The junior doctors hours issue remained unresolved and difficult to plan for over this period and ANNPs came
through as a resource that could be planned for in the midst of other uncertainties

In the data above it is clear that the NICU management team discussed potential plans for ANNPs beyond transport. There is acknowledgement that transport has been the common enterprise but also that the junior doctors hours issue may broaden the focus. The emergent issues in the possible trajectories of changes in the availability of medical staff are raising discussion of ANNPs as a future emergent resource for non-transport NICU work. In this way the process of change at work is driving further change.

From a CoP point of view, the junior doctor's hours issue is influencing the NICU organisational response to what will be the common enterprise of the ANNPs CoP. How this influence is exerted is difficult to model with the CoP framework. For example, Box 6.12 shows that the NHS Plan which had just been published indicates the potential for "thousands" more doctors in the NHS. This is influential to our setting as the presence (or absence) of more doctors influences the number and orientation of ANNPs the service needs. This section has shown that this in turn influences the discussion of what the common enterprise of the CoP is to be. Wenger suggests that to understand these influences we need to zoom out to study the CoPs that produced them or to the boundary spanning individuals or objects that introduced them to the setting. But, even if it were possible, studying the CoPs that produced the NHS Plan will not tell us any more about how they came to exert influence in the setting with which we are concerned. The document has nothing specific to say about neonatal intensive care or ANNPs, so the influence it has is not located in the detail. Rather, the reporting of headline issues such as extra doctors has found a foothold in the talk on the NICU and this has in turn become influential in how the senior NICU staff plan for the future. Once again the problem with the CoP model appears to be located in how issues of scale are dealt with, as the framework does not allow for how distal influences are given local context to be understood. This problem is taken-up in more detail in the next chapter.
4. Organisational structure - Infrastructure of imagination and long term interacting trajectories

Reference to the timeline for this project (Figure 1.1) reveals that for some time I was the only ANNP. For a further period prior to the one being investigated in this study, the two individuals around whom this study centres were student ANNPs and one could reasonably hypothesise that they had a student/mentor relationship with me. Over the period of the study issues emerged which reflected changes in this relationship as the two new ANNPs became NICU practitioners in their own right. This led to discussion of what was, or could be, the structure of the ANNP organisation. The future members of the proposed CoP are imagining longer term perspectives, and an infrastructure of mutuality is being supported by structuring entry points to the proposed CoP. This issue is first raised at the end of the NICU ANNP planning meeting on 18.8.00.

Box 6.17 – ANNP organisational structure (from: ANNP planning meeting 18 8 00).

AJL: I think we should think about in the meantime all the same (.) The two things that kept coming up about a hierarchy and progression

CN: Okay yes because we haven't talked about

AJL: and I think maybe (.) well I can see we will have different perspectives on that to some extent and perhaps we should (.) hierarchy (.) progression and responsibility (.) those things are kind of all slightly linked in one way or another

ANNP1: and accountability

AJL: so perhaps we could separately think about those issues and circulate what we've thought with a view to discussing them next time

CN: So we've got to think about hierarchy (.) progression (.) responsibility and accountability Okay

The group starts with the suggestion that the two topics for discussion are hierarchy and progression, the need (or not) for formal structure for the ANNP team and how ANNPs might progress through that structure. To whom ANNPs should be responsible and accountable are added as related factors requiring investigation.
By the next meeting of the group on 12.9.00 a draft document has been produced, which is discussed.

Box 6.18 – Draft document on organisational structure (from ANNP planning meeting 12.9.00).

AJL: So shall I try to summarise rather than everyone reading through this?

CN: Yes

ANNP2: all right

AJL: So we can go straight down to question one I think because the rest was just (.) was just me thinking out loud

CN: and the rest refers to a group I suppose

AJL: Yes (.) so this was about levels of responsibility or will there be incremental stages to further responsibility and I think in summary (.) I thought that there was no alternative except to have incremental stages to further responsibility and what finally convinced me in my thought processes was the notion that somebody might come in fully intending to become a transport nurse practitioner but find that they just hadn't (.) couldn't cut the mustard for that for whatever reason and so therefore ended up stranded at a different level (.) leaving a further team of people who might be being paid the same but who are taking on clearly distinctive responsibility and not just responsibility in terms of the difference that transport work is but also you know the kind of (.) the responsibility for being available and for being late off duty and so on (.) and this other person might have a relatively cushy job that involved doing baby checks and going home at 3 o'clock every day

This extract supports the argument that transport ANNP activity is being perceived as involving working at a higher level than NICU work. The emergent issue is that of the problem of a future ANNP failing to achieve the standard required for transport practice, and the ensuing difficulty this might cause. This has led to the conclusion that there should be some incremental progression allied to pay rates which recognises and encourages movement along the scale to the higher levels of both practice and pay.

How to designate the hierarchical levels of ANNP practice was a subsidiary emergent issue. Box 6.19 from the ANNP meeting on 18.8.00 shows CN talking about hierarchy in terms of medical equivalence, where a lower level of ANNP practice might equal SHO and a higher level equal SpR. At the ANNP
meeting on 19.10.00 this matter of equivalence is discussed and found to be unhelpful (Box 6.20).

Box 6.19 – Equivalence with medical roles used to define levels of ANNP practice (from ANNP planning meeting 18.8.00).

| CN: ...So we've provisionally looked at the idea that over the next five years (.) we might need to increase nurse practitioner numbers up to perhaps ten nurse practitioners across the service in Nottingham but we didn’t particularly look at the detail of that role and yes there was debate whether you could have junior nurse practitioners who were SHO level then senior nurse practitioners at registrar level and do these nurse practitioners need to be able to do transport (.) would we even get any nurse practitioners (.) would anybody prefer to do the job (.) full stop |

Box 6.20 – Using medical equivalence as shorthand for ANNP levels is dismissed (from: ANNP 19.10.00).

| AJL: but my reading of it is that to some extent it’s about recognising that in terms of the three nurse practitioners that we’ve got at the moment the skills ( ) their skills have moved on as a whole group not just any individual amongst that group and that on the unit we use the resource substantially more and although (.) and I think this discussion of hierarchy is traditionally within (.) has been to some extent unhelpful although it’s clear that if I’ve got a problem still on the unit my first port of call is the registrar (.) That doesn’t make me an SHO and certainly in the eyes of the SHOs that doesn’t make me an SHO |

| CN: No |

| AJL: Or indeed in the eyes of the registrar it doesn’t make me an SHO just. |

In this extract the key issue is that simply because an ANNP and an SHO on the NICU might both go to the SpR for help, this does not mean the ANNP and SHO are working at the same level. Box 6.21 shows the reified output of these meetings in a document produced to support further discussion. All reference to medical equivalence is gone and replaced with a numerical system. In this document levels of practice are given numbers with NICU work at level two, transport at level three and potential nurse consultant work at level four. These levels of practice are proposed as based around achievement of clinical competencies. These should not be confused with the numbers allocated to particular tasks in the brainstorming exercise above.
Box 6.21 – Progression of ANNPs up increments of expertise in a competency framework (from ANNP future service structure discussion paper 0501).

For routine purposes we should assume that all ANNPs joining the service will aim to progress to level three. It is likely that this progression will take around two years from the end of training. It is not clear to what extent progression beyond level three is potentially part of this structure. Clearly ANNPs working satisfactorily at level three for a prolonged period are very experienced and have substantial clinical and other skills. As transport has been, and will remain, the focus of ANNP activity it may be appropriate for the routine progression to stop at level three. In addition, a transport focus for the role implies that all potential ANNPs should be selected on the basis that they want to progress to that level, and that failure to make progress to that level will not be routinely acceptable. It might be possible to responsively develop other routes than transport to the highest level of practice, depending on the demand for other specialist roles as the field of caring for sick newborns develops.

This extract shows the emergence of a resource to deal with the issue of ANNPs who fail to progress to transport. In CoP terms this is the production of a paradigmatic trajectory which makes clear to new members of the CoP that there are incremental stages of competence through which they should aim to progress. Paradigmatic trajectories are part of Wenger's infrastructure of continuity. Wenger (1998d, p. 156) argues that CoPs provide models for negotiated trajectories and these include both written inscriptions outlining career ladders, such as Box 6.21, and also more subtle influences in the histories of participation of practitioners in the CoP.

The next organisational issue discussed at the NICU ANNP planning meeting on 12 9.00, is who should manage ANNPs.

Box 6.22 – Should ANNPs be managed by a senior doctor, senior nurse or both? (from: ANNP planning meeting 12.9.00).

AJL: ...Er (.) who will the ANNPs be managed by? I think this is the one that (ANNP1) wrote lots of comments about wasn’t it? She might want to (.) (laughs) er but it’s essentially (.) my discussion here was er (.) that although ANNPs are responsible and accountable to (CN) (.) but a consultant Neonatologist for clinical practice ( ) that’s the only bit I think of our lines of responsibility that’s really very clear (.) and the role description isn’t much help. It just suggests that ANNPs report to the senior nurse manager (.) and in general that’s tended to mean that the three of us have gone to different people depending on the nature of the problem

CN: Right
AJL: And there isn't really any clarity about what ( ) who you got to with what And some things like off duty and annual leave we're kind of sorting out between us ( . ) but as we become a flatter structure and we are becoming ( . ) I mean perhaps a couple of years ago when ( ANNP2 ) and ( ANNP1 ) were just post course ( . ) it was clear that I was ( . ) I was ( . ) you know working

CN: above them ( . ) yes

AJL: at a slightly more senior level ( . ) just through duration of time doing it But we're becoming an increasingly flatter structure and there's an increasing ( . ) well it isn't clear ( . ) you know if ( ANNP1 ) comes to me for example with an off duty problem or an annual leave problem where the two of us are in dispute about which week of annual leave we might have or something ( . ) it isn't clear that I necessarily have any sanctions in that situation ( . ) or indeed who we go to to resolve

This extract is debating the tension which may exist in who ANNPs report to. It is clear that ANNPs report to the consultant medical staff for issues in their clinical work, which is directly delegated from that group. For other workplace issues the lines of managerial support appear less clear, and this "tended to mean that the three of us have gone to different people depending on the nature of the problem " In the final paragraph of the extract it is suggested that this lack of clarity means it is unclear who will resolve workplace disputes. This extract supports the hypothesis that the hierarchical structure has flattened as the two new ANNPs have become more experienced, and suggests the issue of how disputes might be resolved has emerged as a consequence of this.

This emergent issue is refied in the ANNP future service structure discussion paper, where the components of the management activity required are outlined and two broad categories of solution are given.

Box 6 23 – Options for ANNP management (from: ANNP future service structure discussion paper 0501)

   The management options are two:

1. Medical management. Because of the delegated nature of some of the work of ANNPs it is necessary that they are responsible and accountable to a Consultant Neonatologist for some of their clinical practice. It is possible that this person could assume complete responsibility for the ANNPs.
2. Joint medical/nursing management. The necessary delegated medical issues could be managed by a consultant, with other managerial responsibilities covered by a senior nurse. This senior nurse could be the SNM for the unit, or a "Senior ANNP" of some description.

The management job, will in briefest summary, consist of managing the following both for individuals and the team as a whole:

- Off duty
- Annual leave
- Study leave and routine/statutory updates
- Sickness and absence
- Performance review and appraisal
- Discipline and grievance procedures
- Succession planning
- Budgeting
- Motivation

In line with the purposes of a discussion paper Box 6.23 shows the two broad categories of management option and outlines the sorts of issues which require some management.

The data in this section suggest that a number of significant issues emerged in relation to how ANNP s might be organised. A resource used as shorthand in the debate, matching ANNP s to "equivalent" medical roles, was found to be unhelpful and was replaced with a nursing structure based on a competency progression. A debate also emerged around which specialty, medicine or nursing, should manage ANNP s, but this was not resolved during the period in question. This suggests the lack of a pressing need to resolve the issue and that existing ad-hoc arrangements were satisfactory.

From the CoP perspective the institutional debate about job progression for ANNP s is one which is based on the continuity provided by participative memory. An established CoP will be self-sustaining if there is an ongoing possibility for generational encounters where new members can learn from old-hands. For a job with a long lead time such as this, it is important that new members don’t leave quickly but instead find the possibility of sufficient progression to sustain interest and commitment long enough for them to supervise the next generation of new starters. This work is therefore important in sustaining the proposed new CoP over subsequent generations of members.
The production of an outline for a competency-based ANNP progression attends to issues of paradigmatic trajectory, laying bare to new ANNP s what are the steps that they are expected to take to gain entry. These longer-term trajectories also attend to the infrastructure of imagination by orienting new staff in time by locating them on a future-focussed trajectory.

The social landscape has been substantially local and midlevel in this section, and the CoP framework has dealt well with the organisational responses to the emergent issues. The suggests that the CoP framework works comfortably when used to support description and analysis of change at work when the elements of this change are located in the work of the setting and are not substantially subject to influence from more distal sources, such as the government reports in the previous section.

5. Retention of staff – Continuity for future generational encounters.

The data in this chapter have shown the extent to which the NICU has moved to a position where ANNP s are a key part of the workforce for the future. ANNP s are a scarce resource however, and it is most likely that the NICU will have to expend money and time to train all the ANNP s it wants. In this context retaining those individuals is of critical importance. Additionally, for a CoP to be self-sustaining it will be important for the old hands to stay in post long enough to pass the inside knowledge on to new generations.

Staff retention emerges as an issue late in the period under examination, in the business case for expansion of ANNP s, from November 2001 (Box 6.24) and in the discussion document regarding ANNP hierarchy from May 2001 (Box 6.25).

The first extract addresses retention of staff by suggesting that having an ANNP programme is a strategy which may help retain neonatal nurses (not just ANNP s) in the service by enabling a clinical career progression. This is placed in the context of contemporary government planning for the NHS:
Box 6.24 – ANNPs may help retention of nurses (from: Business case for developing ANNPs 1101).

Recruitment and retention of trained staff is a major issue for neonatal units nationally. Many Neonatal nurses seek opportunities for career progression and this initiative together with the development of expanded roles and advanced practice will help retention of high quality, trained staff within the service. The NHS Plan emphasises the need to fundamentally re-appraise the place of nurses and nursing in health care delivery. The chief nursing officer's proposed “ten key roles for nurses” emphasise that a facilitative and progressive view is being taken on the future roles of nurses. The Nottingham Neonatal Service ANNP provision meets these challenges, and should continue to go forward on that basis.

The business case from which this extract is drawn may be seen as a reification of the views and experiences of senior staff in the neonatal service, as it was written and approved by consultant, managerial and senior nursing staff. It suggests a view that ANNPs may have wider impact on service delivery than the observable tasks of day to day work.

The second extract, below, is concerned with retention of ANNPs in the NICU and is taken from the discussion document concerning hierarchy, progression and accountability of ANNPs.

Box 6.25 – Potential dissatisfiers for ANNPs and the need to minimise these to promote retention (from: ANNP future service structure discussion paper 0501).

From the literature it is possible to synthesise a list of tensions in ANNP jobs which are potentially major dissatisfiers and therefore may lead to higher rates of turnover:
- Failure to define role before employing
  - Hours/place of work
  - Salary
  - Structure and objectives of daily work
  - Clear lines of responsibility and accountability
  - Establishing non-clinical time and roles
- Ongoing role confusion.
- Institutional disharmony in ANNP role definition.
- Lack of opportunity to progress – specifically lack of time for non-clinical activities.
- Continuing need for unsocial hours working, esp. nights.

We have a number of important strengths in the Nottingham Neonatal Service ANNP programme which might enable us to buck the national trend and continue to produce rounded, expert, eclectic ANNPs. It may be that
doing so will minimise the dissatisfiers identified by the ANPs in both the studies above and promote staff retention.

For these reasons it is of substantial importance that working patterns as well as the supervisory and management structures for ANNPs are established for new staff well in advance of them starting work, and preferably before appointment. A key dissatisfier in these studies were situations where pre-training or pre-employment expectations were not met.

This extract cites a range of potential dissatisfiers that may lead to poor retention of ANNPs, and suggests resources which may be helpful. The CoP issues that are attended to here are similar to the ones in the organisational structure section above, being substantially concerned with continuity and generational succession. Thus the key CoP issue attended to in the data in this section is the need for the proposed new CoP to retain members long enough for skills and knowledge to be passed on to new members. This is part of Wenger’s infrastructure of continuity (Figure 4.1). Clearly generational continuity is not explicitly a concern of the people in the setting, who appear simply to be concerned that retention, as opposed to loss, of staff is a self-evident good. This shows a way in which the CoP framework may extend the understanding of workplace change for those concerned to implement or research such changes by showing the interrelated and future-focused elements important in sustaining workplace groups.

6. Audit – Infrastructure of competence

Audit is a key part of monitoring and improving health care and is embedded in the work of all health settings via clinical governance structures. In this section the material elicited shows how the CoP infrastructure of competence is supported by creating occasions for mutual evaluation.

Audit emerges as an issue as a discussion point at the ANNP planning meeting on 18.8.00. It is discussed as part of a report on what ANNPs are doing on other NICUs around the UK. Box 6.26 shows one of several such extracts, suggesting that time for doing audit is part of the ANNP working week in a number of other units. This supports the findings of Redshaw that audit is a
component of the work of ANNPs on most NICUs (Redshaw & Harvey, 2002a & b).

Box 6.26 – Audit is part of the work of ANNPs in other centres (from: ANNP planning meeting 18 8 00).

ANNP1: Yes (. ) I mean there are six of them (. ) you’ve seen how many you get if there’s six (. ) They do five days a week but one of those days is non-clinical to again audit (. ) to do anything that comes under the non-clinical bracket (. ) education (. ) audit (. ) research

The next extract, from later in the same meeting, raises the issue of the ways in which ANNPs might undertake audit. The issue is raised as to whether ANNPs might undertake audit about ANNPs, or be part of the wider NICU audit strategy.

Box 6.27 – Directions for ANNP audit activity (from: ANNP planning meeting 18.8.00).

CN: Before we move onto the second section can I ask a question about the second section because it kind of goes through my mind (. ) the whole thing (. ) Do you see things like audit and research and education (. ) well we audit and research and education and we talked about that a little bit (. ) but do you see that in terms of audit and research in relation to the neo nurse practitioner or do you see it as something bigger than that? In other words related to the whole unit and maybe you don’t see them as any different to each other but do you see it as sort of little audit product related nurse practitioners or do you see it as (. ) you know (. ) being involved in big discipline and audit projects (. ) part of the neonatal audit committee and that sort of thing ( . ) or the audit lead the neonatal unit

A: The latter broadly ( ) It’s important not to be too (inaudible) but yes

ALI: Yes (2) its

In the two passages above the possibility of the involvement of ANNPs in NICU audit work is in a theoretical or planning stage. Box 6.27 shows broad discussion of what topic areas ANNPs might be involved in the audit of. The question is raised as to whether ANNP audit might be concerned with ANNP activity or with broader clinical issues on the NICU. All present agree that ANNP involvement in audit should be outward-looking at broad NICU issues, and not looking inwardly at isolated ANNP issues. This is congruent with the discussion in Section 2 (How will the NICU use ANNPs?), above, which
suggests a broad deployment of ANNPs in NICU care delivery.

At the next meeting of the same group, on 12.0.00, audit is discussed again. The previous meeting established that audit is part of the work of ANNPs on other units, that they are given time away from clinical work to audit, and that broadly Nottingham would like its ANNPs to contribute similarly. At this meeting (Box 6.28) the discussion is focussed on the practicalities of facilitating some non-clinical time for the new ANNPs.

Box 6.28 – Time for non-clinical activities, including audit (from: ANNP planning meeting 12.0.00).

| CN: But by the same sort of (.) if we all came to meet and we all felt (.) and everybody felt that this was something they needed to know about then you could agree that somebody could go away and do some work on that for the following week or two weeks and it would and that (.) it's something that we could do that now and an hour is cope-able but an afternoon isn't (.) But then you could put (.) tag that onto the same afternoon where you could have an afternoon for doing reading in the long (.) I think it shouldn't just be reading (.) I think if you're going to have a whole afternoon off you're going to have to start developing some of these things like audit type work or er (.) guideline production or (.) I know you've done your guidelines and whatever but it can't just be three hours |

In this extract the detail of how non-clinical time might be spent is discussed. The emergent issue of audit is bound together with that of non-clinical time which had been discussed at an earlier juncture (Box 4.13). CN appears keen to ensure that any non-clinical time is productively utilised, and audit may be part of that utility.

The practical involvement of the two new ANNPs in audit is not discussed until the final ANNP meeting, as shown in the next extract.

Box 6.29 – Practical involvement in audit and limited appreciation of the audit process (from: ANNP 24 4 01)

| CN: ...At some stage I'd like to discuss how we might improve (.) you know we've done this long line audit twice before (.) you know the SHO's have done an audit trying to work out how we use long lines (.) its just not worth it (.) they've got seven or eight patients but I really liked the audit I used for the long lines and I'm trying (.) I've written an audit form and it was much more simple I think (.) because all I really want to know is how many (.) or actually
all I want to know is how many long lines we use each year. And a bit about how long they stay in ( ) how many infections do we think we get when we put a long line in ( ) so how many presumed infections ( ) how many definite infections and how often we remove the line if there were infection ( ). How is the best way do you think to guarantee that an audit like that gets done and that every single long line is

ANNP1: Is this an audit or is that a research?

CN: No its audit ( ) audit because all your audit ( ) You're auditing infection rate

ANNP1: Right

CN: No research needed ( ) just an audit

ANNP1: Okay

ANNP2: (SpR)'s looking at ( ) erm septic screens and infections in the notes

CN: who's that?

ANNP2: (SpR) wants to try and get some type of flow diagram or flowchart in the notes isn't it?

CN: we're going to present our sepsis stuff ( ) I mean (inaudible) we're going to try and present it in the next couple of weeks

ANNP2: Um

CN: But its just how we take it a step further and all I really want is a baseline of how long lines ( ) but really want I want to know is how many long lines we have over a year but I'm not sure how else we can get data and then talk to (Prof.) to see how that comes out ( ) obviously in his audit

ANNP1: I suppose when you put a long line in just fill in an ( ) put an audit form

CN: Yes but do you make it something that you could the juniors to do if you really pushed it and they managed to do it every single time?

ANNP1: What are we trying to do? Are we trying to get the juniors to fill in an audit form every time?

CN: Basically anybody that puts in a long line to fill in an audit form and then to fill it in again when it's removed

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1 A long line is a medium term (several weeks) vascular access device inserted on the NICU. It is threaded into a vein so that the tip of the line may be in a large ven the infant's chest or abdomen. Insertion of these devices may lead to septic illness if pathogenic micro-organisms are introduced.
By this point in the period of the research the two new ANNPs are both established NICU practitioners. ANNP1 is able to do solo transfers and ANNP2 is approaching that stage too. In the extract the consultant neonatologist is recruiting their help with an audit project. As both the new ANNPs are substantially clinically based they may be seen as ideally placed to ensure that clinical audit actually gets attended to in the daily work of the NICU. This is the first evidence in the data of the new ANNPs becoming practically involved in audit. This links to Box 6.7, where audit was rated as an essential activity for ANNPs to be involved in and shows that links are starting to be made between theoretical and practical possibilities for ANNPs non-clinical activity. This section shows that audit emerged as a topic of concern early in the study period and showed a clear trajectory of movement from theoretical possibility to practical involvement.

The data in this section suggest that over time the ANNPs were developing audit interests, and the ability to do this was linked to the possibility for non-clinical time. As might be expected for individuals in valued clinical jobs there was a clear perspective from CN that any non-clinical time was to be of demonstrable value. Thus audit is the emergent issue and non-clinical time is the resource mobilised to deal with it.

From a CoP perspective the work being attended to is broadly concerned with the NICU infrastructure for supporting a regime of competence by creating occasions for mutual evaluation. Audit is a highly structured form of mutual evaluation used ubiquitously in NHS settings. It is of note that the mutually evaluative framework being proposed is explicitly not one that is focussed on ANNPs activity, and so the work of a notional ANNPs CoP in isolation is not seen at this stage as in need of audit scrutiny. Further, an infrastructure of imagination is supported by creating facilities for reflection on practice by comparisons with other practices.

In the discussion of audit in Box 6.29 ANNP1 does not appear to have a rounded conception of the requirements of audit of septic illnesses associated with long-lines (“I suppose when you put a long line in just fill in an ( ) put an audit form”) The CoP framework has been effective in demonstrating the
development of an important part of how this new workplace group is coming together, but how a new ANNP develops a richer practical understanding of the audit process is another example of an issue of scale with which the CoP framework appears to have a problem. The scale issue in this instance contrasts with the problem of how the NHS plan was given local context, discussed above, in that in this instance the issue is located in the need to zoom in to the fine detail of daily practice and how this practice may be audited. Constructing competent audits will be part of the work of the new CoP, so how ANNP1 comes to an understanding of that process is a topic of concern. The CoP framework provides no solution to the problem of understanding how individuals in a CoP build a situated understanding of local context. This issue is discussed further in the next chapter.

7. Study leave – Infrastructure of mutuality

Professional update is essential for clinical staff, and nurses are required by their professional body to keep evidence of how they have kept up to date. In clinical practice this applies particularly to current understanding of what constitutes best practice, and this is accounted for in the CoP framework in the infrastructure of mutuality elements of time for interaction and travel budgets (Figure 4.1). Data in Chapter 4 suggested that "money to support study opportunities" was a resource that emerged at the beginning of the process of transition for the new ANNPs. During the period of transition this issue emerged and broadened, as the following extracts show. These are all taken from the ANNP meeting on 5.10.00, where a significant portion of the meeting was spent discussing study leave issues.

Box 6.30 shows the consultant neonatologist emphasising to the two new ANNPs that it is up to them to decide what study leave applications they would like to make.
Incident: I think in a way you have to decide what's right for you. If you go to things like this, it's a kind of once a year or once every because it's a big course isn't it? I haven't even looked at the costs but it's not expensive actually isn't it? For or I thought you were keen to go on this because it had things about nurse practitioner and Yes it shows the nurse practitioners role as well as you know the study day at the same time.

ANNP1: I am I am

CN: I think you've got to decide you know you've got to decide in your own mind what you want to do. There are a lot of courses around and I'm conscious that you haven't done very much either you particularly

ANNP2: No

CN: this year in terms of study leave have you? So far you were going to go to the regional meeting I can't remember the actual

ANNP1: Yes I couldn't go because I had a

ANNP2: Yes now we're getting the chance to get the last this year I think (all talk at once)

CN: And there are a lot of good courses about

Although there is apparent institutional flexibility in the nature of the study opportunities that will be supported, Boxes 6.31, 6.32, 6.33 and 6.34 suggest that the process of obtaining study leave will be more complex, that a number of factors will be taken into account and that the institutional view, represented by the consultant neonatologist, has not solidified.

Box 6 31 – A guideline for the taking of study leave is presented (from: ANNP 5.10.00).

Although there is apparent institutional flexibility in the nature of the study opportunities that will be supported, Boxes 6.31, 6.32, 6.33 and 6.34 suggest that the process of obtaining study leave will be more complex, that a number of factors will be taken into account and that the institutional view, represented by the consultant neonatologist, has not solidified.

Box 6.31 – A guideline for the taking of study leave is presented (from: ANNP 5.10.00).

CN: So (ANNP2) tell us what you've suggested some guidelines?

ANNP2: This is just me minuting last time we'd got together so I've got five days per year or fifteen days over three years which we discussed I've put on this the reasons like I've had why to allow flexibility in the choice of appropriate study days to attend and then I've got flexible study days to be discussed at ANNP meeting which we are doing now to ensure days are appropriate to ensure that the appropriate candidate or candidates attend because we said last time maybe just one of us should go to certain ones and then feed back rather than we all go to
In this extract ANNP2 is referring to a guideline she has produced about study leave. Numbers of days that may be taken are specified and a process for agreeing who should go to particular events is raised. These include discussing study leave applications at this meeting, to ensure they are “appropriate,” though what constitutes the yardstick for assessing this is not raised. However, study leave has emerged as an issue, and one of the resources raised for dealing with that is a set of semi-formal discussions which will be triggered when study leave is applied for.

This is detailed further in the extract in Box 6.32, and a mechanism for tracking study leave in the performance review process is raised.

Box 6.32 – Process for approving and recording study leave (from: ANNP 5.10.00).

ANNP2: Yes and also aim to discuss at the ANNP meeting (.) we’d discuss change of rota if needed i.e (.) to cover the shifts or to allow time owing days and things. And the ANNP study leave application form to be completed and to ensure that documentation for the study leave and funding etcetera was completed and supported by the trust and you.

CN: Uhuh

ANNP2: Study days to be reported in the IPR yearly which we do anyway don’t we? To ensure that the ANNPs are putting in the scale of practice (.) and then to give feedback my favourite topic

CN: Well I think I mean it’s one of the things that would be nice ( ) to be able to come back to this group and say (.) even if it’s only two lines on each talk (.) this is what I’ve got out of this

This extract raises three more organisational issues in taking study leave – the covering of the duties vacated by the person attending the study day, the reporting in annual appraisal of what has been taken and informal feedback of the content of study days.

Having discussed what number of days may be taken (Box 6 31), the next issue which emerges is what constitutes a day that will be counted? This is shown in the discussion in Boxes 6.33 and 6.34, from different points in the same meeting.
**Box 6.33** – Days that will be counted or not counted off the total study days available to each ANNP (from: ANNP 5.10.00).

AJL: Well if (ANNP1) goes and does an audit course within the hospital is that two of her study days?

CN: Yes

AJL: Right

CN: I think so (.) I mean really I’m just saying it off the top of my head but I would have said yes. I think if there are things that come down from on high that we have no control over to some extent ( ) like this in a way (.) this is something that’s come down from high and like you said it’s slightly the same with that clinical supervision date if anyone (.) but having to get some idea in my own mind as to how much that involved but they could be perhaps counted as extra

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**Box 6.34** – Days that will be counted or not counted off the total study days available to each ANNP (from: ANNP 5.10.00).

CN: But there are some things that I know you have to do to keep your practice up like er (.) let’s say you ( .) I find that an interesting point but let’s say those you can go on ( .) those I would hope you could get without taking it out of your five days

AJL: Which one is this?

CN: Oh I only chose a fire lecture but

AJL: fire lecture ( .) oh okay

CN: fire lecture or health and safety whatever ( .) you don’t have to go to the whole health and safety day do you? You just have

AJL: No

AJL: The NALS Course^{1}?

CN: Well yes that’s another one I was thinking

AJL: (laughs)

CN: But when you do ( .) if you went outside and did a NALS course I think you’d have to count it as your study day because we’d have to pay for any of the things but I think if you’re going each time do the in house one but you’re helping us during the day anyway ( .) because you do don’t you?

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^{1} NALS is the newborn life support course. This one-day training programme teaches resuscitation at birth, and might be considered an essential qualification for ANNPs attending delivery of babies
ANNP2: Hmm
ALI: Hmm
CN: I know this might seem unfair and I would be tempted to not count that as part of your study
ALI: No that’s perfectly
CN: Because it’s
AJL: No that’s fine
CN: if you’re going outside
AJL: that’s work on the company
CN: yes that’s work
ALI: Yes

These last two extracts show that what constitutes a countable day off the total allowed is not straightforward. In Box 6.33 CN starts by being clear that a proposed two day audit course is countable, but then re-evaluates and qualifies this, suggesting “if there are things that come down from on high that we have no control over to some extent ... they could be perhaps counted as extra”. Thus if attending a course is a result of compulsion from "on high" then it may not be countable. In Box 6.34 the additional factor of location of the course is raised in talk about attending NALS (“went outside and did a NALS course”). In this discussion the same course attended locally or elsewhere will be not counted or counted as a day.

These extracts together show that in attending to professional update for new groups of staff, some issues emerged that had to be attended to. The significant group of emergent issues were in attending study courses and meetings, and a range of resources were put in place. The broad sweep of the resources could be constituted as supporting the CoP infrastructure of mutuality through a set of informal rules and agreements that will guide how study opportunities for all ANNPs are managed. These resources covered amount of time that may be taken, what is counted as a "study day", approval
process for applications and recording of study time taken. That money for study opportunities does not emerge as an issue in these discussions suggests that the resource that was put in place at the start of the process was seen as sufficient.

In this final data section of this chapter the CoP framework has fared well in the two areas we are concerned with. First, for those concerned to implement similar workplace changes, reference to the CoP framework would have flagged the need for these components of the infrastructure of mutuality to be attended to. Secondly, this issue would have been flagged-up for those whose interest in the CoP framework is as a research tool that provides structure for organising material that assists in the understanding of change at work.

**Summary**

This chapter has investigated the issues attended to over the period of transport training for the two new ANNPs which were concerned with the "system of care". These issues are distal in the sense of their removal from the core clinical topic of concern for the two new ANNPs, but the term "distal" is used to convey the sense of the connectedness of the issues to the setting under consideration. For the notional ANNP led transport CoP to be created and to thrive there will need to be a local workplace milieu agreed which addresses the emergent issues. The issues and resources elicited in this chapter are summarised in Table 6.1, and are linked to relevant facets of the formation of a new community of practice, in a similar fashion to the previous two chapters.

This chapter and the one before illustrate the importance for all concerned in the process of having places where the emergent issues may be discussed. The timing of the ANNP meetings in two clusters, one in September and October 2000 and another in April 2001, suggests that the meetings came together when there were issues emerging that needed discussion and then naturally stopped happening again when there was settlement. In this way the
coming together of the meetings was supporting the CoP infrastructure of mutuality by facilitating time for interaction.

The data from the sections concerned with the emergent issues of ANNP working patterns, how the NICU will use ANNPs and the influence of junior doctor changes, contributed to the formation of the proposed new CoP by helping define the common enterprise and by imagining different aspects of long term trajectories. The emergent resources brought to bear on the issues of organisational structure, retention and study leave all show the construction of the local system of care, the context in which ANNPs will deliver clinical care. The emergent issue of audit suggests the first steps for a newly emerged CoP in creating the possibility for members to reflect on practice and compare practices, elements which are part of a CoP infrastructure of imagination.

Another finding of this chapter is that the local construction of what the activities of ANNPs comprise was moving away from transport as central ANNP activity and towards a broader contribution to the NICU from ANNPs. As the NICU was only able to come to this position as a consequence of ANNPs being present on the unit as part of their transport training, this raises the possibility that not only does the distal influence the proximal, but that the proximal influences the distal. In other words, that putting ANNPs in place to support transport was an activity where the distal, in the form of the NICU management team made a change in the workforce available in the (proximal, NICU) setting; the practices engaged in by ANNPs on the NICU while not doing transport altered the views of the NICU senior staff into a position which reappraised the value and utility of ANNPs on the NICU (as opposed to transport).

Throughout this chapter and the two previous chapters the CoP framework has provided a significant and useful resource for understanding change at work. However, in this chapter a problem emerged. A key issue raised by the data in this chapter were the findings in the sections on junior doctor’s hours of work and on audit that the CoP model has difficulties when accounting for issues of scale. In the junior doctor’s hours section we saw that the CoP framework conceives the interaction between the local and the global, the proximal and
distal, as a movement between levels mediated by boundary objects and/or brokers. To understand the next level up in CoP terms, for example how the Department of Health influences the local setting, we have to “zoom-out” and study subsequent “levels”. In this situated research we have no access to originators of the distal influences on the process of change. There are likely to be many of these, influencing not just junior doctors hours but also how audit is conducted, how NICUs should be organised and many other policy issues.

Similarly, in the section concerned with the emerging issue of audit we saw that the CoP framework is not constructed to explain how individuals in a CoP build a situated understanding of local context. These two related scale problems will be addressed in the next chapter where analysis of the data proceeds with issues and resources linked to CoP elements, as before, but with the addition of the concept of circulating reference from the work of Latour (1999), which is proposed as an alternative response to understanding issues of scale.
Table 6.1. Summary of the emergent issues and resources in chapter six, with proposed links to factors that support the formation of a new community of practice (Figures 4.1 – 4.3)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Resource</th>
<th>CoP element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working pattern</td>
<td>What other units do</td>
<td>Infrastructure of imagination and long term trajectories</td>
</tr>
<tr>
<td></td>
<td>Junior doctor changes</td>
<td>Definition of a common enterprise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imagination – long term trajectories</td>
</tr>
<tr>
<td>How will the NICU use</td>
<td>ANNP planning meeting</td>
<td>Infrastructure of imagination and long term interacting trajectories</td>
</tr>
<tr>
<td>ANNPs?</td>
<td>Junior doctor changes</td>
<td>Definition of a common enterprise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imagination – long term interacting trajectories</td>
</tr>
<tr>
<td>Junior doctor changes</td>
<td>What other units do</td>
<td>Definition of a common enterprise</td>
</tr>
<tr>
<td></td>
<td>Government and professional</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bodies</td>
<td></td>
</tr>
<tr>
<td>Organisational structure</td>
<td>Hierarchy &amp; accountability</td>
<td>Infrastructure of imagination and long term interacting trajectories</td>
</tr>
<tr>
<td>(Hierarchy and accountability</td>
<td>document.</td>
<td>Continuity - participative memory, generational encounters, paradigmatic</td>
</tr>
<tr>
<td>of ANNPs)</td>
<td></td>
<td>trajectory.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imagination – long term interacting trajectories</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mutuality – entry points</td>
</tr>
<tr>
<td>Issue</td>
<td>Resource</td>
<td>CoP element</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Retention</td>
<td>Emergent issues from earlier in the project</td>
<td>Continuity - Future generational encounters</td>
</tr>
<tr>
<td></td>
<td>ANNP research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government and professional bodies</td>
<td></td>
</tr>
<tr>
<td>Audit</td>
<td>Audit agreed to be part of what ANNP's should do.</td>
<td>Infrastructure of competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competence – occasions for mutual evaluation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imagination – reflection</td>
</tr>
<tr>
<td>Study leave</td>
<td>ANNP meetings</td>
<td>Infrastructure of mutuality</td>
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<tr>
<td></td>
<td>Guideline production</td>
<td>Mutuality - time for interaction travel budgets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Propagation of innovation - rapid transfer of best practices.</td>
</tr>
</tbody>
</table>
Chapter 7.

Change at work: Circulating reference in interdependencies of proximal and distal issues.

Introduction

In this chapter the last set of issues and resources which emerged during the period of transport training for the two new ANNPs are examined. The objective is to build a better understanding of the change process as it unfolded in the setting. This chapter complements the concerns of the previous ones with individual clinical competence and system of care issues by showing the evolution of emergent issues and resources related to the areas of drug initiation. The drugs initiation issue is analysed separately from the previous two chapters as it is one where both proximal and distal factors appear active together, in contrast to the emergent issues in chapters five and six which were readily described as just proximal or distal. Additionally, the previous chapter identified problems with the CoP framework when issues of scale were considered and the mixture of proximal and distal material elicited in this chapter provides an opportunity for investigating these issues in greater detail.

The previous chapters used the communities of practice (CoP) framework as the central analytical tool. In this chapter the emergent issues and resources are elicited along with their trajectories of movement and how they map onto the factors which may support the formation of a new CoP, in the same way as in Chapters 5 and 6. Additionally, further theoretical work is done by adding the concept of circulating reference (Latour, 1999), which is summarised below, to complement the CoP model. Circulating reference is added to the analytical framework in response to problems found in Chapters 5 and 6 with how the CoP framework deals with issues of scale. A richer insight into the situated change process is gained from use of this concept.

In the next section the problem of scale in the CoP framework is explored. Following this is an explanatory summary of circulating reference and related
concepts. These are mapped onto data from the preceding chapters to illustrate how our understanding of situated change is improved by using circulating reference. This leads into the data on drugs initiation issues and resources over time, where circulating reference is used to link the proximal with the distal.

The problem of scale in the Communities of Practice model

Wenger does not use the proximal/distal model for issues and resources, preferring the terms "local" and "global" to distinguish what he argues are levels of influence on the local setting which are conceptualised in terms of scale. He discusses the local and global where "local" is largely the community of practice and the "global" is the world beyond. Wenger (1998c, p. 124) defines communities of practice as a "midlevel" unit of analysis - it is neither a specific or narrow activity nor a broadly-defined aggregate, so a community of practice is more than the work of one person in isolation, and less than the work of an intensive care unit or hospital. A CoP is not found briefly in specific interactions and neither is it possible to view "a nation, a culture, a city or a corporation as one community of practice" (p. 125). While in many ways this is a strength of the CoP framework as it ensures the CoP, as the basic unit of analysis, is always situated in a specific context, it appears to cause problems when examining influences on CoPs that involve shifting between scales. While the global is acknowledged as influential, how this influence is understood and assimilated into practice by the CoP is not elicited. Wenger (1998c, p. 131) says that we "can develop new ways of participating in the global, but we do not engage with it. This has been seen to be at odds with the data in the previous chapter, where issues emerged from a number of proximal/distal or local/global sources which required resources to be applied for change to proceed. For example, the section on junior doctors hours in Chapter 6 suggested that the NHS Plan issued by the government was a significant and influential emergent issue with which the NICU setting was engaged.

Wenger's perspective on scale is firmly rooted in notions of incremental levels. The nature of the interaction between levels, how the influence is given situated
meaning by the CoP, is not comprehensively unpacked. Wenger (1998f, p. 247) suggests, for example, that multimembership of several CoPs by individuals may connect the local and the global, and that this may happen in the interactions between many CoPs ("constellations of practice"). Indeed, Wenger (1998c, p. 131) locates his solution to the local/global conundrum in this larger grouping, suggesting that "in the context of constellations of practices, the local and the global are not different historical moments in an expanding world. Instead they are related levels of participation that always coexist and shape each other". He does not expand on how this relation occurs, or how the constellations of practice filter these influences to the CoPs.

Wenger appears to have a theoretical problem with the issue of scale. From his data he describes office workers in a CoP who complete forms of summary customer data which are then exported from the CoP to the next level of the organisation. In so doing some richness and complexity of the original data are lost while the next tier of the organisation "can only see more by seeing less" (Wenger, 1998c, p. 132). In practical terms this suggests that the utility of the CoP framework for understanding (and guiding) workplace change is limited when it comes to understanding how the proximal setting interacts with distal influences. These problems are highlighted by the data in Chapter 6, where two problems with scale were found. In the junior doctor's hours section we saw that the CoP framework suggests that in order to understand distal influences on the setting, such as government reports, we have to "zoom-out" and study subsequent "levels". Similarly, in the section concerned with the emerging issue of audit we saw that the CoP framework is not constructed to explain how individuals in a CoP may come to understand the interdependencies of the proximal and distal. These two related scale problems will be addressed later in this chapter.

In this chapter an additional analytical tool which overcomes this problem is described and then deployed on the data. Latour's work on the concept of circulating reference is the key text here, and is summarised in the next section.
Circulating Reference – (Latour, 1999)

Latour is concerned with how scientific facts are established. In this early work Latour worked alongside scientists in laboratories seeking explanatory frameworks for the work that they were doing. The concept of “black-boxing” referred to in Chapter 5 was developed here. Latour (Latour & Woolgar, 1986, p. 242) uses the example of a mass-spectrometer, suggesting that this piece of equipment “is the reified part of a whole field of physics”. In the “black box” of the mass spectrometer is incorporated a whole body of earlier knowledge (or substantial part thereof). Machines in neonatal intensive care transport practice, such as blood gas analysers, are often given black box status. This led Latour to an interest in the movement of materials into and out of black boxes and how these materials were completely altered while at the same time retaining something of the character of the original. For example, a blood gas analyser on the NICU is, in Latour’s terms a black box which transforms blood into numbers on a piece of paper.

It is this kind of transformation which led to the development of a broader more inclusive model of how information, knowledge, science is constructed and circulated. The framework he developed may be a solution to Wenger’s problem of scale. To explain the concept of circulating reference clearly it is helpful to summarise Latour’s (Latour, 1999) research in which it was developed. Latour accompanied a group of soil scientists on a research field-trip to Amazonia. The scientists were concerned to be able to represent the nature of the different soils which they found on their return to their university in France. Simply carrying the soil back would not be possible, for many practical and bureaucratic reasons. One part of classifying soil is the colour. Written description may not be adequate to distinguish “reddish-brown” from “brownish-red”, even less the subtle tones within each. For the research to be meaningful for other soil scientists this representation had to be as accurate as possible. Latour describes how the scientists worked to represent the colours of the soil by using a small notebook with rigid pages comprising standardised colours according to the Munsell Code. Early in the 1900’s Albert Munsell, a professor at an art school in Boston developed a colour system which offered a means of identifying colours. Each colour has a unique
Munsell code which means the same thing wherever people look at colour. With a published system, people could be specific about which reddish-brown they were referring to (Ford, 2002). Munsell codes look very like the colour strips supplied by paint companies.

The soil scientists had refined the Munsell colour coding book by using a hole punch to cut a hole in each block of colour. By holding a soil sample under the code book, so the colour which best represented the soil could be found. In this way the scientist is able to simply write down a number and the colour of the soil sample may be readily (even instantly, electronically) transported wherever there is another interested soil scientist with access to Munsell codes.

Latour represents the job done by the soil scientists as one of transformation, in this case from soil colour to number. A transformation is one link in a chain of circulating reference. For Latour (1999, p. 69) a key element of transformation is that “it must remain reversible. The succession of stages must be traceable, allowing for travel in both directions”. So in Latour’s example while a soil sample and a Munsell number are quite different forms and the gap between them is bridged by the Munsell codes chart, the one is never entirely the other, it has been transformed. Exactly the same transformation occurs in a blood gas analyser, when a blood sample is transformed to numbers on a slip of paper.

Latour represents this chain schematically thus:

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Figure 7.1 - The components of a link in the chain of representation (Latour, 1999, p. 70)
This may then be built-up into a chain comprising many such links:

Figure 7.2 – Chain of elements. Latour (1999, p. 70) says this "conception of reference follows a series of transformations, each of them implying a small gap between "form" and "matter".

Latour suggests (Latour, 2002) that this chain of transformation, or circulating reference as he calls it, avoids the problem of scale in understanding the social. In a conventional analysis of a social setting he argues that we end up oscillating between the rich detail of the social setting and the need to summarise, to change the scale so we can oversee the data. As soon as we summarise we want to go back to the detail and as soon as we get to the detail we want to summarise. Alternatively Latour suggests we view the social landscape as flat and that instead of transforming from the local to the global we move from local interaction to local interaction. This addresses the problem of proximal and distal influences by focusing on the assembling of context as it is done in the setting. For example, when ANNP drugs protocols are influenced by documents issued from the government, it is of concern to focus on how the government document has been influential in the transformation of the documents and other practices of the NICU.

In the discussion of the CoP approach to scale above I reviewed Wenger's (1998, p. 132) description of office workers in a CoP who complete forms of summary customer data which are then exported from the CoP to the next level of the organisation. In so doing some richness and complexity of the original data were lost while the next tier of the organisation "can only see more by seeing less."
Latour (1999, p. 71) expands on this conception in a further refinement to circulating reference, the notion of amplification and reduction. This figure is intended in Latour's conception as a plan view of the chain in Figure 7.2 above, above. The "successive steps" illustrated in Figure 7.3 are each a step in the translatlve chain, viewed from above.

Figure 7.3 Amplification and reduction: "The transformation at each stage of the reference may be pictured as a trade-off between what is gained (amplification) and what is lost (reduction) at each information-producing step".

Latour suggests that in his example of the soil scientists that as the soil colour was transformed to a number so there was a loss, or reduction, in "locality, particularity, materiality, multiplicity and continuity." This is a loss of the detail of each individual sample. At the same time there was gain, or amplification, of "compatibility, standardization, text, calculation, circulation and relative universality." This is gain of the ability to see more, by seeing less.

Circulating reference will be added to the analytical toolkit already stocked with CoP tools which will be used in this chapter because it provides a way of critically
extending CoP. Before proceeding to the data on issues and resources associated with drug initiation, the concept of circulating reference is brought to bear on some issues that emerged in earlier chapters. This is done in order to illustrate the circulating reference concept with examples from the data and to highlight the analytical extension to CoP offered by circulating reference.

**Examples of circulating reference from the data in preceding chapters**

In the summary conclusion to Chapter 5 it was noted how the routinely collected data from the transport audit forms are reified in two quite different ways in Chapters 2 and 5. In Chapter 5 the data for each individual transfer are used in clinical supervision meetings as a resource that represents key aspects of each individual transfer. Rich detail is available here giving opportunity for in depth discussion of individual incidents and opportunity for learning for those engaged in peripheral participation. The reification of the data in aggregated form in Chapter 2 as representation of the safety and practicality of a service loses the fine-grained detail in the need to represent many transfers in a digestible form. Nonetheless, both are examples of reificative connection. Both reifications are derived from the same pieces of paper, the transport audit forms, and the same data are used in the reification. The purpose to which the data will be bent determines the nature of the reificative output. This is a significant example of the issue of scale referred to in the introduction above.

The move from individual audit data sheet to summary of many sheets (and back, if necessary) is an example of a translation (see Figures 7.1 and 7.2). A single value of blood oxygen level may be translated into part of a big table of summary data. In so doing two quite different, but linked things are produced. Latour suggests that these chains may continue ad infinitum. So, for example, the level of oxygen actually in the blood of a baby is translated to a number which is in turn translated into part of a larger summary. Latour’s’ chain of translations, or circulating reference, might look like Figure 7.4.
Figure 7.4 Circulating reference and blood oxygen level. Point (a) is the level of oxygen in the blood of a baby, which is translated via (b) and (c) into a number in a spreadsheet, which in turn becomes part (d) of a table of results. In the move between points there is complete disjunction (blood to number), while a connection of some kind to the previous step is retained. The chain is reversible, so from summary data the original individual data points could be re-examined if necessary.

<table>
<thead>
<tr>
<th>Level of oxygen in baby's blood</th>
<th>Blood sample in a syringe</th>
<th>Results slip from gas machine</th>
<th>Data point in a study spreadsheet</th>
<th>Table of results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>(b)</td>
<td>(c)</td>
<td>(d)</td>
<td></td>
</tr>
</tbody>
</table>

This supports Latour's (2002) conception of the social landscape as flat as opposed to hierarchical in that there are no "levels" through which meaning is communicated, simply links in chains of translation. This also illustrates the related concepts of amplification and reduction (Figure 7.3). In Chapter 2 the aggregation of the data from many transfers loses the fine-grained detail of each discrete event (reduction) while at the same time the bringing together of many transfers in summary form increases (amplifies) compatibility, standardization, and relative universality. This is gain of the ability to see more, by seeing less. In contrast in Chapter 5 when each transfer is discussed with the ANNP who attended, the need to focus on the fine-grained detail of the conduct of a single transfer means that the clinical data are neither significantly amplified nor reduced.

In Latour's model of a flat social landscape we focus on the assembling of context as it is done in the setting. We saw in Chapter 6 that in the business planning process a pragmatic decision was made regarding which influences were likely to lead to a need for more ANNP's. One of these was the potential for many more
doctors in the NHS, as outlined in the NHS Plan. In that section we saw that the CoP framework suggests that in order to understand distal influences on the setting, such as government reports, we have to "zoom-out" and study subsequent "levels", and that this was problematic. When a secretary at the Department of Health puts the NHS Plan in an envelope and posts it to the NICU it has become, in CoP terms, a boundary-crossing object that is representing the work of CoPs at the DH. But simply noting the crossing of the boundary in this way does not explain the influence which a document may have. Similarly, zooming out to study the CoPs at the DH which produced the document will not explain its local importance. It becomes influential, it becomes an emergent issue, when people in the setting contextualise the content in terms of what matters for them. A chain of circulating reference is being sustained (Figure 7.5). What matters in studying the setting is that we have access to how the contextual relevance of the distal influences was assembled in the setting. In this case we saw in the talk and documents in Chapter 6 the extent to which these were topics of explicit concern and that they profoundly influenced the shape of policy for the future. Figure 7.5 below illustrates the chain of circulating reference for how the NHS Plan was given local context.

Figure 7.5  Circulating reference, the NHS plan and the need for more ANNPs.

<table>
<thead>
<tr>
<th>Policy makers meet at DH</th>
<th>NHS plan produced</th>
<th>Local discussions</th>
<th>ANNP business case written</th>
</tr>
</thead>
</table>

In this proposed chain of reference we assume (a) that the NHS plan was produced following a process involving people meeting and deciding what should be in it. The plan was disseminated and in turn (b) generated local discussions (Box 6.12) which were sedimented out (c) in local documents, such as the business case for employing more ANNPs (Box 6.16). Latour's argument is that if
the chain of translations between these points is robust and reversible, then the result is reliable. This reversibility is demonstrable in the data in Chapter 6, where the written outputs of the NICU senior staff are traceable back through recorded meetings to the government document.

This example shows how circulating reference flattens the social landscape in a way that Wenger's conception of the local and the global does not allow. In the CoP model the production of the NHS plan happens at another level to which we do not have access, unless we choose to go and study the Department of Health (and all the other myriad distal influences). Using circulating reference to model the distal influences on the local setting makes how those influences are given local context the topic of concern.

One further example from the preceding chapters illustrates the variety of uses to which circulating reference may be put. In Chapter 6 we saw the doing of audit by the new ANNPs become a topic of concern. The data in Box 6.29 suggest that the ANNP did not at that time have substantial audit skills.

Learning to undertake effective audit may be conceptualised as learning to assess the robustness of the translations in a chain of circulating reference. In the example discussed in Box 6.29 the proposal is for an audit of long line infections. Long lines are intravenous catheters sited in infants who require secure and reliable medium term vascular access. They are called “long” lines as the catheter is threaded into a vein until the tip is near the heart. Although inserted under sterile conditions, the lines are associated with significant risk of introducing infection, either at the time of insertion or later in the routine connections and disconnections needed to maintain the drug and infusion regimen administered through the line. CN wants some data on long-line infections and is proposing audit as the way to measure a rate of long line infection. Although other workers in other centres will have published such data, these are not what matter to Nottingham except for comparison. What is at issue is what happens to the long lines and infants in this NICU setting. The chain of circulating reference might run from a microscopic grain of bacteria that is introduced to a baby's blood stream when a long line is
sited through to a number on a table of data in a completed audit and is illustrated in Figure 7.6.

Figure 7.6 Circulating reference and audit of long line sepsis.

![Diagram](image)

Latour's argument is that if the chain of translations between these points is robust and reversible, then the result is reliable. The chain will include several translations between long line insertion and audit result. These will include translations from bacteria to clinically evident sepsis in the infant (b), to a printed results slip (d) which is filed in the right notes where the auditor can find them. The chain is reversible from a results slip back to bacteria found in a culture medium in the laboratory and back to a clinical picture of sepsis. Making a further reverse step, a reliable translation back to bacteria that might have been introduced at the time of long-line placement will be more problematic, and clinicians will make a judgement on whether the species of bacteria found in the culture medium was of a type likely to be on the skin of the operator. This suggests utility for circulating reference as a tool for assessing the robustness of data collection for audit and possibly also for quantitative research. This example shows that understanding how context is assembled in the setting by using circulating reference provides a fix for the problem of scale in the CoP framework. Where Wenger's model obligates moving up or down scales from the midlevel CoP, and losing detail and locality in the shift from local to global, Latour's concept reframes the analysis away from issues of scale and towards understanding the influences on the local by studying how those influences are contextualised in the setting.
In the next section of this chapter the data on drugs initiation over time by ANNPs will be presented, integrating issues and resources with CoP formation factors and using circulating reference to show the interdependence of proximal and distal issues. Latour’s complementary concepts of amplification and reduction (Figure 7.3) are also used to expand the explanatory framework.

**Drug initiation issues and resources in the data**

There is considerable background to the issues in drugs initiation for ANNPs in Chapter 4, in the section headed “Drug initiation issues and resources.”

The data in Chapter 4 suggest that drug initiation had been recognised as a significant issue, that substantial work had been done by stakeholders in this area and that there was more to do. The data from that early period showed that baseline work had been done in producing patient group directions (PGDs) which supported ANNPs in performing prescribing-like activity. Over the period of transition with which this study is concerned the two new ANNPs had to move from being unable to able to initiate drug therapies. Transport practice would not be possible until this was achieved. Over this subsequent period the two new ANNPs both move to a position where the drug initiation milestone is passed. Six emergent issues and resources are tracked in the data below. The first three (Sites of practice; Process for entry to approved personnel list; Training & assessment framework) build on baseline issues presented in Chapter 4. The second three (Content of PGDs and the need for updates; Legal framework; Controlled drugs) are new issues that emerged in the data over the period under consideration. In each case resources are being proposed or produced which address these emergent issues. The data that are used to track issues and the resources that are brought to bear on them are from tape-recorded and written sources, and these are detailed in Table 3 2.
1. **Sites of practice – defining the common enterprise.**

A specific issue regulated by the PGD documents is the environments in which ANNPs may initiate drugs against the PGDs. These are defined in terms of category of environment, for example "on transport". This section shows how the sites where ANNPs were authorised to initiate drug therapies changed over time. In CoP terms the data shows work being done to decide fundamental issues in where ANNPs will contribute to practice, which is defining what the common enterprise of the CoP will be. The data also show how the documents which support drug initiation are part of how a local regime of competence is defined and also how they manage boundaries. The documents themselves are a reified source of continuity, connecting ANNPs to the discussions and negotiations which facilitated their prescribing-like activity. This last point is key, as in this section the circulating reference model is used to show how the proximal and distal are connected in chains of translations.

Box 4.1 shows that baseline work was done to establish the NICU as a site of practice authorised by the hospital where ANNPs could initiate drugs using the PGD framework. Box 7.1 shows Appendix 3 of the 2000 version of the NICU ANN PGDs. This shows that the discussion in Chapter 4 regarding sites where ANNPs may legitimately prescribe has been reified in the relevant supporting documents, making clear that the neonatal unit, as well as transport, is an approved site.

Box 7.1 – Places where ANNPs are authorised to initiate drugs using the PGD framework (from: Drug protocols 0400).

<table>
<thead>
<tr>
<th>Appendix Three.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sites of practice for ANNPs</strong></td>
</tr>
<tr>
<td>These documents are intended primarily to facilitate the initiation and administration of drugs by ANNPs leading the Nottingham Neonatal Transport Team.</td>
</tr>
</tbody>
</table>
It is recognised that the availability of transport is sporadic and unpredictable, and that ANNPs will practice on the neonatal unit when not required for transport.

Approved ANNPs may initiate and administer drugs and intravenous fluids on the neonatal unit at Nottingham City Hospital, provided they do so according to the same indications, dosages and constraints imposed in the above protocols. These drugs may be checked and administered by nurses and/or doctors in the normal way.

With ANNP drug initiation authorised for transport and NICU work, the other potential site of practice to be raised was labour ward. Box 4.9, from 17.8.99, shows that the new ANNPs were also being encouraged from the baseline stage to practice in labour ward, attending the delivery of infants of who may need resuscitation. The next extract shows that these issues were being considered and necessary changes made so that ANNP-led labour ward practice could proceed.

The meeting that these minutes are from involved the consultant neonatologist, hospital chief pharmacist (HCP) and me and was one of a series convened to explore the issues in ANNP drugs initiation. In particular the remit of this meeting was to ensure that the scope of the NICU PGDs stayed within what HCP advised were acceptable limits.

Box 7.2 - Labour ward is authorised as a site where ANNPs may initiate drug treatments (from: Drug minutes 7.8.00)

ANNPs will soon be attending labour ward unaccompanied by a doctor. (AJL) will amend appendix three of the drugs protocols to indicate that this is an authorised site of practice. In addition, this appendix will further authorise the use of only naloxone, epinephrine, bicarbonate and fluids in labour ward, and this will be cross-referenced to the resuscitation policy.

This extract shows a key amendment to the PGD documents being authorised. The "sites of practice" appendix (Box 7.1) is to be amended to add labour ward. A further amendment is to the effect that only the drugs listed in Box 7.2 are to be used by ANNPs in labour ward. This small number of drugs reflects the limited need for and utility of drugs in resuscitation at birth.
The next extract is taken from a one-off meeting convened to help ANNP1 prepare for a “medequate” interview. The extract shows ANNP1 reflecting on the areas where she can practice, from the perspective of a question regarding “freedom of action”. Although a rather disjointed extract, it reflects that ANNP1 is now at the stage where she can practice independently on the NICU, on labour ward and on transport and that the drugs protocols support this. This shows that the issue of sites of practice continued to emerge and require the application of resources over the study period, in the form of amendments to institutional documentation, and that these sites of practice were indeed opened up to the two new ANNPs.

Box 7.3 – (from: ANNP1 medequate preparation 18.6.01).

ANNP1: And labour suite is another place (.) unit (.) freedom of action unit (.) oh freedom of action on the unit (.) labour suite sort of fits between the two (.) you have much more executive decisions on transport and it is aimed at sort of on the unit it is ( ) erm its more guideline-driven (.) drug protocols are the same and you have available at your disposal at those times (.)

The PGD data on sites of practice show a progression over time. Initially these drugs protocols were written to support transport. Having made transport available as a site of practice the NICU was added (Box 4.1), followed later by labour ward (Boxes 7.1 and 7.2). This progression mirrors the broadening of the utility of ANNPs, seen in Chapter 6 which showed, for example, that labour ward work was rated as “essential” (Box 6.7) For these other aspects of clinical work to be possible, work had to be done so that these were supported by the PGD documents so that in turn ANNPs could initiate drug therapies as required on labour ward.

A chain of circulating reference (Figure 7.7) may be constructed connecting junior doctor’s hours concerns through several translations to changes in the NICU PGDs. This illustrates the interdependencies of the proximal and distal. General distal concerns regarding changes in the medical workforce were given locally

1 “Medequate” is a structured interview tool used by the hospital human resources to assess the level of seniority of a job where there is some uncertainty
situated expression in the plans for ANNPs on the NICU. These plans give rise to a perceived need for ANNPs to practice in places other than transport, such as the NICU and labour ward. This need leads to amendments to the documents which describe the boundaries of ANNP practice. This mirrors Latour’s conception of amplification and reduction, and this is illustrated in Figure 7.8. Over the several stages of that transformation the issue of junior doctors hours has been reduced to the point of invisibility in the data, while at the same time the local issues in the detail of the delivery of a competent regime of care have been amplified.

Figure 7.7 – Circulating references from junior doctors hours to sites of practice for ANNPs.

Figure 7.8 Amplification and reduction: Progressive loss of junior doctors hours issues and contemporaneous gain in the sites of practice for ANNPs and in the necessary supporting infrastructure.
This chain of circulating reference in Figures 7.7 and 7.8 has three translations to be made, at points (a), (b) and (c).

The translation at point (a), from concerns about hours and availability of junior doctors to discussion of possible roles for ANNPs is discussed in Sections 2 and 3 of Chapter 6 where the former is shown to be driving the latter. The translation at point (b), from discussion of possible ANNP tasks to the attribution of "essential" status to labour ward and NICU work (as well as transport) is seen particularly in Box 6.7. Following this "essential" labelling, the translation at point (c) is seen in Boxes 7.1 and 7.2. It may be seen, therefore that without concerns about the hours and availability of junior doctors labour ward and the NICU may never have been opened-up as sites for ANNP drug initiation.

In Chapter 6 it was suggested that by providing a workplace milieu which supported the ANNPs transport goal, the NICU senior staff had serendipitously created a setting which allowed for observation of ANNP practice. Having observed the NICU setting and seen effective ANNP working there was a subsequent concern with broader and longer term issues in how ANNPs were deployed. If the NICU had always been on a trajectory towards using ANNPs in a broad swathe of settings, including transport, labour ward and the NICU, then it is likely that this would have been reified in the institutional documents at the time, rather than added piecemeal over time, as was the case. This shows that people in the NICU setting were actively engaging with the local contexts of providing care and adapting responses as issues emerged. These responses are shown to have sedimented-out in the written documents of the institution (Boxes 7.1 and 7.2).

From the perspective of the formation of a new community of practice (CoP), attending to sites of practice is part of defining the common enterprise. By including labour ward and the NICU as well as transport, the nature of the common enterprise is broadened and stabilised, though with a transport focus intact. The local regime of competence is being further worked-up and boundaries
are being managed. By including the outcomes of the discussions in the formal written output of the NICU institution, the continuity provided for by reification is also being attended to. Adding circulating reference has allowed a richer understanding of this situated change. Circulating reference accounts for the interdependent influences of proximal and distal on the process of change by showing how concerns derived from distal sources are assembled into the local context and contribute to change. In this way, change itself (for example, in numbers of doctors), is put to work.

2. Process for entry to approved personnel list - Managing boundaries and opening peripheries.

To be able to initiate drug therapies under the auspices of the PGD framework the two new ANNPs would have to have their names added to an "approved list." Boxes 4.2 and 4.3 show that there was agreement at the outset of the process that the two new ANNPs would have to reach a stage where they were eligible to have their names added to such a list. They also suggest that the process for reaching this stage is completion of an assessment procedure, the precise nature of which was at that time unknown. This section shows CoP work being done in the production of a clear path through a boundary by making entry points to practice both available and clear. The versions of the PGDs which were in place at the outset of the process (Drug protocols 99) made no mention of an assessment procedure, although there was an approved list of authorised ANNPs in Appendix 1 of those documents. The process for being named on the list is given in the introduction to the document:

Box 7.4 – Criteria for being eligible to initiate drugs against the PGDs in 1999
(from: Drug protocols 99)

The following drugs may be initiated and administered by advanced neonatal nurse practitioners (ANNPs) who have successfully completed ENB Course A19. A complete list of advanced neonatal nurse practitioners working in the neonatal service is given in appendix 1.
In this version, which predates the arrival of the two new ANNPs, there is no formal additional eligibility process beyond simply being a trained ANNP ("completed ENB Course A19").

By the next version of the PGD documents this section has been altered, thus:

Box 7.5 - Criteria for being eligible to initiate drugs against the PGDs in 2000
(from: Drugs protocols 0400)

| The following drugs may be initiated and administered by advanced neonatal nurse practitioners (ANNPs) who have successfully completed ENB Course A19 and successfully completed the local assessment of competence (appendix four). These protocols do not apply to any other nurses or ANNPs. A complete list of advanced neonatal nurse practitioners working in the neonatal service is given in appendix 1. |

This alters the simple requirements in Box 7.4 by adding a clear requirement that a local assessment of competence be achieved. It is of note that at the time Box 7.5 was written there was no local assessment of competence, although one was in production (see below).

The reasons for the decision to alter the criteria for entry to the approved list were discussed at the ANNP meeting on 18.8.00:

Box 7.6 – The concerns which led to the decision to produce a formal training package in drug initiation (from: ANNP planning meeting 18 8 00).

CN: ...to talk about you prescribing, and partially because certain issues are changing potentially with the law, and how we perhaps ought to perhaps formalise more, A) your final training about doing drugs and B) the type of assessment that we do on you. (SpR) had already written assessments, that we'll use as part of that, but that maybe we need to do some proper teaching ...the educators, or us. (AJL)'s going to write a package, based on a package written by somebody else, and hopefully because we've already got most of the information ...maybe...I know we said we'd do it in the first week of September but in all fairness... we're not meeting till the end of September, are we?

AJL: It's a little while...we'll get you out on transfers anyway...

CN: Yeah, that's not a problem...I don't think you'll see this as a big issue, it's
just really about showing that, in the future, you've gone through a proper process of being allowed to prescribe, which actually will be better for you in the long term. You'll feel more secure in terms of doing a procedure which may not be totally within the law or whatever...

ANNP2: So we're not being assessed at the beginning of September now?

CN: No

AJL: And we think we've done most of the work already, it's just a matter of fitting it into this framework that's been devised to make it look good and proper

CN: In other words, we think you'll probably do the same...probably do the same assessment form, but we probably ought to do you some more teaching, just the same teaching we did for the SHOs last week, about writing prescriptions and things, and responsibility for writing prescriptions. So just making it a more formal...

ANNP2: Mmm

ANNP1: That would be good

CN: ...a more formal structure. So it's just going to take us a little bit longer...um...but we think in the long term it will be better, and then in the future if there is another nurse practitioner or whatever, the system's in place. We're kind of guinea pig for the rest of the hospital I think, to some extent, but it just shows that we've thought this through thoroughly and it's not just been a case of. oh well, Friday afternoon we decided you were ready to prescribe...and to some extent, from my point of view, it would make me feel happier, because, to some extent, I'm ultimately responsible...

AJL: To a very large extent!

CN: I am ultimately responsible! So at least if we can show we have been through a thorough process...when my head's on the block at least I will feel happy we did it correctly. Shouldn't stop you going out on transport at all, because at this stage of we're ...um... um...not talking about you going out on your own, and one of the advantages of this new system is you should still, unlike (AJL), you should still be able to have period of prescribing before you actually start transport, so you've got a period when you're prescribing within a sort of very secure...I don't know if secure is the right word...

AJL: relatively secure

CN: ...secure environment compared to when you are out on transport, and there is nobody else there to check or ask questions to. But it won't be delayed by long
This extract delineates the concerns that led to the production of the training and assessment process, and a number of factors appear to be influential. First the interests of the two new ANNPs are raised (“You’ll feel more secure...”), in the context of a process that the institution is concerned may not “be totally within the law...”. The interests of the hospital are raised as the next emergent issue, noting that the NICU is the first ward to undertake this process in this hospital. The “guinea pig” comment raises the possibility that the process will be observed by the wider hospital institution. Finally the interests of the consultant neonatologist are raised. This individual is named as the responsible clinician on the PGD documents and so is concerned about situations where her “…head’s on the block...” and so wants to be sure that a robust procedure has been followed.

The data in this section show that the criteria for entry to the approved list of ANNPs who may initiate drugs changed over time. The issues that caused the change are a complex set of proximal and distal ones that are all influential. Proximally, the two new ANNPs recognise that they need to learn about how the PGDs work (“That would be good “ Box 7.6) and the issue is raised that their interests are being protected by being trained and assessed. The distal factors at work are significant and include “the law” (Box 7.6). The problem that the CoP framework has with scale is again evident here. The new CoP needs a training programme which defines an entry point for new members, and this programme will be locally constructed. The programme will need to conform to stringent distal influences, including the Medicines Act and other drugs regulations. In CoP terms, the hospital chief pharmacist (HCP) acts as a broker, carrying information about the regulatory framework from a putative Pharmacy CoP to the NICU prescribing group. Wenger might argue that to develop broader contextual understanding we may need to zoom-out or move up a “level” so that more of the prescribing landscape can be seen (and so less detail of the local setting). However, this study is concerned with a locally situated change, with how a specific change was achieved. Moving to study a different section of the hospital (for example, the pharmacy), does not appear helpful. Latour argues instead that we move from interaction to interaction in chains of circulating reference, making how meaning is assembled locally the topic of our concern.
There is a chain of circulating reference with the Medicines Act at one end and drug initiation in practice by ANNPs at the other. Because “certain issues are changing potentially with the law” and also because of concerns that some features of the PGDs “may not be totally within the law” (Box 7.6), the issue is to ensure that each step of translation from legislation to practice is made properly. This theme is developed and illustrated further below (Figures 7.9 and 7.12).

A number of CoP formation issues are attended to in this section. The future trajectory of continuity of reificative memory is attended to by developing a system which names individuals in the outputs of the institution. Boundary issues are being negotiated, and this appears to be an issue which was managed by the manipulation of an explicit boundary, with a single entry point. That is, to be able to work effectively the new ANNPs have to be able to initiate drugs, and to be authorised to initiate drugs their names have to be placed on an official list. Being placed on the official list of ANNPs who may initiate drugs will mark passage through the entry point. How to negotiate the entry point will be via a training programme, and the next section is concerned with this issue.

3. Training & assessment – Infrastructure of competence.

Over the period with which this study is concerned a training and assessment programme for ANNPs drug initiation was produced. This is important in the negotiation of an entry point into the new CoP. The data which follow show a number of emergent issues and resources which were influential in this process.

The training and assessment programme represents several links in the circulation of reference, being the document which transforms the relevant sections of the medicines legislation into a package which, when completed, will have contributed to rendering new ANNPs able to initiate drug treatments (Figures 7.9 and 7.10). The training programme documentation was completed in July 2000, and ANNP1
completed the transition to being able to independently lead transfers the following month.

The first extract, from the clinical supervision meeting with ANNP2 on 9.12.99, reviews the progress with producing the training package and suggests that production of this has not been as prompt as was hoped.


AJL: ...The next thing that we’re doing is writing an education programme for you and (ANNP1) and for what else whoever comes along behind you to take you through to the point where you’ll be able to in inverted commas prescribe er

ANNP2: Ooh

AJL: Yes so that’s getting there and er I think it’s regrettable that it’s taken as long as it has you know I think we all wish it I think we all wish it had got done quicker however it is really time consuming work

ANNP2: Yes

AJL: And er

ANNP2: at the end of the day it will be worth it probably won’t it?

AJL: Yes absolutely and I think certainly whenever we have more nurse practitioners being trained we’ll have all this stuff in place and we would anticipate that going through this process rather earlier you know we wouldn’t be quite as long as we’ve left you and (ANNP1) but just because of reasons how long it takes to prepare the work er yes and

This hints at some tension related to the timescale for production of the document, suggesting that the process has taken longer than desired ("we all wish it had got done quicker"). It also suggests that the work is being done with a longer-term agenda than just the two new ANNPs, and that future ANNPs may do the drugs training and assessment earlier in their ANNP progression.

This concern about the delay in making available a gateway to drug initiation is reified in different form in Box 7.8. This is from the ANNP business case
document, produced in November 2001, and is a part of a section which proposes incremental levels of competence from one to five for ANNPs (just level 2 is shown). It makes clear that ANNPs should undertake drugs training and assessment promptly after completing a 1 year precepted post-ANNP course period. As the timeline (Figure 1.1) illustrates, the training programme for drug initiation for the two new ANNPs was not completed until July 2000, twenty-two months after the new ANNPs competed their ANNP course.

Box 7.8 - Future expectations of when ANNPs will undertake drugs training (from: Business case for developing ANNPs 1101).

<table>
<thead>
<tr>
<th>Level</th>
<th>Expected time frame</th>
<th>Qualification</th>
<th>Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1 year or on-going</td>
<td>BSc, A19 + 1 year at level 1</td>
<td>Works on base unit developing expertise in technical skills and advanced knowledge. Supervision or assistance needed only for new situations. Prescribing assessment to be completed and subsequently initiating medicines to protocol to be implemented. Works independently on labour suite once able to &quot;prescribe&quot;</td>
</tr>
</tbody>
</table>

Box 7.7 suggests that there was delay in producing the PGD training, and that this may have been a topic of concern for the new ANNPs. It also shows that this issue is addressed in the institutional reifications which reflect this set of problems (Box 7.8), suggesting that those responsible learned from this problem and made avoiding it’s repetition a part of the future trajectory of action for ANNPs.

There are data to suggest that the hospital management generated emergent issues in this process. In November 1999 the hospital senior management wrote to Clinical Directors of services, including CN, suggesting that in future permission from the hospital will be required for all proposed new nurse-led services. Additionally, Clinical Directors were asked to retrospectively complete the hospital permission documentation for all existing nurse-led services, so that the hospital
was aware of what was already in place. In response the NICU produced the document "New nurse-led service" in January 2000, and the extract in Box 7.9 shows that the drug initiation training issues were being represented as important.

Box 7.9 – Importance of ANNP drug initiation and associated training (from: Proposal for a new nurse-led service 0100).

It is necessary for nurse-led transport that the ANNP is authorised to initiate drugs under the relevant protocols (attached), as approved by the Clinical Risk Management and Drugs and Therapeutics Committees in 1997. A formal training programme in this is being devised at present and will be forwarded when complete. This aims to promote the highest standard of "prescribing" practice by ensuring that ANNPs have excellent knowledge of the relevant drugs as well as a clear vision of how the group protocols work and what the legal framework is. This programme will be completed by the two current candidates and by future ANNPs.

While Box 7.9 shows the NICU team doing work required of them by the hospital senior management, in Box 7.6 we saw that the drugs initiation work could be represented as a "kind of guinea pig for the rest of the hospital". This clearly shows an interdependent relationship between proximal and distal. While senior hospital management require the NICU setting to conform to national and hospital drug initiation standards, what happens on the NICU may in turn be influential for the rest of the hospital.

Other data suggest that making the assessment available to be administered emerged as an issue. Box 7.10 from the clinical supervision session with ANNP2 on 23.3.00 alludes to unspecified problems with the PGDs in a debate with the Hospital Chief Pharmacist (HCP) about who it is appropriate to administer the assessment to.

Box 7.10 – Problems with PGDs for the new ANNPs (from: ANNP2 23.3.00)

AJL: ... Things are progressing with prescribing you'll be pleased to hear

ANNP2: Oh(.) oh good because (there was something in the media the other day about nurse-prescribing, is that the same issues?)

AJL: No, I don't think so, it will go one way or the other soon (.) I'm taking the
line with (HCP) the fact that she doesn’t (.) either (.) either what we’re doing if not actually frankly legal it’s at least acceptable er (.) and if it’s acceptable for me to be doing it then we ought to facilitate you and (ANNP1) to do it and promptly (.) And if it’s not acceptable for me to be doing it (.) if the process is not acceptable then I shouldn’t be doing it either and I know I shouldn’t and it will stop it (.) I hope it doesn’t go that way, but

ANNP2: Hmm

AJL: So I think the issue just needs driving along a bit

In this extract it appears that the debate with HCP has been conducted on two fronts. First on legality (“either what we’re doing if not actually frankly legal it’s at least acceptable”) and second on who is acceptable to do drug initiation (“...if it’s acceptable for me to be doing it then we ought to facilitate you...”). Resolving this issue is key to making the drugs initiation training available to the new ANNP1s.

The minutes of the next meeting of the PGD group from April 2000 show this issue to have been resolved, and that the two new ANNP1s will undertake the training and assessment programme.

Box 7.11 – Process for moving the new ANNP1s toward being on the approved list of drug initiators is agreed (from: Drug minutes 13 4 00)

(CN) has produced an outline training programme for new ANNP1s who want to be able to initiate drugs. We agreed that this was an important step, and discussed the issues in implementing this for the two latest ANNP1s, particularly in the light of the uncertainty regarding group protocols outlined above. We agreed the following:

1. It seems clear that group protocols are acceptable for transport, and as this is to be (ANNP1 & ANNP2)’s key area of practice, we should start now to train them for this.
2. (HCP) will do initial lecture/teaching and also provide reading material for the pre-course pack.
3. (ANNP1 & ANNP2) will work through the training programme as outlined in the attached pack. This will include a summative assessment to be successfully completed prior to doing any drug initiation.

A secure chain of circulating reference has facilitated resolution of the issue, and is summarised in part by the numbered points in Box 7.11. This is illustrated in
Figure 7.9. This figure shows movement from legislation through to ANNPs undertaking the PGD training, via four transformative steps (a to d). For the process to be secure (and reversible) each of the translations (a to d) has to have been properly made. Point number one in Box 7.11 (above) ("seems clear that group protocols are acceptable for transport") is a reification in the literature of the institution of the acceptability of the translation at point (a) (legislation to PGDs for transport). It also appears in Box 7.11 (point 2) that HCP has agreed that the teaching programme that has been produced is acceptable (b), and so the time and conditions are right for the new ANNPs to go through the training (c). A further step into drug administration practice is illustrated (d). Figure 7.10 complements Figure 7.9 by illustrating that there is simultaneous loss of detail of the relevant legislation and gain in locally-negotiated infrastructures which support practice.

Figure 7.9  Circulating reference and drug initiation.

Figure 7.10 Amplification and reduction: Progressive loss of legislative issues and contemporaneous gain in ability of ANNPs to be trained to initiate drugs.
In this example the issue was the delay in making the PGD training available to the new ANNPs, which was in turn delaying them from becoming fully effective practitioners. There appears to have been a blockage in the system, hinted at in Box 7.10 which is resolved by a process of re-checking the links in the chain, as shown in Box 7.11.

These data show several emergent issues and resources within the broader issue of training and assessment in drug initiation. The timing of the process appears to have been problematic (Box 7.7), and these problems fed back into how the NICU institution foresaw supporting future ANNPs (Box 7.8). Broader hospital concerns emerged, and the production of the training programme appears to have been an important resource in attending to those concerns (Box 7.9). For the individual ANNPs the production of the training programme is a topic of concern, as the assessment is the gateway to the next level of practice (Boxes 7.7 and 7.10).

Production of the PGD training and assessment programme attended to some CoP formation factors. Being able to initiate drugs is necessary for transport practice, as well as for independent labour ward work. By producing a training and assessment programme which facilitates movement through the only gateway to "prescribing", so the degree of peripheral belonging is increased. By producing a training and assessment document that is oriented toward future members of the CoP, not just the two who were the contemporary concern, the institution is providing for the continuity of reficication. For the two new ANNPs an infrastructure of competence is being supported by engaging them with fundamental issues concerned with the tools which allow them to practice. This tool, the training and assessment programme, is a specific one for the putative ANNP CoP, and specific tools are a representation that a CoP may be forming or has formed.

This section has also shown that the proximal and distal are mutually influential and interdependent. The relevant law as well as senior hospital management both influence how the NICU actors proceed with the project. The wider hospital setting may in turn be influenced by the outcomes of this. Circulating reference shows how these influences are given situated meaning in the setting and avoids the
temptation to study ever bigger structures in order to gain broader understanding of how CoPs interact. Instead, by concentrating on how meaning is negotiated locally in the context of proximal and distal influences we are able to see how change at work is accomplished.

4. Content of PGDs and the need for updates – tools and artifacts that support competence.

The patient group directions (PGDs) are the drugs protocols produced locally which delineate the boundaries of the prescribing-like activities which ANNPs may undertake. This section reviews the emergent issues and resources in maintaining and updating the PGDs. From a CoP perspective the PGDs are artifacts that support competence and so their good repair is a matter of concern. The material in this section illustrates the issues in maintaining the PGDs in a state of good repair. In particular the connections of the PGDs to other NICU documents, which are a necessary feature of the PGDs, are seen to be via a secure set of links in chains of circulating reference. This sets up a range of tensions in how the PGDs are developed, used and maintained which are discussed below.

The PGD documents comprise details of drugs which may, under certain conditions, be initiated by ANNPs. Each drug PGD is cross referenced to one or more NICU clinical guidelines or policies. These guidelines, of which there are many, are intended to represent a consensus approach to managing critically-ill neonates. They are produced by doctors, nurses and others and all are processed through a formal peer review ratification procedure. NICU clinical guidelines may include reference to relevant drug therapy, and will be themselves cross-referenced to a master guideline that guides drug therapies. Box 7.12 illustrates the sense in which the PGDs are embedded in other NICU documents. It is an extract from one of the PGDs in Drugs99.
Box 7.12 – Links between PGDs and NICU clinical guidelines (from: Drug protocols 99).

<table>
<thead>
<tr>
<th>ALBUMIN 4.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INDICATION:</strong></td>
</tr>
<tr>
<td>1. Hypotension(^1), defined in policy(^2) 17.1 as mean BP below gestational age.</td>
</tr>
<tr>
<td>2. Poor perfusion - Capillary refill &gt; 2 seconds.</td>
</tr>
<tr>
<td><strong>DOSE:</strong></td>
</tr>
<tr>
<td>A dose of: 10ml per kg I.V. may be administered as per policy 2.1.</td>
</tr>
<tr>
<td>If there is no improvement after a single dose during transport, advice must be sought from a Nottingham neonatal consultant.</td>
</tr>
</tbody>
</table>

In this extract the possibility for an ANNP to administer a dose of albumin 4.5% is guided not just by the PGD but also by policies 17.1 and 2.1. All the PGDs are similarly rooted in contemporary treatment guidelines. As Box 7.13, from Drugs00 shows, this embedded-ness was stated feature of the PGDs.

Box 7.13 – The interdependence of PGDs and NICU clinical guidelines (from: Drug protocols 00).

| These protocols must be used in conjunction with the relevant clinical guidelines, and these are referenced in the text of each protocol. |

In the extracts above reference is circulating between NICU clinical guidelines and the PGDs. While each PGD is centred around a single drug, such as Albumin 4.5% above, the indications and directions for use are translations from a number of NICU guidelines. Thus, in Box 7.12 we can see that a dose of albumin may be given for “hypotension, defined in policy 17.1 as mean BP below gestational age” and that the dose to be given is “10ml per kg I.V. ... as per policy 2.1”. In this way two translations from NICU clinical guidelines are folded together in the PGD.

\(^1\) Low blood pressure.

\(^2\) The terms “policy” and “neonatal clinical guideline” are interchangeable.
The issue of the content of the PGDs and their need for update or additions emerged in two ways in the period of this study. First as part of routine review and second after the two new ANNPs started using them. The PGDs were written with prospective dates for routine review which involved checking the PGDs to ensure they remained congruent with NICU clinical guidelines and reflected the drugs needed for ANNPs to practice. The process of checking that the PGDs remained in step with the clinical guidelines could be conceptualised as checking that the links in the chain of circulating reference remained secure. Routine review happened over this period and a number or amendments were made to the PGDs in this process, for example by adding 15% Glucose to the list of fluids ANNPs could initiate. Box 7.2 shows that simple amendments to where particular drugs could be administered were also undertaken.

Amending the PGDs also emerged as an issue in discussion with the new ANNPs, in the period after they had completed PGD training and assessment. The issues that emerged are illustrated in the next two extracts where total parenteral nutrition (TPN) is discussed. TPN is used in infants who cannot be fed via the gut. It comprises a mixture of carbohydrate, protein, fats, vitamins and trace elements which are administered intravenously. The TPN is made daily for each baby by the pharmacy and the basic "recipe" is adjusted by the doctor in an individual prescription that takes account of changes in the infants blood results. For example, if an infants routine daily blood tests indicate that the blood sodium level is lower than normal then the amount of sodium in the TPN prescription is increased. There is no PGD for TPN.

The daily TPN prescription will routinely require consideration of the need to alter the sodium, potassium and fat contents, as well as the total volume of fluid to be administered. The first extract (Box 7.14) is from the ANNP meeting on 17.4.01 and follows on from a broader discussion about infant nutrition.
Box 7.14 – The inability of ANNPs to initiate TPN “prescriptions” is raised (from: ANNPI 17.4.01).

| CN: | Do TPN. ... but then it occurred to me that theoretically you’re not allowed to prescribe TPN |
| ANNP2: | No, we're not |
| CN: | so are you prescribing TPN? So that’s the first thing (.) are you actually prescribing TPN? |
| ANNP2: | Sort of |
| ANNP1: | Well (.) um |
| CN: | This was at the beginning of the new SHO’s and you’d signed them (.) you had signed them all or |
| AJL: | No ( ) no |
| ANNP2: | We don’t ever sign them |
| AJL: | We write them and they sign them |
| CN: | Anyway so it was obviously they’d all got muddled up anyway (.) |
| ANNP2: | There’s a whole list of things on here about TPNs though as well ( ) Prescribed at 8 o’clock not the appropriate time I don’t think but TPN’s |
| ANNP1: | TPN isn’t a two minute subject, but anyway |
| ANNP2: | There’s loads of implications of doing TPNs at 8 o’clock in the morning which is why I think (inaudible) and we should prescribe them anyway shouldn’t we? |
| ANNP1: | Yes |
| CN: | So we need to have a set up we need to put TPN (.) We need another meeting with (HCP) (.) |

There was no PGD in place which gave authority for ANNPs to initiate TPN. Whilst the subject is glossed over in Box 7.14, it makes clear that an informal resource has emerged for TPN prescribing on the NICU (“We write them and they sign them”). This suggests that a pragmatic solution has been reached to problems raised by the inability of ANNPs to sign a TPN prescription. In summary, the solution is that the ANNP writes the prescription and the junior doctor signs it. This
compromise solution allowed the ANNPs to bring their experience to bear on the TPN prescriptions, so that the TPN was prescribed appropriately, while attending to the letter of the legal requirements of the situation by getting the signature of a medical practitioner.

The next extract (Box 7.15), from the ANNP meeting a week later, is a wider discussion of these issues held over from the meeting above.

Box 7.15 – Can TPN be added to the PGD documents so that ANNPs can initiate TPN themselves? (from: ANNP 24.4.01)

ANNP1: Like yesterday ( ) over the weekend I’ve done all the TPNs and they’ve literally just been rubber stamped by the SHO’s and that’s not very nice for the SHO’s because it puts them in a very vulnerable position

CN: Yes ( ) So you’d like to be able to prescribe TPN?

ANNP1. I guess at the end of the day it does make the most sense ( ) its just the

CN: and that really is a guideline you’re following( ) it’s more guideline than anything else

AJL: I don’t think it is

CN: You don’t?

AJL: I’ve thought long and hard about whether to write a drugs protocol for prescribing TPN and I think the ( ) the way in which the constituents of TPN are adjusted is as much art as it is science really

CN: Yes

AJL: You kind of look at ( ) you might ( ) so if we take a simple example like the sodium’s been dropping for a few days and we’ve been gradually putting a bit more in and everyone can see that that’s a perfectly sensible way to go about it but how you quantify that and write it in to a ( ) in to a protocol

ANNP2: you don’t calculate like you calculate a

AJL: no you don’t ( ) no ( ) They say well okay we had six in yesterday but the sodium’s still a little bit low ( ) we’ll put in eight tomorrow or ten tomorrow or something ( ) do you know what I mean?
And I’ve thought about this in some depth ( ) I can’t see how to write a protocol
Box 7.15 begins with ANNP1 pointing out the central problem with the ad-hoc solution outlined in Box 7.14 ("We write them and they sign them"), that this places the SHO (junior doctor), as the signatory to the prescription, in "a very vulnerable position." Their signature makes the SHO responsible for the TPN prescription, but responsible for a prescription they did not write and may not understand. If the ANNP made a gross prescribing error in the TPN prescription the SHO who signed the form would carry some of the responsibility for that. For this reason the ad-hoc system is held to be unsatisfactory.

There follows a discussion of whether the PGD framework is a suitable one to facilitate ANNP TPN initiation. The data have already shown the extent to which the PGDs are rigidly formulaic. Box 7.12 shows a simple example where one of three measurable physiological conditions has to be met for a PGD to be operative and in response the ANNP is able to give a single dose of drug according to a simple weight-driven formula. There is little obvious room for manoeuvre in the protocol in Box 7.12, either in when a dose may be given or in the size of the dose. In Box 7.15 the difficulties of applying this approach to TPN prescription are discussed. The problem may be understood in terms of a complex set of proximal and distal interdependencies. The debate in Box 7.15 is based around a simple conception of TPN prescription where a blood test result leads to a straightforward calculation of how much of a particular salt to add to the TPN. However, the real clinical decision is much more complex and many other factors are involved, such as how much of this salt has previously been given, how much fluid, whether the infant is passing urine adequately, whether milk feeds been started. None of these factors is alone able to generate a number which will determine the TPN prescription. Instead a judgement is required which balances the factors and arrives at a conclusion based on experience. Box 7.15 suggests that the current state of the legislative framework for ANNP drug initiation does not provide for

<table>
<thead>
<tr>
<th>(. ) each individual electrolyte or other constituent would need its own guidance on how to do it</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN: So you think then it's an impossible thing?</td>
</tr>
<tr>
<td>AJL: I think under the group protocol routine it just isn't possible</td>
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</tr>
</tbody>
</table>
complex multi-dimensional decisions and prescriptions, such as for TPN. It is of note that the ad-hoc solution ("We write them and they sign them") is based on the ANNPs possessing those complex decision-making skills.

The PGD framework is, as we have seen, rigidly formulaic. It permits ANNPs to initiate drugs therapies according to variations on a formula of "if x, then y." Secure chains of circulating reference may be constructed following such formulae. However, if the formula is more complex and requires some calculation that is not made readily visible then the PGD will not be possible. Circulating reference is a helpful explanatory tool for understanding why and how PGDs work for some drug decisions, and not for others. In Figure 7.11 the chain of circulating reference pertaining to low blood pressure and administration of albumin is shown. There is a secure link (a) from a NICU clinical guideline to the albumin PGD (Box 7.12). The link is secure because the NICU blood pressure guideline says explicitly that if the blood pressure is low (according to a standard definition) a dose of albumin should be given. This allows the next link (b) to be created, which allows a clinical response.

Figure 7.11 Circulating reference and albumin prescription

This illustrates the problem of producing a TPN PGD. What is desired is a chain of translations which facilitates movement from clinical and laboratory findings (for example, the level of salts in the blood of a baby; urine output; milk feeds starting, etc.) through to a protocolised prescribing response which delineates the amount of each salt to put in the today's TPN. However, as was detailed above there is no
simple formula for this because of the myriad potential factors which may influence the decision and which render the exercise impossibly complex.

Circulating reference also illustrates a sense, beyond the purely legal, in which the ad-hoc response to this problem of the ANNP writing the TPN prescription and SHO signing it ("We write them and they sign them") in Box 7.14 is unsatisfactory. A secure chain of circulating reference is reversible. If the signature on the prescription is not traceable back to how the prescription was derived because the person signing did not make the decisions about the prescription then reversibility is not achieved.

By becoming familiar with, and being able to criticise, the fine detail of the PGDs the new ANNP are seen to be attending to CoP-formation work. The PGDs are a specific tool and source of reificative continuity for their group, and an infrastructure of competence at using those tools is emerging in these data. The discussions of the PGDs as applied to TPN show that their engagement in clinical practice has brought about a knowledgeability with these tools where they appreciate that the PGDs may be both issue and resource: resource when used to facilitate clinical practice, and issue when the boundaries and limitations of the PGDs are found.

Circulating reference has enriched the understanding of these issues by showing how the construction of secure chains of translation is a necessary part of producing robust drugs initiation protocols. Further, circulating reference illustrates the complex interdependencies operating in the setting. Whilst distal influences from the Department of Health are influential in how the NICU deals with ANNP prescribing issues it is in the local assembly of context that meaning is given to the DH emissions. Creative solutions to problems are found when the fine-grained detail of local context is examined, and while these may not be perfect in terms of professional or legal demands, they address the contingencies of a setting where experienced responses to clinical problems are deeply valued attributes.
5. Legal framework - Production of a local regime of competence

The legal framework under which ANNPs could initiate drug therapies was discussed in Chapter 4. In summary, there was no explicit provision in law for the prescribing-like activity undertaken by ANNPs or other specialist nurses. The Department of Health (DH) however took a broadly facilitative view of the need for a framework which sanctioned existing drug-initiation activity. This led to a series of documents and reports from DH appearing over time which contributed to the formation of such a framework. There were no changes in the primary legislation, the Medicines Act, over the period of this study, but there were a number of guidance documents issues by DH which interpreted the Act in terms of nurse prescribing issues. The CoP framework has difficulty in this section attempting to provide an account of proximal and distal connections and influences. The work done in the setting to deal with legal issues undoubtedly contributed to the production of a local regime of competence, but this does not adequately represent the complexity of the work that was done in the setting to place distal influences in proximal context. In CoP these distal influences are understood either as boundary objects or by zooming out to study more of the social landscape (such as the CoPs that wrote the distal documents), with the consequent loss of detail that this entails. In contrast, the circulating reference model provides a robust and richly detailed framework for understanding these complex connections. Our understanding of the change with which we are concerned is enhanced by staying in the setting and examining how distal outputs were locally influential.

The next extracts illustrate how the legal framework issues evolved over the period under consideration. Box 7.16 is from the minutes of the NICU drug protocol group meeting in April 2000, and it outlines the position at that time, and shows that new information and guidelines from distal sources was continuing to arrive and require attention.
Box 7.16 – (from: Drug minutes 13.4.00).

<table>
<thead>
<tr>
<th>1. (HCP) had recently received and circulated a consultation paper from the DoH regarding group protocols (ref: MLX 260). This paper outlines the proposed DoH position on the use of group protocols throughout the NHS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 We felt overall that the document supported the approach we have taken to the production and implementation of our ANNP drug initiation protocols. There were one or two areas of concern, which received detailed discussion.</td>
</tr>
<tr>
<td>1.2 The proposals do not apparently allow ANNPs to initiate drugs which will be given when the ANNP is not present, for example starting a five-day course of antibiotics. This is not a problem for emergency drugs, obviously, and paradoxically not a problem on transports, when the ANNP will always be present. Two solutions seemed possible at the end of the discussion:</td>
</tr>
<tr>
<td>1.2.1 ALL long-term prescriptions on the unit (or on babies returning from a transfer) to be signed by a doctor</td>
</tr>
<tr>
<td>1.2.2 All prescriptions, for all babies on the unit, to be formally reviewed on the ward round each 24 hours, so that a proper check is made.</td>
</tr>
<tr>
<td>1.2.3 (HCP) is going to contact DoH to seek clarification of this.</td>
</tr>
<tr>
<td>1.3 Controlled drugs appear to be a problem, with the discussion paper suggesting that no group protocols for CDs will be acceptable. Alternative strategies were discussed and (CN) and (HCP) were going to consider ideas for pre-signed sticky prescription, and find-out what other units do.</td>
</tr>
<tr>
<td>1.4 Representations should be made on these points to the DoH, and (AJL) and (CN) have written a letter.</td>
</tr>
</tbody>
</table>

This extract shows new guidance from DH (DoH) had arrived against which the existing drug initiation documents had been reviewed. The DH document appears to have contained a mixture of reassurance that the NICU PGDs were broadly acceptable alongside new problems, with long term prescriptions and controlled drugs, which required attention. Plans were made for how to deal with the issues raised (controlled drugs are discussed in more depth in the next section). The new problem with long-term prescriptions is that this most recent advice insists that the PGD framework was not intended to allow nurses to initiate courses of treatment that will continue after the nurse has gone home. In response to this a significant change is made to how the ANNPs work (Box 7.16, point 1.2.1) so that all long-term prescriptions started by ANNPs will be countersigned by a doctor. The guidance issued by DH has no content which is concerned with ANNPs or NICUs.
In particular. It is in the work of the local group that the general guidance is given situated meaning for local ANNPs.

This suggests that the period with which this study is concerned was not one where drug initiation issues had achieved stability. Local institutional and national regulatory frameworks were shifting and causing the proximal system to require repair. Point 1.4 in Box 7.16 shows that the proximal was also attempting to influence the distal, by making written "representations". There is no record of any reply to this letter.

Box 7.17 is from the training programme in the use of the PGDs that was eventually produced for the two new ANNPs. It shows that the hospital chief pharmacist would undertake formal teaching sessions for the new ANNPs which would cover the legal framework. This shows that legal framework issues were both influential in the process of producing acceptable PGD documents and important enough to be disseminated to the users of the documentation. In learning to initiate drugs therefore it was judged to be insufficient for the new ANNPs to simply learn to use the documentation in the intended manner, but also that they appreciate the underpinning framework.

Box 7 17 – Legal framework included in training for new ANNPs (from: PGD training 0700).

<table>
<thead>
<tr>
<th>Formal teaching sessions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown report/prescribing/accountability (delivered by HCP)</td>
</tr>
</tbody>
</table>

This session will cover:
1. legal framework for nurse-prescribing under group protocols
2. effective, safe drug initiation

Box 7.18 is from the same document and shows that the external influences were sedimenting-out in the training programme, as the reports and documentation were part of the reading matter supplied to candidates. For example DH document
MLX 260, to which a local response is discussed in Box 7.16, is included in the reading list.

Box 7.18 – Legal framework documents included in directed reading in the PGD training for new ANNs (from: PGD training 0700).

<table>
<thead>
<tr>
<th>Directed reading (attached):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Crown reports x 2</td>
</tr>
<tr>
<td>2. Hospital therapeutics newsletter Feb 2000 – prescribing information and hints</td>
</tr>
<tr>
<td>3. Hospital prescribing policy</td>
</tr>
<tr>
<td>4. DoH discussion document (Ref MLX 260)</td>
</tr>
<tr>
<td>5. Home office letter re. controlled drugs</td>
</tr>
<tr>
<td>7. CHN NNU group protocols</td>
</tr>
</tbody>
</table>

In January 2001 the NICU prescribing group wrote to the hospital Clinical Risk Management Committee to update that group on PGD activity. This senior hospital committee represents the hospital board, and an extract is in Box 7.19.

Box 7.19 – Local compliance with legal requirements (from: Letter to clinical risk management committee 0100).

As expected, the national issues which underpin the drug initiation protocol have continued to shift, and the prescribing group (HCP and ourselves) has continued to meet over this period to ensure that the protocols are safe and meet the most up-to-date guidance. Compliance with the protocols has been audited once, and we will present the results of that audit to the Committee at the meeting.

This suggests that a central concern of the NICU prescribing group over this period has been to keep the NICU documentation and frameworks in a state of good repair "and meet the most up-to-date guidance". It appears broadly that the NICU dealt with successive tranches of guidance from central government sources and attempted to keep a system in good repair in response to these. The guidance was issued for the whole NHS with no regard for the individual issues and needs of relatively small specialities. These outputs from the centre produce a continually
emerging set of related issues which become the resources required to keep the hospital PGD documents in good repair

The important CoP work of producing a local regime of competence was thus difficult to achieve, but the presence by the end of this period of a training programme which was acceptable to the hospital is evidence that the proximal actors were able to stabilise the issues sufficiently. A way in which this was achieved is seen in the training programme excerpt in Box 7.17 where the programme simply states that the hospital chief pharmacist (HCP) will lecture candidates on the legal framework. The absence of more detail in the programme allows for the possibility that the hospital chief pharmacist will have to update and adapt the programme each time it is delivered. By having the lecture delivered by a senior pharmacy person, as opposed to by a member of the NICU team, the hospital is assured that the most up-to-date information will be given.

The data in this section suggest that there was a problem over the study period for the proximal producers of local regimes of competence in producing stable regimes in a rapidly shifting environment. Multiple requirements from distal sources were dealt with, and these were often generic demands made on end users regardless of their individual circumstances. These may represented as a chain of circulating reference where there are ongoing problems maintaining the translatlve links in a state of good repair, as illustrated in Figure 7.12. For the chain of circulating reference to be legally secure a number of translations must be properly made.

Figure 7.12 Circulating reference and the ANNP drugs initiation legal issues.
In this chain of reference, for the connection between the Medicines Act and ANNP drug initiation to be secure there are (at least) three key translations. First at point (a) the guidance issued by the DH or Home Office which interprets the legislation has to be based on a sound legal interpretation. This results in the issuing of interpretative guidance, and this step happened on several different occasions over the period of this study. The next step at point (b) is the production of a local framework which contextualises the interpretative guidance for the NICU or transport setting. It is this step that we are concerned with in this section. As each successive piece of interpretative guidance is issued so the people assembling context locally have to return to the local framework and ensure it is has been accurately translated from the guidance issued centrally. As the guidance issued changes perspectives, for example on ANNP’s initiating continuing courses of drugs (point 1.2 in Box 7.16), so the link in the chain is challenged and may require repair(point 1.2.1 in Box 7.16). The key translatlve tool at point (c) is the training in drugs initiation, as outlined above. It is of note that the translation at point (c), from local framework to practice, is shown to have been the subject of audit (Box 7.19). This audit can be understood as investigating how sound this link in the chain is.

The CoP framework does not adequately deal with the issues in this section. Wenger (1998c, p 131) says that we “can develop new ways of participating in the global, but we do not engage with it,” but this section shows the detailed engagement of local participants with global issues. While the work that was done to deal with legal issues undoubtedly contributed to, in CoP terms, the production of a local regime of competence, this does not adequately represent the complexity of the work that was done in the setting to place distal influences in local context. Circulating reference provides a framework for a detailed understanding of these complex connections. By flattening the social landscape questions of scale are replaced by a concern with the assembly of local context and this in turn illuminates how the process of change was accomplished.
6. Controlled drugs - Production of a local regime of competence

Controlled drugs are a group of drugs which are potentially misused and so are subject to legislation which controls their storage and administration. While purely pharmaceutical drugs are regulated by the Department of Health (DH), controlled drugs are primarily regulated by the Home Office. The key legislation is the Misuse of Drugs Act (1971), under which such drugs are classified as Class A, B or C. The supply of a number of pharmaceutical drugs is regulated under this act, and a small number of these are used in NICU practice most notably morphine and diamorphine. These are both classified as Class A drugs under the legislation and are used frequently in the NICU and on transport for several indications, most commonly to provide sedation and reduce discomfort for infants requiring respiratory support via an endotracheal tube (ETT). Box 7.20 shows this, from the PGDs used by ANNs.

Box 7.20 – Controlled drugs included in PGDs (from: Drug protocols 0400).

<table>
<thead>
<tr>
<th>DIAMORPHINE (CD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INDICATION:</strong></td>
</tr>
<tr>
<td>1. Sedation of infants who are ventilated. All infants who are intubated should be sedated.</td>
</tr>
<tr>
<td>2. For pain relief pre-operatively for a baby with a tender abdomen Diamorphine may only be initiated by a nurse practitioner for this indication following prior explicit discussion with the Nottingham neonatal consultant. Guidance on the assessment of pain is included in guideline 1.15.</td>
</tr>
<tr>
<td>3. For pain relief immediately following surgery and for up to 48 hours post-operatively.</td>
</tr>
</tbody>
</table>

This excerpt shows that controlled drugs were a part of the PGD framework that was set-up to support transport for ANNs. Indeed the letter sent to the hospital Clinical Risk Management (CRM) Committee in March 1997 (CRM Comm 0397) when approval for the PGDs was first sought emphasises the need for controlled drugs, as the next extract shows:
Box 7.21 - Controlled drugs raised as a separate important category for inclusion in PGDs (from: CRM Comm 0397).

3. Controlled drugs. It is essential that ANNPs are able to initiate controlled drugs. Diamorphine, and occasionally morphine, are used frequently for the sedation of babies who are ventilated during transfer.

That these were approved by the CRM Committee is seen by the presence of these drugs in the PGDs (Box 7.20). In the period prior to that with which this study is concerned therefore, opiates were part of the PGDs and were routinely prescribed under that framework.

Controlled drug initiation and administration emerged as an issue during the period of this study, as the following extracts show. Box 7.16 (point 1 3) shows that when the NICU prescribing group met in April 2000 they had recently received a communication regarding patient group directions which included guidance on controlled drugs (CDs) which suggested that CDs should not be included in PGDs. Further weight was apparently added by another communication that had been copied to a member of the group, and which was discussed at the same meeting (Box 7.22).

Box 7.22 – Sources of doubt about the inclusion of controlled drugs in PGDs (from: Drug minutes 13 4.00).

A letter from the Home Office to Pharmacy at Plymouth (19 March 1999; ref: DDA/9840/32/2) was discussed. This adds to the uncertainty about our current approach to controlled drugs.

Box 7.16 shows that the meeting left the matter unresolved, but with a plan to "consider ideas for pre-signed sticky prescription, and find-out what other units do." The next meeting, on 7.8 00, looked again at this issue following an informal survey of the practice of other units in use of PGDs for initiating controlled drugs, as shown in Box 7 23.
Box 7.23 – Discussions of the place of controlled drugs in PGDs (from: Drug minutes 7.8.00).

1. (CN) reviewed the replies received regarding the initiation of controlled drugs by ANNPs.
   1.1 The meeting agreed that at present the basis for the initiation of controlled drugs by ANNPs looks insufficiently solid, and that this practice should stop immediately.
   1.1.1 The meeting agreed that controlled drugs, particularly morphine and diamorphine, are an essential part of effective transport, and that a legal and rigorous way to facilitate the initiation of these drugs by ANNPs should be sought.
   1.1.2 ALL prescriptions for morphine and diamorphine MUST be signed by a doctor.
   1.2 (HCP) will look at stickers that are used elsewhere in the hospital to facilitate nurse-prescriptions. These might involve a pre-signed sticker that the ANN attaches to the drug chart, with space for the weight of the baby, the dose of the drug and the diluent and the name of the ANN.

This excerpt records the suspension of CD initiation under PGDs with immediate effect. This suggests the findings of the survey of the practices of other NICUs were not reassuring. The minutes go on to record the problem that this raises (point 1.1.1), and to establish the imperative need for “a legal and rigorous way to facilitate the initiation of these drugs by ANNPs”. Point 1.2 raises one possible solution, via the use of pre-signed stickers. The hospital chief pharmacist suggests that elsewhere in the hospital provision is made for nurses who cannot initiate a particular drug to be issued sticky labels which are signed by a doctor and affixed to a prescription card by the nurse when needed.

Boxes 7.24 and 7.25 are draft versions of such sticky labels which were produced at this time. They illustrate the nature of the solution that was being proposed.

Box 7.24 – Proposed sticky label for diamorphine loading dose (from: Controlled drugs stickies 1200).

<table>
<thead>
<tr>
<th>Diamorphine loading dose (50 micrograms/kg)</th>
<th>Babies name</th>
<th>Babies weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorising doctor (sign)</td>
<td>Loading dose.......... micrograms</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>Diluted in 5% glucose....... mls, over 20 mins</td>
<td></td>
</tr>
</tbody>
</table>
Box 7.25 - Opiate sticky label for diamorphine infusion (from: Controlled drugs stickies 1200).

<table>
<thead>
<tr>
<th>Diamorphine Infusion (15 - 30 microgram/kg/hour)</th>
<th>Babies name</th>
<th>Babies weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorising doctor (sign)</td>
<td>Put .......... mg Diamorphine in 50ml 5% Glucose to make a solution</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>which contains .......... microgram/kg/hour when infused at 0.5ml/hr.</td>
<td></td>
</tr>
</tbody>
</table>

If this system were adopted these boxes (7.24 and 7.25) would each be produced as a roll of sticky labels. The labels would be pre-signed by CN. When an ANNP went on a transfer he or she would fill in the blank sections of the label and fix it to the infants prescription chart. These were never produced or used, and the next extracts show how a simpler ad-hoc solution came to be used. The next extract is from the ANNP meeting on 5.10.00. At this stage ANNP1 has completed drugs and transport training and has been attending transfers as team leader for some weeks. In this extract she is talking about her first solo transfer.

Box 7.26 – ANNP1 gets opiates prescribed by a doctor before departing on a transfer (from ANNP 5.10.00).

ANNP1: Er yes but in fact there then was a bit of a delay I caught up with Doctor (CN3) told them that I was going to ( ) told them that it was my first one and talked about it with you er (.) so various people knew that I was going

AJL: You got your opiates written up didn’t you?

ANNP1: Yes

CN: Have we started using these new stickers (.) no?

AJL: No I don’t think we have I’m afraid

CN: But at the moment we’re getting it written up? That’s fine

ANNP1: Yes

ANNP2: What’s that
ANNP1: and in fact

CN: It's just a sticker to help us write up diamorphine when we're going out on transport but we'd probably use it for all diamorphine babies where we have problems(,) use it in other areas with anaesthetic and ITU and things like that

This shows that the sticky label system had not been put into practice by October 2000, but also shows that an alternative ad-hoc system had developed. In this extract ANNP1 got her opiates prescribed ("written up") by a doctor before departing on the transfer. Such a system is possible, as routine pre-transfer data collection will include asking for the current weight of the infant, and this is the key information required to write a prescription. This extract suggests that the sticky label system is still being discussed.

By the time ANNP2 completed drugs and transport training and began attending transfers it appears that the ad-hoc solution, of asking a doctor to write a prescription for opiates before departing on the transfer, had become the established solution, as the next extract from a clinical supervision session with ANNP2 suggests:

Box 7.27 – Opiates prescribed by a doctor before departing on a transfer (from: ANNP2 21.6.01).

ANNP2: So after I pulled the UVC back while I was there because I already had gloves on so we did that and resutured it in at the right position (,) I thought anyway (,) At this point he was not handling at all starting to to de-saturate (,) good air entry bilateral still but still poor chest movement (,) bagged up eventually (,) 100% oxygen ( ) erm was active so we gave a dose of my diamorphine the doctor already prescribed before I left

AJL: Um

ANNP2: And then increased the infusion to 30 mikes ( ) erm he didn’t look quite as good then so I gave bolus of HAS because I thought the perfusion wasn’t good anyway (,) erm then he had a chest x-ray then while (,) yes chest x-ray (,) chest x-ray showed the ET tube was a bit too far down on that one as well
The ad-hoc pre-prescription solution appears to have worked without problems here ("so we gave a dose of my diamorphine the doctor already prescribed before I left"), and the pre-prescription was apparently sufficiently flexible to allow the diamorphine dose to be adjusted in line with clinical assessment ("increased the infusion to 30 mikes\(^1\)).

The sticky label solution never progressed beyond the draft stage outlined above. It appears the ad-hoc solution was sufficiently robust to obviate the need for sticky labels. The sticky labels were discussed as a resource that could be brought to bear on the emergent controlled drugs issue, but they turned out to be a resource that was supplanted by a simple and effective ad-hoc resource.

While controlled drugs were originally included in PGDs (Box 7.20) and appeared unproblematic in practice, the national legislative framework became hostile to this. No data were collected that shed any light on why this might have come about, though one could speculate that broader policy concerns influenced these decisions. In particular the trial of Dr Harold Shipman ran through most of 1999 and there was substantial public and executive concern that opiate drugs had been readily available to a general practitioner who used these to murder his patients (Sweeney, 1999), and this may have been influential.

If a satisfactory solution to the CD problem could not be found it was possible that the transport ANNP community of practice would not have been able to grow and prosper. However, from the minutes of the prescribing group it appears that the possibility of declaring the project to be defunct was never seriously considered. Instead the group persevered in finding repairs to the damage caused to the local regime of competence by the distal influences. Further CoP work was attended to in the emergence of the ad-hoc solution to the CD problem. The solution which was eventually adopted was one that grew from the practice of the new members of the (proposed) CoP, and this is evidence that the CoP was propagating

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\(^1\) "Mikes" is verbal shorthand for micrograms
innovation and working-up specific tools and representations as part of a local regime of competence.

Circulating reference may again be used to explain how the emergent issues and resources were dealt with locally. Boxes 7.20 to 7.27 show that CDs are necessary for transport and that the PGDs were initially thought to be a suitable framework under which they could be initiated by ANNPs. Box 7.23 shows that on 7.8.00 the cover for CDs to be initiated under the PGD framework was withdrawn in response to a change or clarification of the interpretative guidance issued by DH and/or the Home Office. This rendered the connection between two stages in a chain insecure. If the local documents could no longer be reliably traced back to the official guidance and be found to be congruent with that guidance, then the link was broken. In response the local team produced two emergent responses, one planned (sticky labels) and one which arose from practice (pre-prescription by a doctor). It is likely that both responses were sufficient to restore the integrity of the link between interpretative guidance and practice, as both required the signature of a medical practitioner.

The work done by NICU actors in this section has been concerned to repair proximal systems in response to changes in distal advice. Circulating reference shows the importance of the connections and interdependencies between the proximal and distal. Understanding the change that happened over time in this setting may be conceptualised by referring to disruptions to translative links in a chain of circulating reference. The answers found to the controlled drugs problems engaged the energy of the local participants in finding solutions that restored reversible links in chains of circulating reference.
Summary

While this chapter has explored a final group of emergent issues and resources associated with the change to ANNP-led transport it has also been concerned to develop a critique of the CoP framework based on the problem of accounting for issues of scale in CoP. This critique was detailed at the beginning of the chapter and the concept of circulating reference was introduced as an additional tool that would complement the CoP framework by accounting for the interdependencies of the proximal and distal without losing situated contextuality.

Six emergent issues and resources are tracked in the data above. These emergent issues share two characteristics in all being concerned with drugs initiation and also all being issues where proximal and distal concerns appeared to be closely associated with each other. The material presented in this chapter has shown that the issue of drugs initiation by ANNPs is a substantial one and that ongoing work is needed to maintain the system in a state of good repair. Because of the legislative framework which regulates drugs supply and administration, this work to maintain the local system is not optional. The material in this section divided into six emergent issues which related to drugs initiation by ANNPs.

The problem for the ANNPs and for the senior staff of the NICU was to achieve a stable system in an environment which was frequently changing because of distal influences. Using the CoP framework to both account for and study how stability was serially achieved proved problematic, and the problem was the difficulty that CoP has in dealing with changing scales of influence. For example, in the section covering the emergent issue of the sites where ANNPs may practice we saw that the need to discuss and stabilise this issue was driven by diverse distal concerns regarding numbers of junior doctors. Using the CoP framework to account for this we can do several equally unsatisfactory things. First we could simply say that there were some outside (global/distal) influences, but we had no access to them. This does not help elicit the nature of the distal influence. Secondly, we could look to the people or objects that carried the information regarding junior doctor numbers across the boundary into the local CoP, but in this case there was no
clear boundary spanning object or person (see Chapter 6, Section 3), and even if there were, simply showing how the news was brought to the setting does not help us understand how it was given meaning. The third CoP response is to “zoom-out” to study the CoPs which produced the distal guidance, but this does not add to our understanding of the setting with which we are concerned but changes the scale so that we see more of the landscape and less of the detail.

The application of the concept of circulating reference facilitated the reframing of the analytic problem. Circulating reference refocused the practical and research concerns onto the setting where the change was occurring. The problems with CoP outlined above are circumvented by asking how the distal was given meaning in the proximal? This study is concerned with the process of a situated change, with how this process may be represented to others interested in implementing similar changes, and circulating reference ensures that the research focus is kept on the setting of interest. This reclaims the study of the setting from the need to zoom out to the generalities of the wider distal influences by investigating instead how the distal is given meaning locally, and how that meaning is responded to.

Table 7.1 follows the format of the previous chapters in summanising the emergent issues, resources and CoP formation factors that have been identified in this chapter. The next chapter draws together the data from Chapters 4, 5, 6 and 7 to assess the value of the analytic frameworks used, draws conclusions about the change process that has been tracked as two new ANNPs became able to do neonatal transport and places this back in the context of the outcome work from Chapter 2.
Table 7.1 Summary of the emergent issues and resources in chapter seven, with proposed links to factors that support the formation of a new community of practice (Figures 4.1 – 4.3)

<table>
<thead>
<tr>
<th>Issues</th>
<th>Resources</th>
<th>CoP elements</th>
</tr>
</thead>
</table>
| Sites of practice                           | Sites of practice were clarified, to allow drug initiation on the base NICU and labour ward. PGD meeting and written output of that meeting. | Defining the common enterprise  
Definition of a common enterprise.  
Production of a local regime of competence.  
Continuity - reification  
Mutuality - boundaries and entry points. |
| Process for entry to approved personnel list| Interests of the two new ANNPs. Interests of the hospital Interests of the consultant neonatologist  
Creation of a process for entry to the approved list.  
Longer-term trajectory of institutional action. | Managing boundaries and opening peripheries  
Peripherality - entry points and boundary issues  
Continuity - reification |
| Training and assessment                     | Training document production negotiated. Attending to hospital concerns. Interests of the two new ANNPs Interests of the hospital Interests of the consultant Longer-term trajectory of institutional action. | Infrastructure of competence  
Peripherality – ways of belonging to various degrees.  
Continuity – reification  
Continuity - participation  
Competence – tools and artifacts.  
Specific tools |
<table>
<thead>
<tr>
<th>Issues</th>
<th>Resources</th>
<th>CoP elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content of PGDs and the need for updates</td>
<td>NICU treatment guidelines</td>
<td>Tools and artifacts that support competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specific tools</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuity - reification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Production of a local regime of competence, for individuals and institution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competence - knowledgeability of engagement</td>
</tr>
<tr>
<td>Legal framework</td>
<td>Outputs from Department of Health and Home Office</td>
<td>Production of a local regime of competence</td>
</tr>
<tr>
<td>Controlled drugs</td>
<td>Sticky labels and ad-hoc solutions</td>
<td>Production of a local regime of competence</td>
</tr>
<tr>
<td></td>
<td>Consultation exercises</td>
<td>Propagation of innovation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specific tools and representations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Production of a local regime of competence</td>
</tr>
</tbody>
</table>
Chapter 8.

Conclusion: Outcome, process and change at work.

Introduction.

Chapter 2 uses a retrospective evaluation of routinely collected data to comment on two fundamental topics of concern when there is change at work. First the extent to which the new ways of working are as safe or safer for patients as the old. This was investigated by comparing the condition on completion of transport of babies transferred by ANNP and SpR, along with a range of other factors, such as incidence of serious problems with the baby during the journey. Secondly, as well as concluding that ANNP-led transport is as safe as SpR-led, the chapter concludes that this change at work is "practical". The practicality of the change is not supported by quantitative data but by the simple evident fact that the change was made. It is the argument of this thesis that the successful completion of the change was not inevitable, that the process of implementing the change required substantial work in the setting by many people and that the process is therefore as much a topic for investigation as the outcome. By studying the process we answer the next set of questions about practice innovation – how was the innovation accomplished? In what ways was the change made practical? How may others replicate the innovation?

This chapter brings together all the strands of the research with which this thesis has been concerned. Firstly the outcome data from Chapter 2 are reintroduced and this is followed by a summative and evaluative account of Chapters 4, 5, 6, and 7. Those chapters investigated the qualitative data available to produce an understanding of the process of change which led to the new ANNP being able to undertake transport of sick newborn infants. Thirdly the two themes, outcome and process, are placed each in the context of the other in order to make visible their complementarity.
Outcome.

In the broader context of neonatal care in the UK the data in Chapter 2 will be of interest as the first report of ANNPs and transport. It is right that a first report should ask questions about safety for patients. The data presented suggest that ANNП-led transport is as safe as contemporary local standard practice. However, this conclusion needs to be balanced by acknowledgement of limitations.

There is the possibility of both type I and type II errors consequent on sampling technique. Although the groups could be said to be allocated fortuitously, or by chance, to ANNP or SpR-led transfer on the basis of time of referral, there remains a possibility of an intrinsic difference between the groups. A type I error occurs when it is erroneously concluded that there is a difference between the groups, when in fact there is none. For example, we found that there was a difference between the groups for response time, with the ANNPs apparently becoming mobile faster than the SpRs. This may well be a consequence of sampling from groups where their availability for responding is determined by distinctive characteristics outside the control of the individuals in the groups involved. The difference found does not represent an intrinsic feature of either group, and it would be wrong to conclude that ANNPs respond more quickly to transport requests than SpRs.

There is a pre-transfer difference between the groups for pH and PaO₂, suggesting a difference between the ANNP-led and SpR-led groups which might have important implications. If the SpR-led group are less stable than the ANNP-led group in the pre-transfer period it could be argued that the SpR’s had an intrinsically more sick group of babies to transfer which were not directly comparable to the ANNP-led group. Conversely, because this is a retrospective study we do not know if these differences actually reflect differences between the ANNP and SpR-led groups - perhaps the SpRs have worse blood sampling technique leading to baseline tests showing worse results, or perhaps they are
consequent on the SpR-led team taking longer to respond to the request for transfer.

A type ii error, the erroneous conclusion that there is no difference between groups, may arise in underpowered studies. In this case a failure to have sufficient babies enrolled could be masking significant differences between the groups. For example, there were trends in the data that did not achieve significance, such as the increased tendency for SpR's to reintubate babies for transfer and for ANNPs to do more first intubations for transfer. Larger numbers might confirm, or refute these trends.

The generalisability, or external validity, of the study is also of concern. The work of only three ANNPs is assessed, and most of the transfers were done by one of the three. It may be that these three are not representative of the skills of the larger ANNP group. If the Nottingham ANNP group are worse than average then this study may have failed to identify significant benefits for babies that might accrue from the wider adoption of ANNP-led transfer. If they are generally better than average, this might lead to the wider adoption of an intervention that is less safe in the hands of those with more average skills. The same problem is equally possible with the SpRs in the study. The local systems for making SpRs available mean that they are a highly heterogeneous group who each individually do few transfers. In this way they are not representative of potential other models of SpR-led transport provision which use SpRs who are substantially dedicated to transport.

There is a problem in the design of a study where the lead investigator is also part of the group under investigation and this may lead to a number of problems. The data collected may be systematically biased to highlight the self-perceived clinical strengths of the lead investigator. Further, the lead investigator undertakes each transfer in the knowledge that it may later be evaluated as part of a study. Although SpRs may well have been aware that an evaluation was happening, they will not have had the intimate knowledge of the nature of the evaluation that might
have enabled the lead investigator to practice on transports in ways that met criteria for quality in the study.

Despite these limitations, it is clear that 51 babies were transferred by ANNP-led teams and that when compared with SpR-led contemporary transfers those infants completed transfer in equivalent condition. Future research might finesse the design of outcome evaluation further by undertaking a randomised trial, including economic analysis, and subsequent adopters of the ANNP model should consider such studies. However this would not provide us with any basis on which to implement change in different but equivalent settings. In other words, knowing that ANNP-led transport is safe and practical, whilst forming a basis for evidence based practice, does not provide any insight into how to replicate such change in other situations where ANNP-led transport might be taken to be worth implementing. The argument of this thesis is that outcome evaluation should be complemented with a detailed analysis of the process of change. The process evaluation was necessarily presented as a series of densely descriptive chapters which elicit the process as it happened over time. The data sources from which the material was derived proved to be rich and varied. The data were made navigable by being presented as emergent issues and resources and by linking those to the communities of practice framework. However, limitations were found with the CoP framework and a need arose to explain in more detail the relations between the proximal issues of situated competency within the emerging CoP framework and the distal issues within which we might argue that the CoP is contextualised. In raising this contrast the issue is raised of just how the proximal and distal connect, as is the notion that the two are interdependent. The circulating reference model provides a way of identifying and exploring these interdependencies. These issues are discussed in more detail below.
Process

Chapters 4, 5, 6, and 7 sought to build on and extend the data in Chapter 2 by extending the concerns to the process of change at work. For others who are interested in implementing or prospectively evaluating ANNP-led transport, information on process will be of value.

These data were shown first from a baseline perspective at the start of the period of transition (Chapter 4). Subsequent chapters analysed data over the period where the ANNPs became able to do transport from three perspectives, the achieving of clinical competence (Chapter 5), the changes in the system of care (Chapter 6) and the achieving of drug initiation authority (Chapter 7).

The data in this thesis contradict the finding of Woods (2000a) that the orientation of practice reconstruction for advanced practice nurses is always uni-directional to either clinical care or system-of-care. The two ANNPs were clearly engaged in both of these throughout the data presented in Chapters 4 – 7.

Two analytical perspectives were brought to bear on the data. Communities of practice (Wenger, 1998a) was introduced in Chapter 4 and continued as a strand through the remaining chapters. Particular attention was given to marking the emergence of issues or resources which appeared consistent with factors proposed as important in the formation of a new CoP, as there was no existing ANNP CoP which the new ANNPs were joining. These data are summarised in tabular form at the end of each of these chapters. The second perspective was Latour's (1999) concept of circulating reference, which was introduced in Chapter 7. Circulating reference was needed to overcome an analytical limitation of the CoP framework in accounting for the interdependencies of proximal and distal influences. Circulating reference does this by focussing the research on showing how proximal and distal emergent issues and resources are assembled into local context. This makes visible both how the changed perspectives of distal sources are put to work and how change at work is accomplished.
In this section the conclusions of Chapters 4, 5, 6, and 7 are drawn together in order to make visible the components of the change process which were found in the data. In so doing the utility of the communities of practice and circulating reference models are reviewed using the study material and conclusions drawn on their complementarity.

a) Communities of Practice

A key aim of this research is to assess the utility of the CoP framework for both guiding and researching change at work.

In order to make the process of change visible the data from the concluding tables in each of Chapters 4, 5, 6, and 7 have been conflated into Table 8.1 below. Additionally, the tables have been transposed, so that in the left-hand column are the elements proposed as features of the start-up of a new CoP, and the associated emergent issues are in the adjacent column. The column of resources in the earlier chapter’s data has been omitted for simplicity, but the assumption should be made of a link between each emergent issue and its associated resource(s) as was given in the preceding chapters. The material is arranged in order of Wenger’s (1998, pp. 237-8) proposed infrastructure of mutuality, competence and continuity, which are proposed as key for the formation of CoPs, and followed by the elements of the infrastructure of imagination, as reproduced in Figures 4.1, 4.2 and 4.3.

It may be seen in the table below that mutuality, competence and continuity are CoP elements that were found to have been attended to often in the data. In other words, that the work done in the process of change was work that was on a trajectory to the formation of a new CoP. Elements of the infrastructures of imagination and alignment were sought in the data and it may be seen in Table 8.1 that only limited evidence for their mobilisation was found. These were in emergent issues which mapped onto the facilities for imagination of location in time and meaning. The substantial lack of evidence for these elements in the data suggests that they are indeed not a significant part of the start of a new CoP. This
shows that the CoP model may be accurate in suggesting that these facilities are not substantially mobilised until after a CoP has formed, though this was not investigated.

Table 8.1 - Elements in formation of a new CoP and associated emergent issues.
The number in brackets after each emergent issue is the chapter in which that issue is described. To elicit the emergent resources associated with an issue go to the summary table at the end of the relevant chapter.

<table>
<thead>
<tr>
<th>CoP element</th>
<th>Emergent issue (chapter in which it is described)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mutuality</strong> - interactional facilities: physical (and virtual) spaces;</td>
<td>Educational support for transport training is envisaged (4)</td>
</tr>
<tr>
<td>interactive technologies and communication facilities that extend mutual</td>
<td>Financial support for clinical update envisaged (4)</td>
</tr>
<tr>
<td>access in time and space; time for interaction and travel budgets.</td>
<td>Availability of transfers (5)</td>
</tr>
<tr>
<td>Propagation of innovation.</td>
<td>Study leave (6)</td>
</tr>
<tr>
<td></td>
<td>Controlled drugs (7)</td>
</tr>
<tr>
<td><strong>Mutuality</strong> - joint tasks: things to do together, availability for help.</td>
<td>Drug initiation (4)</td>
</tr>
<tr>
<td>The definition of a common enterprise in the process of pursuing it in</td>
<td>Opening access to activities that may support the transition to transport (4)</td>
</tr>
<tr>
<td>concert with others</td>
<td>Multiple and confusing demands on the new ANNPs (4)</td>
</tr>
<tr>
<td></td>
<td>Condition of babies on completion of transfer (5)</td>
</tr>
<tr>
<td></td>
<td>Working pattern (6)</td>
</tr>
<tr>
<td></td>
<td>Junior doctor changes (6)</td>
</tr>
<tr>
<td></td>
<td>How will the NICU use ANNPs? (6)</td>
</tr>
<tr>
<td></td>
<td>Sites of practice (7)</td>
</tr>
</tbody>
</table>

Contd
Mutuality - peripherality: boundary encounters; ways of belonging to various degrees, peripheral participation, entry points; observation, casual encounters, open houses. The opening of peripheries that allow for various degrees of engagement.

Exclusions to drugs protocols (4)  
Access to clinical experience (4)  
Opening access to activities that may support the transition to transport (4)  
Availability of transfers (5)  
Technical competence at clinical procedures (5)  
Performing procedures in context (5)  
Organisational structure (Hierarchy and accountability of ANNPs) (6)  
Sites of practice (7)  
Process for entry to approved personnel list (7)  
Training and assessment (7)

Competence - initiative and knowledgeability. activities that bring about the knowledgeability of engagement, occasions for applying skills, devising solutions and making decisions, problems that engage energy, creativity and inventiveness.

Drug initiation (4)  
Opening access to activities that may support the transition to transport (4)  
Availability of transfers (5)  
Equipment (5)  
Technical competence at clinical procedures (5)  
Performing procedures in context (5)  
Content of PGDs and the need for updates (7)  

Contd.
**Competence** - accountability: occasions for exercising judgement and for mutual evaluation; recognisable style; negotiation of joint enterprises.
Local regime of competence.

- Note and record-keeping (5)
- Availability of transfers (5)
- Condition of babies on completion of transfer (5)
- Equipment (5)
- Audit (6)
- Sites of practice (7)
- Content of PGDs and the need for updates (7)
- Legal framework (7)
- Controlled drugs (7)

**Competence** - tools: artifacts that support competence; (shared) discourses, terms and concepts; delegation facilities

- Note and record-keeping (5)
- Equipment (5)
- Condition of babies on completion of transfer (5)
- Training and assessment (7)
- Content of PGDs and the need for updates (7)
- Controlled drugs (7)

**Continuity** - reificative memory: repositories of information, documentation, and tracking; retrieval mechanisms.

- Drug initiation (4)
- Note and record-keeping (5)
- Condition of babies on completion of transfer (5)
- Sites of practice (7)
- Process for entry to an approved personnel list (7)
- Training and assessment (7)
- Content of PGDs and the need for updates (7)

Contd
**Continuity - participative memory:**
generational encounters, apprenticeship systems; paradigmatic trajectories; storytelling.

Drugs initiation (4)
Educational support for transport training is envisaged (4)
Note and record-keeping (5)
Condition of babies on completion of transfer (5)
Equipment (5)
Technical competence at clinical procedures (5)
Performing procedures in context (5)
Organisational structure (Hierarchy and accountability of ANNP) (6)
Retention (6)
Training and assessment (7)

---

**Imagination - Orientation**

1. location in space - reification of constellations, maps and other visualisation tools, open spaces.

2. location in time: long term trajectories, lore, museums

Multiple and confusing demands on the new ANNP (4)
Working pattern (6)
How will the NICU use ANNP? (6)
Organisational structure (Hierarchy and accountability of ANNP) (6)

3. location in meaning: explanations, stones, examples

4. location in power: organisational charts, process, transparency

Condition of babies on completion of transfer (5)
Imagination - Reflection – models and representations of patterns; facilities for comparisons with other practices; retreats, time off, conversations, sabbaticals and other breaks in rhythm

Educational support for transport training is envisaged (4)

Audit (6)

Imagination - Exploration – opportunities and tools for trying things out; envisioning possible futures and possible trajectories

Drug initiation (4)

Interpreting the detail in this table requires reference back to the original chapters. For example, if we are interested in elements of the infrastructure of continuity via reflexive memory or connections, the table lists seven emergent issues which had relevance to this. Each of these may be traced back to the data. The issue of sites of practice, for example, is referred back to Chapter 7, specifically back to the table (Table 7.1) at the end of the chapter. In Table 7.1 it shows that the emergent issue of sites of practice was associated with emergent resources of clarification of sites of practice "to allow drug initiation on the base NICU and labour ward" and also with a "PGD meeting and the written output of that meeting". These in turn may be traced back to the data in Boxes 7.1 to 7.3. This is a chain of circulating reference, and also an example of amplification and reduction (Figure 7.3). Table 8.1 is data reduced from Tables 4.1, 5.2, 6.1, and 7.1, which were in turn reductions from the data in their respective chapters. Detail of what was said at meetings and written in documents has been lost in the chains of translations to Table 8.1. At the same time there has been amplification of compatibility, standardisation and relative universality. This is gain of the ability to see more by seeing less, and is analogous to the steps in Chapter 2 where data on many infants were mathematically summarised in steps which lost detail but gained the ability to compare.
From this we may conclude that, based on data from a clinical setting, the engagement-focused CoP model is able to account for the emergent issues and resources which were found in an investigation of the change process. There were no categories of emergent issues or resources which were not able to be mapped to the CoP model.

The framework for the start up of a new CoP may be of use to others. For those responsible for implementation of change at work where that change requires the engagement of a community of people the CoP framework provides a useful and broad-based guide to facilitating that engagement. In the ANNP-led transfer sphere new implementers will have access to the detail of the process of the change in one setting. The utility of CoP in this sense is worthy of prospective investigation, where the relative importance of the various elements could be investigated, along with implementation issues.

For researchers concerned with situated workplace change CoP has attractive qualities. Where the process of change at work is the topic of research and where the changes involve how workplace groups engage with the work to be done, then looking at the presence, absence, formation and dissolution of CoPs may give structure and an analytical handle on the research material.

This study found the weakness of CoP to be in the ability to account for how distal influence is assembled proximally, and this led to the addition to the analysis of the concept of circulating reference.

2. Circulating Reference

While a strength of the CoP concept is that it is rooted in readily recognisable midlevel workplace settings (Wenger, 1998c, p. 124) this is also a weakness when the concern is to show how those settings make sense of relevant activity beyond the boundaries of the CoP. While Wenger argues that this is dealt with by people and objects that cross boundaries (Wenger, 1998f, p. 247), the data in Chapters 6
and 7 show that merely crossing boundaries is not enough. Circulating reference is able to show that what matters in the setting is how meaning is assembled locally, and this is understood by reference to chains of translations.

This is of practical importance, as this concept lays bare what should be a critical topic of concern for policy-makers at all levels, that the meanings of their inscriptions and pronouncements are always a matter for local debate and interpretation. For example, when the Department of Health issues more guidance on circumstances under which nurses may or may not initiate drugs therapies, then this guidance is subject to local scrutiny and interpretation. This interpretation translates the DH document into practice according to local factors, and people in the setting negotiate what the meaning is and how it should be given local context.

Being mindful that meanings are assembled in local context is also important for workers in settings, as they will need many of the facilities of mutuality ("interactional facilities. physical (and virtual) spaces; interactive technologies and communication facilities that extend mutual access in time and space; time for interaction" (Wenger, 1998e, pp. 237-8) in order that space is made for that work to be done.

Circulating reference was also found to be widely resonant with the work of a clinical setting, as a way of understanding how the translations through, for example clinical findings to assessment to response may be constructed to ensure a chain which is robust. This has much in common with the principle of reliability in the assessment of tests and investigations. A measurement is said to be reliable if it may be repeated with little variation (Broughton Pipkin, 1984), that is that the measurement is an accurate and repeatable reflection of the physiological parameter. Circulating reference extends the notion of reliability away from the "test" in both directions and makes clear that the researcher or auditor or clinician has to give attention to both what conditions or translations led to the test result as well as what further secure translative actions should proceed as a result of the test.
This leads to the conclusion that the concept of circulating reference has broad applications in many settings, from clinical practice to reductive research to understanding the social.

3. Process conclusions

Some questions were proposed at the end of Chapter 2 as representing the "process" concerns which led-on from the outcome-focussed evaluation. These were proposed as the kinds of questions that other NICUs interested in implementing ANNP-led transport might ask and they may now be re-examined. The questions were:

a) What issues might emerge in our institution during the change? What must we attend to in our centre to make this possible?
b) Who should be involved in making this change happen? What facilitates the processes of this change?
c) What kind of robust structures will support people involved in the process?
d) How should we educate people for this new challenge? How do we support new ANNPs to become competent in transport?

The issues that emerged and were attended to during this process of change have been thoroughly elicited in Chapters 4-7, and are summarised in Tables 4.1, 5.2, 6.1 and 7.1. In terms of who should be involved in the change process, these data show that involving both senior staff of the neonatal unit/hospital and the individuals around whom the change is focussed appeared to facilitate change. There are a complex set of interdependencies between these groups seen in the data, and neither group can make the change happen without the active support and involvement of the other. Table 8.1 shows that by reducing the fine-grained detail of the highly locally situated discussions and documents which are represented in the emergent issues, the complementary process of amplification has produced a summary which may be mapped onto the CoP framework. This suggests that in the first instance further adopters of ANNP-led transport seeking
robust structures to support the change process should take a broad view of how
the identification and resolution of issues in clinical competence, system of care
and drugs initiation may be facilitated by attention to elements of the
infrastructures of mutuality, competence and continuity.

The data have shown that the details of the process of making the practice
innovation happen are situated in local contexts. When an issue emerges the
calculation of what response to make is negotiated according to local or individual
factors. While this means that the findings from one centre are not generalisable in
terms of the detailed precise discussions and responses, it also means that
implementers of projects should become explicitly aware of their own local
details and be prepared to negotiate local responses in that light. This means
that in terms of the answers to the questions there is no simple recipe which, if
precisely followed will lead to ANNP-led transport. Instead there is a framework,
from CoP, and an underpinning foundation from circulating reference that makes
clear that change and response to change is situated in the local negotiation of
meaning. Summary advice for implementers of ANNP projects is in Appendix 3.

This thesis proposes a view of educating and supporting people for the challenge
of ANNP-led transport which is based on situated learning and is one-step
removed from courses and qualifications. This is not because courses, such as the
ANNP course undertaken by the new ANNPs, are unimportant but that their value
is in providing foundations for the subsequent situated learning of how to do the
job. Learning to account for the multiple complex factors which might influence
whether to replace the breathing tube of a baby for transfer is situated learning
and this may be facilitated and organised by supporting engagement through
infrastructures of mutuality, competence and continuity. For example, from
mutuality the possibility for peripheral participation, from competence the
opportunity to exercise judgement and from continuity the generational encounter
with “old hands”. It may be that using the concept of circulating reference as an
explicit model for learning how clinical findings, test results, assessments and
plans are related to each other is worthy of further evaluation and prospective
investigation.
Change at work

The title of this thesis has a deliberate ambiguity. It is intended to express interests in both change in the workplace and change as the topic of concern which is mobilised for action.

In Chapter 2 the outcome of the change was the topic of investigation. The data suggest that whether transfers are led by ANNPs or SpRs infants complete the journey in equivalent condition. This chapter deals with change by displaying an end result.

Chapters 4 - 7 are concerned with the process of change, and the communities of practice framework accounts for how the setting made possible the practice innovation which was evaluated in Chapter 2. Circulating reference was added to the analysis in Chapter 7 and this shows how dealing with the interdependencies of proximal and distal was key to achieving the situated change. It shows that dealing with change, whether that is in the form of drugs guidance from the government or a baby with evolving breathing problems, is done by people in the setting who are able to put that change into a context of circulating reference. Learning to do the job is learning to assemble robust chains of circulating reference.

These illustrate the final argument of this thesis, that the approaches to research used are complementary. By using quantitative and qualitative methodologies to interrogate outcome as well as process a richer understanding has been gained of the change to ANNPin-lead transport. The tie which binds the research approaches is circulating reference. As an explanatory or modelling tool it is evident in the outcome data in the hundreds or thousands of discrete physiological events which were translated into measurements that were recorded and later aggregated together which eventually became a number in a table of results. The quality of the links in the translatable chain is the determinant of the reliability of the data output.
While Wenger (1998c, p. 131) says that we "can develop new ways of participating in the global, but we do not engage with it", this work has shown quite the contrary in a rich set of engagements of proximal and distal. This does not, paradoxically, make Wenger wrong; what this study shows is that the circulating reference concept does away with the problem of scale which was built in to the CoP framework and allows us to see how the local/proximal engages with the global/distal. In this way circulating reference and communities of practice are fundamentally complementary.

Circulation of reference is also in Table 8.1 above and the chain of links back to the data which this allows, as described above. It is there too in clinical practice when clinicians trying to make good clinical records that include an impression as a summary of what they think is the current clinical situation. The goal is a record which is an accurate translation of the many strands of information into a plan for action. The "impression" makes the translation clear. Circulating reference is also to be found wherever people in settings deal with change. When the great and the good declare that neonatal care must only be delivered by "trained" personnel, this distal guidance is brought into the setting and translated into locally situated assessments, plans and actions.

What this thesis has shown is that learning to do any of these things, research, clinical care or system of care work, is a matter of understanding the translations in the chains of circulating reference that matter in the setting and make the setting matter.
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Appendix 1.

Glossary of Abbreviations.

Below is an alphabetical list of common abbreviations found in the text, with their derivation and an explanation, if needed.

AJL – me, in transcripts.

ANP – Advanced Nurse Practitioner. This is a generic term which may apply to nurses in any area of practice who are recognised to be working at "advanced" level.

ANNP – Advanced Neonatal Nurse Practitioner. As ANP above, but specifically neonatal nursing.

BM – Business Manager, in transcripts.

CN – Consultant Neonatologist, in transcripts.

CN2 and CN3 – Other Consultant Neonatologists.

CRM – Clinical Risk Management (committee) This committee represents the hospital board in risk matters.

DH/DoH – Department of Health.

HCP – Hospital Chief Pharmacist.

IV – Intravenous Route for drug administration.

IM – Intramuscular Route for drug administration.
NALS/NLS – Newborn life support course.

NICU – Neonatal Intensive Care Unit

PGD – Patient group direction. A document produced locally which supports the initiation of prescription medicines by ANNP s for infants in their care.

PICU – Paediatric Intensive Care Unit.

Prof. – Professor.

SHO – Senior House Officer. This is a training-grade of doctor. The most junior grade of doctor routinely employed on neonatal units.

SpR – Specialist Registrar. Like the SHO, this is a training grade, but this group have further experience and will be specialising in paediatrics.

TINA – Proprietary name for a brand of transcutaneous oxygen monitor.

TN – Transport nurse, in transcripts.

UAC – Umbilical artery catheter. Newborn infants are unique in having ready access to their circulation available via the umbilical cord. A UAC is a tube inserted into the umbilical artery in order to monitor blood gases and blood pressure.

UVC – Umbilical vein catheter. Similar to UAC, but inserted into the umbilical vein. Used to infuse drugs and fluids.
Appendix 2.

Audit form.

On the next two pages are reproduced the audit forms used by the transport service. They are normally printed back-to-back and are completed contemporaneously, usually by the transport nurse, as the transfer unfolds. These were used to generate the data summarised in Chapter 2 and in the discussions at clinical supervision meetings in Chapters 4-7.
Nottingham Neonatal Emergency Transport Service - Audit Form

Baby:

<table>
<thead>
<tr>
<th>Name</th>
<th>CHN number.</th>
<th>QMC number</th>
<th>Birth weight</th>
<th>Weight at transfer.</th>
</tr>
</thead>
</table>

Date | D O B | Gestation at birth | Date | IDOB |

Baby moved from: | Baby moved to: |

Unit | Hospital | Unit | Hospital |

Journey:

5. Arrival at referring unit | 6. Departure | 7. Arrival at destination |

Further times

| Baby attended by team but not transferred | Baby died in transit |

Please explain any delays apparent from the times given

Personnel/ Family/ Diagnosis:

<table>
<thead>
<tr>
<th>Transport Nurse</th>
<th>Doctor/ANNP:</th>
<th>Grade of doctor</th>
</tr>
</thead>
</table>

| Learner(s) (Name and type of learner) | |

Mother seen? | Y/N | Father seen? | Y/N | Video seen? | Y/N | Babyfax given? | Y/N |

Reason for transfer

Appropriate? | Y/N |

Procedures:

<table>
<thead>
<tr>
<th>1st Intubation</th>
<th>Extubation</th>
<th>Reintubation</th>
<th>Surfactant</th>
<th>UAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral art line</td>
<td>UVC</td>
<td>Chest needed</td>
<td>Blood culture</td>
<td>Antibiotics</td>
</tr>
<tr>
<td>Sedation</td>
<td>Muscle relaxation</td>
<td>Inotropes</td>
<td>CPR</td>
<td>ETT Suction</td>
</tr>
<tr>
<td>Blood gas (n=)</td>
<td>X-Ray (n=)</td>
<td>Chest drains (n=)</td>
<td>IV Cannula (n=)</td>
<td></td>
</tr>
</tbody>
</table>

Transport Score:

Please complete score one on arrival at the referring unit, before you intervene. If possible, do a second score before departure to reflect how the stabilising period has gone. Score three should be completed when the baby is settled in a static incubator at the end of the journey. If only capillary pO₂ is available, record the TINA and saturation readings.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Blood Glucose</td>
<td>&lt;1 3</td>
<td>1 3 - 2 2 or &gt;9 7</td>
</tr>
<tr>
<td>2 Systolic Blood Pressure</td>
<td>&lt;30</td>
<td>30-40</td>
</tr>
<tr>
<td>3. pH</td>
<td>&lt;7 2 or &gt;7 5</td>
<td>7 2 - 7 29 or 7 46 - 7 5</td>
</tr>
<tr>
<td>4 pO₂</td>
<td>&lt;5 3</td>
<td>5 3 - 6 5 or &gt;13</td>
</tr>
<tr>
<td>5 Temperature</td>
<td>&lt;38 1 or &gt;37 6</td>
<td>38 1 - 38 5 or 37 3 - 37 6</td>
</tr>
</tbody>
</table>

Score one: | 1/ | 2/ | 3/ | 4/ | 5/ | TOTAL |
| Actual values: | 1/ | 2/ | 3/ | 4/ | 5/ |

Score two: | 1/ | 2/ | 3/ | 4/ | 5/ | TOTAL |
| Actual values: | 1/ | 2/ | 3/ | 4/ | 5/ |

Score three: | 1/ | 2/ | 3/ | 4/ | 5/ | TOTAL |
| Actual values: | 1/ | 2/ | 3/ | 4/ | 5/ |
# In Transit

## Equipment & monitoring:
Tick any of these items used during transfer

<table>
<thead>
<tr>
<th>Item</th>
<th>ECG</th>
<th>Venilator</th>
<th>INCA CPAP</th>
<th>Prong CPAP/IMV</th>
<th>Humid-vent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>Pulse-oximeter</td>
<td>Arterial BP</td>
<td>Dinamap BP</td>
<td>O₂ analyzer</td>
<td></td>
</tr>
<tr>
<td>Temp probe</td>
<td>SureTemp</td>
<td></td>
<td>TINA (no ABG cal)</td>
<td>TINA (pO₂ cal)</td>
<td>TINA (pCO₂ cal)</td>
</tr>
<tr>
<td>Vehicle call-code</td>
<td>Graseby pump</td>
<td>System 1 or 2</td>
<td>Nitric Oxide</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## I.V. and I.A. fluids and drugs required in transit
Please tick:

<table>
<thead>
<tr>
<th>Fluids</th>
<th>Other infusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance fluids</td>
<td></td>
</tr>
<tr>
<td>10% Glucose</td>
<td>Heparnised Saline</td>
</tr>
<tr>
<td>15% Glucose</td>
<td>Diamorphine</td>
</tr>
<tr>
<td>5% Glucose</td>
<td>Midazolam</td>
</tr>
<tr>
<td>Other</td>
<td>Sodium bicarbonate</td>
</tr>
<tr>
<td>10% Glucose &amp; 0.18% Saline</td>
<td>Dobutamine</td>
</tr>
<tr>
<td>4% Glucose &amp; 0.18% Saline</td>
<td>Morphine</td>
</tr>
<tr>
<td>5% Glucose</td>
<td>Tolazoline</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

## Respiratory support:

<table>
<thead>
<tr>
<th>Mode</th>
<th>PIP</th>
<th>PEEP/CPAP</th>
<th>BPM</th>
<th>FiO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of journey</td>
<td>Mode</td>
<td>PIP:</td>
<td>PEEP/CPAP</td>
<td>BPM</td>
</tr>
<tr>
<td>End of journey</td>
<td>Mode</td>
<td>PIP:</td>
<td>PEEP/CPAP</td>
<td>BPM</td>
</tr>
<tr>
<td>Maximum settings</td>
<td>Mode</td>
<td>PIP:</td>
<td>PEEP/CPAP</td>
<td>BPM</td>
</tr>
</tbody>
</table>

## Problems:

Did any equipment fail, or give problems?

Were there any problems with the baby in transit?

Action taken

Please phone other units for final scores if necessary

**IMPORTANT:** Check this form is complete before filing - a mark in every box
Appendix 3.

Summary guidance for implementation of ANNP projects.

Rooted in the findings of this research, the guidance below may be helpful in implementing ANNP-led neonatal transport and other ANNP projects.

• ANNP projects require the committed and active support of ANNPs, consultants, managers and others, such as pharmacists.
• Create spaces for these groups to come together to formulate responses to emergent issues.
• Be clear about the central goal of the project, so that all concerned are jointly oriented toward the same outcome.
• Ensure the availability of access for ANNPs to the desired clinical settings.
• Provide expert supervision for ANNPs in these clinical settings.
• Create spaces for reflective discussion by ANNPs on clinical issues with experienced personnel.
• Drug initiation will be a persistent problem requiring multidisciplinary senior support.
• Define local competence according to measurable standards, and audit these.
• Make clear the place of ANNPs in the organisation. Provide clear leadership.
• The communities of practice framework offers a rounded and comprehensive model to structure the approach to implementation. Consider the elements of the framework and how these map onto local circumstances and issues.
• Use circulating reference as a tool for understanding how the project relates to influences from different sources and thus how responses to those influences should be formulated. Be aware of specific local and other contexts.
• Use circulating reference as a tool for teaching and learning about how to make secure clinical and managerial decisions.