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AN INTERPRETATION OF TEACHING AND LEARNING IN APPRENTICESHIP

Morag M Macdonald

B.A., M.Ed.

submitted to The Open University for the degree of

Ph.D
Institute of Educational Technology

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UnRESTRICTED

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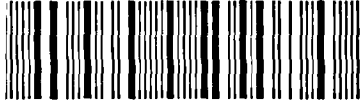Date of award 2nd April 1998

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ABSTRACT

The diagnosis and management of patients requires professional know-how or medical craft knowledge. To explain how this knowledge is acquired, this research asked 'How do medical experts pass on their craft?' Other questions arose through successive data collections and progressive focusing on what medical experts did well in their work and teaching. The programme comprised: pilot interviews with three expert physicians; a case study in a hospital medical unit; and paired consultant/SHO interviews. Participant observation, interviews, and expert-novice comparisons explored clinical work, teaching, and learning in apprenticeship.

Data analysis of participants' responses and ward round discussions allowed identified categories to cluster within three inter-related constructs instrumental to the acquisition of medical knowledge: gaining experience in the experiential process of clinical practice (1); and the products of experience which manifest as experts' clinical expertise (2) and teaching/learning expertise (3). These constructs can be located within a model of apprenticeship based on Spady's (1973) analysis of authority in effective teaching containing two frames of reference: the social, 'traditional-legal'; and the individual , 'expert-charismatic'. The medical apprenticeship is associated with similar perspectives: the 'traditional-experiential' represents the professional process of learning through patient care with its infrastructure of clinical methods in presentation, discourse, and commentary; and the 'expert-charismatic' represents clinical and teaching expertise coupled with vocational enthusiasm.

Experienced experts synthesised two repertoires of knowledge and skills derived from the craft knowledge of medicine and pedagogy, respectively. Both crafts are required for effective clinical education. While apprenticeship accommodates a range of teaching/learning experiences, in postgraduate education experts pass on knowledge through the deliberate engagement of junior doctors in diagnosis and management. The skills involved in this process were largely unrecognised by most senior and junior doctors and were not perceived as 'clinical teaching' although learning was structured through service-based work.

ACKNOWLEDGEMENTS

CONVENTIONS

1. The pilot interviewees are identified by the interviewee's speciality:

   CH   Professor in Child Health
   GP   Professor in General Practice
   GM   Consultant in General Medicine

2. The case study interviewees are identified by their grade prefix:

   CE (Consultant Expert), or C   Consultant
   Senior House Officer   SHO
   HO   House Officer
   UG3.1; UG3.2; UG3.3   Phase Three undergraduates
   UG2.1   Phase Two undergraduate

   The data are identified in the order of their respective interviews; eg: C1, C2, refer to the first and second consultant interviews; SHO1 refers to the first interview with the SHO.

3. The case study coding was designed to use the same code plus the grade prefix:

   eg: Attitude   =   ATT
         Learning   =   LEA
         SHOATTLEA   =   SHO attitude to learning
         HOATTLEA   =   HO attitude to learning

4. All quotations from the case study are identified by the appropriate interview prefix and the numbered lines of the *Ethnograph* programme:

   eg: Quotation 'SHO2 241-255' applies to the second SHO interview, and from lines 241-255 of the numbered or coded transcript.

5. Quotations and data as evidence from the six consultant interviewees in the interview study are referred to by the numbers indicating the numerical order in which the interview took place and the letter A, thus giving 1A; 2A; 3A; 4A; 5A; 6A. Quotations are also identified by the numbered transcript lines and, where appropriate, the position on the transcript. Their respective SHOs are referred to by the corresponding number and the letter B to give 1B; 2B; 3B; 4B; 5B; 6B. N, or Nse is used for 'nurse'.

   eg: Quotation '1A 52-54' applies to the first consultant in the interview study and is from the specified lines in his interview. In Appendix D, where there is insufficient space to include all line references, several references are separated by a semi-colon.

6. Transcribed working tapes were identified as WT1, WT2, WT3 and the line numbers as above.

7. Field Notes are identified as FN and the observation date.

8. The validators were given the prefixes MEV, Medical Education validator; and CV1 and CV2, first and second clinical validators respectively.

9. Round brackets ( ) are used in two ways throughout the thesis: for researcher clarification of interviewees' comments; and to query drugs or unclear clinical details.

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LIST OF DIAGRAMS AND TABLES

THE PROBLEM

It is widely accepted that undergraduate and postgraduate medical education are delivered by formal and informal teaching methods; and that medical experts pass on their professional know-how to novice clinicians within apprenticeship and on-the-job learning. Yet, while the parameters of formal teaching are well defined (3.3.3 below), and their often didactic approaches appreciated, both informal teaching, and apprenticeship as a learning model, lack in-depth analysis. There is insufficient information about how the young doctor develops as a professional. Compounding this lack of understanding in the medical education process, informal teaching and apprenticeship are under attack as appropriate means to learn medicine since they are currently subject to numerous pressures. These include: changes in work practices; new training procedures; demands on staff to meet service commitments; and evolving patterns of health care. This research does not set out to justify informal over formal methods since both have their place, but there is a sharp distinction between the skills involved in each form of teaching. For example, lecturing, tutorial, and didactic clinical skills teaching differ from individual approaches towards supervision and safeguarding patients. The argument is that substantially different explanations of valued, but implicit, informal apprenticeship teaching/learning activities need to be made explicit. This was the research task.

The chosen methodology was to apply previously successful classroom craft knowledge (CK) research methods to generate descriptions of valued, senior physicians' experience and expertise in their approaches and attitudes towards work and clinical teaching; and how they initiated less experienced clinicians and students to the tasks of interacting with, diagnosing, and managing patients. In the research process, the CK of medicine and the CK of teaching are defined and their relationships explained. Apprenticeship is shown to be a comprehensive, flexible learning model in which experiential learning can be exploited and managed provided senior clinicians possess, and deploy, a full range of clinical, and teaching, experience and expertise to the learner's advantage. Recommendations are made for future educational improvements in medical education.

CHAPTER ONE

APPRENTICESHIP IN MEDICINE

1.1 The research question

This thesis sets out to provide explanations and descriptions of apprentice learning by asking the question 'How do medical experts pass on their craft?' Focusing initially on both undergraduate (UG) and postgraduate (PG) fields, but subsequently on the latter period, the research seeks to describe how the professional knowledge of medical practice is passed on from experienced to less experienced individuals. The following commonsense, historical definitions which are adopted in this research, provide a helpful orientation: 'Apprentice: is a person bound by formal agreement to a skilled person to learn a craft or trade; a novice; and apprenticeship: the state of an apprentice; a time of training for a trade, or for any activity' (The Chambers Dictionary 1994). These basic definitions are relevant since both medical students and qualified practitioners are bound by university agreements or job contracts respectively, and both learn from their skilled superiors.

The literature review, structured in four chapters, is largely based on the three elements in the thesis title: apprenticeship; Craft knowledge (CK); and medical teaching and learning. The review is not intended as an in-depth critique of these elements. It serves two main functions: to introduce the concepts necessary to understand clinical teaching; and to substantiate the argument that current explanations and descriptions of both it and apprenticeship are inadequate - hence the reason for this study. Specific questions, which the research is designed to answer, are raised at the end of each chapter.

The first chapter introduces both traditional and contemporary perspectives on apprenticeship as the accepted, but largely taken-for-granted, learning model in medical education. The model applies to medicine and surgery, although it will become clear that in general, more detailed information appears to be available on surgical apprentices. Chapter Two presents the concepts and theories of CK research in general teaching and introduces the work of theorists who have realised new interpretations and explanations of professional practices. Learning from experience and learning from experts' expertise are emphasised. Chapter Three deals with the clinical environment and previous research into clinical

teaching. While, in the UG field, effective clinical teaching has largely been explored using quantitative measures with limited (as perceived by this researcher) results, new hybrid methodologies in both UG and PG areas have begun to offer new interpretations of clinical teaching and learning. Chapter Four introduces the sociological and psychological concepts and background required for the emergent theories and descriptions of this study.

1.2   An historical perspective on apprenticeship

1.2.1   Early clinical traditions

Interpretations of early cave paintings with dancing figures or shamans have led to hypotheses that prehistoric people practised and passed on the cult of healing. Evidence of surgical skills or magical arts is demonstrated in trephined skulls from the Neolithic period, 10,000-7,000 BC. In early Egyptian medicine, the pharmacological action of drugs, including emetics, diuretics, sedatives, stimulants and pain relievers also appears to have been well known.

At that time, these forms of knowledge were invested in 'Imhotep', the physician, priest and court official of early Egyptian medicine. He was a master in all fields of learning and the forerunner of priests who practised therapeutic methods including anointing with holy water, healing baths, and the use of silence and suggestion (Mason and McCall Smith 1991; Magner 1992).

A form of psychotherapeutic temple medicine existed in early Greece. Pilgrims based their treatment on rational thought which used spiritual healing, herbs, and dietetics (Ibanez 1965). The gods, from whom emanated the other 'scientific' sources or wisdom to practise medicine, supplied the supernatural or mythical elements (Kudlein 1968). This author informs us that:

> If medicine was a manual work, a craft, the physician was like a 'tekton' and could be named. The source of his learning was therefore merely an empirical one. But in so far as his knowledge, be it a technical or theoretical one, tended to become a science, there was something irrational involved, for the gods alone possessed an infallible science, that is, a 'wisdom' or 'sophia' (*ibid.* p.3).

The fifth- and sixth-century Greek physician belonged to the class of craftsmen, although there was clear differentiation between itinerant craftsmen who possessed enhanced status due to the national emphasis on health, and the sacred physician (Lyons and Petrucelli 1978). Thus, even at that time, the division between science and craft existed.

The same source informs us that physicians came mainly from the aristocracy and that:

> The training system was by apprenticeship, and apparently for a fee the neophyte received instruction, participated in the care of patients, assisted and nursed as needed, and performed menial tasks in maintaining the equipment as required by the teacher (*ibid.*, p.196).

Later, the teaching of Hippocrates in 460 BC left posterity a patient-centred approach to medicine, a method of cataloguing case histories based on observation and biological frameworks, and an image of a humane, ethical practitioner with a healing mission (Ibanez 1965). Hippocrates shares his fame and time with Asclepius who was elevated to the status of a god. Cures for conditions such as arthritis, gout, migraine, impotence and infertility were believed attainable at the temples of Asclepius, the sources of healing. The daughters of Asclepius, Hygeia (hygiene), Panacea (cure-all) and Telesphorus (convalescence) were often portrayed in his presence (Pollack 1963).

In ancient Greece, learning was in the oral tradition of dialectics, commentary, argument, and disputation with information passed on from father to son. 'Questio', or question and answer, was part of the learning process (Talbot 1970). The 'art' of medicine as developed from the Hippocratic 'Cos' school grew from success remembered, descriptions registered, the recognition of physical signs by exposing the sick, and reasoning (Wartman 1961).

The Greek tradition reached a peak of perfection in the work of Galen (d. ca AD 200) who synthesised his native heritage of medicine and integrated learning in anatomy, physiology, pathology, symptomatology, hygiene, and therapy. He confirmed the teaching of Hippocrates and the belief that physicians were also philosophers (Saraisi 1990).

Saraisi (*ibid.*), writing of Medieval and Renaissance medicine, accords the latter a unique place in the history of early western European science and technology. Its history not only enlightens broad societal mores and cultural patterns of the period, but its inheritance and influences extended to the mid-seventeenth century and the discoveries of Harvey. Apparently, reconciliation of the theoretical and practical aspects surrounding medical practice has always proved both elusive and problematical:

> Medicine, just as much as natural philosophy and astronomy, fully shared in the western medieval recovery of Greek, and reception of Arabic, learning; but, unlike natural philosophy, medicine embraced both high culture and techniques. The relation between the learned and the technical or craft aspects of medicine was often uneasy and ambiguous but always present (*ibid.* p.ix).

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The effects of introducing medicine to the university curricula of the Middle Ages and the Renaissance were profound. Saraisi found that traditionally, expertise consisted of practical skills and cognitive knowledge:

> University curricula systematised the transmission and reinforced the authority of a body of medical books, concepts, and techniques that provided the basis for medical practices and beliefs broadly disseminated throughout society ... Because medicine was at once a system of explanation and a set of techniques, the acquisition of medical expertise was both an intellectual enterprise and a process of gaining skills (*ibid.* pp.48-49).

Talbot (1970) perceived the detrimental effects of these developments on medical education, which during the Middle Ages and long after the Renaissance, consisted of learning set texts based on Galen's principles with little change in philosophy or procedures. Indeed 'the training of the candidates for the medical profession lay untouched, like some antiquated fossil buried beneath layers of tradition and an inert mass of indifference' (*ibid.* p.85).

1.2.2 The development of clinical teaching

Clinical teaching as we know it today is said to have originated in Leyden in the late seventeenth century under the guidance of Herman Boerhaave (1668-1738) who developed a form of teaching which linked medical and surgical studies to the treatment of hospital patients. A gifted teacher, he was also apparently responsible for introducing biochemistry into the curriculum, teaching to appropriate levels, and placing emphasis on clinical signs (Lindeboom 1968; Blackden 1982).

Implicit in Boerhaave's teaching is the pursuit of the apprentice system in which a medical student acquires the necessary theoretical and practical knowledge to practise the craft of medicine from a master. The system had many advantages. Apart from the actual on-the-job training, the master and the apprentice took on mutual responsibilities and adopted a code of conduct towards each other. Sixteenth-century indentures carried strict rules about dress and behaviour, even the wearing of beards! (Franklin 1955).

Historical records in the form of apprentice books at the Barber Surgeons' Hall in London date from 1657. An earlier folio from 1603 shows that masters at that time had to present their apprentices and pay a fee of 2/6d. A minister paid £262 10s in 1719 for his son's apprenticeship. Registers recorded the parental occupation and miscellaneous details in Latin, including the length of the apprenticeship, usually seven years. Even then, the length of training was arduous (RRJ, *British Medical Journal*, 1944).

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Researching seventeenth-century medical education in Edinburgh, Dingwall (1994) dates the structured training of surgeons to the 'Seal of Cause' accorded to them by James IV in 1506. However, only fragmentary information exists on contemporary physician training apart from the certainty that they studied in the Low Countries after an initial Master of Arts degree taken at home:

> The physicians who treated the sick in seventeenth- and early eighteenth-century Edinburgh pose a considerable challenge to the historian. There was no organised or corporate structure till 1681, and therefore, no centralised records and little information on training or subsequent practice exist (p.99 *ibid*).

Lane (1985) surveyed the careers of the eighteenth century surgeon-apothecaries and their apprentices in England. At this time, physicians, all university educated, were not apprenticed. In Hereford General Hospital in 1776, each surgeon-apothecary was allowed two pupils, receiving 'a satisfactory gratuity for their instruction' (p.86). They could only dress a patient under supervision and they could not operate. These limitations and strict controls permeate the profession today. Lane (*ibid.*) explains that the benefits of apprenticeship (for all professions) accounted for its survival, bringing economic and social advantages, including guaranteed levels of competence and legal commitments. The number of recruits was controlled, thus preventing the profession from being overstocked with an excess of skilled men. Incomes of those qualified were maintained and competition was reduced. The apprentice could become a freeman and vote and there were additional social benefits in living in the master's home, although support for marriage was impossible. These circumstances prevailed in a stable economy and static social order, but apprenticeship itself remained inflexible, preventing change.

However, in eighteenth century London the medical apprenticeship system prospered. By 1773, the apprentice walked the wards of the London hospitals under the direction of master surgeon and doctor. This became an established form of medical study which was also patterned in Edinburgh after Leyden and presaged a more active form of learning (Rosner 1991).

At the beginning of the nineteenth century, three kinds of doctor existed: physicians, who used their heads not their hands (they did not profess to technical knowledge); surgeons, who did practical work; and apothecaries (Newman 1957). At that time, the profession was changing. Working in the hospital was converted into a discipline and student learning became more active. Until the twentieth century and the growth in scientific knowledge, the apprenticeship system was considered an adequate basis for learning medicine ('Todd Report' 1968). This endorses the perpetuation of the system but does not explain precisely what happens within it from either a surgical, or a medical, point of view.

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1.2.3 More recent attitudes towards medical apprenticeship

In 1955, Franklin said that modern thought about medical education called for a re-examination of the apprentice system and asked 'Has anything been lost that should be rescued?' (p.967). Franklin (*ibid.*) cited Rivington, a surgeon to the London Hospital in 1888 who foresaw carefully prepared training after qualification including experience in communication skills, common conditions, and prescribing. Franklin perceived these ideas to foreshadow the pre-registration year and questioned if a balance could be achieved 'between technical education in the science and craft of medicine and training for the life of the doctor'. This seems an early allusion to the problems inherent in the 'service-training' dimensions, a consideration for this thesis.

Addressing the acquisition of professional education in medicine, Dinham and Stritter (1986) reviewed the many facets of learning which the novice must possess:

> In apprenticeship the aspiring professional learns many facets of the profession from the master...Cognitive or intellectual learning can range from the simplest levels of factual knowledge acquisition to the complexities of synthesis, evaluation and reasoning. The learner also encounters and assimilates the rich fabric of socialisation, interpersonal skills, moral reasoning, and attitudes distinguishing the profession's members (p.955).

1.3   Apprenticeship: contemporary sociological perspectives

1.3.1   The learning context

Recent work in children's cognitive development has tended to displace Piagetian principles in favour of a view of cognitive growth which is socially situated and contextualised. Learning is thus rooted inextricably within contextual constraints (Butterworth 1992). Parallel trends in other fields, notably sociology, have led to renewed interest in the ways in which knowledge is construed and acquired and to an emphasis on context. Further endorsement of apprentice learning which has relevance for medical education has come from Resnick *et al.* and Rogoff, both in 1991.

Resnick (*ibid.*) views knowledge as:

> ...an interpretation of experience, an interpretation based on schema, often idiosyncratic at least in detail, that both enable and constrain individuals' processes of sense-making (p.1).

Firmly drawing on the perceived advantages and characteristics of apprenticeship, all of which can be recognised in medicine, Rogoff (*ibid.*) has located aspects of children's spatial learning in guided participation with the following analogies:

- apprentices are active in gathering information and practising skills as they participate in skilled activities

- the learning of apprentices is structured by practices developed by their predecessors to meet socially valued goals

- apprentices are assisted in their learning by communication and involvement with more skilled people - experts and more advanced apprentices - who help to determine how to divide the activity into sub-goals that a novice can begin to handle, as well as provide pointers on how to handle the tools and skills required

- apprentices seldom learn alone...apprentices learn in a community... interaction with and observation of other novices provides challenge, support, collaborative puzzling out of problems, and models of learning in progress

(Rogoff 1991, pp.349-350).

1.3.2 Situated learning

Lave and Wenger (1991), whose work is highly appropriate to this research, have also considered the learning context. Their theory of situated learning revalues and reappraises apprentice learning and may provide new theories about learning itself:

Situated learning contributes to a growing body of research in human sciences that explores the situated character of human understanding and communication. It takes as its focus the relationship between learning and the social situations in which it occurs (*ibid.* 1993, p.14).

These authors examined five culturally different and diverse forms of apprenticeship among varying professions, consisting of Yucatec midwives, Vai and Gola tailors, naval quartermasters, butchers, and non-drinking alcoholics. Their analysis provides the matrix for new accounts of learning among novices and experts in varying fields. Specifically, 'craft-like' features in apprenticeship were identified from new theoretical perspectives. Apart from learning theories, it was observed that communities reproduce themselves and knowledge was seen to be passed on via modes of behaviour and 'co-participation'. Lave and Wenger emphasised 'the diversity of historical forms, cultural traditions, and modes of production' which apprenticeship fostered compared with the uniform effects of schooling (*ibid.* p.63). They also contrasted and balanced this view of craft acquisition with the advanced levels of knowledge and skills in medicine, law, the arts, sports which, at least in the USA, depend on various forms of apprenticeship.

The term 'legitimate peripheral participation' (LPP) was conceived and applied to learning which is not acquired in the abstract and applied later, but is gained, to a limited degree and with limited responsibility,

while participating in actual practice with an expert. Lave and Wenger justified their theories about LPP on the grounds that it was more comprehensive than apprenticeship. Their interpretations of situated activities:

> ... took on the proportions of a general theoretical perspective, the basis of claims about the relational character of knowledge and learning, about the negotiated character of meaning, and about the concerned (engaged, dilemma-driven) nature of learning activity for the people involved (*ibid.* p.33).

'Legitimate' implies 'belonging' which in turn implies privileged access and status. 'Peripheral', taken to be a positive and empowering term, means 'on the edge of activities' and practice as the learner moves to full participation, from an initial role at the edge of a process. This position is seen as an interactive one whereby the learner simultaneously performs several roles - 'status subordinate, learning practitioner, sole responsible agent in minor parts of the performance, aspiring expert...' (*ibid.* p.23). 'Legitimate peripheral participation' is proposed as a descriptor of engagement in social practice that entails learning as an integral constituent' (*ibid.* p.35). The authors' contention is that action should be rethought in such a way 'that structure and process, mental representation and skilful execution, interpenetrate one another profoundly'. Learning is located, 'not in the acquisition of structure, but in the increased access of learners to participating roles in expert performances' (*ibid.* pp.16-17).

Apart from this view of the integral nature of learning, the belief that LPP is more than apprenticeship is based on the premise that it is an analytical viewpoint on learning as well as a way of understanding the learning process. This theoretical standpoint is derived, not only from the aspect of communities' abilities to reproduce and pass on identities and transferable skills, but from the very special meaning derived from 'the negotiated character of meaning' and the 'relational character of knowledge and meaning' (*ibid.* p.33).

Lave and Wenger use powerful arguments to support their theories, not least the potential of LPP to structure diverse learning resources within communities and integrate learners into the 'discourse of practice' while fostering professional identity and generating motivation (p.91). Two concepts, 'decentering' and 'transparency', deserve clarification in view of their relevance to the apprentice system of learning medicine.

A decentered view of the master-apprentice relationship focuses on the strengths of the whole community and its constituent members to contribute to novice learning activities. The master is only a part of the

whole. While this may seem to question the master's authority, a decentered view which allows for diverse relational input to learning is not incompatible with the expert role. A further implication is that decentering 'moves the focus of analysis away from teaching and onto the intricate structuring of a community's learning resources' (p.94). Transparency will be discussed in the next section.

It is difficult to accept that LPP goes beyond apprenticeship since this would trivialise the latter and relegate it to a less powerful, lower form, albeit of the same species, of learning. What Lave and Wenger have done is to raise the status of LPP to a theory of situated learning in which apprenticeship plays a part. This part has attractions in its interactive and dynamic properties. Their failure to recognise that apprenticeship provides safeguards (for example, sequential learning in practical procedures and safety measures) seems an omission, although gradual learning and assimilation are positively acknowledged.

What does seem to be true is the insistence that conventional forms of learning promote a dichotomy between 'inside and outside' and theory and practice. Instead, learning should be seen as a process by which the learner internalises knowledge, whether discovered, transmitted, or experienced, on an individual basis. Certainly LPP, as an analytical tool for understanding learning, and particularly the mutual exchange of learning experiences between master and pupil, re-establishes apprenticeship as a learning model worthy of attention in its own right.

For the purposes of this thesis, LPP helps to emphasise the levels of participation and relational positions of all learners within a community or profession, either up and down or on the same rungs of the ladder. LPP also recognises the importance of tacit learning, or the learning that appears to be devoid of 'any intentional educational form, much less a pedagogical strategy or a teaching technique' (ibid. p.40). In other words, it is the learning that occurs within pedagogical frameworks but without express objectives or direct teaching.

1.3.3 The implications of 'Legitimate Peripheral Participation' for medical education

In a review of clinical teaching, Dauphinée (1990), acknowledged the work of Brown et al. (1988) into 'cognitive apprenticeship' in classroom research. Here apprenticeship is seen as the first phase in a larger learning model and sequence. The second more autonomous phase is similar to that described by Lave and

Wenger in which learners work within a supported team framework on joint tasks. Dauphinée likens this to ward learning. Medical students work within the team or unit early in their clinical education. This promotes professional identity via modelling and increases motivation through access to the privileged position of a patient's presence. The young doctor's learning is located in the patient's illness or problems under the close supervision of senior colleagues whether it is on the ward, in the clinic, or elsewhere.

Most of the Lave and Wenger concepts discussed above are readily understood although probably, and inadequately, in a taken-for-granted or non-articulated sense. 'Transparency', while it may simply be taken to apply to that which is so obvious that it demands no comment or explanation, is essentially more complex.

Lave and Wenger refer to the use of artefacts or tools of the trade or profession in one application of the term, stating that, in its simplest form, 'transparency may just imply that the inner workings of an artefact are available for the learner's inspection' (1991, p.102). Learners may also be party to information flows and discourse in 'transparent' practice. Usage of technology accesses learners to practice and experiences which are important for the cultural contexts and organisation of knowledge acquisition:

> Productive activity and understanding are not separate, or even separable, but dialectically related... Mirroring the intricate relation between using and understanding artefacts, there is an interesting duality inherent in the concept of transparency. It combines the two characteristics of invisibility and visibility: invisibility in the form of unproblematic interpretation and integration to activity, and visibility in the form of extended access to information (*ibid.* p.103).

This would certainly be true in medicine where initiation to the stethoscope and the physical examination have particular connotations and meaning for undergraduates. Moreover, skill in practical procedures at UG and house officer levels has a distinct bearing on the growth of confidence, both in one's self and in patient management (Jolly and Macdonald 1989). Much earlier Flexner (1925) said:

> The student must be trained by doing things: if he is merely told, or if he merely reads, his training is inactive and hence remains on a informational basis... active participation - doing things - is therefore a fundamental note of medical education (p.178).

It is the taken-for-granted aspects of transparency which must be described and analysed in medical practice, teaching and learning. Medical professionals have always subscribed to learning in practice and acquiring skills in the context of apprenticeship but all too often the subtlety of these experiences   has remained unexplained and unsubstantiated.

Similar to LPP and its potential to generate motivation, medicine possesses seductive qualities which are highly motivational. Learning clinical medicine and professional skills within a team confers privileges and provides insights into human lives and behaviours. Access to patients and the intimacies of their lives has always granted rare entitlements. Intrinsic motivation (Peters 1959) to cure the sick, either from the vocational and/or the intellectual interests inherent in the diagnostic process, should not be forgotten. 'Achievement' motivation, or the need to succeed (Atkinson and Raynor 1974), is also present in the highly competitive medical profession.

1.4   Summary of apprenticeship issues

The literature has shown that, in spite of the ubiquity of the concept and the high value placed on apprenticeship by the medical profession, neither a great deal of information nor in-depth descriptions are available to clarify how apprentice learning takes place. Much appears to be taken for granted. However, it was possible to identify the traditional co-existent and ambiguous relationships between the theoretical and practical components of medicine which are responsible for the debate surrounding the contexts and organisational frameworks for the acquisition of skills and competencies to practise medicine. These issues, and the arguments surrounding the relationships between theory and practice, give rise to some of the main discussion platforms for the design and implementation of modern clinical education.

The sociological reviews have revalued and endorsed apprenticeship as a learning framework while emphasising its regulatory role in the acquisition of professional skills within structured relationships. One of the most important issues raised by Lave and Wenger is the learning which takes place outside formal teaching arrangements but which is implicit in the activities and concerns of senior members who control and regulate the work of novices. This also emphasises the fusion and integration of practical and theoretical learning experiences in which artificial boundaries and separate functions are notably absent. Theory and practice in this case are operationalised and synthesised in the minds and activities of learners and their supervisors.

Apprenticeship fosters a unique bonding relationship which creates learning opportunities that are embedded and perpetuated in work and practice. Professional knowledge and skills are acquired in the constant interaction and flow between theory and practice. Additionally, the system provides controlling and monitoring functions for its members.

1.5   Questions raised by the review

A central theme arising from the historical perspective on apprenticeship, is the lack of an explicitly formulated understanding of the nature, benefits, and limitations of apprenticeship learning in medical education. Therefore, of fundamental importance is the need to explore medical practitioners' views and beliefs about the model in order to probe more deeply into the ways in which learning and teaching occur. Aided by understandings gleaned from new theories about situated learning, a question framed to ask about these beliefs has the potential to reveal the taken-for-granted (in LPP terms, the 'transparent') aspects of apprenticeship, as well as to clarify its benefits and values from the participant's viewpoint. Lave and Wenger have also emphasised the contributions towards learning and teaching made by different participant members at the various levels of superiority which are implicit in apprenticeship. Building on their term 'decentered' as a concept of LPP (p.9 above) would seem a productive way to gain more information about the relational, and hierarchical, contributions to teaching and learning made by different personnel at various stages on the apprenticeship ladder. Therefore, two questions arise as those most likely to shed light on the medical apprenticeship:

1.   Which beliefs do clinicians hold about the current medical apprenticeship model?

2.   How does the hierarchical structure of apprenticeship in hospital medicine affect teaching and learning?

Although this chapter has been concerned mainly with theoretical notions of apprenticeship learning, the review has revealed perceptions of the craft of medicine and its craft-like characteristics. Chapter Two will consider the concept of craft and the impact of CK research in general teaching and its application to this thesis.

CHAPTER TWO

CRAFT KNOWLEDGE RESEARCH

2.1   Introduction

Over the last decade, general teaching has benefited from research into craft knowledge (CK) in order to describe classroom teaching expertise. In this chapter, conceptual clarification of the term 'craft' precedes the background to the development of CK theories and a review of CK research into general teaching. The point of the review is to ask if the same theoretical principles and similar research questions, including those about tacit knowledge and professional know-how, could be applied to medicine to increase understandings of clinical teaching, and how medical CK is passed on.

2.2   Definitions of 'craft' and the concept of craft knowledge

2.2.1   Definitions of craft

Miles (1957) considered a threefold classification of definitions which are useful in understanding the meaning of 'craft'. 'Real' definitions attempt to capture essential meanings; 'nominal' definitions are concerned with the way words are typically or specifically used; and 'operational' definitions are concerned with observable, measurable operations. Miles found that real definitions are often elusive and this applies to craft where the nominal definition is easier to achieve.

'Craft' originally meant 'power', 'force', or 'strength'. These meanings still apply in German. Interestingly, it also meant 'virtue'. That we have come to revere 'craft' in a mechanistic society is in some part due to the Arts and Crafts Movement associated with Ruskin and Morris in the mid-nineteenth century when art and craft were synonymous. A reaction to depression in towns and the ugliness of industrialisation, this movement promoted ideas such as 'truth to nature' in a craft ideal which moderated the loss of the human touch as mass production proliferated (Bayley 1985). Creativity and individuality were encouraged and 'craft' or 'crafts' became positive virtues worth preserving except in the case of witchcraft or magical arts.

To craft an artefact is to fashion it expertly. The transference of the word craft to specific skills, arts, and skilled professions, often accompanied by manual dexterity, is particularly English (Oxford English Dictionary). However, novels, politics, and organisations are 'crafted'. It is in the sense of professional skill, both cognitive or practical, that it has come to be applied in the teaching profession. Craft is also associated with 'guile' or 'cunning' and this sense is appropriate when applied non-pejoratively, to the subtleties and strategies of teaching.

2.2.2 The origin of craft knowledge concepts

CK research has its origins in the criticisms of Desforges and McNamara (1977, 1979; McNamara and Desforges 1978), which deplored the overly simplistic application and dilution of the social sciences in teacher education. They claimed the results were counterproductive to effective training. Subsequently, their arguments centred on the possibility of amalgamating various aspects of knowledge and practice into an 'academically rigorous, practically useful and scientifically productive activity' (1979, p.145). Finding that teaching skills were highly practised routines and that 'competent teachers often made their job look easy' (*ibid*. p.149), they believed that such knowledge should be made more comprehensible and readily available.

Approximately a decade later, there was a reaction against research which had failed to illuminate the comprehensiveness of teaching as a complex multi-faceted process (Shulman 1986; Calderhead 1987). Calderhead (*ibid*.) outlined the limitations and unsatisfactory explanations from earlier research into teaching which emphasised the widespread acknowledgement that, in the 1970s, the behaviourist school of psychology had generated theoretical, ideological, and methodological problems, rendering only crude or deficient statements about performance and practice. Research instruments such as rating scales and systematic observation schedules, proving selective, had failed to reveal the intricacies of teaching which embraced multiple skills in daily task execution. The true nature of individual approaches to practice had eluded the research. The inability of quantitative measures or the experimental tradition fully to explain and describe teaching and practice will be more substantively addressed in the section dealing with the research methodology.

Eraut (1985), concerned with new ways to conceptualise professional knowledge and the inter-relationships between theory and practice, distinguished between different kinds of professional knowledge

specifying 'generalisability' (knowledge of cases, precepts, and theory) and 'explicitness' (codified

knowledge, knowledge embedded in traditions, CK, and tacit knowledge, p.117 *ibid.*). By generalisability,

Eraut referred to the personal experience of actions or procedures which may be brought to bear and

applied in varying situations through experience of previous cases. As we shall see, this has important

implications for medicine.

Eraut (*ibid.*), cites Oakeshott (1962) who, like Aristotle, distinguished between technical and practical

knowledge. While the technical can be codified and explained, the practical is learned and used

idiosyncratically and implicitly, through experience with practice. Eraut gives credence to this implicit

'experienced-derived know-how which professionals intuitively use' (*ibid.* p.119) and believes that it

should be described, analysed, criticised, and disseminated. Large areas of such knowledge, open to varying

perceptions, are omitted from training programmes. Eraut's ideas echo those of Lave and Wenger (pp.7-11

above) where learners acquire professional ways of working and experience through various encounters

with practice and seniors' expertise.

2.2.3 Definitions of craft knowledge in classroom teaching

There is no one, simple, accepted definition of CK in general teaching. However, key features include:

emphasis on positive, as opposed to negative, aspects of practice; a non-evaluative stance; the need to find

accurate and useful theoretical descriptions of professional actions; and the articulation of apparently

'commonsense', often taken-for-granted, actions. Practical, experientially acquired knowledge, is valued.

Berliner (1987) used a simple contrasting clarification - craft knowledge or practical knowledge about

teaching. Zeichner *et al.* (1987) have referred to CK as a 'rubric' for studying the psychological context of

teaching in a wide field, including teachers' attitudes and beliefs and implicit theories couched in teachers'

own language.

The most explicit definition, and the one applied to medicine in this study (apart from the substitution of

classrooms for clinical settings) is that of Brown and McIntyre (1988a; 1988b). They set out to explore:

> ...that part of teachers' professional knowledge which is acquired primarily through their practical
> experience, is brought to bear spontaneously and routinely on their teaching, and so guides their day-to-
> day actions in classrooms. We refer to this as their professional craft knowledge (implying that
> apprentice student teachers learn from 'master craftsman' teachers) (1988a, p.39).

These authors also referred to CK as 'the sort of knowledge and expertise which teachers acquire through their various experiences' and which student teachers are 'expected to pick up during teaching practice' (1988b, p.4).

2.2.4 Craft knowledge research

Researchers working in various fields have contributed to new understandings of professional practices. Broadly, their theories and concepts can be clarified under the following headings:

- notions of tacit knowledge

- the literature on teachers' thinking

- craft knowledge cited variously as 'Pedagogic knowledge', 'Teachers' practical knowledge' or 'Professional craft knowledge'

- nurse education.

2.2.4.i   Tacit knowledge

The credit for conceptual clarification and elucidation of tacit knowledge goes to Polyani (1983) who built on original Gestalt theories which:

> demonstrated that we may know a physiognomy by integrating our awareness of its particulars without being able to identify these particulars (p.6).

For Polyani, 'knowing' encapsulated theoretical and practical knowledge. The 'wissen' and 'können' or 'knowing that' and 'knowing how' of Ryle (1949) is exemplified for Polyani in the work of the clinical diagnostician. The integration of such knowledge can also be found in kinaesthetic awareness, artistic judgements, and micro- or macro-psychomotor skills. Physicians experience this in the 'hands-on' experience of patient examination and practical procedures.

Argyris and Schön (1974) argued that professional actions are based on implicit 'theories-in-use' as opposed to 'espoused theories' which are based on proffered explanations about actions. When 'theories-in-use' are made explicit and are open to criticism, they are the key to professional learning. Schön (1983), noting the returning interest of philosophers to the 'topics of craft, artistry, and myth' (*ibid.* p.48), rejected what he perceived as the prevailing epistemology of practice which is dominated by the scientific approach. He called for:

...an epistemology of practice implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness and value conflict (p.49).

Schön has coined the term 'knowing-in-action' to describe the intuitive, tacit, implicit way that professionals go about their daily tasks. When these actions are deliberated upon, made sense of, analysed, and personalised, it is termed 'reflection-in-action' (when professionals think about what they are doing when doing it). Schön apparently uses 'reflection' in two senses: the immediate mirror, or reflected image sense to enlighten; and the considered, meditated approach.

Developing his work in 1987 and wishing to delve more deeply into professional competence and action in what amounts to a search and elaboration of CK, Schön calls for clarification and explanations about practice:

> Just as we should inquire into the manifestations of professional artistry, so we should also examine the various ways in which people actually acquire it (1987, p.14).

These theories are in direct opposition to scientific explanations and theories, termed by Schön as 'technical rationality'. In accepting the need for the approach advocated by Schön, as indeed this thesis sets out to do for CK in medicine, it is important not to drive a wedge between the 'scientific' and 'craft' approaches but to develop understandings and applications of both in relation to their complementary contributions and application to educational theory.

2.2.4.ii   The literature on teachers' thinking

Previously, attitudinal studies stressed the consistent nature and homogeneity of individuals' teaching, but CK research has tended to emphasise contradictions and the heterogeneity of practice as well as cultural differences. Referring to the socialisation of teachers, Zeichner et al. (1987) postulate that experiences gained in training are influential in the adoption of role models and conditioning, although much work requires to be done in this area. Their own research found that political and negotiating skills, which furthered the ability to adapt to the internal ecology of institutions, were important to young teachers and hence the development of their 'craft'.

Calderhead (1983) and Berliner (1987), using the 'expert-novice' contrast, support Schön in the notion that the ability to reflect on practice distinguishes the expert from the novice and renders the former more resourceful and discriminating. In words familiar in medical education, these researchers find that experts

have more highly developed schemata or networks of knowledge for understanding practice. Berliner refers to this knowledge as pedagogical knowledge which is gained from thousands of hours of instruction and interactions with students. For Berliner:

> It is knowledge that influences classroom organisation and management and is the basis for interpreting the curriculum. Such knowledge is complex, often tacit, only derivable from extensive experience, and in most other fields of endeavour would be called expert knowledge (1987, p.63).

2.2.4.iii Pedagogic or professional craft knowledge

The development of a theoretical body of knowledge about practical teaching and its skills and competencies has recently been addressed from new perspectives. This has come about in the belief that CK, as practised in the privacy of classrooms, has suffered from poor or non-existent descriptions and an absence of shared expertise.

Several researchers have examined the ways in which teachers teach by probing **what** they do and **how** they do it (Calderhead 1983; Berliner 1987; Olsen and Eaton 1987; Wilson *et al.* 1987; Brown and McIntyre 1988a, 1988b; 1993). By articulating cognitive and practical skills which form the basis of the teacher's autonomy, decision making, and management, they have provided new descriptions and information about teaching competencies and how processes are transmitted.

Aiming to generate generalisable principles from theory grounded in practice and interpretative accounts, Brown and McIntyre (1988b), assumed that CK, as a body of knowledge and information about classroom teaching, existed. These researchers focused on teachers' strengths to explore and illuminate practice compared with 'a deficit model' which criticised inadequacies. Setting out to discover what teachers valued and did well, they assumed that CK was identifiable and distinctive and that most experienced teachers commonly used a wide range of sophisticated teaching skills worth sharing. These researchers also maintained that '...over a of period time experienced teachers have acquired substantial practical knowledge about teaching, largely through their classroom experience rather than their formal training' (p.1). These approaches have been adopted and termed 'CK research principles' in this study.

In the need to explore beyond the formal training programmes, and in the knowledge that different information and explanations were required about learning to teach, the Brown and McIntyre research aimed to uncover a body of knowledge about practical teaching where teachers, as experienced practitioners, were seen in 'the role of models, experts, masters, mentors, coaches' (1993 after Berliner

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1986). The findings, elicited from pupil responses about their teachers, ranged from means of pupil control and motivation, to the development and maintenance of good relationships and presentation methods.

In the field of curriculum planning, Elbaz (1981), and Reynolds and Saunders (1987), criticised the overly simplistic ways in which teaching is conceptualised. Maintaining that theory and practice are too often divorced and fragmented, Elbaz (*ibid.*) states that practical and experiential knowledge has been devalued compared with empirical and analytical experiences.

For Elbaz, this practical knowledge which teachers hold in highly individual distinctive ways, consists of five orientations: situational (or teachers' knowledge of specific tasks); theoretical; personal; social; and experiential. Elbaz also outlined fairly narrow 'rules of practice', distinguishing them from the broader 'practical principles' and 'images' which epitomise teachers' values, beliefs, and needs. These rules, perhaps procedures, are fused into a 'cognitive style' which is interpreted as 'doing informed by individual knowledge'. In other words, teaching becomes highly individualised.

Wilson *et al.* (1987) have developed the concept of subject-matter knowledge and the role it plays in teaching. In addition, they have emphasised other skills which contribute to CK:

> Successful teachers cannot simply have an intuitive or personal understanding of a particular concept, principle or theory. Rather, in order to foster understanding, they must themselves understand ways of **representing** the concept for students (p.110).

Shulman (1986, 1987), arguing for a more elaborated and sophisticated knowledge base for teaching, has defined categories similar to Elbaz to encompass the complex mix of knowledge required. These embrace: philosophical grounds; content; curriculum and pedagogical knowledge; and knowledge of learners and educational contexts. Of these, pedagogical knowledge is of special interest:

> It represents the blending of content and pedagogy into an understanding of how particular topics, problems or issues are organised, represented and adapted to the diverse interests and abilities of learners and presented for instruction (p.8, 1987).

Shulman (1987) also maintains that teaching is trivialised through the means by which competence is assessed and that the situation is not eased by teachers themselves who 'have difficulty in articulating what they know and how they know it' (*ibid.* p.6).

2.2.4.iv   Nurse education

Benner (1984) and Macleod (1990) have used CK principles to show how an articulated theory of practice can inform daily nursing tasks. Macleod, over one year, observed and interviewed ten surgical nursing sisters, teasing out the ways in which their expert knowledge was applied to patient care. Hermeneutic reasoning was applied to understand how practical knowledge is applied.

Benner (1984), used Ryle's (1949) distinction between 'knowing **that**' and 'knowing **how**' to distinguish two different kinds of knowledge. Practical knowledge may elude scientific explanations of 'knowing that'. According to Benner, professional practical skills or 'know-how' in an applied discipline like nursing, can be extended, developed and made public by charting and describing clinical experience to further patient care. These skills apply to theoretical and practical ways of conducting professional practice. In her words:

> The intentions, expectations, meanings, and outcomes of expert practice can be described, and aspects of clinical know-how can be captured by interpretative descriptions of actual practice (p.4).

Her work with expert nurses subsequently identified several areas of clinical knowledge which were derived from descriptions of clinical judgements.

As a methodology to interpret practice, Benner had applied the Dreyfus and Dreyfus (1979, 1980) model of skill acquisition based on studies of chess players and airline pilots which posits that students pass through five levels of proficiency in acquiring and developing skill: novice, advanced beginner, competent, proficient, and expert. These levels reflect three changes in skilled performance which passes through the use of abstract principles to the use of past concrete experience, changes in learners' perceptions of situations, and finally to increased involvement from an initial detached stance. Both Benner and Macleod emphasise the need for experience as a prerequisite and precondition for expertise and subscribe to the Dreyfus model which perceives experience as being developed along the three dimensions quoted below. The ability to grasp the whole situation, termed 'salience', as a mark of rapid engagement with previous experience thus facilitating quicker access to problems, is emphasised:

> ... there is a shift from relying on abstract principles to perceive and interpret problems to using past experience as a base for judgement; there is a change from understanding parts of a situation and building a whole picture, to an immediate grasp of the whole situation; there is a shift from being detached and 'outside' the situation to a stance of being involved in the situation. (Macleod 1990, p33).

In what is also a reference to professional tacit exchanges and inter-colleague communication Benner (1984) says 'Experts pass on cryptic instructions that make sense only if the person already has a deep understanding of the situation' (p.10). She accredits these instructions to Polyani's (1958) term 'maxims'.

These nursing studies have provided strong exemplars for this research in pointing to experts' actions and activities in the practice of nursing which, at the same time, facilitate learners' knowledge and skill acquisition. Possession of CK content and method, and the CK of teaching that content and method, appear to have an inseparable relationship. The task for this thesis is to explore how the craft of medicine is passed on. Inevitably in the process, we will need to understand aspects of the craft of medicine itself.

2.3   Summary of craft knowledge research

The common denominator in the literature described above has been the need to uncover and provide comprehensive accounts of hitherto implicit, tacit knowledge about teaching and practice. CK researchers in general teaching support the view that diverse and varied forms of knowledge, such as tacit, practical, and commonsense knowledge, should be described to enable novices to share in the discourse and skills of expert practitioners. They found experience to be a prerequisite to teaching expertise and the development of professional know-how which is often a synthesis of practical skills and theory. In nursing studies, experience shows in the ability to grasp the 'whole' situation or circumstances. The ability to reflect upon explicit, articulated theories of practice is considered to be the benchmark of professional activity. However, the Argyris and Schön view is that practitioners' espoused theories about these activities are at variance with actual practice.

We are now in a position to explore how CK research principles in general teaching (p.15 above) and nursing studies can be used to clarify and explain what experienced clinicians do well in their work and teaching/learning which enables learners to acquire medical knowledge and skills. This present research shares assumptions similar to those in Brown and McIntyre (p.18 above): that experienced physicians have views about their own, and colleagues' approaches to teaching and practice; and that these perceptions are worth sharing through the adoption of a non-censorious approach which seeks to identify positive, as opposed to negative, characteristics. The need to qualify these assumptions, coupled with the necessity to explore issues such as: 'What information do junior doctors 'pick up'? or 'How do they adapt

to varying clinical environments and personnel within apprenticeship?' give rise to question three and the methodological questions below.

Based on Argyris and Schön's notions that implicit 'theories-in-use' are at variance with 'espoused' views, it will be important to ascertain the consistency of medical practitioners' views with their actions in work and teaching. This gives rise to a fourth research question.

2.4   Further research questions

Research questions

3   What are clinicians' theories and perceptions of their teaching and learning?

4.   Are clinicians' theories of teaching and learning consistent with their practice?

Methodological questions

a)   Can CK research principles be used to describe and explain what medical experts do well in their practice and teaching rather than using a deficit approach?

b)   Can tacit knowledge and teaching strategies be articulated to provide descriptive examples of clinical teaching and learning?

To further the exploration of how CK in medicine is passed on, more information is required about the necessary content, skills, and methods required to practise medicine. Chapter Three will outline these before reviewing research into clinical teaching.

CHAPTER THREE

UNDERSTANDING CLINICAL TEACHING

3.1 Introduction

The necessary knowledge for medical practice is usually apprehended and encapsulated within the expression 'clinical skills'. These skills are required for two key tasks - the diagnosis and management of a patient's problem. In the words of Munro (Preface, 1990) what 'the clinician must acquire and develop in order to formulate diagnostic procedures and management plans'. Both of these tasks rely on content knowledge and specific skills, including clinical reasoning abilities. Clinical action is also dependent on well-defined ethical codes of practice. Therefore, clinical skills embraces professional theoretical and practical knowledge which can be construed as CK. The CK of teaching medicine is dependent on the application of this knowledge and that derived from educational principles in the behavioural sciences and other educational theories. An exploration of the latter, the central theme of this study, must take the former into account but with some necessary omissions.

The research focus omits certain areas of clinical and pedagogical knowledge. Ethics is a philosophical discipline outside the bounds of the study. The highly structured ways of teaching history-taking, the physical examination of systems, and practical procedures are not directly in focus. However, the application of these skills in practice is of research interest. From the teaching domain, assessment, evaluation, and curricular theory have been excluded. Although they impinge on all teaching and learning contexts, they are not immediately required for an inquiry into the transmission of clinical CK.

The chapter begins with an explanation of the research context. This is followed by a conceptual clarification of clinical skills before reviewing the relevant research into clinical teaching. This mainly quantitative research, while pointing to successful teaching characteristics, is perceived by the researcher to have failed to deliver descriptive, in-depth accounts of the clinical teaching/learning processes.

3.2 The changing medical education context

The Department of Health Report, Hospital Doctors: Training for the Future (1993), commissioned to enable the UK to comply with EU legislation and subsequently implemented by the government, has been instrumental in effecting a drastic reorganisation of higher specialist training in the UK. The prevailing career pattern within hospital medicine at the time of this research was: UG; house officer (HO) (General Clinical Training); senior house officer (SHO) (Basic Specialist/General Professional Training); registrar (R) and senior registrar (SR) (both Higher Specialist Training), culminating in a consultant's post. The report recommended changes in higher specialist training, abolishing R and SR levels and introduced a single specialist registrar grade. The term 'unified training grade' was introduced with a 'Certificate of Completion of Specialist Training' (CCST) to be awarded approximately eight years after licensing. However, a diagram showing the basic career grades at the time of this research field work is given below.
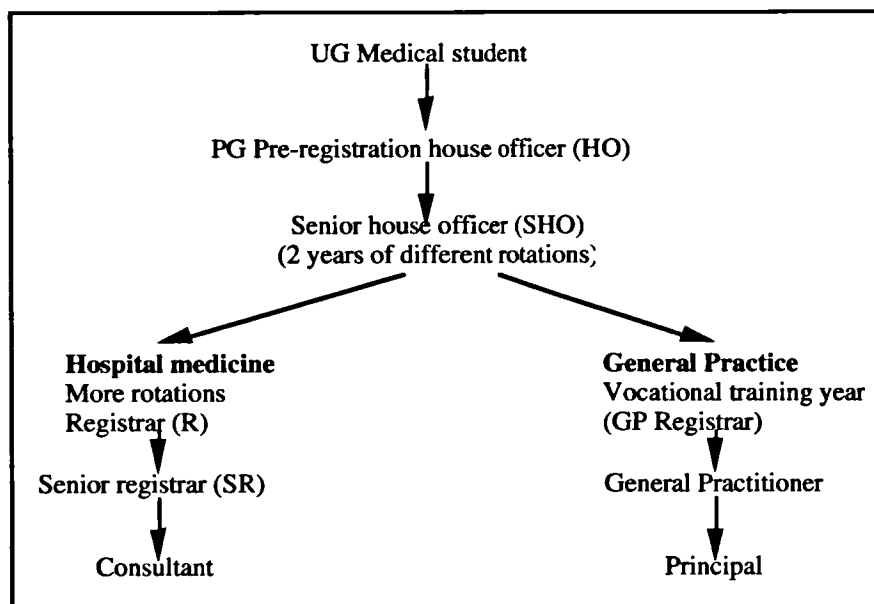
Diagram 1:
Career grades prior to implementation of
The Department of Health Report,
Hospital Doctors: Training for the Future (1993)

Implementation of the reforms to higher specialist training (NHSE Report, 1996) means the instigation of more structured training, appraisal, and assessment in all grades (McCarthy 1995). The implications of the report are not yet clear (particularly in relation to early decision-making about career paths, manpower, and issues concerning a consultant-led service) but present indications are that education away from the job will cut down on experiential training and exposure to patients (Dickson *et al.* 1994). Some

have seen the moves towards more structured 'off-the-job' learning as a response to the inadequacy of the apprenticeship learning model in which to acquire the requisite knowledge, skills, and competencies of modern medicine (Biggs *et al.* 1994a; Harden 1994). (Several important weaknesses in the model arise on p.55 and all problematic issues are addressed on pp.213-214 below.) In the restructuring process, the consultant's role in bearing ultimate responsibility for patients has been highlighted (Charlton 1993). There would appear to be a view that 'something more' than the traditional method of gaining experience is required, although there is a plea from Toft (1994) that the paternal benefits and other advantages of apprenticeship should not be forgotten.

The management structure of hospital medicine has changed over the last decade due to the NHS re-organisation into Trust hospitals, the introduction of major clinical posts such as clinical directorships, and modifications to junior doctors' hours ('The New Deal' 1991). The report 'Working For Patients' (1991) has had a huge impact on the service-training dimension in the need to match financial and patients' expectations. While service takes first priority, there are efforts to redress the balance and to introduce more robust principles to advance the training of doctors. Linked to this, several studies (Towle 1991a; SCOPME 1992, 1993; Lowry 1993a) have addressed the deficiencies in training hospital doctors to teach. There is, unquestionably, a new interest in teaching methods and management (Biggs *et al.* 1994b).

Following health service changes, clinical teaching is also in a state of flux due to differences in: disease patterns; demographic changes; cost-effective health measures affecting patient care; shorter hospital stays; a reduction of beds; technological advances in diagnostic procedures; and dramatic transformations in non-invasive surgery. These changes have resulted in an upsurge of interest in the potential of different learning venues, including outpatient clinics and the community at large (GPEP Report 1984; The Edinburgh Declaration 1988; Feltovich *et al.* 1989; Dauphinée 1990). Recent outpatient studies showed that, from both teachers' and learners' perspectives, there are distinct differences and difficulties in clinics compared with ward-based teaching rounds (Towle 1991b; Macdonald 1991; Krackov *et al.* 1993; Steward 1993). Clinics are primarily service oriented and patient needs predominate. This service commitment means that teaching UGs and trainees in clinics has a lower priority. The majority of these studies conclude that future outpatient teaching will need to reflect staff attitudinal changes towards setting learning agenda as well as effecting organisational changes in planning and supervision.

3.3 Clinical teaching

3.3.1 Definitions of clinical teaching

Dauphinée (1990) used Stritter and Baker's definition of ambulatory teaching to highlight three elements:
the instructor/student interface; the location (near to patient); and the patient or class of patients:

> The teaching/learning interaction between instructor and student that normally occurs in proximity of a
> patient and focuses on either the patient or clinical phenomena that concerns a patient or class of
> patients (Stritter and Baker, 1982).

'Normally' is controversial since many professionals would take a more comprehensive view and include
all teaching about patients and diseases, whether in the lecture room or elsewhere, in their definition. A
more practical definition (albeit still with a North American flavour) is provided by Snell (1988):

> Clinical teaching done by faculty or housestaff to improve trainees' (medical students' and residents')
> clinical competence takes place at or near the bedside or ward, and is often done concurrently with
> patient care. It includes teaching factual knowledge, data acquisition, problem-solving techniques,
> technical skills, inter-personal and communication skills and attitudes (p. 611).

This definition assumes the traditional teaching venues and one might disagree with 'improve' since
initial knowledge acquisition is of basic consequence.

3.3.2 The characteristics of clinical teaching

Clinical teaching consists of many apparently conflicting paradoxes and polarities. For example, it ranges
from planned 'formal' teaching (see 3.3.3 below) to the spontaneous incidents of what is known as
'informal teaching'. It contains moments of total certainty and great uncertainty in the diagnostic process.
At times it appears relatively straightforward in its strict attention to protocol and procedures. Yet it has
reason to be considered the most complex, and the most taxing, of all teaching activities because of the
patient's presence on many occasions and the implications of clinical decisions.

Clinical text books on teaching clinical skills emphasise the logicality and predictability of 'the clinical
method' which is usually conventional and follows well-defined pathways with little room for flexibility
or creativity. Teaching is presented in sequentially constructed tasks or skills. The proliferation of skills
laboratories reflects the general acceptance that certain skills can be acquired through fairly prescriptive
methods and audio-visual approaches. For example, there is a set way and order to describe the pulse; by
its 'race', 'rhythm', 'volume', and 'character'. The following is an example of textbook advice for the
novice clinician:

Whichever part of the body one is examining, one should always use the same routine; 1. Inspection 2. Palpation 3. Percussion 4. Auscultation (Turner and Blackwood 1987, p.19).

Clinical teaching, of necessity, employs a highly esoteric, condensed language as the means of communication about illness and patients (Atkinson 1984). A patient may suffer from 'aortic incompetence' (there is an abnormal flow of blood through the aortic valve, as a result of which the valve is not functioning properly) or be 'orthopnoeic' (suffer from breathlessness on lying down). This elliptical, economic, and often elegant language, facilitates presentation and inter-doctor communication. Precise means of delivering case presentations train learners to be logical and precise.

3.3.3 Formal and informal clinical teaching

Grant et al. (1992) defined the characteristics of formal education provision, a term virtually synonymous with formal teaching as: having a primary educational purpose; having a pre-determined content and process; being discrete; and occurring at a set time and location. Because of the professional emphasis on career status qualifications and the resulting highly structured examination and certification programmes, formal teaching is highly regarded, particularly if it is conducted in 'protected' time and set free from service provision. Informal teaching, said to be opportunistic and spontaneous, takes place outside these boundaries in constant interaction with all team members. Informal teaching lacks precise definitions and appears to have been insufficiently researched.

3.3.4 The acquisition of clinical skills

These skills form the practical and theoretical knowledge which are synthesised in caring for patients (GMC 1993, 1997). They comprise: observation (or 'the clinical gaze'); the interpretation of any physical signs; history-taking; physical examination; the diagnostic process; and patient management. They also embrace the ability to perform practical procedures, from fairly straightforward ones such as giving injections or taking blood pressure, to the complex invasive manoeuvres of gastroscopy or putting in central lines. To this list can be added communication skills, the ways in which the doctor, using verbal and non-verbal means, interacts with the patient.

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3.3.5 History-taking

'The history is the patient's account of the illness and is often the most important part of the clinical assessment' (Munro and Ford 1989). The teaching of history-taking employs formal teaching methods accompanied by demonstrations. Taking a history, or clerking (acquiring and recording information about a new hospital patient), involves methodical questioning and the recording of the details as notes. After ascertaining personal details such as sex, age, and marital status, and often employing relatively set questions, the history usually follows a sequence to include: a brief statement of the patient's view of the problem; the presenting complaint; the history of the presenting complaint; the past medical history; a review of systems (omitting the one involved in the present problem); any treatment or drugs; the social history; the family history; and a summary.

The routine clinical history was researched by Gale and Marsden (1984) who found that, in addition to being used as a fail-safe or background search mechanism by students and doctors, the history was also subject to their individual responses and interpretations in the process of gathering clinical information. These researchers previously found that more experienced clinicians ask fewer questions and reach conclusions on fewer data. A full history is not always taken or recorded. For example, in clinics, only specific information is sought.

3.3.6 The physical examination

The physical examination, which may or may not follow the history, is determined by precise routines and methods for each system of the body, again initially using procedural teaching methods. A full examination of systems may not be done routinely. It takes many years, even after qualification, to become proficient in carrying out the complete physical examination with flow and confidence. Edwards (1990) gives uncompromising advice to students:

> The clinical study of disease is founded on two processes, the history of the patient's disability and the clinical examination. 'Clinical examination' comprises both these components, each of which is based on a methodical and comprehensive routine to which the student should adhere, particularly throughout the junior apprenticeship (*ibid.* p.1).

A precise or differential diagnosis, or pragmatic judgements in difficult cases, leads to patient management which may also involve tests or investigations. The diagnostic process, often referred to as 'clinical reasoning' or 'clinical problem solving', will be dealt with in Chapter Four.

3.4 Communication

3.4.1 Research into communication

The history of deficiencies in practitioners' communication with patients, often leading to litigation, is well documented (eg: Byrne and Long 1976; Maguire 1984; Simpson *et al.* 1991; Tate 1994; Fielding 1995). Inadequacies range from inability to recognise patient problems and ineffective strategies to deal with sensitive issues; doctors' personal failures in the face of strong feelings; patients' questions about disease and its consequences; and doctors' own limited professional emotional development. To rectify this situation, there is a consensus in the literature that the practice of effective medicine owes a great deal to the art of communication and a number of skills that can be taught and learned (Tuckett *et al.* 1985; Stewart and Roter 1989; Pendleton *et al.* 1990; Cohen-Cole 1991; Simpson *et al.* 1991; Smith 1996). Indeed Kurtz (1989) has said:

> Communication is a series of learned skills. Communication is learned behaviour, so it can be improved through experience, personal effort, and formal training (p.155).

According to Pendleton *et al.* (1990), 'the consultation is the central act of medicine which, as a pattern of events, has antecedents, processes and consequences' (p.1). These authors cite varied approaches to studying and understanding the consultation: in medicine, the emphasis is on disease and diagnosis; the roles of the doctor and patient predominate in the sociological and anthropological sciences; Balint groups look to the dynamics of interactions; and the social scientists analyse participants' behaviours. An anthropological perspective identified cultural attitudes towards illness and commented on three aspects of authority. These are described as 'sapiental' (the right to be heard on the basis of knowledge or expertise); 'moral' (the Hippocratic motive to do good for the patient); and 'charismatic' (from the original unity of medicine and religion). The authors relate charisma to the magnitude of the life and death issues which doctors deal with and their apparently priestly role, for example, in 'powerful rituals such as examining and describing' (*ibid.* p.9). These approaches are not mutually exclusive and all share a number of skills and strategies.

While it is recognised that cultural, social, and psychological factors are basic to understanding issues such as verbal and non-verbal cues (Argyle 1975; Preston-Whyte 1992; Tate 1994), most communication models are derived from variations on perspectives such as: the patient or doctor-centred approach (Byrne and Long 1976); the active-passive approach in which participants play complementary roles (Schwenk

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and Whitman 1987); and the shared interaction process which treats the patient as an equal expert (Tuckett *et al.* 1985). Neighbour (1987), differentiating between conscious and unconscious learning, favours a more psychological analysis of interviewing styles based on either dominant right or left brain hemispheres and their characteristics.

3.4.2   Teaching communication

Given the undisputed need for effective communication, curricular attention has focused on when and how it should be taught, specifying questioning, interacting, listening, and responding skills. Various advocated formulae have resulted in: focusing on the beginning, systematically conducting, and closing interviews; data gathering, forming and maintaining relationships; dealing with difficult issues such as breaking bad news; imparting information; and therapeutic skills (Pendleton *et al.* 1990; Simpson *et al.* 1991). Additionally, suitable accommodation, greetings, facilitating, understanding, and numerous attitudinal components such as empathy, meet in an integrated, complex focus which should always be attentive to individual circumstances (Stewart and Roter 1989; GMC 1993, Kendrick and Freeling 1993). The important relationship between skilled communication and history-taking is self evident (Maguire and Rutter 1976; Tate 1994). Interestingly, Tate (*ibid.*) notes that 'taking a history is a method of controlling what the patient says' (p.1).

3.5   Research into undergraduate clinical teaching

3.5.1   Research methods in clinical teaching

Until the early 1990s, most clinical teaching research, particularly in the UG field, tended to focus on the perceived inadequacies in clinical teaching methods and personnel. Methodologies used quantitative and parametric procedures which could be measured and validated, and were reliable according to the testing procedures employed. This was partly due to the medical profession's distrust of so-called 'soft data'. Thus, most studies followed the experimental, quantitative tradition. (Grant and O'Pray 1981; Harden 1986).

The acceptability of quantitative research methods has meant that surveys, questionnaires, and inventories employing rating scales have tended to dominate the field. Subsequent valuable recommendations included skill acquisition such as delivering feedback, or the need to provide more effective direction from more

precise aims and objectives (eg; Byrne *et al.* 1976; Daggett *et al.* 1979). However, the main limitations of this approach were: that teachers were often unrepresented and their perceptions of teaching activities ignored; that the concept of teaching tended to be narrowly construed with little attention to its complexities as reviewed in Chapter Two; and that the nature of the collected data did not generate new theories about practical teaching.

Latterly, the increased acceptance of qualitative and hybrid research methods has led to different ways of interpreting clinical teaching activities other than by eliciting effective teaching characteristics. This is in line with the need to integrate curriculum philosophy with practice and provide diverse kinds of information about teaching (Coles and Grant 1985; Smith and Noblitt 1989; Lowry 1992).

3.5.2 Valued characteristics in effective teaching studies

Bennard and Stritter (1989) said that the literature on effective clinical teaching contains a strong prescriptive element and is heavily influenced by learning theory developed by Gagné, Knowles, Bruner, and Kolb. In Bernard and Stritter's view, the literature:

> ...advocates a high degree of planning prior to teaching that includes structured elements related to adult learning, experiential learning and problem solving. These elements, in turn, require the teacher to assess learner needs, formulate clear objectives, mix didactic and non-didactic teaching methods and provide learner orientation, feedback and evaluation (p.142).

There is a gap of over twenty years between this view and that of Reichsman *et al.* (1964) who, in a seminal study which used interview and observation techniques, found serious organisational deficiencies in ward teaching which were compounded by mediocre presentation. These authors were the first to recognise individual student learning needs but these were not pursued in detail. They also found inadequacies in teaching clinical reasoning and little preparation for ward rounds which often left students unchallenged and uncorrected.

Rating scales and analyses of variance identified important components of teaching performance and those skills valued by students (Cotsonas and Kaiser 1963; Stritter *et al.* 1975; Irby 1977; 1978; Daggett *et al.* 1979; Irby and Rakestraw 1981; Sloan *et al.* 1996). In general, studies into effective teaching, including those of Jacobson (1965) and O'Connor (1972) who used critical incidents to isolate valued characteristics, are well summarised by Stritter *et al.* (1975) who endorsed six dimensions identified by rating scales: active student participation; preceptor attitude toward teaching; emphasis on applied

problem solving; student-centred instructional strategy; humanistic orientation; and an emphasis on research.

In general teaching, Hildebrand *et al.* (1971) found that ineffective university teachers were characterised by a lack of attributes associated with effective teaching rather than by those associated with poor teaching. Successful components of classroom teaching included good organisation and presentation skills, enthusiasm, and knowledge base. In clinical teaching, these components were supplemented in medical students' opinions by positive supervision, clinical competence, and the teacher's ability to model professional characteristics (Irby 1978). These peculiarly clinical aspects are recurrent in most clinical teaching studies.

Schor and Grayson (1984), still using questionnaire and rating methods, turned to the characteristics and behaviours of 'good' teachers with results which paralleled those of other rating scale studies. Both junior and senior physicians highly regarded superior knowledge, clinical judgement, interacting well with house officers, and enthusiasm. Interestingly, this study found that neither age nor experience influenced selection as an outstanding teacher.

Ethnographic studies (Mattern *et al.* 1983; Weinholtz *et al.* 1986; Weinholtz and Edwards 1992) have tended to emphasise skills and techniques to improve activities such as better preparation, time management, feedback, and questioning. These emphases, while they can usefully isolate certain skills and behaviours, tend to lose sight of the creative and individual aspects of teaching. Many teachers do not like to conform to set guidelines, no matter how logical they may appear to be.

Daggett *et al.* (1979), pointing to diversity, quoted Hussey on the need to explore and delineate the roles of all parties in the teaching programme from senior to junior practitioners (decentering p.9 above). Even then there was a paucity of information which discussed these roles and their requirements in depth:

> The medical staff of each training hospital should explore the role of all parties involved in the teaching program and develop suitable guidelines delineating roles of the attending personal (admitting, private) physician, the teaching attending physician, the house officers, the program director, and the referring physician (Hussey, 1974).

Dauphinée (1990) refers to this as the 'dynamic interchange' of the whole team maintaining that insufficient attention had been paid to it.

3.5.3 The UG learning climate

Environmental factors and 'the learning milieu' have received research attention with variations in the extent to which they influence learning (Lowdermilk and Stritter 1984; Skeff *et al.* 1985; Rosinki and Hill 1986; Irby *et al.* 1991). The first authors, in defining environmental factors as including the physical setting, organisational factors and social climate, found that these issues profoundly affected clinical skill development. However, this study may have had as much to do with teaching methods and the opportunities on offer as with other factors.

Skeff *et al.* (1985), in a much self-criticised study, used videotape analyses to investigate the process/product learning model and correlated eight instructional criteria with many significant results. The 'learning climate', as one criterion, embraced the tone of the clinical teaching setting including learner attention, participation, and comfort. Skeff (1987) later included the degrees of stimulation and enthusiasm created. The earlier study found that the learning climate was positively correlated with eleven learner outcomes including history-taking and physical examination skills, lecture attendance, judicious use of laboratory tests, and interest in medicine.

The Irby *et al.* (1991) study of clinical teachers in ambulatory care had different results, indicating that environmental variables did not affect ratings. The broad factors influencing learning were similar to previous research findings, ie: that teachers who actively involved learners and promoted their autonomy, as well as demonstrating patient care skills, were highly regarded.

3.5.4 Research into questioning

In general teaching, teachers' questioning behaviours and pupil reactions to these have received considerable research attention. Questioning techniques must be viewed in the context of 'teaching' as opposed to 'telling' and how the teacher elicits information. The skills include accepting, rejecting, deflecting, and modifying responses as well as the management of question and answer sessions and handling provocative situations.

The early work of Barnes *et al.* (1969) classified questions as: factual (naming or asking for information); reasoning ('how?' and 'why?' questions); open (without reasoning); and social (control and appeal types). Categorisation allowed 'closed' questions which have only one acceptable answer and 'open' questions

which solicit various responses. In 1977, Barnes and Todd used complex linguistics and syntactic structures to analyse communication. Flanders (1970) analysed classroom interaction based on observation checklists. Powell (1985) recorded different questioning modes stressing teacher clarity, variety, effectiveness, and feedback. Dillon (1988) found ten categories to describe questioning behaviours including quality, form, and manner. Schwenk and Whitman (1987) analysed concepts in communication in patient care and teaching to include attentive silence; observation; purposeful eye contact; tracking (nods and grunts); open-ended encouragement and advocacy; and surface paraphrasing. Thus, skilled questioning is a highly interactive and flexible process.

Questioning in clinical bedside teaching, and often teaching in corridors, tends to be teacher-centred and interrogative in character. The tendency is to test factual knowledge bases or to use probing and clarifying questions (Weinholtz and Edwards, 1992).

3.5.5 New directions in UG clinical teaching research

In the realisation that rating scales, questionnaires, and quantitative methods in general have been unable fully to explain and describe clinical learning and teaching, several researchers have recently focused on qualitative methods to explore the importance of teaching styles and varying teacher behaviours.

Weinholtz and Friedman (1985) used participant observation and interviews in case study methods to study how senior physicians carried out their daily tasks in general medical wards. Recognising that existing descriptions of the clinical teaching process were vague, their rationale was expressed as follows:

> The decision to undertake such a study was rooted in the complexity of the clinical environment; particularly, how the group dynamics of the ward team affects an attending physician's teaching effectiveness (p.152).

The researchers worked with a number of attendings for one month, concentrating on the related activities of HOs and students. The results of this study were couched in the form of fifteen propositions to guide further study and were derived from grounded theory. One proposition is quoted to give the flavour of the findings:

> The attending physician most readily obtains an indication of a team member's ability to present a patient by adopting a low-frequency/clarifying questioning style during the presentation (proposition 5, p.173).

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In pointing to an effective individual non-confrontational style in the context of case presentation skills, the authors indirectly attribute the latter an important place in learning medicine.

3.5.6   Moving towards an experience-based learning model

Working mainly in the UG field, Irby (1986) pointed to the challenge of clinical teaching which requires novices to collect data, interpret and synthesise findings, evaluate actions critically, perform procedures, and relate satisfactorily to patients.

Irby perceived clinical teaching to be a complex phenomenon with three distinguishing positive characteristics: a problem-centred approach in the context of professional practice; an experience-based learning model; and a combination of individual and team learning. 'Distinguishing' here meant the unique and distinct ways the medical profession has at its disposal to pass on information to its members. The **context** of patient-centred learning, with its propensity for intrinsic motivation, permits **experiential** learning within a **team** framework. These perceptive insights virtually pre-empt part of Lave and Wenger's situated learning theories and Irby's components are the central constructs of apprenticeship learning.

In later work, Irby found the clinical teaching environment to be 'ill-structured':

> Like other forms of teaching, clinical instruction occurs in the context of ill-structured and dynamic environments that are characterised by simultaneous multiple demands on the teacher that require immediate attention (1992, p.630).

Between 1991 and 1996, intent on illuminating 'good practice' as in CK methods and eliciting different information, Irby drew on various aspects of a study based on the Elbaz and Shulman categories (p.19 above) to study the teaching styles and characteristics of individual attendings (1992; 1993; 1994a; 1994b). Using mainly qualitative, multi-component research methods consisting of structured task interviews, teacher-learner interviews, and observation techniques, the work was based on intensive case studies with six senior expert physicians. Continued focus on ward teaching rounds yielded rich information about different aspects of expert practice. There was continued emphasis on the case presentation: 'the pivotal interaction between the teacher and the learner takes place during the case presentation' (1991, p.5). Increasingly refining his findings over the five-year period, Irby realised the significance of teaching through the patient, the acquisition of experience through practice, and 'the apprenticeship of observation' (1993, p.760). Additionally, Irby's experts shared vocational attitudes:

All these (six) physicians shared common characteristics; extensive knowledge of internal medicine, enthusiasm for, and commitment to, teaching, Socratic teaching skills, good interactions with, and genuine concern for, patients and learners, ability to establish a climate of mutual respect, and skill at efficiently integrating teaching into patient care (1992, p.636).

3.5.7 Physician knowledge-in-action: new trends in clinical teaching research

Dunn *et al.* (1996) linked the ideas of North American CK exponents (Schön, Shulman, Irby) with experimental methodologies. Interested in Schön's 'knowledge-in-action' as the professional knowledge of experienced, competent experts, they used a simulated patient with classical chest pain and stimulated recall (S-R) to explore the teaching/thinking processes of six expert physicians/teachers and six students as they interviewed and examined the case. They were interested in asking if physicians were aware of the experiential knowledge they accessed and used in particular cases and how such knowledge was utilised in practice.

In their video analysis, the researchers looked for 'examples of knowledge-in-action as opposed to the application of formal knowledge' (p.92). While it would seem wrong to create division between action and expertise, where the latter usually means the application of an integrated cognitive and practical knowledge base, several expert 'capabilities' or abilities were identified. In history-taking and examination, these included the abilities to: keep the patient focused on primary issues (in spite of deliberate distracters); gain information under time constraints; and keep track without taking notes. Experts categorised patients as 'good historians' and developed individual management strategies such as using patients' families as allies in the therapeutic process. Discussing the results, and almost negating their earlier polarised views, Dunn *et al.* said:

> ...capabilities related to a focused physical, performance under time constraints, skilled memory for information without relying on notes, and patient as a good historian are all related. They are all in the service of carrying out an accurate and efficient diagnosis. Therefore, even though a single capability might be under discussion, its relation to other capabilities and to the overall goal should be kept in mind (p.94).

3.6 Research into postgraduate clinical teaching

3.6.1 The limited research field

With some notable exceptions, the PG field in the UK has received relatively little attention apart from the mandatory pre-registration year in terms of the emotional, training, and induction needs of very junior doctors (eg: Jolly and Macdonald 1989; Biggs 1989; Dowling and Barrett 1992; Grant *et al.* 1992; Lowry 1993b; SCOPME 1993). The year, often perceived to be stressful, is the time when young doctors are initiated into responsibility and teamwork. Excessively long hours, lack of positive reinforcement, and inadequate training in communication skills were frequently reported.

Successful ward administration depends on HOs who are responsible for admissions, test returns, filing investigations, and many clerical functions relating to patient care. HOs do contribute to UG learning, although their teaching role has a history of being little understood and inadequately studied (Barrows 1966; Brown 1970; Tonesk 1979).

Those who have researched PG education and training in the UK have criticised it severely (Grant and Marsden 1988a, 1989, 1992; Grant *et al.* 1989; SCOPME 1991; Hale and Hudson 1992). Roberts (1991) found British postgraduate medical education to be 'a brutal enterprise' (p.225). This was justified in condemning exploitation of young doctors and the 'fatigue from long nights and long years'. What are the reasons for these criticisms?

3.6.2 PG questionnaire and interview studies

Grant and Marsden (1988a, 1989; Grant *et al.* 1989) in comprehensive questionnaire and interview surveys of learning, teaching, and work conditions of SHOs in SE Thames found: a history demonstrating a lack of organised training (even in specialties which had valued, developed educational plans); *ad hoc* planning (more justified in some specialties); marked local differences in educational provision; limiting effects of service on training; and strong differences in opinion about teaching and learning between senior and junior doctors. For example, 84% of consultants compared with 55% of SHOs were reported as saying that learning occurred on ward rounds (1988a, Part 2, Exhibits, 7).

The perceived barriers to junior doctors' learning uncovered by these studies included: inattention to learners' individual needs; lack of seniors' basic teaching skills such as the inability to provide feedback;

and poor educational management and organisational skills. Often inappropriate learning strategies were reinforced by the lack of imaginative and creative preparation in devising learning strategies for both senior and junior doctors. These findings were substantiated by SCOPME in 1992.

Inquiring into the best teachers for SHOs, Grant and Marsden (1988a) found that consultants, senior and junior registrars, each made different contributions with varying advantages. Consultants, often more available, were the more practised teachers and were able to pass on their experience while providing continuity. The advantages of registrars lay in their up-to-date knowledge of practice and theory; closer rapport with SHOs in shared examination experiences; their available time and knowledge of day-to-day patient care; and their keenness to teach. In the USA, Weinholtz and Edwards (1992) found that registrars may be the best to advise on laboratory values and drug dosages as well as being more approachable for juniors reluctant to show ignorance or lack of confidence to their seniors.

Grant and Marsden (1989) highlighted an issue of seminal importance to this present research, namely what constitutes 'teaching'. How indeed is 'teaching' interpreted and construed by participants?

> Senior house officers receive teaching from various doctors at a similar level and more senior levels. This is not surprising if interactions occurring in the course of providing the service - which will almost invariably contain new information or clarification for junior doctors - are interpreted as teaching (p.1267).

They also found that 'only 53% of SHOs cited consultants as providing the most teaching; ...a dramatic and concerning figure both in terms of the training that SHOs receive and, equally importantly, in terms of the changes that might be made in teaching arrangements' (1988, Part 1, p.24). Equally problematic and worrying to the authors was the finding that, although one of the most common learning methods was that of unsupervised practice, it was least valued by SHOs. The system also had the potential to develop wrong habits and skills:

> It is the case that much learning occurs during service, though how much of it is bad or unnecessary we do not know. Neither is it clear whether unsupervised learning is correctly regarded as training. The central paradox of our findings, however, is quite clear. Unsupervised practice is one of the commonest quoted learning methods of SHOs but is regarded by all groups (including consultants) as one of the least effective learning methods (1989, p.869).

Questioning the relationships between service and apprenticeship, these authors said in 1989 that, if unanalysed, the apprenticeship model, the accepted dominant model of PG training, 'perpetuates the unhelpful confusion between training and service, to the extent that providing the service may become

identified with receiving training' (1989, p.1267). Problems were exacerbated and compounded by the six-months job-changing rota experienced by SHOs as they moved between specialties.

3.6.3   Other PG research

The 'Tavistock Study' (Hale and Hudson, 1992) also used sophisticated clinical inventories, questionnaires, and interviews with twenty young doctors aged approximately 28 years, and uncovered severe emotional difficulties within the sample. The study also revealed disillusioned attitudes towards training and medicine in general. Delineating teachers' characteristics to which learners do and do not respond, the research highlighted the relationship between senior and junior doctors as one of the most powerful and profound part of learning experiences. Demonstrating that teaching relationships and the interactions between senior and junior doctors are at the heart of apprenticeship they said:

> Our SHOs clearly warmed to those consultants who acted as surrogate parents, the relationship in a number of instances, having a formative influence on the professional life of the SHO in question (1992 p.458).

3.7   Summary of clinical teaching issues

Clinical teaching has been set in changing health service and educational contexts but the review has emphasised the traditional structured ways in which clinical skills, construed here as professional CK, are taught in the UG years. Many UG teaching studies, using predominately quantitative methods, have successfully identified valued teaching characteristics resulting in recommendations to improve specific teaching skills. Findings also concluded that clinical competence, positive supervision, and professional role modelling are esteemed by student clinicians. However, focus on teacher deficits has resulted in insufficient attention to participants' interpretative accounts of the learning/teaching processes. Thus, while much is known about the characteristics of 'good' teachers, the research to date has been unable to explain the complexities of clinical teaching as a unique phenomenon. The nuances and subtleties of professional action and how CK is passed on are lacking, particularly in relation to informal teaching activities within different contexts such as wards and clinics where learning/teaching opportunities vary.

Nor do we have accurate accounts of how young doctors become professional. Apart from the work of Irby, and Grant and Marsden, there is a singular lack of studies which have considered the effects of different levels of clinical experience and team practices on all participants. The latter researchers have

tantalisingly hinted that 'teaching' may be differently construed (p.38 above) implying that new criteria on which to base judgements about the concept of clinical teaching are required. This present research will attend to this problem.

These perceived inadequacies contribute to the argument that insufficient attention has been paid to the apprenticeship system and the relationships between the CK of medicine and the CK of teaching it. Apprenticeship remains to be fully analysed as a model which provides participants with unique interactive learning opportunities that are embedded in work and the interface of patient care. At a time when the apprentice system is being challenged, it seems a particularly auspicious time to probe into, and ask questions about, the widely held belief that to work effectively as a doctor, extensive, practical, supervised, experience is required.

3.8   A further research question

In the light of the above perceived limitations and, given the inter-dependent relationships between service, training, and apprenticeship, the following question arises:

5.   What are the relationships between clinical experience, work, and teaching and learning, and the ways in which CK about medical practice is passed on from experienced to less experienced individuals?

The next and last review serves several functions: it complements this chapter in providing substantially different insights into clinical work and teaching/learning activities; it introduces the work of Spady whose ideas were instrumental in forming a theory of apprenticeship from grounded data in this research; and it provides the necessary background to research into the diagnostic process, the focal point of clinical medicine.

CHAPTER FOUR

SOCIOLOGICAL AND COGNITO-PSYCHOLOGICAL APPROACHES TO UNDERSTANDING CLINICAL TEACHING

4.1   Introduction

Lave and Wenger's perspective (pp.7-11 above) on contemporary educational thinking points to a fusion between the cognitive-psychological and the social-anthropological domains resulting in a view of cognition as a complex social phenomenon (Lave 1988; Resnick *et al.* 1991). The effects of these new inter-disciplinary approaches, stemming from socially shared contexts and cultural dimensions, are becoming profound. It would be inappropriate to conduct an inquiry into clinical teaching without taking cognisance of certain sociological and psychological theories and research studies which have particular relevance for apprenticeship and the transmission of clinical CK.

4.2   Sociological concepts and studies relevant to apprenticeship

4.2.1   Learning through experience

The now classic 'Boys in White' study (Becker *et al.* 1961), is as famous for its model of sociological inquiry as its findings which detailed the ways in which Kansas Medical School students set about the task of learning to become doctors. The 'Boys in White', within the tutelage of apprenticeship, experienced a gradual introduction to responsibility in caring for patients, with consequential safeguards and personal attention to patients' well-being. In other words, they were exposed to situated learning and 'LPP' (p.7 above). Friedson (1970) and Atkinson (1981) highlight the study's two main emphases which found that 'the two norms of responsibility and experience were critical in guiding the way in which the medical students managed the level and direction of their efforts' (Friedson *ibid.*, p.165).

Clinical experience, taken to be actual experience in dealing with patients and disease, as opposed to obtaining theoretical or scientific information, was highly valued by the students for its perceived means of legitimising approaches to patient management. Not unnaturally, the students appreciated the teachers

and the teaching which secured this clinical experience. They 'managed' their learning, implying selectivity in the process, around the valued and examinable aspects of their course as well as highly regarding clinical experience for its rewards and potential for personal gains. While this may partially be attributed to 'the hidden curriculum' and efforts to survive assessment procedures or content overload, the research showed experience within apprenticeship to be instrumental to acquiring knowledge in medicine.

Friedson and Atkinson also bring facets of hospital and teamwork organisation to their interpretations of the medical world. Friedson (1970) points to the division of labour in hospital work which allocates specific duties to each grade of personnel, including those of the house staff whose work is theirs alone and cannot be done by others. He also notes team members' inter-dependency and the inability of the individual doctor to work alone.

Resnick (1991), pointing to the interpretation of individual experience in knowledge acquisition, maintains that:

> The empiricist assumption that dominated many branches of psychology for decades, the assumption that what we know is a direct reflection of what we can perceive in the physical world, has largely disappeared. In its place is a view that most knowledge is an interpretation of experience, an interpretation based on schemas, often idiosyncratic at least in detail, that enable and constrain individuals' processes of sense-making (*ibid.* p.1).

Rogoff's (1991) 'guided participation' (p.7 above), which offers explanations about children's learning in specific contexts, is said to be acquired through subtle and tacit means of communication, often within practical settings, as well as those achieved by explicit interaction. This is perceived to be a dynamic process of structuring and supporting development. These, almost commonsense approaches to knowledge acquisition emphasising its social dimension, have a direct appeal in their immediacy and accessibility, although individual uptake, assimilation, and interpretation must be taken into account.

4.2.2   The relationships between theory and practice

Atkinson (1981), as participant observer, studied Edinburgh medical students' initial exposure, termed by him as 'a crucial phase', to 'the reality of clinical medicine' which he maintained was 'socially organised, achieved and managed' (p.115). His intention was not to produce an exhaustive account of becoming a doctor but, in many ways, his interpretations and descriptions of student activities permit unique insights into this very process. Disappointed with aspects of the Becker study which largely ignored teaching, Atkinson concentrated on bedside teaching. Participating in students' reactions to the medical culture in

everyday clinical teaching, he was also sensitive to their attitudes towards gaining clinical experience. He

found clinicians to be pragmatists who demonstrated 'the primacy of clinical knowledge over theory',

with neither crude nor unsophisticated knowledge', but with the:

> subtlety of experience grounded in painstakingly accumulated knowledge of 'the real world', not based
> on the theoretician's theoretical or experimental excursions (p.19).

Atkinson's belief, that accumulated exposure to practical experience of patients and clinical work leads to

professional development and competence, echoes those of Becker *et al.* and Friedson as well as those of

CK theorists:

> The clinical culture is predicated therefore on the personal accumulation of clinical experience, and such
> a stock of knowledge is an essential component of any practitioner's competence. It is acquired in large
> measure at the patient's bedside - that personal and perceptual space encompassed by the clinical gaze
> (Atkinson, 1981, p.6).

Earlier, Friedson (1970) had distinguished between the clinician as a practitioner and a man of action who

looks for, and depends on, results as opposed to a theorist or a scientist, although the responsibility for

this practical action renders the clinician vulnerable. Atkinson (*ibid.*) holds that Friedson's components,

'all mutually interdependent, comprise a distinctive, occupational culture, characterised by a particular

orientation towards knowledge and action' (p.5).

Both of these views serve to emphasise the practitioner's specialised knowledge although it would seem

unacceptable to separate the practical, the theoretical, and the scientific dimensions of medical practice.

Atkinson's attention to the integrative features on which clinical actions depend, emphasises the unique

ways in which the doctor works. To separate theory and practice may be untenable since certain aspects

form a species of 'indeterminate knowledge'. According to him, 'indeterminate' knowledge is possessed

by all crafts and professions although practitioners believe it is not susceptible to 'rational codification

and explicit statement'. In general, this coincides with the views of CK theorists (although they attempt

to make such knowledge explicit) and the notions of tacit knowledge already discussed. In medicine, such

'indeterminate knowledge' is associated with the notion of clinical experience (*ibid.* p.5). The concepts of

indeterminate and technical knowledge require clarification.

4.2.3   Technicality and indeterminacy

These terms stem from a critique by Atkinson *et al.* (1973) of Jamous and Peloile's (1970) theoretical

framework for a sociological analysis of the professional process. Seeking to explain the ways in which

professional control and power are exerted, Atkinson *et al.* maintained that the original French work on indeterminacy was unspecific, hard to apply, and lacking in detail, but that it clarified important areas of professional knowledge and how professionals construe the ways in which they think about, and understand, their work.

Atkinson *et al.* (*ibid.*) define technicality as that 'which is entirely susceptible to codification in terms of explicit, public rules, procedures or techniques...' (p.3). Performance could be uniformly and unambiguously evaluated by reference to these public criteria. Whereas:

> Indeterminacy, on the other hand, refers to a variety of types of 'tacit' and private knowledge that is the personal property of the practitioner. It cannot be made explicit, and it remains untranslatable into precisely formulated rules or prescriptions. Unlike **techniques** such means of production are not transmissible by means of public formal methods, and may be transmitted by example, or observation of practice by the trainee. Some types of indeterminate knowledge may not be passed on at all, and personal rules of thumb are developed afresh by each new practitioner (p.3).

The contrast between the two forms of knowledge is that the former is external, open and explicit; the latter is internal and implicit. Atkinson (1981) also says that there is a difference in the mode of transmission of such types of knowledge. While technicality can be based on mechanical reproduction, mastery, and rote learning, indeterminacy depends on example and tacit means. The novice would have to pick up such knowledge rather than being taught it explicitly (p.109).

It must be remembered that these definitions and analyses, and indeed Atkinson's interpretation of Friedman's work as a particular kind of or orientation towards knowledge in action, preceded the work of Schön (1983, 1987). Atkinson's views also seem close to the Lave and Wenger position on the ways in which professional practice and expertise are conveyed to learners, in situated learning, as part of their cognitive and social development. Indeed all the sociology studies reviewed share the perspective that much professional knowledge is socially and experientially managed and acquired. The medical apprenticeship conforms to this mould. It is an interactive process, based on dialogue among participants, with opportunities to observe, try, and learn from senior practitioners.

4.2.4   Errors and their correction

Bosk (1979), also as participant observer, researched the ways in which expert surgeons initiated, trained, and controlled the work of their junior novice surgeons. He studied the behaviours of two contrasting styles of surgical leadership and classified the types of errors made by surgical teams. These were

portrayed along two continua. One was high on clinical and low on research work, the other vice-versa. These gave rise to differences in attitudes, priorities, and standards in training, reflecting different leadership styles and interests. Bosk described the 'collective conscience' of surgeons and how this contributed to group cohesion, solidarity, and professional control of competencies.

In ascending order of severity, Bosk determined four types of errors or failures: technical, judgmental, normative, and quasi-normative, each requiring different forms of correction or sanctions. The precise nature of this classification need not concern us here but correction and supervision are directly relevant to the delicate issues in training juniors. In controlling juniors' work, seniors face a dilemma in that errors must not be repeated, but sufficient scope for personal development and initiative must be allowed to take place through the making of decisions, some with possible erroneous consequences. Bosk terms this 'social support':

> He (seniors) must control mistakes. Yet at the same time, if he wishes to train competent, independent (and eventually) autonomous individual professionals, he must allow his subordinates enough room to make the honest errors of the inexperienced (p.3).

Riegelman (1991), interested in prevention, used a simpler twofold classification of basic errors: 'errors of ignorance' which imply that clinicians lack the necessary knowledge; and 'errors of implementation' which are more common and relate to using knowledge in diagnosis and therapy. Ende *et al.* (1995) classified different forms of giving feedback which were designed to preserve interns' self-esteem and confidence.

4.2.5   Typologies in the analysis of effective teaching

Spady's work was in general teaching, not medical education. However, his views about 'control' and 'authority' and their affects on the teaching process can be usefully applied to medicine. His (1973) analysis of the conflicting goals, functions, and styles of different educational practices says that the school takes custody of the child, shaping and developing the relevant attitudes, values, and expectations for later life. He maintains that the final responsibility for learning and accomplishing these aims is with the learners since all is dependent on their co-operation. Ultimately, learners control the learning but neither the content nor the assessment. In this, Spady finds control to be the overriding feature of the school.

From here, it is but a philosophical step to analysing the means of control. These split into: compliance or voluntary means (employing persuasion, influence or authority); or involuntary methods (using power, threat, or force). The former is obviously preferable but places more demands on the teaching effectiveness in the need to negotiate and justify all learning activities. It also renders responses unpredictable with the only solution resting, in Spady's conclusion, in 'authority'.

According to Spady, 'people willingly obey directives whose wisdom they do not question. The subordinate party in an authority relationship grants legitimacy to the dominant party because the latter embodies attributes that the former regards as consistent with his own goals and as valuable in promoting his general welfare'. (This was the position of 'The Boys in White'.) Reserving judgement and criticism, the learners' voluntary compliance is invested in legitimacy (p.5). But respect must be won in the first instance.

We now have another interpretation of 'legitimate' to compare with legitimate peripheral participation (p.7 above). In medical education there would appear to be a two-fold legitimacy. Firstly, the UG is sensitive to the vocational aspects of medicine; and secondly, he/she is responsive to the skills of communication, diagnosis, management, and prognosis possessed by seniors. These values are not inconsistent with seniors' career interests and personal goals which are often seen as desirable by learners.

Spady (*ibid.*) has recourse to Weber's (1958) conceptual analysis of legitimacy which complements LPP. Weber proposed 'three value orientations' that legitimise the exercise of control: beliefs in charisma; tradition; and rational-legal processes. Charismatic authority is associated with respect, dynamic leadership, and a sense of mission. Those possessing this quality are said to prove themselves by demonstrating 'the capacities for outstanding performance that are recognised as relevant and beneficial by their constituents'. Moreover, such charismatic leadership includes 'meeting the needs' of others with a sensitive and empathetic awareness of these needs (*ibid.* p.6). The legitimacy for traditional authority lies in that which has 'strong attachments to and reverence for established customs and institutions' (*ibid.* p.6). In the maintenance of the social order, this mode of exercising authority is viewed as inviolable and associated with inherent privileges.

The rational-legal type of authority is dependent on the supremacy of rational law. According to Spady, Weber 'assumed that the law is rational in that it reflected social norms intended to channel conduct in the

efficient pursuit of specified goals', becoming bureaucratic in the process. Spady goes on to differentiate between the primacy of rules and law, and rationality or expertise. The former depends on allegiance to 'codified sets of social arrangements' while the latter is dependent on the demonstrated competencies of the expert, regardless of status and characteristics (*ibid.* p.6).

Spady provides a typology from these four modes of legitimacy: charismatic; traditional; legal; and expert. This typology is defined by two major frames of reference, one socio-structural and the other normative or value based. 'Traditional and legal' are based on values which emphasise social institutions, whereas the 'charismatic and expert' reflect individual attributes. Taken from the normative or value orientation the combination of 'traditional and charismatic' is based on emotional and mystical criteria.

Although Spady says that this typology reflects an idealised theoretical construction, he does not comment on Weber's initial value-free distinctions. Nor does he comment on Weber's 'assumption' on the rationality of the law. All of the proposed modes of authority have the potential to lead to unwanted and errant means of control as, for example, in dictatorships or controversial religious leaderships. Spady appears to make the assumption that all is for 'good' even in his explanation that legitimacy is developed through trust and experience (p.6). He says:

> The implications for the classroom teacher are explicit: if the dominant mode of classroom organisation is to be legitimate rather than persuasive or coercive, the teacher must earn the respect of each student (p.7).

Here persuasion seems to be viewed negatively compared with his original perspective. Nevertheless, the development and relevancy of this analysis when applied in the benevolent and positive sense as Spady certainly intends, is undeniable and has undoubted relevance for clinical teaching.

Spady (*ibid.*) was committed to the need for teachers to realise security, confidence, and supportive environments for learners prior to successful learning. He delineated specific criteria:

- have something of substance and interest to say
- be capable of saying it clearly and accurately
- be capable of saying it in a stimulating and exciting fashion
- base this communication directly on a concern for the personal welfare of each student (p.8).

The first two of these criteria refer to subject matter expertise and pedagogical skills. The last two define a charismatic, stimulating, and caring dimension. In this sense, control, authority, and expertise are very closely related. There is also the inference that, in an ideal teaching world, the combination of subject

matter expertise and the charismatic (in its empathetic as well as its stimulating sense) should lead to the most successful learning and teaching.

4.3   Summary of sociological issues

Sociological methods have been used to realise information and descriptions about individuals, organisations, and professions within cultural perspectives. The view that professional CK is socially and experientially achieved, often within teamwork, offers an important focus for this investigation into CK acquisition. It also affords a perspective from which to explore the relationships between theory and practice.

The work of Atkinson and Spady will be recognised in the data analysis and discussion of this study. Atkinson's 'technical' and 'indeterminate' dimensions are identifiable in explicit formal teaching and in, for example, some history and examination skills which respond to explicit, procedural teaching. The implicit aspects are represented in tacit, informal, apprenticeship learning/teaching events. Spady's two-fold typology 'traditional/legal' and 'charismatic/expert' will be used to form a theory of apprenticeship. Bosk and other researchers illustrate how learners learn from mistakes in the clinical environment and how their supervisors use these errors in the learning process. Errors readily translate into learning needs.

There are some remarkable parallels in the literature reviewed. The main concepts which have been identified within the apprenticeship and the sociological literature are summarised in Table 1 below. Their possible applications to medicine are included.

Table 1 Summary of sociological concepts as they relate to apprenticeship

Spady's typology on legitimised authority	Lave and Wenger's LPP	Atkinson's dimensions	Application to medicine
INDIVIDUAL			
Charismatic authority Dynamic leadership and a sense of mission	—	—	Dedication to ideological principles; enthusiasm for medicine; vocational emphasis
Expert authority Demonstrated competencies	Access to expert performances	—	Legitimised authority in demonstrated skills and abilities
SOCIAL			
Traditional authority Institutional	**Legitimate Peripheral Participation** Situated learning; transparency	**Indeterminate** Implicit methods; values, attitudes	Apprenticeship; experiential learning tacit learning
Legal authority Codified sets of arrangements	—	**Technical** Explicit, public protocols, rules or procedures guidelines	Formal teaching practical procedures clinical skills

4.4 Cognitive psychology concepts and studies relevant to apprenticeship

4.4.1 Experience

Within the broadly cognitive-educational and socio-educational approaches, there is a renewed interest and convergence of views in the effects of 'experience' on learning. To be 'experienced' encapsulates a variety of meanings, nuances and understandings. The dictionary defines experience as 'actual observation of, or practical acquaintance with, facts or events; or knowledge or skills resulting from this' (OED). In practice, what it means to 'be experienced' is often difficult or impossible to describe or convey.

Macleod (1990, p.20 above) has said the term is 'slippery', a notion complicated by the fact that 'to experience is to have experience' and the notion that it can refer to the past and the present. Gale and Marsden (1983) describe the term as 'amorphous' but agree with de Groot on the aspects of experience which can be applied to areas other than chess. They quote de Groot's (1965) words:

> ... a master is a master primarily by virtue of what he has been able to build up by experience: and this is:
> a) a schooled and highly specific way of perceiving, and b) a system of reproductively available methods in memory (p.154).

There are several points here. This view perceives experience as cumulative knowledge (see Gagné below) which is characterised by a disciplined and distinctive way of seeing the world. Importantly, experience is associated with methods and knowledge which can be retrieved and put into practice through superior memory sources. Thus a master clinician might be expected to possess these attributes. A master clinical teacher might be expected to apply them to teaching.

4.4.2 Experience and expertise

Experience must not be confused with expertise where the latter implies specific skills or knowledge. Benner (1984, p.20 above) offered theoretical accounts of expertise in her documented descriptions and exemplars of the practices of experienced nurses, acknowledging that not all knowledge embedded in expertise can be captured (p.4, *ibid.*). She used the term 'experienced' to refer to the 'refinement of pre-conceived notions and theory through encounters with many actual practical situations that add nuances or shades of differences to theory' (p.36 *ibid.*). In medicine, where clinical expertise is impossible in every field, even limited or specialty expertise are contingent upon experience, otherwise the career structure

would be irrelevant. However, teaching expertise may be latent at any developmental stage through natural aptitudes, sensitivities towards learners, and motivation to teach.

Benner (*ibid.*) describes expert nursing practice in narrative and interpretative form but states that it is impossible to tap into reasoning or to make assumptions about it as a stepped process. This has relevance for medical practitioners' clinical reasoning processes where, too, there can be no assumptions that these are sequential in practice. This point also has a bearing on the unsatisfactoriness of S-R methods and their inability to recapture the speed of content and process in thinking. Although faithful in their accounts and attempts to reprise their thinking processes, participants may be unable to capture the precise details, order or speed of thinking when prompted:

> ...it is not possible to recapture from the experts in explicit, formal steps their mental processes or all the elements that go into their expert recognitional capacity to make rapid patient assessments... to assume that it is possible to capture all the steps in nursing practice is to assume that nursing is procedural rather than holistic (Benner 1984, p.42).

4.5   Experiential learning

4.5.1   Definitions of learning

Many theorists have faced problems in attempting to form inclusive and satisfactory definitions of learning which account for all its activities and processes (e.g.: Gagné 1965; Kolb 1984; Knowles 1990). In most cases, what predominates is a consensus that learning involves change and that the manner of this change can be termed the learning process.

Believing that the environment strongly influences the change process, Gagné (1965) laid down criteria for learning, maintaining that any changes in behaviours, attitudes, and values must be permanent and not merely attributable to developmental reasons. He says:

> Learning is a change in human disposition or capability, which can be retained, and which is not simply ascribable to the process of growth (p.5).

In his eight types of learning based on five domains, Gagné (*ibid.*), draws attention to the levels of complexity in learning processes and the conditions or pre-requisites upon which each form of learning depends. Referred to as 'a cumulative learning model' (Glaser 1976), Gagné's domains include many aspects required by medicine including motor skills, verbal information, intellectual skills, cognitive

strategies, and attitudes. The comprehensiveness of his classification is especially appropriate to the apprenticeship learning model.

Gagné's hierarchical typology points to increasingly complex behaviours in learning processes. As a model, it is appropriate for the gradual accumulation of experience and competencies which are acquired and refined in medical education from student to consultant. Such learning is the *modus operandi* for access to patient care, acquiring professional know-how, and the gradual assimilation of the requisite knowledge. Thus, apprenticeship is a hierarchical model which binds theory and practice as progressively more complex skills become integrated within the model.

4.5.2 Novice/expert differences

Interested in a psychology of instruction, Glaser (1976) defined the competencies which distinguish between novices and experts. These can be applied to the novice clinician in both theoretical and practical senses, as for example in abilities to perform practical procedures and in the diagnostic and management processes:

> The changes that take place as an individual progresses from ignorance to increasing competence are of the following kinds:
>
> (a) Variable, awkward, and crude performance changes to performance that is consistent, relatively fast, and precise. Unitary acts change into larger response integrations and overall strategies.
>
> (b) The contexts of performance change from simple stimulus patterns with a great deal of clarity to complex patterns in which information must be extracted from a context of events that are not all relevant.
>
> (c) Performance becomes increasingly symbolic, covert, and automatic. The learner responds increasingly to internal representations of an event, to internalised standards, and to internalised strategies for thinking and problem solving.
>
> (d) The behaviour of the competent individual becomes increasingly self-sustaining in terms of skilful employment of the rules when they are applicable and subtle bending of the rules in appropriate situations... (p.8-9).

In the learning process, Glaser (*ibid.*) also drew attention to covert methods in Resnick's (1976) work on mathematics teaching. Resnick said that it would be wrong to assume 'that efficient instruction is necessarily direct instruction in skilled performance strategies rather than instruction in routines that put learners in a good position to invent or derive efficient strategies for themselves' (*ibid.* p.12). This alludes to the subtle management of learning which appears to be self-directed but is in fact teacher controlled. It also parallels the emphasis of Lave and Wenger (p.9 above) where learning occurs without apparent pedagogical strategies or structure.

4.5.3 Kolb's theories of learning

Kolb (1984) promoted both experiential learning and the apprenticeship system. It is for these reasons that his ideas are recounted here. He developed his theories after the work of Dewey, Lewin, and Piaget, all of whom he considered 'the foremost intellectual ancestors of experiential learning theory' (*ibid.* p.15). Kolb also recognised the humanistic school's developmental and affective emphases in the learning process. Within the social dimension, he perceived that formal education should become less dominant, eventually giving way to individual and personal subjective experiences.

Kolb afforded Dewey, as the progenitor of experiential learning, a special place in his attention to the role of experience:

> I take it that the fundamental unity of the newer philosophy is found in the idea that there is an intimate and necessary relation between the processes of actual experience and learning (Dewey, 1938, pp.19-20, in Kolb, 1984).

Kolb also developed features of Lewin's work (1951), not least on the importance of a supportive environment to effective learning. Lewin is renowned for his development of leadership, management styles, and training in 'T groups'. In the mid 1940s, he was receptive to input and appraisal from his students and fellow workers when these were offered in a positive and co-operative spirit. These contributions and criticisms can now be construed as inducing ownership and feedback skills but Kolb stressed the importance of analytic skills within a relevant context for the immediacy and the efficacy of experiential learning:

> ...the discovery was made that learning is best facilitated in an environment where there is dialectic tension and conflict between immediate concrete experience and analytic detachment (Kolb, 1984, p.9).

4.5.4 Kolb's learning cycle and the practice of adult learning

Kolb conceived experiential learning as a four-stage cycle comprising: concrete experience; observation and reflection on that experience; formation of abstract concepts and generalisations; and testing the implications of concepts in new situations. This allows learning in four modes or as requiring four different abilities: affective (experience of concrete events); perceptual (reflective observation); symbolic (abstract conceptualisation); and behavioural (related to taking actions and active experimentation).

His conception of experiential learning is appropriate for the adult learner where fluidity and transfer between theory and practice and self-motivation are paramount (Mezirow 1981; Knowles 1990; Grant and

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Marsden 1992). Experiential learning caters for a number of issues which are important to adult learners. Adults are more highly motivated and successful when they are responsible for their own learning agenda and when personal learning needs are self-delineated or contracted with teachers. Effective learning in this vein is also said to be dependent on conducive environments which allow for learning at one's own rate and in self-allocated times, and negotiated outcomes. Within this framework, adult experiential learning requires that the learning tasks should be relevant to the everyday problems encountered.

Experiential learning is best facilitated by the teacher employing non-didactic principles (Knowles 1990). This equates with finding out information for one's self through self-directed learning within planned frameworks. These should be structured to allow teacher input and learner feedback to achieve more satisfactory learning experiences. Consequently, the adult learner is theoretically more able to develop behaviours such as inter-personal discussion skills as well as content knowledge. The need for personal motivation and feedback, originally dominant in behaviourist learning theories (Taba 1962; Bigge 1964; Child 1977), is differently construed and applied by the teacher in experiential learning circumstances.

4.5.5 Kolb's learning model and apprenticeship

Kolb promoted traditional 'apprenticeships, internships, work/study programmes and laboratory studies' (1984, p.5). Experience, all-important in this learning arena, is incorporated into Kolb's definition of learning 'the process whereby knowledge is created through the transformation of experience' (*ibid.*, p.38). Kolb perceives learning as an adaptation process in which knowledge as a 'transformation process' is 'created and re-created' rather than an entity to be acquired (p.38). The learner is transformed through experience.

Translated into medical education, Kolb's learning cycle is an apt theoretical model for learning clinical medicine. The 'affective, concrete experience' lies in the patient's problem at the bedside with its associated scientific and emotional concerns. Learners grow and mature through the experiences derived from watching seniors treat patients in the clinical environment. They are changed by the experiences of participation and engagement in the circumstances and the nature of the problem as, for example, in seeing participants deal with terminal illness. Action, as the end product of the cycle for the would-be doctor, is the application of knowledge and experience to new patient cases.

Thus, clinical apprenticeship is a model of experiential learning which, as well as possessing cumulative characteristics, is 'holistic' in that it reveals the totality of the learning process to the learner within the working environment. As such, experiential and situated learning take on board what it is really like to become a professional in complex environments in which attention may be spread over many circumstances and events.

Participation in the work of senior medical professionals determines, not only the learning processes and potential outcomes, but the assimilation of the expectations, roles, and duties, of participants. As such, the medical apprenticeship is the epitome of 'whole-part-whole' learning in a macro-process in which the learner is given a glimpse of the total scheme of things before acquiring deeper knowledge and skills about the constituent parts.

4.5.6   Problematic issues in apprenticeship as an experiential learning model

The inherent dangers of the model lie in the exposure of vulnerable uncritical learners to faulty role models and it is liable to fail through individual knowledge and skills weaknesses. Moreover, merely being present at events does not guarantee that effective learning takes place. These and other weaknesses in apprenticeship will be addressed p.213-214 below.

In applying the experiential adult learner model to medicine there is an apparent paradox. On the one hand, while Kolb's learning cycle perfectly suits the UG acquisition of the professional ethic and the clinical culture, there is often little choice at all developmental stages about the content or the learning methods experienced. These are often pre-determined by numerous factors beyond the learners' (and teachers') organisational control. For example, very often the patient mix and the spectrum of illness and disease are fixed by local circumstances which may distort the learning content. Young doctors must be selective about their jobs in order to gain experience and even this may be determined by demographic issues such as many old people in long stay wards or changes in work practices.

Finally, 'trial and error' learning methods, redolent of the behaviourist learning mould, may or may not achieve satisfactory results. Given the need for patient accountability, it might be assumed that these methods are highly controlled in clinical medicine and possibly limited to specific areas such as laboratory work or personal projects. However, little appears to be known about their use within PG supervision.

4.6   Reflection

4.6.1   Reflection on experience

The implication behind the Kolb and Lewin theories, that teaching and learning are managed processes, requires that teachers and learners share in reflection about events and activities to maximise educational opportunities. Apart from Kolb, several theorists have given the process of reflection on experience or reflective thinking a high profile in the totality of the learning process (Mezirow 1981, 1989; Schön 1983; Olsen and Eaton 1987; Boud *et al.* 1985; Silcock 1994).

Mezirow (1989), after the Habermas (1971) distinctions of 'the technical, the practical, and the emancipatory or self-reflection' aspects of cognition, says that 'reflective dialogue represents the most distinctly human attribute, the capacity to learn the meaning of one's own experience and to realise the value potential in nature through communication' (p.174). In the learning context, Boud *et al.* (1985) perceive reflection to be 'a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciations' (p.19).

Schön (1983) said 'usually reflection on knowing-in-action (tacit knowledge) goes together with reflection on the stuff at hand' (p.50). These words emphasise the evaluative sense implied in much reflective thought. Later, Schön's 1987 positions on reflection and coaching furthered his empathy with the proponents of practical and affective knowledge leading him to use the arts and artistic media in searching for new meanings about reflective actions in practice. He included apprenticeship in the crafts but unfortunately termed them 'deviant' in their traditions (p.xii).

Barrows (1988) developed Schön's work on coaching in his approach to the tutorial process. In essence, since coaching appears to involve advanced teaching skills, teachers call upon different skills and teaching methods when coaching students towards self-discovery. Schön (1987) perceived participants to arrive at solutions together, through dialogue in working in the 'reflective practicum'. This embraces a scenario analogous to an artist's studio which engenders reflection-in-action from learning by doing 'as it happens'. This aspect of reflection differs from reflection-on-action, a post-practice activity.

Fish *et al.* (1991), used Schön's theories to identify deeper interpretations of student supervision. Within an holistic approach, they identified four reflective 'strands': the Factual (description of procedural knowledge - what happens in practice); the Retrospective (an evaluative stance); the Sub-stratum

(exploring the values and beliefs which underlie personal practice); and the Connective Strand (how to relate present to future practice). This model was applied to Schön's 'reflective practicum' with some success but with admissions that the process of 'de-briefing' using the model was complex. However, their work finds reflection to be a pre-requisite in probing teacher/learner ideas about practice.

Schön (1987) has given status to professional practical knowledge or procedural know-how by identifying the values and uniqueness of complex and varying circumstances. His version of the 'professional artistry' in this process includes adaptability and individuality but he has not enlarged upon the role of experience apart from implying that the coach should have a repertoire of methods at his/her disposal in his various models of coaching (ibid. p.xii). Fish et al. interpreted Schön's reflection-in-action as 'thinking on one's feet' (pp.11-12). Presumably this reflects the fruits of experience which are present in professional judgements and when making decisions.

In his critique of Schön's theories of professional knowledge, Eraut (1994) found the explanations of reflection-in-action and reflection-on-action inadequate, inconsistent, and unable to support the 'epistemology of professional creativity' which Schön was concerned to develop (ibid. p.143). Eraut said that it is preferable to view Schön's ideas of practice as a 'theory of metacognition'. He also maintained that Schön ignored the time variables, the past, present, and future aspects of the reflection process.

4.6.2 Reflection in medicine

Practical reflection in medicine occurs in post-mortems, discussion with colleagues, learning from case presentations, feedback on management, and audit. It also presumably occurs in writing up notes or letters, and in deliberations with and about patients. Deliberate reflection on experience as an evaluative, but positive, activity which can be encouraged by removing obstructive feelings, has also played a part in effective teaching/learning activities. Specifically, reflection as feedback and analysis has been applied to the doctor/patient consultation and in communication and counselling skills where participants, through critical appraisal, are made to feel at ease and supported in discussion about practice (Maguire 1984: Pendleton et al. 1990).

Silcock (1994), referring to Schön's analysis and interpretation of professional 'moment-to-moment choices for action' as part of judgements about practical teaching, points to 'the level of sophistication skilled actions reach when they are under conscious control without being consciously articulated'

(p.279). This level of sophistication presumably applies to clinicians but it is not known to what extent they are able to articulate and apply their individual reflections on experience to teaching.

4.7   Ways of approaching the diagnostic process

What happens in the diagnostic process, sometimes referred to as clinical reasoning or medical problem solving, is the most important aspect of medical practice. It is arguably the nub of medical craft knowledge in its use of observation, history-taking, and the physical examination prior to, or as part of, the management process. The area is contentious and made more difficult by the lack of a common language (Norman, 1989). However, researchers are agreed on the fundamental role of experience in diagnostic procedures.

4.7.1   The information processing model

The Elstein *et al.* (1990) ten-year retrospective states that their medical problem-solving research was the first to study the thinking processes of expert physicians. They did this by applying a model of thinking derived from information-processing which stemmed from de Groot's (1965) research into expert and novice chess players and Newel and Simon's (1972) work on human problem solving. This employed thinking aloud and verbal recall measures to capture the problem-solving process.

The chess studies concluded that experts' use of memory was based on different abilities to 'chunk' and 'encode' information compared with that of novices. Groen and Patel (1985) questioned these findings after Chase and Simon (1973) contended that experts used highly elaborate knowledge bases compared with novices' use of general problem-solving methods. Later, Grant and Marsden (1987) indicated that expertise is associated with access to, or retrieval from, superior memory structures.

4.7.2   The hypothetico-deductive process

The identification of the procedures involved in this conceptualisation of diagnostic thinking is usually known as cue acquisition, hypothesis generation, cue interpretation, and hypotheses evaluation (Elstein *et al.* 1978). Much of this research was quantitative, e.g.: the number of hypotheses tested; when they occurred. However, the research failed to establish the differences between expert and non-expert approaches to problem-solving (Barrows *et al.* 1978). Gale and Marsden (1983) also criticised their

paucity of descriptions about thinking. The model had failed to illuminate how doctors actually approached the process of diagnosis.

Elstein *et al.* in 1978, were trying, for the first time, to synthesise problem-solving, decision-making, and issues of judgement in the clinical field. This was a unique effort to unite different ways of thinking about problem-solving. Importantly, they recognised that 'the cognitive activities of the physician do not fit conveniently into a single category of psychological research' (p.10). They also pointed to the mastery of content and the place of experience in clinical reasoning:

> ...the differences between experts and weaker problem-solvers are more to be found in the repertory of their experiences, organised in the long-term memory, than in differences in the planning and problem-solving heuristics employed (p.276).

In spite of some problematic findings, educators turned towards the acquisition of skills deemed necessary to solve clinical problems on the assumption, among other reasons, that training based on solving clinical problems would result in increased competence and accuracy in diagnoses. The idea of some universal method which, when acquired and applied, would facilitate the solving of all problems, has since been rejected (Norman 1988; Schmidt *et al.* 1990):

> There is a convergence of evidence from a variety of fields of inquiry that expertise is characterised, not by the possession of any superior general strategies, but by the availability of an extensive organised body of specialised knowledge (Norman 1988, p.285).

Norman (*ibid.*) also drew attention to the 'central role of experiential knowledge in expert performance', echoing Elstein's own interpretations.

4.7.3   Staging theories

Given the early recognition of variability in performance across cases and the problems of case specificity, it seems strange in retrospect that it was believed a general approach to solving problems was educationally valid. It is important to distinguish between case content in problem-solving and the methods of thinking used to solve them. Not all cases may be solved by the same thinking processes, which is the reasoning behind the 'stage' theory of Schmidt *et al.* (1990). The 'staging process' refers to the ways in which clinicians use their expertise to solve problems outside their own fields but it may equally apply to dealing with undiagnosed patients. The methodologies being used to test these theories are now concentrating on difficult cases to differentiate between approaches and the effects of experience:

...expert clinicians approach routine problems through a non-analytical 'pattern recognition' process based on similarity to prior cases and use formal clinical and pathophysiological knowledge only for more atypical or difficult cases (p.115 in Norman *et al.* 1994, originally Schmidt *et al.* 1990).

In 1994, Elstein maintained that in 1990 he and his colleagues were also making similar claims. 'Experts explicitly use the hypothesis-testing method whenever routine problem recognition methods fail' (p.122). Elstein (*ibid.*) also stressed the relationship between the method of clinical reasoning used and the nature of the problem:

> ...the method selected depends on the perceived characteristics of the problem. There is an interaction between the clinician's level of skill and the perceived difficulty of the task. Easy cases are solved by pattern recognition and by going directly from data to diagnostic classification. Difficult cases need systematic hypothesis generation and testing (p.122).

While Elstein may be arguing with the benefit of hindsight, probably the earlier quantitative emphasis in his work may have obscured other meanings and interpretations of experts' behaviours in the diagnostic process. It may also have diverted attention from the kinds of problems or cases which might differentiate among approaches to clinical reasoning.

4.7.4   Pattern recognition

The dictionary definition of 'pattern' (OED) which is most helpful here is, 'a regular or logical form, order, or arrangements of parts, including behaviour pattern'. There is no precise definition of the term applied to medicine but it can be auditory and/or visual and is applicable to behavioural patterns, and clusters or constellations of signs and symptoms. Pattern recognition appears to be related to hypotheses testing and is deemed to be part of the hypothetico-deductive model. Barrows and Feltovich (1987) state that 'hypotheses are not necessarily diagnostic entities; they can represent anatomical, physiological, or aetiological explanations for the problem encountered.' They go on to describe that these 'explanations' or 'non-specific ideas' can be specific or general. While this may be absolutely true, the language should not be confused. An hypothesis is not an explanation.

However, these authors (*ibid.*) claim that before pattern recognition can occur, it must be preceded by hypotheses generation and testing, otherwise the data to match and compare the pattern would not arise. This argument is used against those who would maintain that the clinical reasoning process is 'pattern matching'. Another reason to support their hypotheses model is that 'the mind is capable of processing

data at very fast speeds and of doing problem-solving at an unconscious level' (p.89). There is no evidence for this statement.

At a commonsense level, if a pattern emerges when patients present with relatively set signs and symptoms, the pattern may be associated with specific diseases or conditions. This does not necessarily mean that specific hypotheses have been set up - it only means that the symptoms have been interpreted. The speed of thinking may induce rapid hypothesis generation.

Gale and Marsden (1983) maintain that, because clinicians have to be selective about information as revealed by the patient, they impose or confer the pattern from the flow of details provided. This is consonant with all the dominant cognitive theories which maintain that individuals actively construe, as opposed to passively accepting, their world. The facts as presented may have the qualities of a pattern but they exist 'in the clinician's mind'. This would also obtain from laboratory data where a pattern has to be imposed and it may or may not be experience-related.

4.7.5 'Prototypes'

Bordage and Zacks (1984) were concerned with the representativeness of problems to contain exemplary features of diseases which facilitate learning and the concomitant educational issues for curricular selection and assessment. Once again, the organisation and structure of knowledge were the starting point. Their theory holds that knowledge of a category is structured round a 'prototype' which encapsulates details and essentials of that category. Both experts and novices were able to apply this theory providing similar, but with quantitatively small, data differences. Experts have readier access to a wider range of prototypes and categories compared with novices, with prototypes serving as 'an indexing scheme for clinicians' knowledge' (ibid. p.415). Some disorders were more prototypical than others in their representativeness to illustrate categories, with implications for the initial nature of problems which should be introduced to learners.

4.7.6 'Forceful features'

Grant (Gale) and Marsden (1982; 1987; 1988b) looked at both quantitative and qualitative ways to describe the diagnostic process and the associated role of experience. Their earlier work questioned both pattern recognition and hypotheses generation and demonstrated that what happened in practice, was that

clinicians (and students) produced 'working interpretations', as opposed to hypotheses, in the first stage of the diagnostic process.

The later work pointed to individuality in expert-novice problem-solving and in the manner in which 'forceful features', or personally important pieces of information, were identified. This was achieved through demonstrated differences in the memory structures between experts and novices, a result of interpretations and explanations of the diagnostic process in terms of 'two mutual and simultaneous cognitive processes of structuring and extrapolating' (p.119).

One of these researchers' most interesting findings was that the 'content of thought differentiated between people with different amounts of experience' (1987, p.96). Thus exposure to many patients can make a difference:

> Experience, then, is not characterised by uniformity of thinking but by individuality of thought, as inexperience is but with different and (the available evidence would indicate) less effective precise content (*ibid.* p.96).

4.7.7 Semantic inferences in the diagnostic process

Work by Lemieux and Bordage (1986), based on S-R thinking aloud methods, has semantic implications. Instead of using the expert-novice paradigm, Bordage distinguished between successful and unsuccessful problem-solvers. In these interpretations, based on language in discourses, experts organise and store cases in their memory as a rich supply of networks and knowledge structures which they can draw upon when required. Cases are stored using broad differentials such as 'acute-chronic', 'gradual-sudden'. Less successful problem-solvers do not possess or employ this facility. One has to experience the library before one can use the indexing system. Experience is all.

Clinicians' store of medical knowledge was classified into 'four states of information processing': low knowledge; high dispersed knowledge; high elaborated knowledge; and high compiled knowledge. In the last category (the most effective), 'all knowledge is compiled into a few words - the elaborated networks of knowledge have been condensed by experience' (Norman *et al.* 1989, p.4).

This type of classification bears a strong resemblance to the student learning research in which richer and more sophisticated descriptions evidence a deeper approach to information processing (Entwistle 1981;

1984). It is also indicative of the highly condensed and sophisticated use of language associated with expertise in delivering clinical case presentations.

4.7.8 Recent developments in the diagnostic process

Schmidt *et al.* (1990), echoing the findings of Grant and Marsden and Bordage above, proposed the development of expertise in medicine, not as superior reasoning skills or in-depth knowledge, but as 'based on cognitive structures that describe the features of prototypical or even actual patients'. These cognitive structures are referred to as 'illness scripts' which depend on the acquisition of experience and the nature of illnesses seen.

From their research into the ways in which written case information was presented and interpreted at different stages of clinical experience, these authors now propose that:

> ...one of the salient features of our theory is the presupposition that physicians actually use the memories of previous patients while diagnosing a new case (*ibid.*, p.613).

There is also the recognition that expertise is based on experience of patients: '...extensive exposure to many different cases may be the crucial factor in developing expertise' (*ibid.*, p.617). In concluding that memory is the overriding source of differences in diagnostic performances between medical students and physicians as a result of variation in experience, these authors endorse the earlier work of Grant and Marsden as discussed.

A feature of the 'illness script' is its serial order which resembles the way in which physicians inform each other about respective patients. It also replicates the 'story structure' in medicine which, of course, has its roots in disciplined history-taking and presentation skills. Another feature is the idiosyncratic nature of 'scripts' depending on cases seen.

The late 1980s and early 1990s witnessed less research into diagnostic activities as purely information processing, and increased interest in descriptive, qualitative methods to shed light on the diagnostic process in general. Past reliance on experimental methods to explore clinical reasoning has given way to investigating experts' mental organisation of knowledge and its relation to expertise (Norman *et al.* 1990). This trend is coupled with the fact that the role of experience, as originally promoted by Elstein *et al.* in 1978, is being accredited with greater influence. One might well say 'at last!'

Elstein's 1990 review, linking new ideas in problem-solving with situated learning, is relevant to the quest to explain how medical experts pass on CK. In his words:

> Outside of the medical domain, there is a growing literature in problem-solving and cognition that supports the use of more realistic situations to study what both experts and novices can do... [he cites among others, Resnick 1987; Rogoff and Lave 1984] These scholars argue for a view of situated, context-dependent cognition that is consistent with our early finding of case specificity (p.27).

In other words, it is unrealistic to examine the effects of problem-solving outside their natural context.

4.8 Summary of cognitive psychology issues

This section began with a conceptual clarification of experience, a concept which is difficult to define, and yet is of key importance to both professional knowledge acquisition in medicine and expert behaviours. The literature has differentiated between experience and expertise while showing the dependency of the latter upon the former. Explanations concerning the differences between experts and novices have increasingly shown that expert actions are characterised by the ability to grasp and deal with a problem holistically. The individual memory structures of experts are also dependent on experience as is their reliance on experience of previous cases to solve diagnostic problems.

The medical apprenticeship model has an affinity with experiential learning as expounded by Kolb (1984) but questions remain as to the extent to which adult learning theory applies to medicine. Another problem remains that there are few detailed descriptions of how experts pass on their experience or how learners become experienced. Similarly, while researchers have emphasised the importance of reflection on experience as a key feature in becoming professional, there are inadequate explanations about how clinicians reflect on their clinical teaching activities.

The review has revealed various ways of thinking about diagnosing patients. A number of concepts explored, such as illness scripts, pattern recognition, case presentations, and experts' superior memories, will be returned to in the Discussion of this research. While a consensus view exists on the importance of experience in relation to the diagnosis process, there is insufficient information on how experts and learners perceive the ways in which it is taught.

The argument at the end of this last review is that to date, research into clinical teaching has been unable fully to explain either apprenticeship as a learning model, or to provide adequate descriptions of the

clinical teaching/learning processes. Two questions on reflection and the diagnostic process have been selected to remedy this perceived lack of information,

4.9 The remaining research questions

6. How do expert and novice clinicians reflect on their experience, their work, and their teaching/ learning activities?

7. How is the diagnostic process taught beyond the acquisition of clinical skills?

4.10 Revised statement of the research questions

Methodological questions

a) Can CK research principles be used to describe and explain what medical experts do well in their practice and teaching rather than using a deficit approach?

b) Can tacit knowledge and teaching strategies be articulated to provide descriptive examples of clinical teaching and learning?

Research questions

1. Which beliefs do clinicians hold about the current medical apprenticeship model?

2. How does the hierarchical structure of apprenticeship in hospital medicine affect teaching and learning?

3. What are the relationships between clinical experience, work, and teaching and learning, and the ways in which CK about medical practice is passed on from experienced to less experienced individuals?

4. What are clinicians' theories and perceptions of their teaching and learning?

5. How do expert and novice clinicians reflect on their experience, their work, and their teaching/ learning activities?

6. How is the diagnostic process taught beyond the acquisition of basic skills?

7 Are clinicians' theories of teaching and learning consistent with their practice?

CHAPTER FIVE

RESEARCH METHODS

5.1   Introduction

Ethnographers Goetz and LeCompte (1984) offer four theoretical dimensions to adopt in framing explanations about reality: inductive-deductive; subjective-objective; generative-verificative; constructive-enumerative. The deductive, objective, verificative, and enumerative dimension is said to be 'hard' and characterises quantitative research. 'Soft' research leans more towards the inductive, subjective, generative, and constructive or qualitative dimension. However, Goetz and LeCompte believe that the 'quantitative-qualitative' distinction is 'inexact and artificial' (*ibid.* p.6) and that most social science research is located between the extremes. The broad differences between these research perspectives are reviewed before outlining the other research methods used in this study.

5.2   Quantitative research methods

Deduction is a form of reasoning derived from Aristotle in which a self-evident proposition gives rise to a minor premise which in turn gives way to a logical conclusion (Cohen and Manion, p.3). Researchers in the deductive mode begin with propositions and constructs for testing. Inductive research builds up data from observations or measurements and then proceeds to construct theoretical propositions and relationships from the data. A theory is formed to explain the object of study.

Quantitative research is verificative in that it verifies or tests previously developed propositions. It also relates to the ways in which the data are expected to generalise beyond the scope of the study in question. The enumerative aspect applies to the manner in which a study's units of analysis are construed. In quantitative work, these are formulated beforehand which places limitations and constraints on their explanatory power. In qualitative research, these units are derived from data by a process of abstraction arrived at through observation and description. To add to the confusion, there may be a quantitative aspect in qualitative methods and quality may also refer to accuracy, relevance, and rigour in both research modes. The objectivity perceived to operate in quantitative instruments is designed to distance the

researcher from the subject of study, preserve respondents' anonymity, avoid subjectivity, and minimise researcher bias. However, as we shall see, this does not always happen.

5.3 The advantages and disadvantages of quantitative research methods

Quantitative research provides information which, if the statistical analyses employed are accurate, valid, and reliable, is readily acceptable. The analysed information lends itself to easily accommodated computerised visual displays in bar charts, diagrams, and frequency tables. In practice, the study design or the instruments may prove problematic when using quantitative methods. For example, in education, the breadth of field, scale, and diversity of subject matter raise problems which cannot be overcome by even large, randomised, controlled trials. Question selectivity may reflect researcher interests and total objectivity may prove elusive. However, selectivity relating to sampling and data analysis procedures, affect any research tool or programme since judgement is involved (Evertson and Green 1986; Mays and Pope 1996).

Questionnaires and surveys permit a wider coverage for possibly larger, more representative samples and hence, greater validity. They also allow more considered responses, although the success of questionnaires, inventories, and rating scales depends on non-ambiguous question phrasing. However, validity depends on the truth of replies (Mouly 1978). Unless questionnaires are administered in controlled conditions, there may be collusion in responses. Thus only 'face' or surface validity may be possible. The issue of truth permeates all replies in all methods.

Closed questions permit computerised data analyses. Yet simple factual answers may not supply the necessary information, and open questions, which allow greater personal reflection and opinion to emerge, may be preferable. These are notoriously difficult to code, are subject to coder error, and unless strict measures to achieve inter-coder reliability are used, the results may be unreliable. The important point to stress is that quantitative methods may not reach or tap into the processes, opinions, approaches, and meanings of individuals, events, and activities. They will supply certain information but this may be limited and if used alone, may allow insufficient or inappropriate evidence. Thus the depth of insight to explain practice and infuse theory will almost certainly be inadequate from a purely quantitative approach.

For the above reasons, quantitative methods were deemed unsuitable for a study which seeks to explain and describe the complex, inexact areas of teaching and learning in the clinical environment and which required the flexibility to interpret data without the constraints imposed by preformulated constructs and propositions. An inductive approach to data interpretation, with less reliance on reliability through the reproduction of events, but with explanatory powers to arrive at theoretical constructs from grounded data, was more appropriate. Naturalistic inquiry methods were chosen as those most suited to realise these aims.

5.4   The characteristics of naturalistic methods

Malinowski in 1914 and Mead in 1928 probed the beliefs and lifestyles of their research subjects to find new interpretations and explanations of behaviours and learner outcomes. Half a century later, Erikson (1986) described subsequent methodological developments as having a family resemblance in that ethnographic, qualitative, participant observational, case study, and interpretative approaches shared similar characteristics but with small differences. Preferring 'interpretative' as an inclusive term, Erikson (*ibid.*) points to the key features: '...central research interest in human meaning in social life and in its elucidation and exposition by the researcher' (p.119).

Other developments and/or characteristics of these methods include: the illuminative approach of Parlett and Hamilton (1972); an open-ended framework associated with an absence of controls in the research process (Guba 1978); an emphasis on process rather than outcomes and products; inductive analysis of data using the study to identify issues while remaining open to new ideas and emergent findings in the data (Bogdan and Biklen 1982; Miles and Huberman 1984); and utilisation of tacit knowledge, emergent design, and case study reporting mode (Tesch 1990). Naturalism in this study was reflected in the deliberate lack of intervention in clinicians' everyday activities.

The terms 'qualitative', 'interpretative', 'naturalistic', and 'illuminative' have become blurred in usage. Moreover, 'qualitative' has wrongly become associated with 'non-quantitative' approaches even if, in most cases, that may indeed be one of its chief characteristics. As Adelman and Young (1985) said:

> ...qualitative research does aggregate 'instances'. Data are regularly collected into typologies, and at least an ordinary level of measurement is regularly invoked by fieldworkers in the claim that, say, things happen more or less frequently, are of more or less importance, are more or less disruptive and so on (p.39).

By collating issues and classifying these into categories, fieldworkers play a different numbers game which is recognisable in aggregating the common features and behaviours of individual and group activities. These principles were applied to this study.

5.5 The advantages of naturalistic inquiry

The chief advantages of the methods lie in their potential to incorporate a repertoire of research tools which lead to substantially different data content. These tools include participant observation, progressive focusing, and interviewing, all of which were used to advantage in this research. Participant observation is a controversial process, usually described as occurring along a continuum stretching from active and full involvement to minimal participation (Junker 1952; Schwartz and Schwartz 1955; Gold 1969; Zelditch 1969; Cohen and Manion 1989). In this study the researcher observed clinical activities and subsequently interviewed participants.

Naturalistic methods permit redefinition and/or changes in focus as new data and interpretations emerge. Parlett and Hamilton (1972) coined the term 'progressive focusing' to describe this feature which includes: flexibility in research which does not follow a linear path; allows an emergent design; avoids early closure; and permits capitalisation on unexpected data and outcomes. In response to new information, changes in focus were used throughout this study.

5.6 The disadvantages of naturalistic methods

Most of the disadvantages centre round: data interpretation issues; observer effects on participants; interviewing problems; and the need to exercise caution in the interpretation of qualitative data which are often said to be impressionistic, subjective, and anecdotal (Schwartz and Schwartz 1955; Mouly 1978; Macdonald 1985; Pollard 1985; Atkinson and Delamont 1985; Adelman and Young 1985; Evertson and Green 1986; Erikson 1986; Cohen and Manion, 1989; Anderson 1990). Biased opinions, attitudes, and personalities, including those of the researcher, may contaminate the data during collection, analysis or reporting. (McCall and Simmons 1969).

Numerous problems present as a series of paradoxes and dilemmas often ethical in nature (Jarvie 1982). For example, maintaining observer detachment while achieving the involvement necessary for

understanding; interpreting informants' views as truth or at face value (Powney and Watts 1987); maintaining good observer relationships in situations which render those under study vulnerable in reporting; achieving objectivity in often highly subjective situations; and reporting accurately while maintaining confidentiality (Becker 1958; Dean and Foote Whyte 1969; Shipman 1981; Becker and Geer 1982).

'Reactive effects' which may affect validity and reliability in naturalistic approaches, meet in the observer as the main research instrument. A major concern is observer effects on the context, content, and behaviours of those being observed and vice versa (Schwartz and Schwartz 1955, 1969; Guba and Lincoln 1981; Bogdan and Biklen 1982; LeCompte and Goetz 1982). According to Patton (1980), the basic notion is that people behave differently when observed. For example, teachers may teach 'better' (in their opinion), or more actively than the norm, for the benefit of the observer, or through consciously trying to further the research process. To obviate this problem known as the 'Hawthorne' effect (Mouly 1978; Cohen and Manion 1989), participants in this research were asked if clinical activities were different from usual. Only one instance was reported (and also detected by the researcher) concerning one consultant in the third phase when more teaching than would have been expected was introduced into a clinic.

5.7 Other constructs in this study

5.7.1 Grounded theory

Born in the sociological tradition, grounded theory demands a non-judgmental stance to data interpretation. In this it resembles CK research methods. The concept was conceived by its proponents to arise from data collected without prior theories or hypotheses. Researchers are asked to suspend all known theories and knowledge about the chosen topic and propose new theory from patterns discerned in the data by a process called 'constant comparison' (Glaser and Strauss 1967). The basic tenet is that:

> The elements of theory that are generated by comparative analysis are first: conceptual categories and their conceptual properties; and second, hypotheses or generalised relations among the categories and their properties (ibid. p.35).

According to these authors, both categories and their properties are concepts indicated by the data, not the data themselves. Indeed, these are said to have 'a life apart' from the original sources (ibid. p.36). Tesch

...data are ordered into preliminary categories according to their conceptual context, and then constantly compared within a category to establish consistency, and across categories to establish clear boundaries (p.24).

In a simplistic sense, this is consonant with the aggregation of instances and the categorisation of 'issues' advocated by Schatzman and Strauss (1973). The categorisation process is also a natural outcome from the 'de-contextualising and re-contextualising' alluded to by Tesch (*ibid.*) in organising and segmenting data for analysis:

> The specific purpose of grounded theory is to arrive at abstract categories that constitute concepts which facilitate our understanding of a phenomenon, and that may have relationships to each other (which are then considered "theories") (p.140).

The processes associated with grounded theory share certain abiding characteristics: saturation in, and interaction with, the data collection; data coding; and data analysis procedures. Later analysis is embodied in elaboration, clarification, and data reduction processes, all of which were experienced in this study.

5.7.2 The case study

Case studies can employ both quantitative and qualitative methods. Their main characteristics are described by Yin (1984) and Tesch (1990).

A case study is an empirical inquiry that:

- investigates a contemporary phenomenon within its real life context; when

- the boundaries between the phenomenon and the context are not clearly evident;

- multiple sources of evidence are used (Yin, p.23).

Tesch has defined it more broadly as 'intensive and detailed study of one individual or of a group as an entity, through observation, self reports, and any other means' (p.39).

Case studies are exploratory, descriptive, or explanatory. They answer 'how' and 'why' questions and can be used to provide information which leads to operational links between events and outcomes (Yin *ibid.*). Yin believes the case study's unique strength is its ability to deal with a full variety of evidence including documents, artefacts, interviews and observations. Other educationists believe it to be the perfect medium for observation and documentation leading to increased knowledge about educational practice (Macdonald and Walker 1975; Walker 1983a; Stenhouse 1982, 1984; Burgess 1985). The case study is also said to

for observation and documentation leading to increased knowledge about educational practice (Macdonald and Walker 1975; Walker 1983a; Stenhouse 1982, 1984; Burgess 1985). The case study is also said to portray instances of intrinsic interest and complexity (Simmons 1989). Its advantages lie in their immediacy to human experience; their 'down-to-earth' characteristics; the ways in which the subtle and the complex can be observed; and their potential to reveal insights leading to action and change. For all of these reasons, the case approach was particularly suitable for this programme.

The problems of naturalistic methods as discussed above apply equally to the case study, particularly in the social intimacies and delicate nature of 'how' and 'where' the data were generated and gathered. All participants, including the researcher, are vulnerable. Macdonald and Walker (1975) produced case study guidelines which detailed ethical and procedural measures designed to protect findings and associated personnel. These guidelines noted that proof is rarely obtainable in case-study research. The recommendations (*ibid.*) were that the researcher should aim to understand all the variables, parameters, and dynamics involved while acknowledging that 'It is implicit in the notion of case-study that there is no one true definition of the situation. In social situations, truth is multiple' (p.9).

In a shot across the bows, or in their own words 'what amounts to a warning signal' to those embarking on case study methods, Adelman and Young cite Walker (1983b) on methodological issues:

> Walker writes about the difficulty of maintaining a suspension of judgement, avoiding co-option, of the difficulties of dealing with informants' reactions to case study drafts given the informants' agreed right of access and comment on those drafts, relying too heavily on the single source of data at the interview and the problems raised by intervention in the lives of others through this form of research (p.49).

Another problem stems from delineating what constitutes 'the case' and what it might contain. Adelman and Young (1985) state that 'the unit of analysis (case) can, in practice, mean almost anything .... Nor is the term "boundary" helpful since it may be artificially constructed by actors and analyses' (p.31). Moreover, there are specific issues relating to sampling, validity, reliability, and generalisation when using case study methods. The implications of these for this study will be addressed in Chapter Six.

5.7.3 Content analysis

Content analysis, as defined by Berelson (1952), is a 'research technique for the objective, systematic, and quantitative description of the manifest content of communication' (p.18). Intensive analyses of interview transcripts are used in discourse analysis to probe the pauses, utterances, and esoteric meanings of

linguistic analyses, often in highly quantitative accounts. This research did not use such detailed analysis methods but a diluted form was applied to individual questioning techniques. This usage was in the spirit of 'anything connected with the phenomenon that interests the researcher qualifies as data for content analysis' (Krippendorf 1980).

Tesch (1990) has referred to content analysis methods as 'the back and forth movement of concept development and data analysis as in grounded theory' (p.64). The technique allows the tabulation of information or simple classification processes. Used in conjunction with observation studies and tape transcripts, the method enables the researcher to analyse incidents, language, and other variables acting on the educational process (Borg and Gall 1979).

Use of content analysis methods may guide a study in much the same way as do coding and categorisation activities, since it involves questioning data to probe meaning, relationships, assumptions, experiences, and the ways in which events unfold. Content analysis was used in this research to identify issues and themes for later interpretation and theory building. This meant constant recourse to re-examining the exact words and meanings in all transcripts within the precise contexts of observations and interviews. New insights and re-focusing also meant constant back-tracking to see whether anything had been missed earlier.

5.7.4 Craft knowledge research principles

The tenets and methods used to articulate CK in general teaching were incorporated into this programme providing it with a particular research emphasis (p.15 and 18 above). This was reflected in a number of ways which will be revealed in the forthcoming chapters as for example: in access agreements; the nature of questions asked; observation foci; the data collected; and the absence of reporting on essentially negative, participant behaviours.

The description of the research process takes the study forward.

CHAPTER SIX

THE RESEARCH PROCESS

6.1 Introduction

> The qualitative researcher plans to use part of the study to learn what the important questions are; he or she does not assume that enough is known to recognise the important concerns before undertaking the research (Bogdan and Biklen 1982, p.29).

These words epitomise this study in that, although the main research questions had been identified from the literature reviews, much remained to be discovered. Hence the use of an emergent three-phase design consisting of pilot, case, and interview studies. Each stage revealed new insights about apprentice learning/teaching and productive means of studying them.

All three phases set out to answer the research questions but not all at once. Broadly, the pilot study (using only interviews) aimed to clarify perceptions of CK in practice (teaching was a by-product at this stage); the case study (using participant observation and interviews) looked more intensively at learning and teaching in one medical team under the direction of one expert consultant; the third phase (also based on observation but with the addition of a semi-structured interview schedule) used a narrower and more controlled paired-study focus with six consultants and their respective SHOs. In the last phase, the emphasis was on learning as opposed to teaching. All phases were conducted in general medicine, the area in which learners acquire and develop clinical skills prior to later specialisation in surgery and in medicine itself.

After discussing sampling and administration issues, each phase is described with reference to the main reasons for the evolving nature of the design. The chapter closes with a discussion of the relevant validity, reliability, and generalisability issues. The research process, showing the distribution of twenty-nine interviews, is summarised in Table 2 below.

Table 2 The research process

Research phase	Method	Interviewees	Context	Total interviews
1. Pilot study	Interviews	Three physicians	office	3
2. Case study	Participant observation + interviews	Consultant SHO, HO, UGs	ward rounds, clinics, tutorials	14
3. Interview study	Participant observation + interviews	6 pairs of Consultants and SHOs	ward rounds, clinics	12
				29

6.2   Sampling issues

Purposeful sampling is said to be a strategy to learn and understand something about a specific case without the need to generalise from the findings and yet glean the most information from it (Patton 1980; Cohen and Manion 1989). Patton (*ibid.*) speaks of other qualitative or naturalistic sampling strategies. Decisions and eventual selection are, quite simply, based on the potential productivity of cases to supply information. The distinct strategies of selecting critical cases afford specific, unique, and important examples as well as those that are particularly diverse. Also, in the need to limit excessive data collection from field notes and interview transcripts, Miles and Huberman (1984) stress that qualitative studies use smaller samples coupled with the fact that the nature of sampling can change during the research process.

Following these criteria, small purposive samples were used in the three phases of this study. The type of samples changed in response to progressive focusing and emergent outcomes. Pragmatically, the study had to be easily managed and cost effective on clinicians' time which is at a premium. Provided the research itself did not suffer from limited sample sizes, it was prudent to keep these small and to limit the number of interview requests.

6.3   The Pilot Study

6.3.1   The sample of interviewees

Certain criteria had to be answered. In the absence of a precise conceptual framework for the main research design, the pilot interviewees needed to generate ideas and indicate a fresh way to explore the craft of medicine and the acquisition of medical knowledge. Those selected had to have the potential to offer diverse views about medical practice and clinical teaching as well as possess personal teaching expertise.

They were required to have the perceived potential to inform the research questions, to reflect on the concept of CK in medicine, and to share their views about how this CK was passed on from expert to novice. It was also necessary to determine the interviewees' values and what they did well in their work.

Observing these criteria, the research began by interviewing a small sample of three expert physicians to allow a thorough look at prospective responses.

6.3.2 The Pilot Study interviewees, interviews, and questions

Two assumptions were made about the chosen three specialist interviewees: that at senior grades they would, by the nature of their appointments, have superior knowledge and offer interesting perspectives on professional issues and their specialties; and that their appointments should denote them as experts, underscoring their clinical expertise.

The chosen interviewees were male, in medical academic posts, and towards middle age. They were: a professor of child health (CH); a professor in general practice (GP) and a consultant physician in general medicine (GM). In addition to fulfilling the above criteria, the selection of these interviewees was based on several factors: the shared roots in medicine provided cohesion and the specialty aspects allowed for mutual and contrasting professional opinions about their work and experience; the hospital, the community, primary and secondary care were all represented; all three dealt with a wide variety of patients and teaching circumstances. All three physicians had taken part in projects in which the researcher had had previous participant observation experience in either a comparative, or evaluative, or other educational capacity over the last ten years. Results had shown that the chosen experts were all highly regarded, experienced clinicians and teachers.

There was also an opportunistic element to the sample. It was known that the three interviewees were interested in educational activities and they were perceived (rightly) to be sympathetic towards giving time to an educational exercise which initially had neither formal structure nor written protocol and was partly experimental.

The pilot study interviews were conducted as unstructured discussions or extended conversations in an informal style (Patton 1980; Becker and Geer 1982; Burgess 1982; Cohen and Manion 1989; Millar *et al.* 1992). This afforded the interviewees greater freedom to react spontaneously to the questions while the

researcher controlled the discussion from an almost deliberately naive position. The interviews, each lasting approximately 45 minutes, were audio-taped, transcribed, and analysed by issues arising (Schatzman and Strauss 1973; Miles and Huberman 1984).

Initial planning conceived three, common, open questions which solicited personal opinions about values and attitudes towards medicine and practice. These questions were: 'What makes you a good doctor?', 'What skills do you value as a doctor?' and 'What do you do well in your work as a doctor?' These broad questions were asked in order to probe for specific examples of medical CK and to find a base terminology about how participants described their professional activities. The first question was abandoned after it was denied by two participants.

6.3.3   The value of the Pilot Study

The pilot study offered useful insights into specialist views of practice and teaching but it was most valuable in realising information about the experts' clinical experience which emerged as their most outstanding shared characteristic. Bearing in mind that an exploration of apprenticeship was at the heart of the study, the nature of clinical experience at different stages within the model seemed to be the most appropriate research vehicle to provide new descriptions and explanations of apprenticeship learning. Therefore, a major outcome was the decision to conduct a case study comprising one medical team to explore the role of experience in learning and teaching.

6.4   The Case Study

6.4.1   The reasons for a Case Study

In concentrating on the work and practices of a few clinicians, a case study had the potential to generate data using grounded theory principles and descriptive examples of teaching excellence. A case, conceived as one medical team with different grades of personnel, offered opportunities to observe doctors at varying career levels as well as the chance to observe 'expert/novice' comparisons in everyday activities. A case study, conducted over an extended period, allowed continuity in the research process, giving time to establish contacts and 'get the feel' of belonging to a hospital and its routines. The medical staff work under contracts and their timetables are constant since ward work, clinics, and hospital routines are

repeated every day, every week, and every month. Another advantage was that, over time, participants' behaviours were likely to be more consistent, thus enhancing validity.

There were no good reasons after the pilot study to change from general medicine and this focus was retained. The chosen team comprised: a consultant, an SHO with three years of experience, HO, and medical students. This concentration of different grades on different rungs of the career ladder allowed exploration of developmental stages of experience in teacher and learner. As a small unit, it offered individual ideas and collective perceptions about the spectrum of activities which a team embraced. It also gave opportunities to observe the ways in which a consultant reacted towards the learning and teaching demands made by differing groups and individuals. The PG and UG fields were both represented and both were the subject of inquiry in this second phase.

The case study was developed in the natural inquiry mode using participant observation and interviews as the main research tools. It was a major undertaking requiring: preparatory planning and access negotiations; observation and interview arrangements; data analysis procedures; and the reporting of the results. At the same time, the issues of sampling, validity, reliability and generalisability had to be addressed.

6.4.2 The Case Study aims

The case was designed to encompass three broad fronts:

1. Experience within apprenticeship

    An exploration of experience across career levels acted as a unifying theoretical orientation and underpinned the case study research process which was guided by the research questions (p.65 above) and progressive focusing from the pilot study.

2. Craft knowledge principles

    The study incorporated into the methodology, principles derived from CK classroom research approaches to explore and describe what participants valued and did well in their professional tasks. This meant deliberately seeking out participants' positive attributes and skills rather than adopting a deficit approach. What was good about practice was sought for interpretational and descriptive

purposes (pp.15 and 18 above). These principles are said to facilitate a non-threatening atmosphere for the research subjects since an overly evaluative stance is avoided.

3. An open-ended approach

The intention was to capitalise on an open research strategy which could not be precisely pre-planned but aimed to be responsive to two main facets: the observation of clinicians' activities and their approaches to work, teaching, and learning; and to react to participants' responses to the questions and issues arising from observation sessions.

6.4.3 The Case Study sample

The case had to be representative of medical units in its staffing, patient mix, and the range of opportunities it afforded for participant observation. Otherwise, the criteria for the case study sample were similar to those enumerated for the pilot study apart from one crucial factor: in addition to the consultant being an expert clinical teacher, he/she was required to agree to the research proposals and give permission for the research to proceed. The research proposals were discussed with the local Postgraduate Dean who facilitated an approach to a consultant with special teaching interests.

The consultant in question led a small medical team which was part of a larger unit in a 375 bed district general hospital (DGH) on the outskirts of Edinburgh. A diverse range of referrals from within and outside the city boundaries is seen in the hospital which enjoys a reputation for teaching excellence and is reputed to appoint staff on the basis of maintaining high teaching standards. The hospital gives a high priority to teaching and runs a formal teaching programme for junior doctors at certain times of the year. Unfortunately, there was no opportunity to participate in this aspect because it did not coincide with the observation period.

The chosen team was representative in its staffing complement of different grades, the varied ages of the junior doctors, its patient intake, and the ways in which it approached everyday clinical work. The latter consisted of typical service demands such as routine clinical duties, 'post-waiting' periods, ('on take' or accepting overnight cases), and outpatient clinics. Senior (Phase 3 or UG3) and junior (Phase 2 or UG2) clinical medical students undertook attachments in the hospital to complete the range of UG and PG activities available.

6.4.4 Preparatory planning and access negotiations

A letter of introduction from the Postgraduate Dean secured an invitation to meet and discuss the research proposals with the consultant. After an exchange of letters, two extended preliminary interviews were held using a research outline as a basis to secure his permission and approval for the study. The consultant explained that there was a grade missing in the staff chain, that of registrar or SR. This was regretted as a major omission in the hierarchical ladder, but the decision was made to proceed on the basis offered in view of the consultant's reputation and since three levels of differentiated, qualified experience were nonetheless available.

Implementation of an observational study demands that researchers make a:

> ...series of systematic decisions about who, what, when, and where to observe, in addition to answering the question of how...the researcher selecting observation as the principal way of collecting information about processes, events and issues must be concerned about sampling, representativeness, and systematicity (Evertson and Green 1986, p.189).

Bearing this in mind, initial discussions addressed the extent and limits of the proposed observation and interviews. The allocated observation amounted to two sessions per week, covering ward rounds, clinics, and tutorials. These events made it possible to observe clinicians and students in the patient's absence or presence. Researcher presence at outpatient clinics was refused in understandable deference to the patients, but permission to audio-tape the patients' clinic consultations, and subsequently to conduct interviews with respective personnel (patients excluded), was granted.

Patients' permission was not asked either to tape or to quote aspects of their cases, but total confidentiality and anonymity was maintained throughout the research process and at no time were names or hospitals disclosed. The researcher wore a white coat as an observer participant and was, in all instances, introduced to patients as an educationist. This practice was continued in the third phase and there were no objections to researcher presence at any time during the study. The privilege accorded in this process was greatly appreciated.

After the consultant gave his permission to proceed, he requested that each of his staff be approached individually to ask their permission for the research to go ahead. This was duly done and work with the unit began at the beginning of May 1991. The work was planned to last two months but because of the June UG final examinations, it was completed at the end of July 1991.

6.4.5 The Case Study interview design

A series of 'learner and teacher' interviews was devised using senior and junior doctors and students in all possible pairings afforded by the various career grades. For example, it allowed Consultant with SHO, with HO, and with UG, pairings; or SHO with Consultant, HO and UGs. Each pairing gave two interviews about the same observed event. Participants were interviewed separately. The record of fourteen interviews and observation details forms Appendix A.

Within the paired construct, the consultant was always 'the teacher'. This is not to deny on-going learning in a senior physician but it placed the consultant in the accepted role as leader and expert teacher in the team. The UGs were always learners. The junior doctors were in the dual role of learners and teachers in relation to other team members. For example, the HO was a learner in relation to the consultant but a teacher to the UGs. In practice, the HO/UG interviews were abandoned due to HO illness rather than acceptance of the HO's opinion that she did not 'teach' undergraduates. Evidence that the HO did teach without acknowledging it as 'teaching' was provided in other interviews.

The paired interview strategy spread the number of interviews and interview time over as wide a range of personnel as possible. Since the interviews were planned round the working roles of participants, there was also the potential to explore the match and mismatch of their opinions.

6.4.6 Ward rounds

The profession distinguishes between ward business rounds, and teaching rounds. Hargreaves *et al.* (1997), in relation to surgical training, sub-divide this further into four types of rounds but the features, with varying potential for teaching opportunities, are broadly similar to those described here. The business round deals with patient affairs and administration and is not primarily oriented towards teaching although spontaneous, opportunistic teaching/learning may arise. The teaching round is specifically used for teaching purposes and, particularly in the UG period, for the acquisition of clinical skills. Importantly, Hargreaves *et al.* (*ibid.*) believe that a hard distinction between rounds is unhelpful since rounds are never 'teaching-free'. However, the distinction does create differences in the minds of participants, including patients, in terms of purpose and the nature of the teaching.

The rounds experienced during the second and third phases of this study were entirely business orientated. Such rounds were ideal for research purposes since they reflected 'on-the-job' action and day-to-day service activities in the course of routine work with patients. Business rounds also gave opportunities to observe experts' roles on the wards and to compare their actions and reactions with junior doctors' inexperience.

Another reason in favour of business round for this study was that it usually has two parts, each of which offers substantially different opportunities to observe learning/teaching activities. The first part, the preliminary ward round briefing, patients do not see. It is often multi-disciplinary in staff composition, taking place near the ward, away from patients. It is here, in an informal setting, that patients' diagnostic problems and management are aired, drugs are discussed, and information relating to admission, referral, and discharge is exchanged. Here too, junior doctors and nurses apprise the consultant about the progress of patients in their care. Case discussions may be brief or extensive. If the ward has received new admissions overnight, the junior staff must inform their consultant about new patients, although changes in on-call hours are affecting this system (The New Deal, 1991). Briefing sessions gained increasing importance as the research progressed, and especially those after overnight admissions. Hargreaves *et al.* (1997) refer to this as the 'planning phase and ward round' saying that it is particularly useful 'since the open discussion before the round supports rapid learning' (*ibid.* p.115).

Business rounds formed the main research framework for the observations and the subsequent interviews about these observations. Had purely teaching rounds been on offer, the data would have been substantially different, mainly because teaching attitudes, content, and methods change when teaching is the main focus of a round and when consultants focus on learners as well as patients. This is partly because the interaction is different and more questions can be anticipated altering the time spent on teaching. Also, very often in teaching rounds, the focus is on selected cases, often with prior permission of the patient. A business round caters for entire wards full of patients and, unless for specific clinical reasons, all cases are seen. The nature of the data reported in the last phase supports these statements.

It should be noted that the participant observation excluded a shadowing element where the researcher might have followed the expert at work with junior doctors other than on the rounds. This excluded many day-to-day discussions, informal exchanges of information, and staff interactions as potential data sources. The omission does not invalidate the existing data but it did affect the nature of the observed activities and hence the interview questions asked.

6.4.7 Selective use of the tape recorder

A small unobtrusive tape recorder was used at briefings, at the bedside, and during all observation sessions, including corridor feedback times.

A complete ward round, often covering several wards, can last over three hours. The audio-tape can be difficult to hear and transcribe. Recording therefore focused on the first eight to ten patient discussions at the briefing sessions and then followed the ward encounters with the same patients. Since communication and clinical examination skills were not the main research focus, only a few such events were sampled in order to demonstrate individual approaches. Additionally, since the amount of data had to be controlled for logistic reasons, the tape recorder was turned off and on subjectively when discussions were perceived to capture the differences in participants' roles, variations in expertise, and specific teaching on patients' problems. Conversations about difficult patient problems and any staff differences of opinion were recorded as examples of clinical and educational interest. Field notes (FN) were taken according to the same principles. Thus a cycle of observe, interview, observe, interview, was established, resulting in constant progressive focusing.

This pattern of observation and interviewing closely followed what has been described as 'freezing' events or activities for subsequent examination (Evertson and Green, 1986).

> The researcher's goal is to freeze everyday activities as well as experimental activities so that they can be examined systematically (p.168).

6.4.8 The audio-tape recordings

All tapes were reviewed immediately after the relevant observation session and before transcription. Fourteen interviews were transcribed by an audio-typist. Two kinds of data arose from the audio-recordings: interview tapes, and working tapes (WTs). The latter included the pre-ward round briefing sessions. The data were substantially different. The former were clear and flowing but, as noted, the working tapes were often difficult to hear and transcribe. Where accuracy was required for illustrative material, it was possible to return to the original recordings and try to capture the meanings, inflections, utterances, and pauses, so often lost in transcription.

6.4.9   The interviews and interview questions

To capture the immediacy of events, the paired interviews were held as soon as possible after observation, usually within three days to one week. Each interview lasted approximately 30-40 minutes. All the interviews were unstructured until after the observation session in which the paired teacher/learner participants took part. Thereafter, depending on the observed event, items for discussion were drawn up. Therefore, the questions mainly depended on what had happened during the context of the observation. However, the researcher had to select from a welter of observations, deciding which to record in the first place, and the subsequent interview questions. Mays and Pope (1996) take the view that:

> All research is selective - there is no way that the researcher can in any sense capture the literal truth of events...research that relies exclusively on observation by a single researcher is limited by definition to the perceptions and introspection of the investigator... (p.11).

Maintaining rigour in the research process, question selection was determined by several factors. Firstly, several were pre-selected through progressive focusing in the pilot study and subsequent phases. For example, understandings about the nature of experience and expertise and their relationships to teaching and learning deepened over the three phases. Secondly, questions were generated from the working tapes and field notes. Thus, they were rooted in real patient or teacher/learner encounters and participants readily identified with the immediate contexts. Thirdly, questions were determined by exemplars and issues chosen as those most likely to answer the main research questions. Fourthly, questions were based on events and actions which would allow participants to explain their work and teaching/learning activities to a lay observer. This last point also had a bearing on paired participants who were asked about the same event, and responses could be compared. Finally, an element of 'connoisseurship' pertained to the selection of events for taping and subsequent interview questions.

Eisner (1975) coined the term 'connoisseurship' from its origins in art criticism and applied it to evaluation. Tesch (1990, p.48) quotes Guba (1978, p.39) on the subject. A connoisseur is a person 'with a refined perceptual apparatus, knowledge of what to look for, and a backlog of previous relevant experience'. Patton (1980) and Guba and Lincoln (1981) criticise connoisseurship for its apparent élitism, emphasis on the presumed competence of the connoisseur, and inadequate attention to the normal procedures and criteria of research inquiry. Nevertheless, previous knowledge of clinical teaching research made it possible for the researcher to identify new items for clarification and description or to revisit

previous findings. The ultimate position was to acknowledge the inevitable subjectivity as an acceptable risk but to pay due consideration to validity, reliability, and generalisability.

The open-ended aspect of the interviews may have disadvantaged interviewees, rendering them vulnerable, since they were largely unprepared for the researcher's interests and questions. However, it drew spontaneous reactions as opposed to prepared replies. While prepared responses might have produced more thoughtful insights, it is doubtful if the team would have considered their replies at length over three months. This spontaneous element increased the validity of responses since they were unable to preempt behaviours or to diverge from day-to-day routine.

In summary there were three case study data sources for analysis and question generation: a working tape for each observation session; an interview transcript for each teacher and learner corresponding to the relevant observation session; and field notes.

6.5 The interview study

6.5.1 A narrowing of focus

There were several reasons for using a different research design for the third phase. Primarily, the findings and interpretations realised in the first two phases needed to be substantiated. Specifically, it was necessary to establish if expert skills, and experience/expertise differences between the case study expert and novices, were individual attributes or were to be observed in comparable clinicians. While the case study had revealed individual teaching strategies towards UG clinical skills, deeper information was required about how clinical CK was passed on other than through this approach. The research had only reinforced public knowledge about this area. Specifically, PG learning had not been clarified by the case study although some clues existed. The second phase had partially explored expert/novice perceptions about apprenticeship teaching/learning but details were lacking in the context of caring for patients on the wards. Also, the research question 'How is the diagnostic process taught beyond the acquisition of clinical skills?' (number 6, p.65 above) came sharply into focus as the direct result of participating in the clinical work.

The decision was taken to look at PG teaching/learning at a very specific stage and to concentrate on the Consultant/SHO pairing. At the SHO stage, young doctors are said to be 'in a steep learning curve' and it

was perceived that SHOs would be able to discuss both their seniors' skills and knowledge, and aspects which they were in the process of acquiring. It is also the time when examinations and further qualifications are important to career moves. An intensive look at the nature of apprenticeship at this stage, other than investigating the teaching which services examinations, seemed the way to uncover more information about clinical CK and its transmission. An interview study was conceived.

6.5.2 The interview study methodology

Partly capitalising on the success and experience of the case study paired interviews, some different criteria were applied in sampling. More information from more than one pairing was required to allow for differences or confirming opinions to arise. It was also necessary to sample the perceptions, actions, and teaching, of younger expert physicians and their SHOs for comparison with the case study consultant. Participant observation and audio-taped interviews were again used to gather data but the interview study, with its narrower focus, aimed to gather more precise data from similar participants using a semi-structured questionnaire.

6.5.3 The interview study sample

The selection criteria again necessitated the inclusion of physicians with reputations for teaching excellence who were prepared to give time to educational research. Parallel conditions with the case study were needed in representative referrals and admissions in general medicine. These criteria were negotiated by the Director of Postgraduate Medical Education in Scotland who wrote initially to three, and subsequently to a second series, of three expert physicians. Therefore the interview study consisted of six pairs of physicians and their respective SHOs, allowing twelve interviews. Each series of three paired observation/interviews was carried out in one of two busy DGHs close to Edinburgh.

6.5.4 The semi-structured questionnaire

A short semi-structured questionnaire with deliberately de-contextualised open questions was used as an interview schedule (Appendix B). These were designed to explore perceptions of experience and apprentice teaching/learning from the expert/novice perspective in order to ask all participants the same questions, thus allowing a core of common data for comparative purposes. While the questions were not rooted in the immediate context, the answers were most likely to be identified with the observational

circumstances. Moreover, the questions, although giving the appearance of being generalised, were related to progressive focusing issues. Thus the researcher, with increased insight, knowledge, and experience, was able to probe participants' responses to much greater depth.

The schedule, constructed using mirror questions for senior and junior doctors, was also designed to capitalise on possible match and mismatch of opinion. Participants were also asked about valued skills in the practice and the teaching/learning dimensions. Questions about the denial of personal skills and junior error were added through progressive focusing as a result of case study findings. Complementary to the schedule, and following on from the case study, questions and issues directly arising from the observation sessions were included. Thus there was a planned and an unplanned element to the interviews.

6.5.5 Minor methodological differences in the interview study

The researcher requested, and was granted, permission: to observe and audio-tape one ward round; to observe one clinic; and to interview the paired participants separately for approximately 30-40 minutes.

There were three differences between the series of paired interviews. The first three consultants received the interview schedule which they were invited to share with their respective SHOs. Therefore, taking into account the possible lack of spontaneity in responses, the first interview study participants were apprised of some questions in advance. The second series of interviewees was not given the schedule, in order to make response comparisons. These steps were taken in case both a second series of interviews and a comparison were required. In practice, there were no detectable differences and a fourth phase was not considered necessary.

Secondly, the observation in clinics was abandoned in the second series of interviews. This was partly due to the fact that, in recent NHS regulations, new patients must be seen by a consultant and SHOs are permitted to take follow-up clinics only with consultant supervision. The types of cases and problems presenting difficulties to SHOs could have been detailed but this would have meant a different study requiring different methodology. Substantiation of case study issues was better served in ward rounds. It also became necessary to narrow the focus even further and to limit the observation. This was one clear way to do so.

6.5.6 Use of stimulated recall

The third difference was that in four consultant interviews, short taped episodes of the working sessions were used for stimulated recall (S-R) purposes in an attempt to probe new dimensions of practice. This involved playing a short section of audio-recording to the interviewee to trigger the memory. Although valuable, it became apparent that, in the time available for interviewing, the choice was between depth in a few selected issues using S-R, or pursuit of the schedule and the open-ended questioning element. For the sake of parity among participants, the schedule was retained and S-R discontinued.

6.6 Data organisation and reduction

6.6.1 The analysis process

The second and third phase data were derived from: a working tape for each observation session; an interview transcript for each teacher and learner corresponding to the relevant observation session; and field notes. Approximately 35 hours of interviews and working tape transcripts over the entire research process resulted in a large database which was ultimately anchored in the exploration of experience in relation to practice, clinical expertise, and the teaching/learning processes. The analysis process began with the pilot study and continued throughout, and after, the entire field work. This concurs with the Tesch (1990) summary (after Glaser and Strauss 1967, and Miles and Huberman 1984) that 'analysis is not the last phase in the research process; it is concurrent with data collection or cyclic' (p.95).

Concurring with Bosk (1979), it was difficult to abandon certain data, especially in the initial stages of analysis where the tendency was to regard all comments, responses, and observations as valuable. Eventually, the analysis process largely consisted of the backwards and forwards constant comparison method. Scripts were heavily annotated and, prior to coding, were analysed largely according to the research questions and the design structure. This is consonant with the method as advocated by Tesch (1990) who advised focusing on: the research questions; the research instruments (in this case the expert/novice comparisons); concepts or categories from previous research; and the actual data (*ibid.* p.141).

In both the case and interview studies, issues arose from the questions arising from each observation session and new ones realised in the constant progressive focusing of the research process. In the case

study, the UG and PG periods made clear areas of differentiation serving to delineate boundaries in data organisation. Gradually, from observation and participants' responses, a picture of expert actions and behaviours evolved which could be compared and contrasted with less experienced clinicians. Analysis also coincided with the annotation of interview transcripts and the collation of issues while searching for parallels, comparisons, and theoretical frameworks in the data. The transcripts were also examined for match and mismatch of opinions, and for commonalities, omissions, uniqueness and problems (also as advocated by Tesch, *ibid.* p.145).

6.6.2   Data coding stages

The coding arrangements followed the three stages recommended by Tesch (1990, pp.85-86) after Strauss (1987), the proponent of grounded theory:

1.   **Open coding** - categorising actions, events, as observed and described by participants

2.   **Axial coding** - 'intense analysis done around one category at a time resulting in cumulative knowledge about intra- and inter-category relationships...' the analyst then applies specific criteria and develops core categories

3.   **Selective coding** - 'the analyst delimits coding to only those codes that relate to the core codes in sufficiently significant ways to be used in a parsimonious theory'.

6.6.3   Derivation of Case Study coding categories

All the interview transcripts and the transcribed working tapes were coded. The categories were related to major concepts in the research questions such as 'experience', 'attitudes', 'teaching' or 'learning'. Other factors which affected the derivation of codes were related to the nature of the three very different ward rounds and the mix of sessions observed. This led to many codes being devised which were infrequently used. For example, there was only one briefing session taken by the consultant over the observation period since the round with the HO was informal without preliminaries, and the ward round with the SHO was conducted in the consultant's absence. However, the latter round began with a briefing session which contained the genesis of many ideas to follow up in the third phase. Moreover, while the UG teaching centred round acquisition of basic clinical skills and generic teaching skills such as giving feedback or setting objectives, the main data sources and subsequent coding categories in the PG perspective arose

from varied events in the course of patient care and work. Cognisance was taken of differences in approaches and opinions among the levels of team personnel.

The codes applied to the interview transcripts were entered into the 'Ethnograph' computer programme, one of a number designed to cope with qualitative data and requiring preparatory functions to be carried out. These include confining transcripts to specific margins, preliminary line numbering, and prior manual data coding. Appendices J and K form the open coding framework and extracts using multiple coding respectively. An example of the use of open codes is illustrated below.

Codes CONSATTT (consultant attitude to teaching), CONSATTL (consultant attitude to learning), CONSEXP (consultant experience), were applied to the following extract which contains subtle aspects of outpatient teaching and an experienced approach to accommodating the learner:

> I mean the teaching at Outpatients is in actual fact, I accept it, it is subtle...it is a subtle expertise and it is because, you know, the student mustn't be sleeping...if the student is not sleeping, if the student is saying 'Why did he ask about cow's milk?' 'Why did he ask about eating rhubarb?' or whatever it is. OK... I wouldn't have asked anything if the student's not there (C5 199-129).

Manual coding of the transcripts involved constant interaction with the data and, in practice, the three coding phases were amalgamated. The constant annotating of transcripts, combined with the chunking and segmenting arising from the coding process, resulted almost *de facto* in the 'constant comparison' of grounded theory methods combined with a form of content analysis based on issues and observation outcomes. All codes arose from the data and were not predetermined.

6.7 The interview study data analysis

In the third phase, the data management and analysis were determined by three factors: the schedule; the open-ended observation; and the paired interview design. The following sequential process was adopted for ease of data organisation in the light of similar and disparate interview content.

1. All twelve interviews were transcribed as were twenty patient case excerpts from the working tapes. To maintain parity among ward rounds, these excerpts were chosen from the first 1-8 patients seen by consultants. Five of the six consultants were represented in these extracts which were also coded. Eleven of these excerpts, containing categories progressively built up over the three phases from interview and working tape data, were subsequently used for validation purposes (Appendix C). Bearing in mind that the open-ended observation in each round had resulted in

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different researcher questions and participant responses which were reflected in the interviews, these data sources were annotated by issues arising to examine: frequencies; patterns; confirming and disconfirming evidence from the case study; differences and similarities in participants' responses and actions; and new issues. This was the open coding stage.

2. Since the schedule questions were not asked in a set order but according to the interview flow, the questions and responses were entered onto a grid as a check on missing data. There were insufficient data to report fully on SHOs' difficulties and on the question: 'Does medicine get simpler with experience?'

3. A process of constant review, checking, and interaction with all the data sources (interview tapes, working tapes and field notes) was instigated and continued throughout the analysis process.

4. Decisions were made to exclude the few political statements and curricular criticisms in the data since they did not contribute to new descriptions or knowledge about teaching and learning in medicine and they were incongruent with CK research methods.

5. The analysis began with answers to schedule questions. These included: consultants' and SHOs' comparative perceptions of experience and attitudes towards teaching and medicine; errors and how these were dealt with; views of formal and informal teaching; valued skills; and learners' needs.

6. As in the case study, and after open coding, **the interview data only** were organised according to consultant and SHO mirror responses under concepts which reflected the main research questions (p.65 above) and the schedule questions. The six concepts were: EXPERIENCE; LEARNING; TEACHING; THEORY (and practice differences); FINDINGS; and CLINICAL PRACTICE. Using Microsoft Office 'EXCEL', these interview data were plotted on grids according to the numbered lines of the interview transcripts (Appendix D).

7. These data were further reduced and collapsed to form a conceptual map of apprenticeship learning under three of the six concepts in 6 above: CLINICAL PRACTICE; EXPERIENCE; and CONSULTANT EXPERTISE in work and teaching (Appendix E). These were the main constructs on which to build new interpretations of apprenticeship learning. From these three constructs, nineteen interview categories which were common to those identified in working tape transcripts, were investigated for validation purposes. The relationships between open coding and axial coding, the latter the building blocks of the Discussion, are shown in Appendix F. The categories, which

were built up over the research process, are shown in Tables 6, 7, 8 on pp.118, 161 and 206 respectively.

6.8   Validity

6.8.1   The concept of validity

Validity is concerned with fidelity or truth. How can we believe that the researcher's observations truly reflect 'empirical reality' or 'represent or measure the categories of human experience that occur?' (LeCompte and Goetz 1982, p.32). Hammersley (1993), emphasising plausibility and credibility in findings states: 'By "validity" I mean truth: the extent to which an account accurately represents the social phenomena to which it refers' (p.60). For Smith (1975) and Yin (1984), accuracy and completeness in accounts increase validity.

6.8.2   Validity in this research

To advance validity prospectively, several factors were taken into account: there was purposeful sampling of expert physicians with reputations for teaching excellence; the choice of everyday activities (eg: ward rounds, clinics, briefings) as data sources and from which to generate interview questions, was carefully planned with participants; a case study allowed for reasonable consistency of behaviours to occur over time; routine clinical work with patients was observed in natural settings without changes for research purposes; reactivity in various forms was anticipated; and audio-recordings exist as evidence.

Accounts or statements are said to have 'Face validity' when they can be accepted on the basis of existing knowledge. In Hammersley's words:

> In the case of some claims, they may be so plausible that we can reasonably accept them at face value, without needing to know how the writer came to formulate them or what evidence he or she can provide to support them (p.61 1993).

Face validity operated where there was no reason to doubt participants' explanations, for example: in consultants' interpretations of learners' needs; or in participants' comments that they learned from charismatic teachers. Until proven otherwise, the researcher accepted certain participants' responses as valid beliefs and perceptions about teaching and working in clinical medicine. Working tape data, containing only clinical dialogue were deemed to have additional integrity due to patient content. These could be interpreted without querying the truth or validity of the content. However, the issue of whether

espoused theories of practice were congruent with practice was a research issue and this aspect required substantiation and evidence beyond face value.

'Psychological concepts such as intelligence, anxiety, creativity are considered "hypothetical constructs"' (Borg and Gall 1989, p.255). In this research, this applies to major constructs such as clinical 'experience' or 'expertise' which are not directly observable but are constructs supported by evidence. They are 'researcher designated constructs' which 'should be grounded in and congruent with actual data' (LeCompte and Goetz 1982, p.47). Certain theories and interpretations which have been extrapolated from the grounded data in this study were derived from categories in the research database. Therefore, steps were taken to verify these concepts and categories and to ensure validity.

6.8.3 Triangulation in this research

Triangulation methods increase validity by using opposing and complementary perspectives to gain balanced accounts of findings (Cohen and Manion 1989). These authors maintain (*ibid.*) that triangulation is particularly appropriate when an holistic educational interpretation is required or when a phenomenon is sufficiently complex or controversial to warrant careful elucidation. Triangulation employs cross-checking data methods such as comparing researchers' observations or:

> ... it can involve comparing data produced by different methods - for example, observational data can be compared with interview data - or it can involve comparing data from different times, sub-settings, or subjects (Foster, 1993, p.71).

Triangulation in this study existed in the use of paired, mirror interviews where expert and novices were asked to comment on the same issues or events, often using identical questions. By giving opportunities for convergence and divergence of ideas and opinions to emerge, balanced accounts and descriptions arose from the data. Agreement far outweighed the disagreements, all of which are reported.

Anderson (1990) claimed that the strongest argument in favour of the internal validity of a case study was a chain of evidence which the reader could follow. The data here, gathered over three successive stages, provide such a chain although this may be construed as a self-validating process. The strongest validation exercise was in inviting others to comment on the issues and categories determined by the researcher which led to new theories and interpretations from grounded data. These categories evolved over the research process as follows:

Phase One: Pilot study	Phase Two: Case study	Phase Three:Interview study
1. emphasis on the history	11. prioritising	20. team involvement
2. diagnosis by signs	12. application of knowledge	21. importance of presentation
3. diagnosis by symptoms	13. leadership	22. continuing comment/interaction
4. diagnosis by pattern recognition	14. decision-making skills	23. thinking aloud
5. diagnosis by exclusions	15. assertions	24. succinct condensed language
6. superior knowledge	16. anticipation	25. clinical feedback
7. less intervention	17. teaching by telling	26. uncertainty
8. consideration of wider options	18. correction	27. the staged process
9. teaching by questioning	19. checking	28. holistic approach
10. management/facilitation of learning		29. summarising skills
		30. simplification of management

The ten categories identified in the pilot study were found again through progressive focusing in the case study; these ten categories and a further nine categories, making nineteen in total from the first two phases, were found again in the interview study; the interview study generated a further eleven categories making a complement of thirty categories in total. The thirty categories used for validation purposes, clustered under three principle constructs: **Clinical practice; Clinical expertise; and Teaching/learning expertise** (Table 5, p.101 below). These headings were chosen because, as the categories clustered in a certain way, grounded theory developed. Appendix G shows examples of the categories applied to statements in eleven validated case excerpts.

6.9   The two-stage validation process

Only after Phase Three, when the thirty categories above had been identified for theory building, was there a strong enough case for a triangulation validation process. It was carried out in two sequential stages by three validators: one medical educationist (MEV) and one clinician (CV1) undertook Stage One; and a second clinician (CV2) undertook Stage Two. The different purposes of these stages is shown below.

Stage One

Identification of issues and/or categories by the medical educator and the first clinician

Stage Two

The subsequent use of these categories in an inter-rater exercise by the second clinician

6.9.1 Stage One: Use of axial coding and emerging categories

In the first identification exercise, there was no discussion with the educator, only written communication. Equipped with only a knowledge of the thesis subject matter, and without a list of categories, the researcher sent him two unmarked case study (Phase two) interview transcripts (HO2 and SHO1). He was asked to carry out the first task 'blind' with instructions to annotate the transcripts. These had been chosen for their perceived insights into apprenticeship learning, especially expert clinical and teaching behaviours. The transcripts were annotated by the educator and returned with comments. This initial exercise was successful in confirming the same teaching/learning issues identified by the researcher as those most likely to lead to new information and accounts of clinical teaching. Secondly, the researcher sent the educator two interview study (Phase Three) transcripts, consultant 3A and SHO 3B, which presented a paired view on the teacher/learner partnership. Researcher annotations on these transcripts were covered by paper prior to annotation by the educator who was asked to write single words or short phrases on the scripts. Researcher work was subsequently uncovered for comparasons.

Lastly, the educator received: eleven working tape excerpts from Phase Three patient cases (see 6.7 p.90 above, and Appendix C); an UG bedside teaching excerpt conducted by the case study consultant; an SHO response to researcher questioning on a ward round; and four Phase Three consultant comments (three by the same consultant). These were chosen to illustrate the range of data over the research process from which categories had been identified. The patient excerpts, devoid of researcher input, represented clinical reality in terms of diagnosed and undiagnosed patients, partial continuity in clinical dialogue mainly between consultants and SHOs, and they offered a complementary perspective to the interview content Atkinson (1995). This time the educator received a list of categories but these were not attached to transcript lines.

The main point of this sequential validation was to confirm that, although there might be differences in interpretation and variations in research emphasis for follow-up, there was general agreement over the issues and categories arising in a cross section of data sources and research stages. Importantly, there were shared interests in asking questions about the ward round, its characteristics, and opportunities as a focus for complex action and interaction. The educator asked 'what was necessary to move on the work?' on a round and also emphasised the expression 'seeing patients'. These questions coincided with researcher interest in briefing commentaries and the ward round dynamic.

In terms of researcher/educator differences, the educator did not identify the following categories: importance of presentation; succinct condensed language; clinical feedback; uncertainty; and assertions. He also asked what stimulated the case study expert's selection of HO teaching episodes on the observed round. The researcher possibly accepted the expert's choice too readily, assuming that he knew her needs. The researcher drew more inferences from teamwork interaction, probably through exposure to this aspect, observer bias, and growing interest in this feature.

6.9.2 Stage One: Identification of categories by the first clinical validator

The first clinician was asked to identify categories and issues on two separate occasions. After the educator he received: firstly, the identical last package as MEV; and secondly, the same eleven patient extracts, since these had proved adequate for the validation of all the categories.

On the first occasion, the clinician corrected clinical details in writing and made brief key word responses on the transcripts to identify issues and categories. Secondly, an intensive ninety minute discussion about the eleven cases was held with the researcher during which the latter made notes and compared the clinician's comments with previously defined researcher issues and categories from the axial coding (Appendix F). Thus, the medical educationist identified a range of categories across a range of data, whereas the first clinician associated specific categories with specific patient cases in a narrower selection of the same data sources.

The first clinical validator did not identify the following categories: diagnosis by symptoms; assertions; teaching by questioning; and correction. Other differences compared with the researcher included the interpretation of clinical details beyond the scope of the researcher. He found that one consultant succinctly clarified 'the aetiological and physiopathological features of disease while placing information in a continuum'; and an element of compromise was detected in one consultant's management. In common with the researcher, he emphasised presentation and summarising skills. He also commented on the lack of positive reinforcement when two SHOs had done good work. Appendix C contains summaries of the first clinician's comments on the patient cases.

The complete results of the Stage One validation are shown in Table 5 (p.101 below). The educator and the first clinician had correctly identified 25/30 and 26/30 of categories respectively. These are marked with an asterisk on the table. The categories which the educator and first clinician failed to identify,

showing an uneven position on eight categories after the first validation stage, is extracted from Table 5 and shown in Table 3 below.

Table 3 Differences in categories between Stage One validators

Researcher category	Educationist (MEV)	Clinician (CV1)
Importance of presentation	no	yes
succinct condensed language	no	yes
clinical feedback	no	yes
diagnosis by symptoms	yes	no
uncertainty	no	yes
assertions	no	no
teaching by questioning	yes	no
correction	yes	no

6.9.3 The justification for the retention of problematic categories

If there was disagreement between one validator and the researcher, the category was retained but not without justification. Considerable researcher judgement rested on the fact that these validators were asked to identify only categories and issues and that their words did not exactly match those chosen by the researcher. Also no training had been given to either validator. The educator had not used the term 'uncertainty', noting on the HO2 script 'The medical skill seems to be to decide when a definitive diagnosis is unlikely and symptom treatment is the best that can be offered'. It was in this sense of an uncertain diagnosis and possible ensuing staging of management that the category arose. The clinician may have found 'symptoms' too obvious for comment. The retention of 'assertions' is more difficult to justify. The word was coined by the researcher, and applied to the analysis and subsequent validation, in the sense of a very specific and strong statement of knowledge or fact. It can be otherwise explained as a strong 'teaching point' and the term assertion was probably too esoteric, thus disadvantaging the researcher. All the eight categories were retained pending the result of the Stage Two validation.

After this second identification exercise at the end of the stage one validation, thirty categories were retained by the researcher as those most likely to produce new theoretical constructs and interpretations

about learning medicine. Importantly, nineteen of these also occurred in the interview data (Appendix E and p.91 above)

6.9.4   Stage Two: Inter-rater reliability using selected coded categories

The second clinician was asked to carry out an intensive task using the same eleven patient extracts as CV1. CV2 was given a list of the 30 categories to find out about their reliable use in a matching exercise. The list was set out under the three constructs: Clinical Practice; Clinical expertise resulting from experience; and Teaching/learning expertise resulting from experience (see p.91 above and Table 5, p.101 below). CV2 was asked to mark each case segment which indicated the presence of the category but to mark it only once per case. Other explanations were that: the category 'uncertainty' was taken to be as in the patient's problem, not in clinicians' behaviours; the categories listed under 'clinical practice' could apply to anyone in the ward round team; Categories listed under 'expertise' in clinical practice and teaching/learning were to be applied to consultant behaviours.

6.9.5   Results of the Stage Two validation

CV2 was able to use all categories. The results can be understood by looking at three issues: the range of categories applied per case; percentage agreement and disagreement per category and per case; and problematic categories. Since each patient case was different and could not be expected to raise the same issues, only certain categories arose in certain cases. Case 5 contained dense material with agreement between the researcher and CV2 on 15 category applications and 8 non-application of categories; there was similar agreement on the only 5 categories contained in case 9.

Percentages were calculated by taking agreement on category matching, and where the category was absent, together per case. Agreement on categories fell into three groups: 'high' 100-91%; 'medium' 82%-73% ; and 'low' 64% and below. The distribution of categories is shown in Table 5 below. Reliability is problematic in the 'low' column where agreement on category application did not occur in the same cases and/or when the category was applied more or less frequently by either the researcher and CV2 overall.

Table 4 Inter-rater distribution of the thirty identified categories

High Agreement 100-91% Categories	Medium Agreement 82-73% Categories	Low Agreement 64% and less Categories
thinking aloud	emphasis on the history	team involvement
clinical feedback	prioritising	importance of presentation
diagnosis by signs	the staged process	continuous commentary/interaction
diagnosis by symptoms	leadership	succinct, condensed language
diagnosis by exclusions	decision-making skills	pattern recognition
uncertainty		superior knowledge
holistic approach		application of knowledge
summarising skills		management/facilitation of learning
consideration of wider options		
less intervention		
simplification of management		
anticipation		
assertions		
teaching by questioning		
teaching by telling		
correction		
checking		

There are two main reasons for the low agreement: category overlap; and researcher bias. CV2 found overlap between: 'thinking aloud' and 'continuous commentary'; consultant 'presentation' (giving past details) with 'summarising' (future issues); 'prioritising with staging'; and 'superior knowledge with its application'. However, CV2 also said that the differences were only in small nuances of opinion which did not upset the main thrust of issues arising in the cases.

Researcher presence and bias probably influenced additional instances of categories since these were accrued over time. 'Pattern recognition' and 'facilitation of learning' need special mention. The former category was one of two applied across cases by CV2 more often than the researcher, due to either or both clinical knowledge and opinion. 'Facilitation of learning' is a complex construct which combines delegation of responsibility, deliberately involving juniors, knowledge of their needs, and fine judgements in, for example, correction and supervision. The medical educationist's interpretations of the transcripts take account of these processes. It was identified and commented on, and thus validated by CV1, as an advanced teaching skill. This category, and the concepts which it embraces, is central to the ways in which clinical experts engage learners in the work process and pass on knowledge. Much of the thesis

rests on this notion and it stands or falls by the inclusion and justification of this category in the Discussion.

6.10   Generalisability

Research is said to be generalisable if the findings hold up beyond the specific subjects and settings involved (Bogdan and Biklen 1982). In qualitative research, diversification, unconformity, and creativity may have more priority than generalisable findings. Guba and Lincoln (1981) proposed a vocabulary change:

> What we would counsel is that the idea of 'generalisability' should be replaced by the idea of 'fittingness'. A generalisation cannot be anything other than a context-free proposition...such context-free statements cannot be made when the inquiry is concerned with human behaviour (for what human behaviour is ever completely context-free?) (p.118).

Here Guba and Lincoln's tenet is that the notion of generalisability should give way to the application of 'working hypotheses that fit more or less well into a context other than the one in which they were derived' (p.118). While the term 'fittingness' only adds to terminological confusion, the meaning is clear and appropriate to the way in which it is intended to generalise from the findings and conclusions in this study. The descriptions should be recognisable and applicable to, and 'fit', the practices of other medical units. Unless the research is generalisable in these ways, it will fail in its main purpose. Using deliberately small samples, the contention is that the research has succeeded in providing insights into apprenticeship, craft knowledge in medicine, and clinical teaching in general. The theories and insights which emerged from the work remain to be tested elsewhere.

6.11   Methodology summary

The methodology has been outlined as an emergent and evolving process involving three distinct but inter-related phases. The case study of one small medical team in a DGH provided a central focus. The main aims were to generate descriptions of CK in medicine and its relationships to teaching and learning through new interpretations of experience at various levels within the apprenticeship model. The perspective moved from a broad general framework which encompassed the learning and teaching of all participants in one team to one which concentrated on fewer issues in depth using consultant/SHO pairings in several teams. Overall, ten experts (two professors and eight consultants) participated in the research. The reader is referred back to the methodology summary in Table 2, p.75 above.

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Table 5 The Validation Process

Researcher categories	Identification of categories MEV †	CV1 ††	Matching of categories MM/ CV2 No.	CV2 †† No.A	Category text references Case Study Chapter 9	Interview Study Chapter 10 & 11	Discussion Chapter 12
Clinical Practice							
1. team involvement	*	*	10/6	6	9.5; 9.5.4	11.3	12.6
2. importance of presentation	-	*	4/4	2	8.2.1; 9.5.2	10.4.2	12.5.2iv; 12.9
3. continuous commentary / interaction	*	*	10/5	5	9.5.3	11.3	12.6.3ii; 12.9
4. thinking aloud	*	*	5/4	4	9.2.6	11.3.6	12.6.3ii
5. succinct condensed language	-	*	3/4	2	9.5.3; 9.6.1	11.2.2	12.5.2v; 12.10.2
6. clinical feedback	-	*	4/5	4	9.6.2ii	11.3.10	12.8.2 (reflection) 12.10
the diagnostic process							
7. emphasis on the history	*	*	9/7	7	8.2.2	10.4.2; 10.5.1	
8. diagnosis by signs	*	*	6/6	6	9.3.3	11.2.5ii	
9. diagnosis by symptoms	*	-	2/2	2	9.3.3	11.2.5ii	
10. diagnosis by exclusions	*	*	3/3	3	8.4.2;9.7.7	11.2.5iii	
11. diagnosis by pattern recognition	*	*	4/8	4	9.7.5	11.2.5iv; 10.3.1	
12. uncertainty	-	*	4/3	3	9.2.3;9.3.2	10.7.2	
the management process							
13. prioritising	*	*	5/2	2	9.2.4	11.2.3; 11.3.4	12.5.2iv; 12.10.2
14. the staged process	*	*	4/4	3	9.7.6	11.3.4	12.10.2
Clinical expertise resulting from experience							
15. superior knowledge	*	*	9/5	5	9.2.6;9.7.1	10.4.2; 11.2.4	12.4.4iii
16. application of knowledge	*	*	11/6	6	9.2.5	10.4.2; 11.2.4	12.5.2i
17. holistic approach	*	*	2/2	2		11.2.1; 11.2.6v	12.5.2ii
18. summarising skills	*	*	4/3	3	8.2.1	11.2.3	12.5.2iv
19. leadership	*	*	9/7	7	9.5.1	11.2.6	12.5.2iii
20. decision-making skills	*	*	8/7	6	9.2.6	10.4.1; 11.2.6	12.5.2iii
21. consideration of wider options	*	*	4/3	3	9.7.2	11.2.5v; 12.10.1	
22. less intervention	*	*	2/2	2	9.7.4	11.2.6iv	12.10.2
23. simplification of management	*	*	3/3	3	9.7.5	11.2.6iii; 12.10.1	
24. anticipation	*	*	2/3	2	9.7.3	11.2.6ii	12.5.5
Teaching/learning expertise resulting from experience							
25. assertions	-	-	5/4	4	9.7.8	11.3.7	12.5.8
26. teaching by questioning	*	-	2/3	2	8.2.2; 8.3		
27. teaching by telling	*	*	6/5	5	9.2.6;8.2.3		
28. correction	*	-	3/2	2	9.3.2;9.6.3	10.5.2	12.5.4
29. checking	*	*	9/8	8	9.6.1	11.3.9	12.5.3; 12.5.5
30. management/facilitation of learning	*	*	3/3	1	8.2.1;9.2.6	10.4.2; 11.3.1	12.6.3iii
No. of cats. identified	25/30	26/30					

†MEV = Medical educationist (case excerpts and interviews)
††CV1/CV2 = First and second clinical validators (case excerpts)
* = agreement on identification of category
No. = Number of times category applied by MM/CV2 respectively
No. A = Number of times agreed by CV2.

CHAPTER SEVEN

THE PILOT STUDY

7.1 Introduction

This chapter reports on the interviews conducted as individual discussions with three experts in medicine. All three discussions aimed to explore practitioners' values and beliefs about medicine and their perceptions of clinical work and teaching/learning activities. A chronological reporting style makes it possible to trace how questions were modified according to responses and to follow the reasoning which led to the decision to conduct a case study. The experts are: a Child Health specialist (CH); a General Practitioner (GP); and a specialist in General Medicine (GM).

Each interview developed its own impetus as a result of specialty influences and participants' responses. Since intensive content analysis methods were inappropriate in these preliminary interviews which were about ideas and concepts in medicine, the headings used in reporting arise from the analysis of common issues and differences across the specialties in response to the shared and other questions arising from each interview. From this point onwards, the validated categories will be revealed in chapter summaries as they unfold over the research process, eventually building to new theoretical interpretations of apprenticeship.

7.2 Interview 1: The Child Health specialist

7.2.1 Early questions about practice and teaching

After setting the research context in terms of entering a conversation rather than conducting an interview, the discussion began with the question: 'If I talk about clinical teaching as a 'craft', do you have any concept of what that craft might be?' The answer was:

> Not entirely, no. I think what I try to transfer to my students, probably, I'm mimicking what my teachers showed me and how I learned my craft so that I will have picked up from senior teachers that taught me, some of their ideas and some of the way they teach and I now project them through myself to my students. So I think its a matter of, probably handed down from Hippocrates - some of the craft of teaching - but I have not sat down and analysed it any further than that.

The question appeared difficult to interpret but the reply was revealing for several reasons. CH acknowledged both his past learning through traditional apprenticeship means and the present perpetuation

of the same process. For CH, the transfer of knowledge was based on role-modelling; and there was an admitted lack of reflection on teaching methods. Perhaps of greatest interest, was that CH separated his craft (professional practice) from the craft of teaching.

In an attempt to probe how CK in medicine might be construed, this response was followed by the question 'So if we try to analyse just a little bit just now, have you been selective in any way about what you try to hand on?' The response was interpreted as decisions about curricular content issues and the need to prioritise time. Selectivity was related to basic UG knowledge and the fundamental contrasting experiences of the normal, and the sick, child.

> ...we have eight weeks to teach paediatrics to 240 students and we have a programme arranged whereby they will have experience of what we think are some of the most important factors of child health, largely to recognise where there is an abnormality of normal development or if the child is sick or well. It's as basic as that.

7.2.2 Clinical skills in Child Health

CH enlarged upon a range of elementary skills required by the novice including how to examine in adverse circumstances such as a dealing with a sick child, or one with behavioural problems. The explanation given below illustrates the flexible way in which the physical examination of a child may have to depart from the adult norm, how information is gained, and the individuality required to build patient relationships. The use of the word 'craft' may have been induced (as in the reply above) in an attempt to conform to the question but it does not invalidate the clinical CK content. This example also demonstrates the clinician's skills in which both care for the child and student learning priorities are dealt with simultaneously. It is also another early indication of the synergy between the CK of clinical content and the CK of teaching it. Interestingly, it also refers to the cunning sense of craft referred to in the definitions (p.14 above):

> You can't tell a child to lie flat on its back and its arms at the side and take the pillow away and examine in the routine fashion. You have to grab children as you can and it doesn't matter whether you listen to the heart first or last in the examination as long as it doesn't upset the child too much and you get the necessary information. So that we, to some extent, turn on its head much of the teaching that has been given in adult medicine. That is not to say you shouldn't try and elicit the same amount of information, but using the guile or craft of making relationships with children.

7.2.3 Teaching skills in Child Health

CH emphasised his teaching skills in a number of ways, beginning with use of different language in front of a parent to avoid sensitive issues and how to use the parent as a teaching aid:

Well, I won't talk about leukaemia in front of a mother if I suspect that. But if I've got a baby that is not of an age of reason, then I will talk in front of a very small baby to students about tumours and various things. So yes, the presence of a parent does alter the teaching but in fact, it is more natural when the parent is there. I use the parent as a teaching aid...history-taking particularly, to show the relationship which may be good or bad. If you've got a case of child abuse where the parent has perhaps been the abuser and shows signs like apparent over-protectiveness and pseudo-caring.

These examples provide an expert's view as to what might constitute CK in paediatric teaching. Some critics might consign this knowledge to 'experience' or label it 'common sense' but it deserves a different categorisation, a higher priority, and a new analysis. The discussion became more centred on personal teaching characteristics.

7.2.4   The difficulties in eliciting personally valued teaching skills

Questions which attempted to elicit personal teaching skills were fielded with some reluctance and not a little embarrassment. The response eventually drawn indicated that CH skilfully managed and/or facilitated the students' learning. He was good at motivating students and encouraging self-directed learning through his questioning. He also said (indirectly assuming that he was able to promote them in students) that he liked to create enthusiasm and enjoyment and to stimulate interest in children's problems. Varied approaches and methods were used. The exchange, illustrating questioning as a valued personal skill, is quoted:

MM   What do you value most in your own teaching - what do you think you are good at?

CH   What an embarrassing question!

MM   But I want you to think positively.

CH   I don't know. I think what I'm good at is getting students to come back at me with questions, because if they ask me questions- if I pose them situations and then they ask me questions-it is a much better way for them to find things out...I'm good at putting them in a position where they are allowed to ask questions and then sometimes made to answer for themselves.

Probing for further information about teaching skills, CH was asked if the same approach to students was always employed. This was negated:

MM   Do you always have the same approach to your students?

CH   No. I have good days and bad days and good students and bad students. Sometimes they fire me up and sometimes I fire them up.

MM   And how do you do that?

CH   I don't know.

MM   Have you any particular 'tricks of the trade' that you use?

CH   No. Clinical teaching with children is such as variable thing. You know, you can go to a child and it's as good as pie. It shows all the physical signs that you want and it doesn't create merry hell... .

The words 'I don't know' had punctuated the interview several times. Were these denials or confessions of inability to analyse personal teaching? Or where they simply reflective comments? The last 'No' above was interpreted as a positive reaction to a bad question which possibly devalued CK in equating it with 'tricks of the trade'. CH indicated twice in this extract that he changed his teaching methods according to student needs and responses. In CH's illustrations, the power that students have to influence the teaching process is evident, as is the dependency in effective teaching on two-way interaction. CK in this context may be interpreted as a flexible approach to teaching and individuals.

7.2.5   The effects of charismatic influences and role modelling on teaching

Three clear instances drew attention to these aspects. When asked about the acquisition of the skills necessary to set up problem-solving exercises and pose questions as cited above, CH admitted to sub-conscious role modelling:

> But it is something I've picked up, probably subconsciously, from people who taught me and the ones I've probably learned the most from. I tended to copy their attributes.

Another question was asked about the influence of previous teachers ('What did you respond to that you yourself wanted to emulate?'). CH admitted that 'a bit of showmanship' as well as content expertise were important to him in teaching but also that such skills perhaps eluded analysis:

> I don't know. There are just some teachers that have a certain magic quality about them and I don't know if it's capable of analysis - a bit of showmanship, certainly a knowledge of the subject, deep knowledge

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of the subject, an ability to say they don't know is another attribute of a good teacher. Because that's where research starts.

Asked about motivating the unmotivated student, CH did not perceive this to be his job apart 'from example'.

7.2.6   Capitalising from failure as a teaching skill

After the discussion about the variability of children's behaviour, CH was asked if he could explain his strategies for dealing with difficult children. The only responses were further denials but this also points to the inability and futility of attempting to extract this kind of information out of context. However, CH did acknowledge a personal teaching success:

> I'm a fairly persistent sort of fellow. I will always get something out of a clinical teaching situation, even if it shows that sometimes a professional can fail.

The confidence to admit failure in front of students, and to capitalise from a difficult situation, is a positive feature if not overplayed and can be turned to advantage. Usually such admissions are founded on a deep and accurate knowledge base and the learners' tacit acknowledgement of the respect won from prior demonstrations of teaching competence.

7.2.7   Craft knowledge as specialised clinical and communication skills

The discussion was concluded by revisiting the meaning of the word 'craft'. CH returned to CK in medicine with references to clinical and communication skills, and practical procedures. He included 'feeling, hearing, and smelling' which are seldom mentioned in the context of clinical skills:

> Yes, but does it [craft] involve skills, technical skills, like taking blood from a baby, a simple thing - that would be included as a craft? Communication with parents, ability to elicit physical signs, what you are feeling, hearing, smelling when you examine children - these are all critical... skill must be part of the craft - like a joiner. It is no use knowing about the timbers and saws and so on, but be unable to use the saw and timber and create something useful and beautiful.

This paediatrician clearly interpreted his craft to include a wide range of professional skills and abilities which are integrated in the application of theoretical and practical specialised knowledge.

7.3   Comments on the discussion with CH

There were four main threads which ran through this interview, apart from the acknowledged variability and opportunistic characteristics of clinical teaching which are fundamental to teaching/learning in the practice context. These were: the relationships between two forms of CK i.e. the CK of medicine and the CK to teach it; CH's emphasis on charismatic and role modelling influences; the reluctance to talk about personal skills and abilities; and an admitted lack of reflection on methods.

Although it is easy to theorise from issues such as teaching failures and their propensity for positive learning, this does not tell us how CH achieved success or what goes on in CH's head during teaching. Nor does it shed light on the rapid decision-making and assessment processes which are presumably involved in what to select, isolate, comment upon, and draw out of each incident. Only observation and close analysis would provide more detailed descriptive information about teaching events. Precise information about clinical and teaching CK were still elusive, although both were presumed to be present in all of the incidents and examples cited.

The interview revealed the complexity and multi-faceted aspects of paediatric practice when caring for patients and teaching at the same time. Paediatric skills and information were passed on simultaneously in work. Thus, experience in paediatric teaching was manifested in dealing with the child, the parent, the students, all at the same time in a form of clinical expertise which dispersed attention to all participants, very rapidly and effectively, according to varying situations. It was assumed that the skills involved in 'keeping a number of balls in the air' would also be effected through an impressive communicative style and a characteristically distinct and highly individual teaching approach.

CH's responses highlighted that teaching is a very volatile, dynamic activity which demands a repertoire of varied skills and approaches. When pressed, these individual skills and attributes could be articulated. The tendency initially to deny or negate personal skills was consistently backed up with examples of success, but these had to be elicited, almost dragged out, through persistent researcher questioning.

From the outset, as a result of question flow and some assumptions on both participants' parts, the interview had totally centred on UG teaching.

7.4 Interview 2: a General Practitioner

7.4.1 Problems in defining 'the good doctor'

Reflecting the need to consider more than UG teaching, this interview was premised on the notion that it

might be productive to start with a question about what made GP 'a good doctor'. It was perceived as a

strategy to find a perspective on clinical CK and any of its characteristics or associations. It was also an

indirect attempt to probe clinical CK by asking what GP valued, not only in himself, but in medicine in

general. The question was immediately parried:

> Well, the truth is that I really don't think I am [a good doctor]. I think a good doctor probably is
> someone who is always available for his patients and with the job I now have, that is not realistic. So I
> am aware that I'm in a fundamentally compromised position as a doctor and that is probably one of my
> smallish number of regrets about the job I do ... we try to reduce the conflicts that creates by making two
> or three younger people who are trying to learn the **trade** of being a general practitioner work much
> more continuously in the practice... .

The compromised position referred to the split commitment between the academic and clinical aspects of

the post. Of all the specialties, General Practice perhaps suffers most from the fact that its clinical focus

is in the community and much of its academic base is divorced from this arena. This is very good for the

reality of the clinical context and content but the teaching personnel often serve two masters.

7.4.2 GP's personally valued clinical skills

The discussion subsequently focused on personally valued skills, eliciting the ability to 'listen' as a key

feature. GP indicated that this listening was now qualitatively and conceptually different from previously

concentrated attention to patients' responses in history-taking and examination. It was an important new

attribute in appreciating patients' visions of their own health and was accompanied by a drastically

different view of medicine which accompanied ageing and experience. GP's initial view of medicine as a

relatively straightforward procedural process and his valued listening skills are expressed below:

> ...I have no doubt that it is my ability to listen that has become keener and that, I think, is the thing
> that has most improved my ability as a doctor. When I was younger...not in general practice at all, I saw
> medicine as a very pathology-centred model which, of course, a lot of it is. So I was comfortable and
> happy with the detective work of organising physical symptoms and signs and prescribing the
> matching remedy.

The 'detective work' perspective had been exchanged for something infinitely more valued. More acute

listening skills were associated with an increased ability to communicate with, respond, and react

differently, to patients. This implies a greater sensitivity to patients' needs. Seeking clarification of

peoples' visions of health created a complex reply:

> Well they are of course independent. They are totally personal and one thing you learn is that you really
> almost cannot group people. They are individuals. That's of course the appealing thing in the art of
> medicine and that's why general practice teaching is probably different from hospital teaching, because
> it is in fact, teaching about the dis-aggregation of generalities rather than the creation of
> generalisations.

Opting not to clarify the last statement which might have led to an interesting, if controversial

conversation, GP was asked about the two words 'art' and 'trade' which had been used in replies because

of their associations with apprenticeship. It was explained that the words had been used sub-consciously

but also that the repetitive and stressful nature of some clinical work, when compared with the variety of

an academic/clinical post, was more akin to a trade than an art. This was accompanied by another

qualification about the inability to be 'a good doctor' in the circumstances of 'keeping the academic show

on the road'.

7.4.3   The introduction of 'experience' into questions about clinical CK

Then a different, but very profitable, question was introduced with the words 'If we change the word from

a 'good' doctor, which I am sure you are, to an 'experienced' doctor, what skills are you using as an

experienced doctor?' In the first part of the reply, experience was related to a greater 'intellectual feeling'

of the relationships between primary care, self-care, and specialist care. This was a specialist academic

reaction. The second part of the response offering a view of experience is quoted below:

> ...and I think what people often call experience is an intuitive awareness of the probabilities of their job
> and the way that you put that into practice is partly, if it's along with your personality, that you would
> take the risks that you wouldn't have taken before based on probabilities and partly that you have much
> greater inter-personal skills to control a consultation. I mean, I now know that if I say nothing, I am
> probably able to terminate a consultation quicker than if I actually take it over.

Even omitting the effects of personality on practice, this reply was almost too complex to deal with in

the time available. Experience for GP was associated with 'intuition', 'taking risks', the weighing of

'probabilities', and an increase in advanced, inter-personal consultation skills. The latter emphasis on

communication and its relationship to experience might have been anticipated in general practice where

communication skills in the consultation have been well researched (p.29 above). GP elaborated on the

subtle way in which he controlled patients by giving them control of the consultation:

> I mean we talk about making a consultation patient-centred, but actually it's a way of making it
> extremely controlling. The more patient-centred it becomes, funnily enough, the greater control the

doctor has over it... patient-centred medicine is allowing the patient to have ownership of the consultation until it becomes more convenient for you to have it.

GP noted the effects, 'not necessarily of ageing but of experience' by saying, 'the basic principles that I retain from my early postgraduate education and possibly to a lesser extent my undergraduate education haven't required to be replaced, and a huge number of fancies and fads have come and gone'.

7.4.4 GP's versions of using pattern recognition in diagnosis

GP also valued the benefits of being able to recognise the really sick patient, and the benefits of diagnostic pattern recognition. In discussing the latter, GP again referred to 'intuition', perhaps as a product of experience:

> There are undoubtedly advantages of pattern recognition - you have seen something that reminds you of something. I think you also probably become able to recognise when somebody is ill and that must be the most important skill of a clinician, knowing who is actually not well visibly, or not well emotionally as well. But you do intuitively I think depend on this sixth sense to know when a cough isn't a cough. Now one of the things that does reassure me is that although I'm doing - I can't remember - say I'm doing about 1,500 consultations a year which is a fifth of the normal work of a general practitioner and I am actually picking up roughly a fifth of the number of people with cancer and a fifth of the number of people ... so although that may represent only two percent of the work I do, I still do seem to be able to get most of it right.

Asked if he felt a 'safe doctor' after this explanation, GP replied 'I think I know what I don't know'.

Apart from GP's pride in his diagnostic record, the opening words clearly refer to GP as an expert clinician with a large memory of cases and his ability to draw on these. However, later in the discussion, and referring to the behaviour of a drug addict's prescription demands, GP associated pattern recognition with repeatable behavioural circumstances:

> Now pattern recognition is seeing the guy sitting there and (GP saying) ' OK, it's one week, not two weeks....' He could have told me the moon had blown up or something like that and I would just have let it wash over me because that is a pattern which is so absolutely repeatable.

7.4.5 GP's versions of using probabilities in diagnosis

Since 'probabilities' had cropped up several times in the discussion, a clarification was necessary:

> Probability - I now know that there will be three people a year who will present a doctor with lung cancer and I know that they will be basically over 50 and smoking 20 cigarettes a day. So if somebody comes to me who is 25 with a cough, I don't rate lung cancer as a diagnosis.

GP referred to the General Practice literature on this issue, and other, more subtle examples of probabilities, including the likelihood of pregnancy terminations and family alcohol problems, were

given. Overall, GP appeared to use a variety of approaches in the diagnostic process. In relation to problematic cases, he referred to this as 'the constellation of probabilities and skills that either consciously or unconsciously come into my mind'.

7.5   Comments on the discussion with GP

Different questions had led to discussions about the craft of practice without using the word 'craft' in direct questions. The turning point of the discussion was the introduction of a question about 'experience' which brought into focus issues in clinical reasoning such as weighing probabilities, intuition, and behavioural pattern recognition. The taking of risks, and the acquired ability to recognise the really sick and ill patient as a result of experience, were of particular note.

After initial denial of being 'a good doctor' GP was able to cite a number of personally valued attributes including getting the diagnosis right most of the time, and superior listening skills. The skill to control the patient was emphasised. For GP, as a result of age and experience, the initial procedural aspects of practice had been exchanged for richer means of communicating with patients.

This interview had provided exceptionally dense descriptions, explanations and illustrations of practice, and overall, less emphasis on UG teaching. It had proved difficult to follow up all the issues within the time constraints of one interview, but new insights into the potential of CK in medicine had been gained. By the third interview, some new interviewing expertise had been acquired in the ability to listen for long periods without interrupting while at the same time making mental and physical notes for follow-up questions.

7.6   Interview 3: a General Medicine specialist

7.6.1   Experience: the number of cases seen

After setting the context, the discussion with GM immediately began to probe the concept of experience as essential to CK in medicine:

> MM   I would like you to tell me first of all what makes you an experienced doctor?

GM   I suppose the simple answer to that is that the more you've done and the more you've

        seen must, if you learn by your mistakes, make you an experienced and useful doctor.

MM   Why the more you have done and the more you have seen?

GM   I've always equated experience with the volume of work that has been undertaken.

'Experience' thus defined, was clearly viewed in terms of the number of patients seen and in the variety of

ways in which patients present. (The allusion to 'mistakes' was interesting but unfortunately not picked

up at the time.) An attempt to link this view of experience with the possible skills involved led to the

opinion that an individual perception of skills did not obtain. Rather, this aspect was left to the

perceptions of others:

> I think in any job, you are not consciously applying skills, at least you don't think of it as a skill, you
> just do your job to the best of your ability. Now other people may perceive that there are certain skills
> involved but I don't think that the individual considers that there is necessarily a skill.

The distinction between skill and ability was not considered important in this context. But was this

another form of denial? Was it a reluctance to admit an area of competence? Probably this was the case.

But it was also an indication of clinical CK and teaching CK embedded and integrated in practice and a

clear example of transparency (p.10 above). For participants, there was no need to articulate, or to

elaborate on, the skills or contexts of the work process. It also indicated that these issues had neither been

fully analysed nor reflected upon.

7.6.2   GM's priorities in practising medicine

GM was asked about the skills of practising as a doctor. Four aspects were considered important:

intelligence, common sense, the ability to communicate, and a vocational sense of having the 'patient's

best interests at heart'. The effects of experience and ageing drew on a personal philosophy of medicine

which included an acknowledged increase in uncertainty as one becomes older:

> My philosophy changes, I think, as I grow older. I used to be much more certain that I was right when I
> was younger. I think when you are young and you're in a steep learning curve, I think everything is
> black and white and you think you know the answer. Now the more you see of medicine, the more you
> realise that you are often not quite right. You hope to be almost right and sometimes you're completely
> wrong, but you become less secure in your diagnoses as you get older. Maybe that is not a philosophy,
> but it is quite important to recognise that... .

And later:

...you have your own experience and once you've seen the spectrum in which a condition presents, and once you begin to appreciate the exceptions to the rule, you begin to realise your diagnosis - not infrequently - is perhaps less secure than you would like it to be. But it is a balance of probabilities and you go for the most likely option, knowing that you might be caught out from time to time. But knowing that is important... .

In this case we have a physician taking cognisance of the diagnostic process by using 'exceptions to the rule' as well as probabilities. Exceptions, possibly based on normal and abnormal presentations, appear to matter in diagnoses. The inherent uncertainty in medicine is apparent as well as the 'spectrum' of cases associated with experience. Personal fallibility is again recognised.

7.6.3 GM's use of probability in diagnosis

Because GM had spontaneously introduced 'probabilities', inducing a valuable comparison with GP, clarification was sought: 'This question of probabilities, can you explain this to me a little more deeply?' GM responded:

> Well, for example, we frequently see patients who are admitted with chest pain to hospital and we saw several on Friday - Saturday night - and of course if they are seen by the cardiology registrar he tends to think they have all got ischæmic heart disease . If they are seen by one of the others they might think of another diagnosis such as pulmonary embolus. Now when you go round that evening or the next morning to review the cases admitted, you begin to realise that the stories don't quite ring true. There's no reason why some of these patients should have ischæmic heart disease and you can't believe they have ischæmic heart disease. So you've listened to this story, and you've looked at the cardiograph and you have to make up your mind what is going on. And to make up your mind, are we going to send this patient home this evening or tomorrow morning reassured or are we going to sit for 2 or 3 days waiting for more ECGs, waiting for cardiac enzyme blood results to come back before we can be absolutely certain. And that's what I mean by a balance of probabilities. You take a chance in a way and say 'Well look there is no evidence that this patient has a myocardial infarction or has ischæmic heart disease, they might have' - but the balance of probability is that they don't and you have to act on that... .

This was an interesting account of how, instead of focusing on just one diagnosis, GM maintained a breadth of options in his differential diagnosis as well as highlighting the importance of history-taking. His words 'the stories don't quite ring true' illustrate making sense of events by fitting them into a clinical picture or pattern.

7.6.4 GM's version of pattern recognition in diagnosis

To complete the comparative picture with GP, clarification of pattern recognition was pursued:

> Well I think the best examples of pattern recognition are probably, firstly, the interpretation of ECGs - that is pattern recognition in that after you have looked at a lot of electrocardiographs in the past, you can look at this 12-lead ECG which to a medical student or the uninitiated looks incredibly complex, but you can look at it and within 2 or 3 seconds and realise it's normal or abnormal and that is pattern recognition. When results come back from Clinical Chemistry in my own particular field you immediately look at them and know exactly what's wrong without it seemingly going through ... . But,

in the broader sense, of course, we are involved with pattern recognition all the time. The symptoms the patient presents with are ordinarily those in the textbook, but you tend to link these symptoms with other investigations and it is really again a mixture of the symptoms, what you find in examination, perhaps an ECG, perhaps some blood tests, perhaps an x-ray - and it all fits into a kind of jigsaw, a pattern that you recognise or have seen before.

Clearly, GM perceived that the diagnostic process might consist of fitting events, physical patterns, investigations, and clinical signs and symptoms into a previously experienced or recognisable pattern.

7.6.5 Diagnosis by exclusion

Because a diagnostic element had been pursued in this discussion, GM was asked to explain the use of negatives as in, for example, 'If it has this and this, it can't be that'. He said:

> ...it's the psychiatric inference we tend to diagnose by exclusion, at least I do, but that's perhaps because I'm not very good at recognising psychiatric illness.

This explanation, apart from acknowledging diagnosis by exclusion, had also drawn a confession of professed inadequacy when confronted with some psychiatric illnesses. Thus it was another example of an expert (as CH) openly admitting to knowledge gaps.

7.6.6 Experience: the management of teaching

The complex teaching scenario, construed in a hypothetical example for CH, was graphically described by GM:

> ...I think there is a certain skill involved in being able, on a ward round for example, to take the nursing staff along with you, take the junior staff along with you, take the medical students along with you and not have them standing round yawning, and with their hands in their pockets, bored stiff. And most importantly of all doing your job which is looking after the patient. The principal part of your job is to make the patient feel at ease. And at the end of it all, not to forget to tell the patient what is going to happen, what the diagnosis might be, and what the investigations might be. Now all of that, I think, does require a certain amount of skill which inevitably comes from experience and some people are better at it than others.

After this excellent account of how clinical bedside teaching has to be managed GM was asked, 'What do you think makes you good at it?' This was met with the now almost familiar denial:

> Well, I am not so sure that I am good at it. It depends - I mean some days I am better at it than others and that depends on the other pressures on your time nowadays.

Apart from other factors outside personal control, GM went on to make a comment, very similar to that made earlier by CH, about the students and their effects on teaching:

... and I think also you relate to the students, if the students are good and students are interested. If students aren't terribly interested or are ignorant, it is much harder work.

7.7   Comments on the discussion with GM

In relation to CK in medicine, GM perceived clinical experience to be the number of patients and the variety of presentations seen. In the diagnostic process, he cited using the balance of probabilities and pattern recognition. He admitted to uncertainty in the diagnostic process and medicine in general, coupled with the knowledge that awareness of this uncertainty grows more acute with age and experience. There was a personal expression of inadequacy, at times, in psychiatry and teaching. A philosophical approach to practice also appears to change with age and experience as does the regard for less unwarranted intervention on patients' behalf.

In relation to the CK of teaching, GM spoke of individual performance variability and the skills required to manage the teaching/learning processes. Denial of individual teaching skills and a lack of reflection on these again featured in the discussion.

7.8   An overview of the Pilot Study

7.8.1   Methodological issues in the interviews

The question changes over the small study resulted in disparate interview content but there were perceived advantages in the richness of individual responses which, either directly or indirectly, conveyed vocational enthusiasm. Since insight not generalisation was the main aim, the small sample yielded useful information. The experts gave their views about practice and teaching appearing comfortable with the questions. All replies were perceived to be valid interpretations of the issues with no evidence of evasion or contamination effects although there was also the potential to give opinions from literature. Illustrative examples given to the researcher reflected the experts' specialty influences.

The reporting was facilitated by issue collation using a chronological approach. The density of responses was daunting.

7.8.2 The craft knowledge of clinical practice

An important definition came from GM - that clinical experience equates with the number and variety of cases seen. This could also be inferred from the CH's and GP's illustrations of practice - many cases equals fingertip knowledge and the ability to apply it. Knowledge came in a variety of forms. CH commented on the clinical skills of examination, history-taking, and practical procedures. GP spoke of 'organising physical symptoms and signs', and history-taking. Both CH and GP commented on skill of recognising sick patients, also contrasting sick and well patients. They also emphasised the importance of communication skills, especially in history-taking. GM's comments on the ward round also endorsed the importance of the history with the words 'the story does not quite ring true'. Controlling the consultation and listening were advanced skills for GP who also spoke of intuition in dealing with patients.

Even this short study emphasised that patients present as multiple problems. They appear to be diagnosed by different methods. GP and GM gave versions of the use of probabilities and pattern recognition in treating patients. GM enlarged on using exclusions in diagnosis. Both of these experts commented on the effects of ageing on attitudes to the jobs and treating patients. Experience and ageing enabled GP to take risks and to view the fads of modern medicine with a certain scepticism while GM associated less intervention and conservative treatment with ageing and experience. GM also kept his options open in the differential diagnosis. There was also a tentative indication that he looked for the simplest diagnosis on some occasions when compared with other physicians.

7.8.3 The craft knowledge of teaching medicine

Participants' responses had mainly centred on UG teaching in giving illustrations about teaching activities. These were also part of the work process. There were examples of taken-for-granted skills and effective personal strategies. However, it was only possible to hypothesise and visualise about how CH, for example, taught in practice. In several instances he professed that, apart from questioning skills, he did not know exactly how he achieved his teaching successes. This shows that out of context, real insight and accuracy are elusive. Interpretations and descriptions need to be rooted in specific circumstances and founded on direct observations of practice. Otherwise, hypothetical, distilled versions of practice are likely to surface.

CH and GM, emphasising reciprocity between participants in teaching and learning, endorsed the effects that students have on these processes in their ability to motivate the teacher and stimulate learning. These experts also alluded to the fact that teaching/learning had to be managed. All experts commented on variability in the teaching process and their own associated performances. CH made clear references to charismatic influences and role-modelling in learning medicine.

7.8.4 Denial of personal skills

A feature of the three experts' responses was the tendency to deny, or to be reticent about, discussing personal practice or teaching skills in positive terms. It was easier to extract participants' generally valued skills rather than personal attributes. All experts acknowledged failures and knowledge gaps in work and teaching but this was perceived by the researcher to be a positive attribute as well as a mark of expertise and maturity in teaching. There was an admitted lack of reflection and analysis of teaching methods in the CH and GM encounters.

7.8.5 Two forms of craft knowledge

The interviews emphasised that the overall research question ('How do medical experts pass on their craft?') required the pursuit of two issues: the **products** or content of CK as the clinical knowledge, skills, attitudes, and expertise of experts; and the ways or **process** in which this CK is passed on to learners in clinical practice. Experience was identified as the key to understanding these product/process dimensions of CK.

In relation to the development of the categories discussed in Chapter Six, the pilot study data can be plotted under the three main headings in Table 6 below. Ten categories (out of thirty), which were subsequently developed and validated as the strength of the data progressed, arose in this first stage. Other ideas encountered later in the research process included: charismatic influences, role-modelling and vocational interests; the recognition of sick patients; contrasts between normal and abnormal presentations; and expert consideration of the simpler diagnoses.

Table 6 Categories identified in the Pilot Study

Clinical Practice (process)	Clinical Expertise (product)	Teaching/learning expertise (product)
emphasis on the history	superior knowledge	teaching by questioning
diagnosis by signs	less intervention	management/facilitation
diagnosis by symptoms	consideration of wider options	learning
diagnosis by pattern recognition		
diagnosis by exclusions		

The experts had given plausible accounts of their practice and teaching but there were only tantalising, partial glimpses of the complex integration between this knowledge and its transmission. Given GM's open admission that he did not perceive the need to articulate professional practice as skills (p.112 above) it can justifiably be said that the work/practice dimension in relation to learning required in-depth exploration. How indeed, do experts use the products of their clinical and teaching expertise in the clinical work process? If these are not explicit, how does the tacit element of clinical exchange operate in imparting knowledge?

To take the research forward, experience became the main tool to explore these issues. A case study to investigate different levels of experience in one team, conceived as a unit of apprenticeship in action, was instigated to explain the product/process relationships of CK in medicine.

CHAPTER EIGHT

THE CASE STUDY:

CONSULTANT UNDERGRADUATE TEACHING EXPERTISE

8.1   Introduction

Building on insights about the nature of clinical experience gleaned from the pilot study, this chapter

focuses on the effects of the case study consultant's clinical experience on his UG teaching. The chapter

describes one expert's approaches to clinical teaching and extends understandings derived from

questionnaires as reviewed (pp.31-32 above),

The contexts include: one ward-based session with five UG2 students: one ward round with a male UG3

student; a tutorial with the same male student (the only session which conformed to the formal teaching

criteria, p.27 above); and one outpatient clinic with a female third year student. Somewhat diverging from

the normal reporting style in order to capture the immediacy of the observations, the commentary

accompanies the extracts. The consultant is referred to as 'CE' (consultant expert); WT refers to a

working tape; FN refers to field notes.

The analysis of selected Ethnograph coded excerpts from the interviews and working tapes illustrate the

expert's clinical and teaching expertise in the categories 'questioning' and 'management/facilitation of

learning' identified in the pilot study (p.116 above). Charismatic influences, also highlighted in the first

phase, and the expert's ability to depart from the norm, introducing novel and unorthodox teaching

methods, are made clear (Glaser, p.52 above).

8.2   Learning from patients

(With reference to Appendices H and I)

8.2.1   The organisation of the session

The UG2 students were relatively new to clinical medicine. In the session based on four selected ward

patients, CE elected to emphasise two main points: the importance of history-taking, specifically

listening to the patient; and that cardiovascular disease can present in unusual ways. The teaching was

classified by the researcher as a classic example of successful planning and organisation in that it had a beginning, a middle, and an end which embraced a summary emphasising key points, and student feedback. The researcher also observed that teaching by questioning, teaching by telling, teaching by demonstration, and self-directed learning were in evidence.

The session, based on sending pairs of students to talk in turn to four patients to elicit a history, was analysed in detail before the interview which began in a deliberately naive manner with the question, 'Can you tell me what made the session effective?' It was hoped to elicit an explanation which elaborated or reflected on CE's own teaching. The answer was 'the patients'. In a further attempt to get CE to talk about his perceptions of his own teaching, another question was asked, 'Can you explain to me how you conducted the session?' The answer was, 'Well, you saw me conducting it!' (C2 15-19; 111-114).

It transpired that CE had selected and asked the patients for their help with the students but he had also primed the former on how to respond. He also admitted to a 'thread' which ran through all the cases acting as a cohesive and integrating factor for the students. This 'thread' also allowed for continuity between lessons, a factor often missing in clinical teaching when much may depend on the clinical cases available.

CE directed the students at the briefing session before sending them to the wards with the words, 'I want you to tell me in **two paragraphs...**'. These words sent them off with a clear indication as to how to organise and report on their 'talking to patients'. At the presenting stage, CE made it clear that a brief, concise, logical presentation of the findings was required with the words, 'Full stop! Can you put these three five-minute episodes into some form of chronological order?' (Appendix H; WT2 7-22).

These short, but very precise directives, were designed to train the students to present their findings briefly and logically. Presentation skills are crucial to medical practice leading to succinct, logical inter-colleague communication. This thesis will later draw deeper implications from case presentations.

8.2.2   Questioning skills with the Phase Two students

CE displayed two distinct questioning techniques with these students. Instead of supplying information when the students had ostensibly exhausted their ideas or asking another question, he probed for additional details by saying 'and?'.... 'and?', as the example below illustrates:

CE	She came up to see Dr Y yesterday and?
UG2.1	She got all sorts of tests (and was) sent home again.
CE	She got all sorts of tests and - you see - sent home and?
UG2.2	Sister made an appointment at the Western.
CE	Two appointments at the Western. (Appendix H)

CE always extracted more information which in turn gave both the students and CE himself greater satisfaction. This satisfaction came from several sources. The students had learned from the carefully planned teaching, but they were led to believe that they had found out the information for themselves. This information had been planted by CE when he briefed the patients. CE knew that the students had attacked the history the correct way:

> Now that pair, because I was listening...I heard her say a whole heap of things which most patients will say given the opportunity...she told them what I had said to her, she told them what investigations...which they should have known (C3 244-252).

When asked about the means of extracting these clinical details, CE initially queried that he used the 'and'...'and' technique but he justified its use in the context of a patient-centred approach to taking histories (C3 233-296).

The other distinctive means of making the students think was to take their phrases, repeat them, and then use them to frame the next question (Appendix H). This is the repetition of content words which acts as a cohesive feature in communication (Barnes and Todd 1977). In the example above the words are 'she got all sorts of tests'. This aspect will be returned to in the Phase Three teaching.

8.2.3   The physical examination

One ward-round case involved a spleen examination when it was possible to observe CE demonstrate and correct the students. Some students had failed to find the spleen. Again an explanation was asked for with the words, 'I wonder if you could explain to me (MM) what particular teaching points you were putting over with this physical examination'. CE said:

> With that, I think you are looking for things which don't exist...they hadn't... (the students had failed to palpate the spleen) because you get that kind of "bump-effect" on the hand (C2 336-344).

This was not strictly true since later in this discussion, in relation to one student who had had some difficulty, attention focused on CE's helpful teaching points and correction. The interview went like this:

| MM | How did you help them to find it? |
| CE | By telling them what to do. |

MM   You told them to map it out.

CE   Well yes and no... She was saying that she was feeling the spleen and she hadn't got to it.
      OK. What I said ... my recollection of what you just said, was, if the spleen is that big
      you've got to map it out. OK. If it isn't that big, you've got to get in until you are right
      up to the costal margin (Appendix I; C3 376-401).

8.2.4   Teaching points

As he helped this student, CE also used an unconventional method of curling the fingers to feel the

spleen. This is the subject 'know-how', the representational knowledge explained in the 'bump-effect' of

CE's observations (Wilson *et al.* 1987). These are the points and the contexts which learners are likely to

remember because of the specific teaching and the physical sensation experienced in hands-on medicine.

This small episode emphasises that teaching skills can be articulated when often they are either assumed

or taken for granted. The tendency may be to deny them in the first place. Schulman (1987) has argued

that many such aspects of teaching are ignored:

> ...teaching is trivialised, its complexities ignored, and its demands diminished. Teachers themselves
> have difficulty in articulating what they know and how they know it (p.6).

While Schulman was arguing for a more extensive knowledge base for teaching other than an

examination orientation, there are comparable instances in the pilot study where neither CE nor GM

(p.104 and p.114 respectively) were willing to accept such knowledge as worthy of attention. Quite

simply, this is Schulman's 'wisdom of good practice' (1987, p.11).

The giving of specific teaching points may be insufficiently recognised in clinical teaching. They are

often met in short neat phrases or hints to remember and will also be found in the next chapter which

reports on the PG findings.

8.2.5   Leaving key messages

The Phase Two teaching ended with a brief corridor discussion/summary of the patient cases. However,

leaving the students with a small amount of important information was emphasised. 'I try with Phase

Two to leave them with relatively simple major messages' (C3 67-69). In this instance, this was related

to the unusual presentation of some cardiovascular diseases. The teaching closed with the advice,

'Remember you are always asking: the priority is, am I missing something which is treatable?' (C2 223-

227).

8.2.6 And the Phase Two student said...

The student interviewee, with some prompts, reflected on the issues reported above. Her first reaction was that she warmed to CE's approach and his communication with patients:

> He's not very formal with you...a lot of the other teachers are more formal with you...he's quite jokey and he's got a very good rapport with his patients...he's very good...he knows how to bring things out in you... instead of maybe telling us...he tries to get us to bring it out...nudging us and things like that...hints from himself... (he) keeps pushing at you till you come out with the answer (FN 13th May 1992).

The student also reacted favourably to CE's relaxed manner, the constructive teaching, and the fact that he did not make the students feel bad about their mistakes. Another way of looking at these comments is to perceive CE's encouragement of self-directed learning. CE's admittedly charismatic manner and approaches to learning were appreciated. She said 'CE was generally concerned that he wanted you to learn'. The students also got mildly competitive homework from CE which the whole student group handed in and all received feedback on.

All of these aspects were highly motivational and the data clearly support and confirm the questionnaire characteristics of effective teaching (pp.31-32 above). However, the student also indicated some assumptions in the teaching by saying that at times the students were confused. 'Maybe it's clear in his mind, but sometimes to us we don't know what he's after'. They did not admit this to CE!

The interviewee was asked what she would remember from the teaching.

> Mainly the heart stuff...it's like...the woman who had the TIA ... (I'll) remember that...I did that one first...the other woman with the big spleen, I don't really remember her because I didn't take the history (FN 13th May 1992).

This admission has a message for clinical teachers in that most of the session, apart from the students' own input, largely went unassimilated. It might be an indication that would-be clinicians remember specific cases and the way in which they present. The reply led to asking about the amount of content which had to be absorbed and learned. The answer was 'osmosis', an answer which permeated other interviewees' responses.

The 'take-away' message from this encounter with Phase Two is that 'the history is all'. It was also clear that CE was gentle with students at this stage and enjoyed instilling correct clinical skills.

8.3 Undergraduate Phase Three: questioning on the ward round

(With reference to Appendices J and K)

8.3.1 Clinical questioning skills

The following examples show how teaching is injected, both opportunistically and deliberately, into a busy ward round. The student (UG3.1) was experiencing the day-to-day business of the unit and had been given tasks and minor responsibilities according to the situated learning theories of Lave and Wenger (pp.7-11 above). The analysis stemmed from the student's interview after the round and his words in answer to a question about any perceived differences in the teaching he received from CE and other team members. His reply was, 'He (CE) questions you differently' (FN 20th May 1992). How differently? We shall see.

CE asked questions in two-part form:

> If I said to you one of the causes of bi-lateral pleural calcification is tubercle, what is the other and why hasn't he got it? (WT1 274-277).

The student gave one right answer, 'Asbestos'. This was followed by a series of more protracted responses resulting from CE's constant probing as he placed the student under considerable pressure for several minutes while the staff checked records. Taking phrases from the student and using the content repetition experienced with Phase Two to clarify, facilitate, and form the next question, CE's questioning skills were formidable. The teaching was memorable for its continuity and the way in which the 'story' developed. This form of teaching has been described and used by Sandler (1990) as a conversation in which a student is questioned in depth about a specific topic or case. A section from Appendix K is quoted:

> CE   He's got pleural plaques, but where do you actually see them? There's somewhere you characteristically see them in asbestosis?
>
> UG3.1   (You) see them at the base.
>
> CE   You see them on the diaphragm...which is unusual...much more likely to see them apically...

Depending on the teaching manner, this intensive questioning as discussion can be a rewarding exchange of information or it can be a threatening and daunting experience. The observed episode veered towards the latter as CE probed for knowledge prior to final examinations. In a similar way to that above, CE put a question to this student with a preface 'On the way upstairs, I am going to ask you in the lift...' (The

exact words were inaudible!). This gave the student time to think and focused his attention but it was a fairly intimidating technique.

In another injection of teaching into the busy session, the student, as part of the team, presented a case that he had clerked. CE taught through correction of students' notes and he made sure that this student would receive feedback with the words 'You'll get my comments'.

CE had distinct views on questioning which he clarified at interview:

> You can make a simple question very difficult... I think sometimes it is more difficult to find out how ignorant they are...far from plumbing the depths of their knowledge which I think is quite easy to do, plumbing the depths of somebody's ignorance... (is) very distressing' (C4 63-76).

8.3.2 UG Phase Three: tutorial on the physical examination

A great deal of UG teaching of clinical skills is prefaced by cautionary words such as 'Do it this way for Finals' or with allusions to these examinations. One tutorial, taken by CE in a seminar room (patients excluded), dealt with the physical examination of the neurological system, partly for the approaching final UG examinations.

This tutorial provided abundant evidence that there is a set approach to the physical examination. The neurological system is usually carried out in a very routine way although CE had an unconventional method of approaching the general physical examination by starting from the feet and working upwards instead of from the upper parts down. Experts can depart from the norm or bend the rules.

Interestingly, the same UG3 student who had participated in the above questioning, was responsible for illustrating how CE varied his teaching approaches. In a tutorial, UG3 wrongly identified the way in which to palpate the posterior tibial artery but he was corrected with humour, tolerance, and subtlety. '...you don't handle that kind of thing by highlighting it. You handle it by saying 'What a splendid original way!' (C3 612-615).

8.4 Outpatient teaching strategies

8.4.1 'Giving space'

This last example of UG3 teaching is a description of how CE devoted his attention to the patient in the clinic and yet kept the student interested and active in the proceedings. CE had an individual strategy to

relieve the pressure on the patient, the student, and himself, in his 'pass the paper' technique. It provides a contrast in styles and strategies to the questioning behaviours and is another example of CE varying approaches according to different clinical contexts.

Short complementary extracts from the respective interviews give the flavour of the technique, one of the main benefits of which is to give the student the time and space to think. The strategy is completely dependent on feedback at the end of the clinic or between patient consultations, an aspect with which CE complied. His humour is obvious.

> CE   I then talk to the patient. While the patient is getting dressed, I look at the piece of paper ..., I then talk to the patient and say 'I'm not going to send you for a CT scan.....the things the students have on his list, but I am going to send you for an exercise ECG...so I've actually taught the student without my saying anything to the student' (C5 144-165)

> UG3.3   CE is very subtle...he actually gets you very relaxed...seeing the patient blind and you haven't got notes in front of you and all you've read is the referral letter which you might not have time to read if some consultants are rushed and then you get blasted straightaway...he waits until he's taken the whole history and then he gets you involved and he'll just pass you a piece of paper...asking what he wants to know...if you're stuck you've got loads of time to think out what your answer is going to be...you can watch him examine and get some clues from that...it's completely non-confrontational (UG3.2, 24-58).

8.4.2   Diagnostic questions

When explaining his outpatient teaching, CE made it quite clear that he taught in a specific way especially for students and that part of his methods included the use of specific questions in eliciting the history. Two features should be noted in the hypothetical example given: that specific questions go with suspected diagnoses; and that exclusion factors are sought.

> Teaching at outpatients is in actual fact, I accept it, a subtle expertise...because you know, the student mustn't be sleeping...if the student is not sleeping, if the student is saying 'Why did he ask about drinking cow's milk?', 'Why did he ask about eating rhubarb or whatever it is OK', I wouldn't have asked these if the student's not there (C5 218-229).

8.5   Other teaching strategies

Apart from motivating individual students, CE also used group dynamics and inter-group competition against himself to engender active thinking and learning. This technique also fosters a group spirit and team interaction:

...when I'm teaching them in a group...I get them individually to write down their answer and then I leave the room and then I get them to put up a group answer. The advantage of that is that it does actually make them think as a group...they very definitely become competitive against me so they are trying very hard to produce the best answer (C4 43-54).

Another deceptively simple way in which CE encouraged thinking, was to ask for a very specific response in the form of one test for one patient. This facet was alluded to by a clinic student (UG3.2) in describing CE's ability to encourage active learning:

...its making you think. It's making you think about things rather than just doing the normal tests which you might do...chest X-Ray and ...you are not really thinking about why you are doing them. Whereas what he is saying is, 'Which out of all the tests you do would you expect would give you a diagnosis, if you couldn't do the rest, which one would you pick? (UG3.2 148-161).

This type of closed questioning makes no concessions to answers which might be guesses. CE made no assumptions about student knowledge. The researcher and the student observed that CE probed for very accurate responses as true indicators of the relevant developmental knowledge base with brief questions such as 'What do you want to investigate?' or 'What is the big thing we've got to exclude?' He varied his techniques.

The same clinic student also referred to CE's two part questions as illustrated above. 'He occasionally did ones where there would be two parts to them, so that "What is your most likely diagnosis?" "If this, what are we going to do?" sort of thing'. (UG2 457-460).

8.6 Summary of teaching skills

The consultant's formidable skills can be enumerated to include: a deep knowledge of learners' needs; ways of motivating and encouraging students; strategies to make them 'think'; means of assessing their knowledge bases; setting aims and objectives; pitching material at the right level; pacing the teaching; summarising; providing feedback; and the use of specific, individual teaching strategies. The examples show a model of teaching excellence illustrating:

- the ability to select salient issues as teaching material

- the use of adroit and varied questioning skills

- the ability to teach using subtle, often oblique, and economical tactics

- the ability to make things simple and to emphasise 'take away' key messages

- the ability to plan and manage teaching

While these may be termed generic teaching skills, the following specifically clinical teaching skills were displayed:

- a strong emphasis on history-taking

- feedback to students through written notes and patients

- the use of the patient to teach the students

- the ability to make unconventional teaching points in examination.

The case study consultant, deliberately and skilfully, helped the students to learn in two key ways: he placed them in situations in which they could find their own solutions to problems; and he did not always tell them the answers. As CH in the pilot study, his UG teaching was 'questioning' rather than 'telling' oriented, a feature which enhances thinking and self-directed learning. However, he used 'telling' where appropriate. 'Emphasis on the history', and 'diagnosis by exclusions' were strengthened as categories (p.94 and Table 5, p.101 above) in this UG analysis of teaching expertise.

This chapter has enlarged upon how one expert passes on the CK of medicine to students using generic teaching concepts and skills in the clinical context. The CK of medicine and the CK of clinical teaching have each been shown to possess separate properties within a symbiotic relationship. Some of CE's methods may be unrepresentative and idiosyncratic but overall, they provide exemplars which are worth sharing and attaining. Other experts will have other ways of passing on their ideas about how to teach core clinical skills. However, although valuable in terms of individual approaches, this analysis of UG events has failed to reveal new information about CK acquisition in medicine. The research questions and the identified pilot study issues remain to be addressed including: definitions of experience and its effects on PG clinical practice, teaching and learning; reflection on teaching; uncertainty in clinical work; and the teaching of the diagnostic process. These issues are reported on in Chapter Nine which summarises the total of validated categories resulting from the case study.

CHAPTER NINE

THE CASE STUDY RESULTS:
BEYOND BASIC SKILLS

9.1 Introduction

This chapter focuses on the consultant's clinical work with his junior staff and the effects of this on the teaching/learning processes. The reporting is based on the analysis of participants' coded interview responses implemented by working tape data. The responses came from the teacher/learner pairings in six interviews with the consultant, SHO, and HO in the context of three ward rounds and their respective working tapes. UG data are incorporated only where appropriate. Certain quotations contain dense material and interpretative comments may be found in more than one section.

Five of the research questions (1, 2, 3, 4, and 6), are addressed. There were insufficient data at this point to report on questions 5 and 7. As well as issues identified in the pilot study, perceptions of experience, charismatic influences and role modelling, and match and mismatch of participants' opinions are discussed. The relationships of the research questions and progressive focusing (PF) issues to the headings used in reporting are shown below.

Research questions and Progressive focusing (PF) issues	Section headings
Definitions and characteristics of experience as identified in the Pilot Study (PF) Which beliefs do clinicians hold about the current apprenticeship model?	9.2 Clinical experience: consultant, SHO, and HO views of clinical experience; attitudes towards medicine and valued skills; denial of own skills
What are clinicians' theories and perceptions of their teaching and learning?	9.3 The teaching/learning processes: clinicians' views
What are the relationships between clinical experience, work, and teaching and learning and the ways in which CK about medical practice is passed on from experienced to less experienced individuals? How does the hierarchical structure of hospital medicine affect teaching and learning?	9.4 Learning from talking to patients 9.5 Learning from clinical practice 9.6 Learning from supervision, feedback, and correction
How is the diagnostic process taught beyond the acquisition of basic skills?	9.7 Learning from expert actions in the diagnostic process
Match and mismatch of participants' opinions (PF)	9.8 Match/mismatch of participants' opinions
Charismatic influences and role modelling (PF)	9.9 Charismatic influences and role modelling

9.2 Clinical experience

9.2.1 CE's view of experience

Rapid confirmation that clinical experience was perceived as the number and variety of patient cases seen, came in the opening interview with CE when he was asked to give his criteria for 'experience'. Initially, he had the ubiquitous conceptual difficulties before qualifying the differences between experience and expertise:

> I have a lot of experience - I mean - it's as simple as that...it reaches the stage where there are very few things that you have not seen before...I would use the word 'experience' very much so in the context of experience - expertise and experience are not necessarily the same thing... working in a district general hospital, one sees the spectrum of medical referral so that you see an awful lot of stuff... of medical referral. I think experience is seeing a lot of patients (C1 9-45).

This comment contains the important words 'seeing patients', a comprehensive phrase apparently used to embrace the scale and diversity of many medical activities. 'Seeing patients', as the pilot study indicated, appears to be the key to experience and an issue to unpack. CE added the nuance that there were no surprises, few 'things not seen', in his criteria for experience. 'Things' were assumed by the researcher (but not defined) to include all manner of diseases, presentations, and problems couched as 'referral'.

CE considered expertise to be possible and sustainable only in a narrow field due to the pace of medical developments. He gave the illustration of his own expertise in severe obesity problems but his inability to claim 'an expertise in the management of every aspect of clinical medicine' (C1 67-68). Here. management, not diagnosis, was important in CE's view of expertise. Later in the discussion, he added that it was important to know one's limitations with the Socratic words, 'It's not knowing what you know that matters - it's knowing what you don't know that matters' (C1 72-75).

Asking about learning needs was another way to solicit team views on experience. Conceptual difficulties were again emphasised when CE was asked about his SHO's learning requirements. He replied 'experience'. The issue was pursued with the question, 'Experience of what?' The response was 'Experience full stop. You know that, I think' (C1 275 -282). This was not perceived to be a deliberately obtuse answer, only that 'experience' simply deserved to be understood in its own right without further explanation. However, this does not advance what experience is and what it entails beyond that it accrues from 'seeing patients'. The definition becomes circular: 'experience means seeing patients' and 'seeing patients means experience'.

9.2.2 CE's attitudes towards medicine

CE's philosophy, which may be construed as his version of clinical CK as a direct result of his experience, was distilled into three main facets: '...my feeling about being a physician is, trying the guidelines, having a listening skill, and having communication skills' (C1 141-145). With acknowledged difficulty in admitting his altruism, he professed to impart values such as the excitement of medicine and to inspire people rather than to pass on knowledge (C1 173-177):

> I know what I try to do, the values I try to - it's a terrible thing to say - I try to inspire people rather than pass on knowledge. (Q. Why is that such a terrible thing to say?) Well it's very conceited. But I try to make people aware of the excitement of medicine rather than the core knowledge (C1 173-186).

In another parallel with the pilot study, CE's attitude towards medicine was affected by age and experience. He treated the swings of fashion with some scepticism:

> One of the things of experience is perspective. Experience is the start of perspective and you see the flavour of 1992 falls into disrepute in two or three years time, and therefore, things are not so black and white as younger people sometimes see them (C1 256-264).

Several of CE's beliefs, for example the privilege and excitement of medical practice, coincided with those of the pilot study interviewees. He also considered (as GM and GP), that 'a lot of general medicine was very run-of-the-mill stuff' implying that it was straightforward or routine work.

9.2.3 The SHO's view of experience and attitudes towards medicine

In articulate responses concerning his own learning needs, SHO identified a number of important characteristics and features of desirable knowledge. His reply is quoted in full since it relates to his inexperience and some qualities he associated with experience in senior colleagues. This desired knowledge is perhaps to be equated with experience, although the minutiae, or a full description of what one does or has as a result of experience, are still absent:

> I could divide into various areas - I certainly need to - get the breadth of knowledge that I require to practise medicine which involves a lot of reading of established knowledge in the form of textbooks. I also need to be - to have an understanding of the up-to-date moves in clinical medicine at the moment and that I can get for myself by reading journals - and perhaps most importantly, what I most need to do is to be in an acute clinical setting where cases are being discussed and managed in a day-to-day sense. And in that setting I will be learning from the people that are managing patients and are making decisions, people like my consultants - and from them, what I will learn is, I think the sort of thing, the knowledge that comes with experience, knowing what to give weight to, knowing how to elicit the findings. It's very hard to impart this information other than in the form of an apprenticeship I think, and that's what I'm doing (SHO1 27-57).

There is a clear differentiation here between theory and practice. Self-directed reading procures certain knowledge, but on-the-job learning from discussion, acute cases, and 'day-to-day' continuity in patient management, are all-important. Learning in context was appreciated and considered essential. Diagnosis was not mentioned but, at middle grade level, SHO was still learning 'to elicit' findings and how to decide on priorities. One can deduce that senior experts already had these skills.

The stated need to see, and to deal with acute, very sick patients as a measure of gaining experience, again noted in the pilot study, was alluded to several times in a subsequent interview with SHO (SHO3 140-142; 268-270).

After saying 'it was hard to impart information other than in the form of apprenticeship', SHO provided an explanation of situated learning in apprenticeship. The six components below were clearly valued:

> Well, what we do is, we gain **knowledge** in a sort of informal way just by **being with people in practical settings** and also doing **ourselves**, and **learning from mistakes**, learning and **being guided** when we are not sure what to do (SHO1 62-69).

This reply again disassociated practical work from theory. Learning in 'an informal way' within apprenticeship, without any references to actual teaching, was an important response. Moreover, SHO implied that supervision, in the form of 'guidance', was very necessary in cases of uncertainty but that this should not be over-controlled to facilitate learning from mistakes. He also implied that apprenticeship learning was continuous and that these components prevailed in his present circumstances.

The SHO put high value on the culture of medicine in hospitals and practical knowledge gained in clinical settings which were more important than book facts. He also found medicine intellectually satisfying and wished to convey this to students since his own UG period, based on dogmatic methods and dry material, had lacked this element (SHO2 144-188).

9.2.4   The SHO's interpretation of CE's experience and skills

SHO was asked to say what CE did well on their joint ward round to tap into the elusive characteristics and qualities of experience and clinical CK. SHO initially found it difficult to identify CE's skills since clearly he was unused to expressing these values. Asking what a senior professional did well as part of his work was clearly an unusual question.

Subsequently, he enumerated a number of valued attributes and abilities under the umbrella of 'advice' including: the possession of a good memory; and listening, absorbing, focusing, selecting, and prioritising skills. SHO also implied that CE was able to function at speed. These skills were additional to the ability to 'give weight to' and 'elicit' findings offered earlier.

> He absorbed the information about a whole lot of patients that he had never met before and was able to rationally listen and advise when we met those patients on the ward round - that's a very difficult thing to do, and it really comes with experience... because he has to be able to focus on the one point or the one or two points that he wants to address. I was quite pleased that he was able to remember the one or two patients he did know...and remember them in a considerably detailed way so that he could give an informed opinion... (SHO1 120-136).

These skills paralleled SHO's own competence on another round in CE's absence where he too demonstrated the ability to select, collate, prioritise, and gather information about patients from case presentations and questions. One can conclude that these skills are the manifestations or products of experience which are developmentally acquired through work with patients and observation.

9.2.5   The HO's view of experience

The HO's explanations were coloured by her recent transition from UG status. For this reason, her observations were valuable markers about experience *per se* and its acquisition. For example, when asked for her version of experience, she replied:

> Well I think you definitely pick up quite a lot of experience through going through medical school and the last couple of years when you are actually on the ward, talking to patients, finding out about them, checking up their case notes, seeing what tests have been done and how they come about a diagnosis. And obviously reading from what you learn (HO1 110-121).

Although this explanation is retrospective and probably affected by recent circumstances, it is useful in the present context since it details some of what 'seeing patients' involves. Notably: experience is 'picked up', implying that it almost comes by chance or fortuitously; that reading follows the practical ward work as reinforcement; and there is the inference that diagnosis 'comes about' from tests but this is unclear. Her more elaborated account of experience was interesting for several reasons. She said:

> I think it's (experience) a continual learning process which acquires your knowledge, that helps you in the future to recognise things more simply (HO1 126-130).

This statement implied that the cumulative effects of experience were stored away until required and that this had the effect of making practice easier. Asked to explain 'simple' in the above context, she revealed other characteristics of expert actions in medicine:

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Well so that you can pick up more obscure presentations of things as you gain more knowledge of having seen more patients who present in unusual ways and, you know, other people who have possibly seen it before presenting in that way, suggesting it and then leading you down the path of investigating that, giving you ideas as to why you need to consider that in the future if that came along. Just helping to exclude the more obscure things which a medical school doesn't really do - thinking of what's common, what's less likely to occur (HO1 137-155).

In this dense account, there are several messages about the nature of experience as perceived at HO level. 'Seeing patients' again includes 'picking up' information, but this time as the skilled detection or recognition of unusual presentations with relevant explanations about management. More options are considered, from the common to the obscure, and exclusion factors are important. Her use of the words 'path of investigation' suggests a discovery route to be followed but one that is full of ideas and resources. Apprenticeship, in this context, is 'follow the leader'. There is also the notion that the UG curriculum cannot (rightly) prepare for all eventualities, although the criticism in this case seemed unintentional.

9.2.6 The HO's interpretation of CE's experience and skills

He has a vast knowledge of what possible problem could be contributing to different patients (HO1 367-370).

These words acknowledge CE's superior content knowledge and the ability to apply it appropriately to different cases. His approachability and ability to collate, prioritise, and use information were commented upon:

He then will sort of collate and come to some sort of opinion on it. And then he'll say 'What about if we do such-and-such, how that might affect it?' Also if you ask anything, he's very approachable...if he makes a decision or asks for an investigation and you are not quite sure why he particularly wants that, sometimes he'll come out right and tell you and sometimes he'll tell you to go and look it up, which in a way is the better learning experience (HO1 392-406).

These words are also an indirect tribute to CE's memory of patients and his capacity to bring knowledge about previous cases to bear on present practice. His memory was a mark of his experience, partially resulting from continuity of care:

...he quite often knows the patients from outpatients in the past or followed them up. He can put the information he already has about the patients and what we have fed in, and bearing in mind the previous situation and what previous patients he has treated in that way, he can come up with 'This is a good idea, but I don't think we should go ahead with it because it is not appropriate here or whatever' (HO1 423-433).

The more subtle expert skills which can be drawn from these explanations of shared decision-making will be further discussed (p.148).

The HO's other observations on experience pointed to what was later to become an important issue - that experts considered wider options in the diagnostic and management processes. This was disclosed in response to a question as to whether she perceived herself 'as a learner' on the ward round with the SHO and UGs. The reciprocity in teamwork is apparent, as is her inability to consider all the options:

> Yes, yes, I probably did. [I was] supplying the information of the results. It was 'middle grader' feeding back what that could be as opposed to what the options were. So I was a learner to that extent. I think it was definitely a two-way process though because I could assess what they said and see whether or not we could do anything with that or not, knowing the patients probably a bit better than they did (HO1 18-30).

In response to a question which attempted to probe the differences in expertise between CE and the SHO, the HO perceived that the SHO's experience was reflected in superior skill in the acute and practical aspects of the job:

> I mean - [SHO] has more - would be much more adept at practical things than CE would be because, I mean, he is still in the centre of dealing with acute situations. So I think probably [SHO] would be more central lines, dealing with somebody who is unconscious, fast management. Whereas CE would be much better at the 'sit back and think what's wrong with this patient and the outpatient side of things'...I think probably SHO still thinks aloud. It is still a case of hitting ideas off one another (HO1 635-646).

The idea that consultants 'sit-back' and distance themselves was also indicated by a student (UG3.3 232-237). This may be an individual characteristic as well as SHO's 'thinking aloud' in problem solving. Nevertheless, 'thinking aloud' became a more important feature as the research progressed.

9.2.7   Denial of personal skills

'Denial' or initial reticence to discuss own skills, first detected in the pilot study, also occurred in the case study. Apparently, doctors are not trained to appraise their positive attributes and skills.

CE reluctantly admitted to his reputation for clinical teaching excellence but he also said 'Well you see, it is very difficult to talk about yourself' (C1 165-169; C3 285-286; C1 155-156). When asked, SHO initially denied doing anything well on his business ward round which typified the pressures associated with patient management such as: investigations to arrange or report; drug changes; discharges; and ward transfers. Getting through the work was all important, but listening to patients was significant for him:

> I don't think I did anything particularly well. I was very tired on that round, it was a very long round...I really wanted to get things done and I don't think I listened to the patients very much on that round (SHO2 320-326).

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When pressed, SHO was able to enumerate features of his sympathetic care with at least one elderly patient, as is illustrated below. 'Getting home', appreciated by the SHO and all understanding doctors, is an important issue for all patients:

> ...I think I probably repeated myself a few times to try and make sure she understood what I said, although I'm not sure that she did. I think I tried to be reassuring...I would probably try to be a reassuring doctor who will take care of things and send her home again (SHO2 365-382).

9.3   The teaching/learning processes: clinicians' views

9.3.1   The consultant's views of teaching and learning

In either a classic misrepresentation of teaching at its most subtle, or an adroit expression of clinical apprenticeship learning post-qualification, CE said at the end of an early interview:

> I have warned you (MM) and I continue to warn you, I do not teach my junior staff...I give them an opportunity, I think, in which they can learn - and that is not teaching (C1 578-608).

By   this, CE meant that he did not 'formally' teach the junior doctors. It was also CE's view of successful, managed learning, a perspective which points to the paradox in clinical teaching - that expert clinicians control the learning process within apprenticeship but do not construe this transparent process as teaching. It follows that other aspects of this process, such as supervision and feedback, may be equally transparent. Further analysis will show how precisely junior doctor participants received individual correction and support.

9.3.2   The SHO's views of teaching and learning

Echoing his consultant's words about the absence of teaching and responding to a request to explain apprenticeship, the SHO said:

> There is no formal teaching for me but on a ward round I will present my management plan to my consultant - he will either agree or disagree because he has a prejudice or feels comfortable about doing something that particular way - and that I would accept as being his luxury because he is ultimately responsible for the patient. And sometimes he will disagree because I have got the facts wrong - I have misunderstood or the depth of my understanding is not enough to be able to appreciate the - the more subtle aspects of the case - in those cases, when he does correct me, I do that (SHO1 70-92).

In his use of the words 'he has a prejudice' or 'feels comfortable', SHO demonstrated his acceptance of CE's legitimised, and possibly at times idiosyncratic authority, recognising that responsibility for patients is at the heart of supervised teamwork. SHO's words also illustrate the need for this close monitoring where his inexperience, manifested in errors such as getting the facts wrong or the inability to

appreciate subtle issues, are admitted. Presentation is clearly significant to the SHO, as the means of demonstrating his competence, as the vehicle of assessment, and as the way in which clinical medicine functions. SHO was also clear that the responsibility for learning rested with himself. 'It's a feature of the way that I am - I do bring things up that I find are important or relevant in a spontaneous way' (SHO1 254-258).

After SHO's business round, he was asked to give his perceptions of the differences between his own, and his consultant's, teaching. An UG3's presence on the round, prior to final examinations, may have influenced the reply which emphasises expert skill in dealing with salient issues:

> ...CE is a very experienced clinical teacher, and I think there are two ways in which what he says or teaches on would be different. One is simply, that he has a greater grasp of what is happening in a patient and for that reason will teach things that I may not have realised or understood or will teach things which he considers are the salient points which I may not have appreciated. But another thing is, that he is probably more attuned to what a student requires than I am and will pitch his teaching appropriately (SHO2 235-255).

This interpretation rests on a view of experience which enables CE to be selective about key points from an extensive knowledge base and to pass on appropriate information at an equally appropriate level. Greater depth of knowledge about patients and clinical expertise are commensurate with greater insight about learning needs. The SHO wisely realised that he lacked the experience derived from educational successes and failures, apparent requisites for effective teaching, as well as the experience of assessing students' knowledge and needs (SHO2 267-276). These comments provide a view of clinical teaching as a complex flexible multi-skill process.

SHO also explained, that on the same round, there were 'scraps of teaching', 'an aside' or 'little conversations' with no detail (SHO2 22-31). These small pieces of information, delivered with apparent lack of detail with no time to ask or answer questions, were not construed as 'teaching'. However, the UG was expected to learn from them:

> If the situation of the patient is put into context for him, then he has the example of a reasonable management of a particular condition in a particular person to learn from, and he can extract from that as he gets more experience (SHO2 44-53).

Therein lies a theory of clinical learning from which learners are expected to extract, and later to draw from and apply, knowledge acquired from seeing patients managed in context.

9.3.3   The HO's views of teaching and learning

The HO admitted that she asked SHO questions that she could not ask CE, not for personal reasons, but

'because he's a consultant' (HO1 273). Her clarification shows considerable insight into the hierarchical

team structure and the importance of not making mistakes in front of CE. These 'mistakes' were not

qualified. She generalised:

> I suppose there is to an extent this feeling that you don't want to appear as a complete idiot in front of
> your consultant. Whereas, you know, your middle grader makes mistakes too but it is fair enough to
> converse with them. And also they have much more time to explain things as they are going around. A
> consultant has always got a lot of things to do and there is a limited space to do things in. They also see
> you for a very limited time, so even if you make a fool of yourself in a very short space of time, that's
> much more likely to stick (HO1 288-305).

The HO found that the 'best management plan came through CE' whereas SHO was 'interpreting what

we have already found and suggesting why we don't do such and such' (HO1 462-468). Her further

considered comments on her senior colleagues' teaching differences, with a reference to her own

inexperience in recognising clinical signs, are given below. Two methods of getting feedback, written

notes and demonstration and/or explanation, were appreciated:

> I suppose with SHO it is more an interpretation of results or investigation or something that comes back
> and how that might be, whereas with CE it is more - on a ward round he might point out clinical signs
> that you have maybe missed, which is good because then you get some kind of feedback on things you
> haven't got. He also tends to write things in the notes a bit more, which is always very interesting to go
> back and see because he leaves his opinion very obvious there - of what you've found (HO1 443-458).

HO learned from CE's methods of creating thinking opportunities and was able to reflect or to cite these

at interview. For example: 'He's very good at pointing out or making you think about it yourself' (HO1

370). This comment was borne out in CE's ward round with the HO. Clearly, he facilitated self-directed,

active learning. Two instances are given to illustrate 'not telling' as a desirable teaching skill:

> ...it was actually bronchial breathing he wanted me to hear. I wasn't convinced at the time, no. I wasn't
> sure what I was meant to be listening for, because obviously he doesn't say beforehand because it
> doesn't make it much of a learning exercise (HO2 192-204).

> He has just got a very logical way of putting things which makes you see them step by step rather than
> 'this is it'. He obviously has an understanding himself so it's much easier for him to explain things.
> He's quite honest, if he doesn't know something, he'll tell you to go and look it up (HO2 241-249)

In turn, the HO was asked what she was most able to put over to students. Not wishing to deter students

by administrative detail, she perceived that her inexperience was a handicap to students. 'Passing on'

information appears to be a casual activity:

I feel as a house officer you are very inadequate to really pass on an awful lot because you are still learning so much yourself...The practical things that you do don't really get passed on. So much of it is filling forms and things like that which you just don't teach a student at that stage. It would just depress them I think (HO1 561-573).

HO interpreted that her role was 'to suggest people to go and see' and then to report on what they (students) had found:

I think our role is really to suggest to them (students) people to go and see and when they come back to find out from them what they have actually done. Quite often they get to the notes before they get to you, so they don't actually get a chance to feedback what they find...Again there are very few occasions when there is just myself and the student and the middle grader there as well. Sometimes I would ask a student 'OK, if this was a diagnosis, what would you do? What are the things that might lead you to that diagnosis?' But again it's interspersed with how much time... (HO1 531-556).

Perhaps instinctively, the HO encouraged a self-directed learning, as opposed to a 'telling' teaching style. Her approach, although she attributed it to inexperience, uniquely resembled that of her consultant and she skilfully managed the juniors' learning, largely without realising it as a teaching skill.

9.3.4 A student's view of teaching and learning

One student offered a generalised opinion about teaching differences, perceiving that SHOs, more oriented towards examinations, were didactic and explanatory in style compared with CE who engendered thinking. This agreed with CE's view that, 'the SHO, in common with junior doctors who lack experience, would approach a problem more in a book-way compared with himself' (C1 213-214).

The student also found that SHO teaching appeared to reflect the received practice of hospital methods and the hierarchical, professional control mechanisms. The extended quote allows a unique perspective on team relationships and how experience affects expert work with novices. Clearly, practical relevance is appreciated, a view which concurred with SHO's own expressed preference for the more technical aspects of medicine where he had undoubted expertise in renal medicine (SHO3 159-160):

SHO teaching is much more akin to the books. Their minds are more set out like the books. So that sometimes you can write it down, if you take notes or whatever, you can write down what they have taught you and you can go back to the book and it's in the same order, completely the same sort of headings. I don't know if that's true for all of them, but they seem to have a much more broad pattern of thinking between them. They are at the level where they've got to take orders and they have got to know the protocols for things that are generally operated by the hospital, what is accepted common practice, and they teach in a very practical way. But it's usually quite detailed. It's completely different teaching. If they talk about a patient they will say "This is an interesting patient because this, this, and this which you might get in Finals". Whereas CE would make you think about things rather than tell you...I often found I was saying 'I don't know' more often to an SHO than to CE... (UG3.2 552-596).

9.4   Learning from talking to patients

9.4.1   Consultant rapport

Excellent communication between patients and staff was a hallmark of the case study researcher observations, contributing to the secure environment experienced. CE placed high value on his relationships and communication with patients and relatives:

> I always have, ever since I was registered, I have made time every week to speak to relatives...and I still do...I have always seen the need to communicate, not just to patients, but to patients' relatives, as an important ingredient of the job. And that is obviously something which has not been a learning skill... (C1 456-467).

Consultant rapport with patients demonstrated a range of approaches according to the demands of individual cases. The junior doctors and students acknowledged CE's ability to instill confidence in patients (SHO1 174 - 179; HO2 260 - 266). Undoubtedly, rapport is personality-dependent, but in separate interviews, the junior staff said:

> He's (CE) probably the best clinician that I've seen with a patient in that the rapport with patients is excellent...I think he engenders respect both from his fellow staff and from his patients with the ease in which I think, in which he moves between talking to doctors and talking to patients. Most people, myself included, will have a subtle change of tone when we do this - CE doesn't do that- he's entirely natural... (SHO1 152-161).

> I very much admire the way he (CE) does handle the patient which I don't think a middle grader ever has the same ability to do - some of them do... (HO1 349-353).

In the instance quoted below, when asked to elaborate on CE's approach on the ward round, the HO made the link between experience and its effects on expert patient treatment and communication. Experience here covers a multitude of diverse skills and attributes distilled as 'treatment':

> Well, one, his medical experience and how that reflects on his treatment of patients and two, his interaction with patients. All patients that come in have been under his care before. Their faces light up when you say 'Dr X will be round to see you.' He just has a very good rapport with patients (HO2 257-266).

While the junior doctors were warm and generous in their praise and appreciation of their consultant, they also showed individual expertise in communication with patients, e.g.: in bending down and touching elderly people; repeating instructions; slowing down their speech rates; and displaying a sense of humour (SHO2 361-371; 384-394; HO FN 16.06.92; FN 11.05.92).

9.4.2   Breaking bad news

The patient's presence, problems of illness, and life and death decisions, raise complex ethical issues:

> CE I am a telling doctor, 'Do you want to know or not?' You pace yourself...and leave it there for today. The craft is in speaking the patient's language. You say 'We have got the results of the test and they have provided us with some useful information'...I take the senior nurse along with me. When you break bad news, patients don't take in half of it... (FN 25.5.92).

This extract points to a successful routine which centres round the sharing of the problem with another colleague who is able to provide follow-up patient care in the knowledge that patients do not initially absorb bad news. Nothing is hurried from either the patient's or the doctor's points of view. CE gave high priority to meeting patients' needs in a language which they could understand. The word 'craft' (an unsolicited response!) implies the use of a distinct strategy derived from experience.

'Giving space and time' has already been noted as a feature of CE's work (p.125 above). Here it allows a patient to adjust to the possibility of difficult results later although the time lag may also cause anxiety. CE, characteristically fronted many explanations to patients about their treatment and management by systematically emphasising 'tests' in his opening words (FN 27.6.92). He inadvertently admitted it above and this observation was confirmed by the HO (HO2 541).

Sympathetic towards patients, HO recognised CE's preferences when giving bad news and agreed that an older, more experienced doctor was the best person to deal with very sensitive issues (HO1 590-600):

> ...if he's got bad news or anything to tell the patients, he always takes myself and a staff nurse in with him. Obviously, you don't want everybody there...but he's quite conscious of the fact that you should be there as well (HO2 514-521).

And on another occasion:

> ...it tends to be somebody further up the tree that does it. I feel quite strongly about that, that it should be somebody a bit older that does that kind of thing because I feel that to get that information from a young hassled house officer is just not right when the patient is so much older than you to start with (HO1 589-596).

9.4.3 Gaining compliance and the benefits of ageing

CE used humour and subtle techniques to achieve patient compliance. He also admitted that increased age, not to be confused with experience, was beneficial when dealing with difficult and sensitive situations. The example he chose to illustrate this related to child abuse:

> I think that one of the phenomena of getting older and that is different to experience, is that it becomes much easier to ask patients difficult questions...part of it is bluntness, not being embarrassed to ask the question for a start (C1 496-517).

The SHO comments also attested to the effects and benefits of age in patient care:

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I think you know, a feature of CE, which may be because of his age, his patients admire him and respect him - they believe that he has their best interests at heart (SHO1 191-197).

9.4.4 Empowering patients

The HO commented on CE's patient management and methods of achieving compliance through his communication skills:

He's very good with patients, putting them at their ease and giving them a feeling, you know, that they have the power rather than "I'm the doctor telling you"... (HO2 278-282).

A Phase Three student, impressed, not only by how CE dealt with patient grief, but how this aspect was founded on a deep rapport during the consultation, said:

'He tends to stay away initially from that patient and not come across as patronising in any way, or get involved...He has a very set pattern in which to turn round and make patients look at themselves and question what they were going to do' (UG3.2 241-261).

Making patients 'turn round' and examine their views is a means of controlling patients by giving them control for their own affairs and well-being. Empowering patients to help them towards resolution and decisions was noted in the pilot study (GP) and may be a mark of experience. Unquestionably, this was part of CE's management and communicative approaches, but the same philosophy pervaded the team. In a clinic session taken by the SHO, the UG student observed the latter's handling of a patient. The student noticed that the SHO was intent on changing attitudes by altering the perceptions of the 'doctor-provider' role by making patients more responsible for their own health:

He (SHO) wasn't patronising at all. Some of the consultants can be quite intimidating to patients... Although he (SHO) knows a lot, he is a very knowledgeable SHO, he actually - when he's telling you something puts it over in a way that doesn't make you feel stupid. He does the same with patients...I think the way he did it was good because he gave the patient a choice in the matter and explained what the options were and left it to the patient. That was his (the patient's) responsibility, his life, and it was up to him to do something about it (UG3.2 117-174).

This example illustrates tacit teaching and learning to perfection since it would probably have gone unnoticed without the question 'What did SHO do well in the session?' At the beginning of the interview the student had said, 'He didn't really teach me, I was just listening' (UG3.3 13-14). Questioning brought out the reflection.

This is an example of 'osmosis' or 'passive teaching' which deserves more credit than it generally receives. There were frequent references to such learning throughout the UG interviews. In all cases the

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learning details could easily be extracted confirming that learning occurs, even when observation may be undirected. One example illustrating reinforcement is given:

> You also get passive teaching in watching him examine, because he's (CE) got a very clear-cut set order in which he examines and comparatively to other people in clinics, he always does a very thorough examination. And, because in front of your eyes, you are seeing the same thing done each time, regardless of the patient - he might add in a few things, for example he might take a bit more trouble over examining the thyroid if he suspects something - but there's always the set pattern...seeing it in front of your eyes each time, it just like gets in...you can then reinforce by watching him do it (UG3.3 325-373).

9.5   Learning from clinical practice

9.5.1   Role boundaries in the team

Structured teamwork is the mechanism for patient care. All team members had clearly defined roles with authority and responsibilities passing upwards in a line management chain of command. The ward routines varied according to the constituent team members' jobs and needs. For example, if a pharmacist or a visiting doctor was present, the discussions varied accordingly.

The boundaries for patient management were well defined with clear rules for 'what' is done, by 'whom', and 'when', within the team. Experiential learning took place within these well defined roles as each member learned different things from other members. CE's leadership was observed, by the researcher and team participants, in specific approaches and procedures which formed established protocols for juniors to follow. These procedures contributed to a distinct management style which demonstrated the way he wished his team to operate and how his authority was exercised.

Certain aspects of patients' treatment were totally controlled by CE. For example, in his words, 'I would be very upset if I came into the unit one day and found that a junior doctor working for me had made an ethical decision not to treat without letting me know - that is my territory...' (C1 330-336). These words show a clear demarcation of responsibility to which junior doctors can respond with respect.

Many procedures corresponded to unwritten codes of practice or guidelines and were codifiable as principles of action which operated on two levels; what the team members did as part of the clinical method or process of looking after patients - that is their jobs; and the clinical process itself. Very often aspects of the former are given to HOs in the form of induction manuals, but the processes inherent in a

distinct clinical method or process, starting with how to approach a patient and proceed from there, seems to be taken for granted after UG initiation to clinical medicine.

The observed clinical activities and consultant leadership attributes contributed to a unit 'style' similar to that described by Bosk in his work with surgical teams (p.45 above). The feature, 'ecological adaptiveness' (Zeichner *et al.* p.17 above) was also apparent in the concessions and adaptations which SHO made according to CE's style. Obviously, SHO negotiated each job, adapting and changing his ways of working accordingly:

> Unfortunately, a lot of medicine is not cut and dried...one tends to establish a way of managing that's peculiar to a team...and when you move to a different team you have to adjust yourself. There are lots of things you will do differently (SHO1 94-102).

SHO said that CE 'ran his ward rounds in a very natural but efficient way', appreciating this feature of leadership and expertise (SHO1 171-173). The HO was clear about the limits of her responsibilities. For example, 'I wouldn't just discharge somebody' (HO2 666), or in relation to drug administration where the team position is clear:

> Things like antibiotics...yes. I would always ask a middle grader I think before I would start on things like diuretics or, I think you would get your wrist slapped if you didn't because you do have to get somebody to agree with you before you do it. If it's a drug that has a known - to have side effects or anything, you are better to wait for a consultant. Sometimes a middle grader will say 'We'll wait until we hear what CE says' (HO2 674-689).

Neither was new management in the HO's hands:

> ...but something going to mean a complete change in management or something that might be detrimental in view of other conditions they have, then I would want the word of somebody on high (HO2 742-748).

9.5.2 Patient presentations

Broadly, the preliminary briefings prior to seeing patients were characterised by consultant- or SHO-led discussions in which CE solicited and assimilated up-to-date patient information. The SHO presented the patients, aided by the nursing staff and other paramedicals who made appropriate contributions as the patients' most recent carers. CE controlled the discussion through his comments and questions about each case.

The acquired learned skill to focus on key issues, either in making, or listening to, case presentations, appears to develop with experience and is central to clinical practice. In the context of more formal

clinical meetings, the HO said 'it is a good learning experience to present something and also to get back information from other people' (HO1 674-677).

The researcher observed presenting to consist of cognitive, administrative, and oral skills. For example, the SHO logically contextualised information, constantly checking patient notes. He detailed: the patients' drugs; reviewed the differential diagnoses; highlighted main problems; aired certainties and uncertainties; and summarised. His role was to inform CE and to supply the necessary information at speed, in a rapid search and select process. The information was distilled by CE who conferred with the team, asked and reacted to questions, and commented on the proceedings (WT and FN 5.5.92). In this way, CE was able to assess the competence of his SHO.

When taking the ward round, SHO, using the same format and skills, presented and briefed the team:

> Peter X, you know his man...72 year old man who came in with a dilated cardio-myopathy, probably ischaemic in origin...mmm...he's going home today. The thing is though, his Digoxin level is low. I'm just trying to think whether we should just increase his Digoxin empirically and leave him...we should follow him up (SHO,WT. 5.5.92).

Presentation promoted discussion forming a key role in inter-colleague communication about patients and problem solving. It initiated a sequential, repetitious formula: present the patient; talk about the patient; manage the patient. The sequence was repeated for up to twenty or more cases, beginning with either male or female patients, and taking each section of the ward or wards in turn. Each case was the subject of comment open to all team participants but the final word rested with the consultant. Within this apparently straightforward and somewhat obvious framework, lie important, unanalysed learning opportunities.

9.5.3 Learning from bedside discussions about patients

In the patient's presence, the SHO had a major role in keeping track of treatment, constantly recording drug details and future management decisions. There were times when the SHO had no time to look at the patient and deal with the administration at the same time, although of course he was more *au fait* about the current state of the patients (FN 5.5.92). CE's role was to communicate the rehearsed decisions, interact with the patients and the team, examine patients, and teach, comment, or question, as appropriate. He wrote nothing down at any time, leaving all administration to the junior staff. This is

probably a taken-for-granted process. His expertise lay in managing and synthesising a multi-component enterprise with consummate skill.

The extracts reproduced below are examples of dialogue and discussions between CE and the SHO at the pre-ward session. They are typical of the interactions experienced about patients and the richness of clinical activity. The significance lies in the way in which the SHO (and all present) is taught through the clinical method or process of patient care while, at the same time, the patient is safeguarded through supervision and given the benefit of expert advice. The extracts (from WT 5.5.92) are regrettably indistinct.

In the first extract, the discussion concerns a patient with multiple problems. The SHO summarises for CE and the UG3.1 listens:

SHO   He's been seen - he's had frequent - three admissions at least to the Royal Infirmary in the mid 80s with cardiac failure and has had MIs in the past... his ECG... [continual rustling and searching of X-rays and ECGs]...tachycardia

CE   Yes, [we've got] bundle branch haven't we? and almost first degree, you know, he's got quite a long peak...

SHO   Mmm, and bilateral effusions to changes in old TB and...cardiac failure. [draws attention to new X-ray] And that is surprising, that is today's X-ray, there is increasing consolidation [and after further consultation of plates]. But there is a change isn't there?

CE   Oh definitely - that's what I'm saying - it is consistent with consolidation.

There are two points of interest in this short discussion. CE qualifies his examination of the X-ray in his words 'first degree' and emphasises the long peak in the ECG. Thus he demonstrates his expertise and teaches the SHO by drawing attention to the trace. Secondly, the SHO is able to show his competence in his ability to pick up the new changes which he offers for confirmation. There is, of course, the shared, tacit understanding about consolidation and the relevant implications.

The second interaction illustrates an urgency, and direct supervision, which the SHO had not appreciated. The patient needs to be admitted:

SHO	But she's got coliform septicaemia.

CE	But she's got an aneurysm.

SHO	And she's got an aneurysm, so you know...

CE	Yes, sure, but what I'm saying is you've got to think - you've got to bring her in.

The third episode illustrates: CE's attention to detail as he checks on drug administration; humorous irony in correction and supervision; SHO learning from trial and error; and SHO honesty:

CE	Who gave her the Setilon, you or M? (another consultant)

SHO	Me (laugh). I gave her...it's the starting dose according to the BNF but it was too much...if I could help it...even more unwell...I was very disappointed.

CE	Your disappointment (laugh) was not tinged with surprise?

The fourth extract illustrates reciprocal learning and the sharing of opinions crucial in teamwork. In this case, the pharmacist assisted CE as an expert in the discussion. The UG (3.1), party to all, asks a question. It remains open as to whether CE's forceful opinion or conservative views are the result of ageism or expressions of wisdom and minimal intervention. The point is the learning opportunities on offer in team discussion:

CE	You see, I have a terrible suspicion, maybe I'm wrong, that Streptokinase will be nothing like...what...it is, when you work it out, really quite an expensive way of covering a lot of people to save a few people, you know, and what one really wants to know, is to find out much more, how you can discriminate giving it inappropriately.

UG3	How much is it a shot per patient?

Phar.	It's about, it depends obviously on the dose, fifty quid, depending on the manufacturer...eighty to one hundred quid per shot...it fades into insignificance compared with...

CE	...and 98% of patients you're giving it to unnecessarily which is not the way... .

9.5.4 Sharing decisions: on the ward with CE and HO

At all levels, but particularly at the HO stage, there is much to be learned from corporate decision-making. Sharing decisions led to a sense of pride in her own contribution, a feeling which came through when asked to explain her position as a learner on the ward round:

> I think it was definitely a two-way process though because I could assess what they said and see whether or not we could do anything with that or not, knowing the patients probably a bit better than they did (HO1 23-30).

On the same theme, and already commented on in relation to CE's experience, a wealth of information lies in the words below:

> This is a good idea but I don't think we should go ahead with it because it's not appropriate here (HO1 429-432).

Firstly, there is CE's skill in accepting ideas with praise and in turning the event to suit his own view. Secondly, the shared teamwork and responsibilities are encapsulated in the use of 'we', a recurrent theme in the researcher's observations. Thirdly, the expert skill is involving the junior doctor.

In another instance, in the context of a patient's possible benefit from surgery, she pointed to the expert skill of making juniors think for themselves and the educational investment in allowing shared team decisions:

> What I mean is, you know, when I asked 'why?', he was quite willing to let me think about it rather than just say 'Well I want to do it' sort of thing and then give me reasons why he wanted it done (HO2 111-117).

9.6 Learning from supervision, feedback, and correction

9.6.1 Learning from supervision

Throughout the reporting, the supervisory aspects have been an indirect factor. For example CE's supervisory role was clear in his ground rules about not treating certain patients or in SHO's version of apprenticeship (p.132 above) where he set out his own inexperience against CE's experience. Teamwork and leadership depend on supervision which can take various forms. The following working tape extracts illustrate not only CE's supervisory and advisory roles in checking the HO's work, but also the teaching/learning opportunities contained in the comments and questions about the ward cases.

In the first case, the HO reports on a patient, revealing her knowledge. An honest admission about missing an X-ray meeting is extracted but CE makes no comment. (This may or may not have been because of the researcher's presence.) The significance of the meeting is not lost. CE double checks all the time:

CE   The (drug) went up then came down - is there any rhyme or reason to that?

HO   Perhaps when her renal function went up... We haven't really got very far with Mrs B. She tried the alimental diet which didn't really work...[Nurse said 'made her sick actually']

CE   You showed her...but you saw the X-ray did you?

HO   No - I didn't really - I didn't get down to the X-ray meeting at all because I was on call, but I actually did forget about it.

CE   And how about the follow through?

HO   We haven't actually got a report back on that yet.

CE   She's had one?

HO   She's had one (WT 27.6.92).

In a second, very simple example of good memory and checking up about pain relief for a cancer patient, CE asked ' And how's her knee?' (WT 27.6.92).

The third extract illustrates how supervision and teaching come about in work through presentation and discussion about patients. The HO summarises and CE, remembering the case, puts the details into a clinical pattern or picture before challenging and advising about the treatment and management. Humour prevails:

HO   ...acute shortness of breath plus MI ...collapsed... he then had diarrhoea and vomit ...had a couple of nebulisers and was fine. He then got pyrexia...treated him for a chest infection and we sent him across for an echo and assessed his heart function with that and a 24 hour tape and then, when he was there, they said he had a large pericardial effusion.

CE   He's had a previous ischaemic heart disease...he's known to have ischaemic heart

disease...he's the guy who came in with AF...he's had a myocardial infarct...You - I mean

- this ECG shows he's had an infarct in the past and that's going away back...you know -

look at all the silent MIs he's had...one of them...He's got everything - he's got the

effusion, he's got the sudden onset of atrial fibrillation, he's got the previous history. So

what are we going to do with him? Have you done his antibodies?

HO   No - we didn't because we were really thinking of the effusion and just...

CE   You're doing urology instead!

HO   Yes - we did.

CE   ...doesn't matter, but I would do his antibodies. I think its a situation where his ESR is

worth doing (WT 27.6.92).

9.6.2   Learning from feedback

Three forms of feedback with the junior doctors were observed: 'negative reinforcement' implying that

performance was satisfactory in the absence of error or lack of competence; feedback through patients

which took the form of comments (or praise) made to patients about junior staff; and feedback through

written comments in case notes. Individual praise was notably absent.

9.6.2..i   Negative reinforcement

While the HO said that more feedback on performance would have been appreciated, CE did not comment

on poor performance 'He doesn't give you negative feedback so you are not quite sure on what level you

stand with him ... you don't really get a differential on that' (HO2 369-379); and 'I wish in a way he

would give me some kind of feedback from that because I just feel I'm just floating along' (HO2 406-

409). It is not clear as to what extent this was part of CE's teaching/learning strategies or style of

training but the same issue was keenly observed by a student; 'He's got this classic look of not being

impressed - he's very good at that' (UG3.2 388-408). Nevertheless, the same student referred to getting

feedback in discussions after a clinic (UG3.2 97-99).

A different interpretation on negative reinforcement came after CE's absence where SHO was pleased with negative reinforcement! 'Perhaps it's because disapproval wasn't expressed... CE is quick to disagree, the fact that he doesn't means something' (SHO1 217-225).

9.6.2.ii   Feedback through the patients

Although more positive verbal feedback was deemed desirable, a form of indirect feedback existed through the patients:

> He might do it (give feedback) through the patients by saying " Dr - is very good at organising this, she'll have it sorted out"...or at the end of the ward round he'll say, "Good, I enjoyed that ward round" (HO2 421-429).

A simple expression of agreement as feedback, where CE instilled confidence in a patient as well as supporting the SHO, was found in CE's words 'I agree with what Dr X thought... touch of inflammation...phlebitis...' (WT1 474-476).

9.6.2.iii   Feedback through the case notes

In his dealings with the team, CE consistently supervised and checked on their work through their presentations and case notes where he left detailed comments. This was referred to twice during the observation period (WT 5.5.92, 225; HO1 680-683). All consultants may not use these methods but it was clearly CE's style of supervision. He structured the learning by using various opportunities. The HO appreciated his methods of auditing the unit's work. 'The medical audit was very useful because that was really looking at our case notes and that gave us back a lot of information as to what we might better do - keeping notes' (HO1 678-683).

9.6.3   Correction

9.6.3.i   What constitutes a mistake?

At no time during the observation was an outright correction of a junior doctor's mistakes heard. Only CE's interview comment below might be construed as an allusion to SHO error and, in one instance reported below, the researcher's presence caused CE to be reticent about correcting his staff. On being questioned about mistakes, the HO said, 'I'm not quite sure if it is mistakes as opposed to differences of opinion' (HO1 313-315). This was said in relation to middle graders' lack of experience which manifested itself in an enthusiasm for over-investigation, regardless of invasiveness.

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With regard to her own deficiencies, the HO noted '...I feel very annoyed if I have missed a sign that he picks up, because I feel I have failed if I haven't picked it up beforehand. Or if I don't have something to hand that he wants' (HO2 355-358). She admitted to a correction which had been dealt with tactfully. The area of disagreement is obvious:

> The patient with antibiotics - I said 'Put him on ...' and he (CE) said 'No, I want him on ...' and I said 'Why?' He said he thought it caused less resistance. Now I don't believe that because ... but I couldn't say anything else. I suppose he corrected me on that one because it wasn't what he wanted. He would change management if he didn't think it was correct, but he wouldn't specifically point at you and say 'You've done this wrong' sort of thing. (HO2 458-476).

9.6.3.ii   Indirect correction

On one occasion, CE was concerned that the SHO had missed the seriousness of an undiagnosed patient but he did not make an issue of this on the ward. The correction came through management:

> I don't think he (SHO) quite got the message which I was making and that was, you know, stop concentrating on treating the diabetes, we must find out what is wrong with this patient and it has become very apparent in the course of today that we have no idea what is wrong with the patient and he is the most worrying patient in the unit (C1 365-376).

Indications that the SHO was aware of his shortcomings in general has already been noted (p.131 above) but, when asked about learning on that particular ward round at interview, he either deliberately avoided the issue or was unaware of it.

CE appeared to demonstrate a high degree of tolerance to juniors in the illustrations above which may be attributed to his personality, humour, and methods of exerting his authority. He used a learner-oriented approach within a framework of close supervision. His methods of inducing learning were often oblique. For example, he once engineered a situation so that his SHO was led to believe that the solution to a problem was his own discovery. The SHO was not told directly what to do. The teaching was tacit and subtle, relating to the SHO's usage of 'Warfarin'. CE recognised that little learning would come from strong words and he manipulated the learning:

> Yes, I think (SHO) probably learned something from that...my recollection of that conversation was... I was much more oblique in my approach to it. I think I said 'Is there any reason why we have not Warfarinised this patient?' or something like that and got him to say 'It's a good idea...' (C1 403-416).

Similar subtle means of correction were reported when an UG student had performed an inadequate neurological examination during a tutorial (p.125 above).

9.7   Learning from expert actions in the diagnostic process

9.7.1   CE's approach to the diagnostic process

CE had information very quickly to hand for his use. In discussing a patient's potential surgery after a stroke, the HO commented on CE's approach:

> It was BM, the lady with a stroke. He (CE) was talking about getting a CT scan and Dopplers of the actual neck. I said 'Why do you want to do that?'. And then he said 'Well you tell me!' So that was quite structured (HO 2 53-60).

And later, on the same issue, the lesson had been learned because HO was able to explain the details:

> ...when I asked 'why?', he was quite willing to let me think about it rather than just say 'Well, I want to do it sort of thing' and then give me reasons why he wanted it done...the 70% degree of obstruction in the artery going up to the neck was an indication that surgery would prevent a major stroke or any further symptoms. Well, if its less than 30% implications for surgery were completely ruled out. If only 30% was narrowed, it really wasn't worthwhile giving them surgery. The risks of surgery were greater... (HO2 111-164).

Extensive experience showed in CE's memory for previous cases and the nature of the history questions asked. His speed of thinking and style of questioning paralleled a general comment about experts made by an UG after a clinic:

> I think consultants tend to be much quicker...they don't go through things so systematically, they just ask relevant questions, they don't ask everything (UG3.3 483-487).

The word 'systematically' is important (in its routine sense, rather than the full systems' review in new patient clinics where a full history is required), appearing to indicate that juniors go through a step-by-step process in problem solving compared with consultants (UG2 564-566). This was substantiated in a HO comment which compared SHO's approach to diagnosis and management to that of CE. HO said, 'I think SHO still thinks aloud', implying that the thinking process was slower and less immediate (HO1 652-653). CE seemed to reach decisions more quickly as a result of experience and his behaviour appeared more reflective.

These instances substantiate the earlier work of Grant and Marsden (1983) on the nature and development of the diagnostic process. They maintained that there were changes in experts' memory structures as a result of experience which affected the diagnostic process:

> The structure, and therefore accessibility, of stored knowledge varies with relative experience of medical education and clinical practice (p.126 *ibid.*)

They also said (*ibid.*) that cognitive structures were dependent on content and process differences which differentiate between experts and novices. The former are able to retrieve stored information quickly from a large body of knowledge which they can   apply to diagnostic problem solving.

The junior doctors made frequent references to the availability of knowledge which CE and other consultants possessed (eg: SHO2 241-244; SHO3 111-112; WT2.129-134; HO1 644- 648). However, it was how CE used his knowledge to make the juniors think for themselves that was characteristic of his approach to learning:

> I think he has a vast knowledge of what possible problem could be contributing to different patients and he is very good at pointing out, or making you think about it yourself... (HO1 367-372).

9.7.2   Wider options

CE appeared to consider wider options as a manifestation of his experience as well as his ability to recall and apply appropriately stored information to patient management. This characteristic was part of the clear differences between CE and junior doctors in their approach to diagnosing problems:

> CE's most valuable input was that he considered the possibility of infection within the heart and I may have considered it but would have not placed sufficient emphasis on it to act in the way that we did (SHO3 86-93).

> CE also pointed out that she could well have labyrinthine syndrome - that could well cause her dizziness you know... (WT3 SHO 130-132).

9.7.3   Warnings and anticipation

On several occasions, it was apparent that CE was 'one jump ahead'. He showed this by suggestion, asking for follow up, checking, and exerting gentle pressure. This acute sense of anticipation was observed in warnings to the junior staff. For example, in relation to future treatment for a patient, CE said 'warn her' (WT1 481-482). Anticipation also featured in a ward round taken by the SHO and in a clinic session (WT3 17; 61-70: UG2 520).

9.7.4   To intervene or not to intervene and how to do it

This issue impinges on drug administration and all manner of investigations. One incident pointed to the confidence which comes with experience in drug treatment and the associated risk-taking. In one interview CE said:

...it's a broad spectrum antibiotic, it is nice to use narrow spectrum antibiotics. You require to be a little more confident to use narrow spectrum antibiotics. You require to be a lot more confident not to use any antibiotics and to wait until you actually... (C1 236-244).

A key word here is 'wait'. Experts have the confidence to take more time to observe developments. The HO avoided taking risks by sensibly 'asking' when she was in doubt (HO2 608-610).

The following comment, drawing a parallel with GM in the pilot study, was made by CE in relation to inappropriate intervention, particularly in very elderly patients:

> ...if I was asked what he (SHO) does particularly need to learn, it is something which you only do when you are a consultant, and that is not to treat officiously for the sake of treating. I think SHO does tend to over-treat patients (C1 303-310).

This observation was confirmed by the HO in a comment explaining her perception of grade differences. It points to excessive intervention in junior doctors in general:

> I think, in a way, the difference between a middle grader and a consultant, is in their degree of investigation. I think a middle grader, probably because of his less experience, is much more likely to be more enthusiastic in investigating every possibility regardless of invasiveness. Whereas, I think, a consultant steps back a bit and looks at it in terms of the patient and whether or not to do it is advisable on somebody who is that age or from that background or whatever (HO1 315-331).

9.7.5   Junior doctors and the diagnostic and management processes

The SHO pointed to two measures of experience. Recognition of the really sick patient has been noted (p.132 above) but he had also reached the stage (in his opinion) of 'keeping things simple' and was able to weigh probabilities (SHO3 272-281). Asked about a case on his ward round with UGs and the HO, he said:

> ...what they (students) don't know, is what to do when faced with a sick patient. What they don't know is how to think through a problem and keep it simple so that one can move through the layers of theory and information that one has to move through and come upon an answer. And also to be able to weigh the probability of that answer with other probabilities, which is the essence of what we do in medicine (SHO3 268-281).

Regrettably, this does not disclose what 'keeping things simple' involves, but it does seem to imply the wider options noted above and hints at setting out priorities.

Echoing CE's words, that medicine follows 'a clearly defined pathway' (C1 121; which can imply both routine measures and simplicity), the HO's reply as to how she approached the diagnostic process took a classical line which emphasised history-taking:

...well, it depends first of all, how good a historian you are. Sometimes you can get a diagnosis just by listening to what they say and putting it in a pattern recognition to what you already know. Sometimes it's a combination of that and clinical findings on examination. Sometimes it is that plus investigations that are suggested by the information that you have got (HO1 75-88).

Pattern recognition here was further clarified as 'the most classical symptoms that go with a particular diagnosis that are picked up through medical school' and in discussion with physicians who had met similar symptoms (*ibid.* 93-99).

The junior doctors' replies suggest that they used various diagnostic procedures appropriate to the presenting case and that they were not tied to one method of clinical reasoning.

9.7.6 Procedures for undiagnosed patients

These patients obviously caused concern in the wards and it was clear that principles of procedure were followed. The HO explained that the underlying diagnosis for a patient might never be made but that symptomatic treatment might alleviate a condition after exclusion (HO2 826-842). Realisation that a clear diagnosis may always be elusive appeared to be a sign of increasing clinical experience.

The SHO commented on pragmatic decisions in the need to treat symptomatically (SHO2 94-99). The assessment of probabilities has already been noted but he indicated empirical management methods in his explanation below:

> So the problem that we had was a woman who presented in an unexplained way with a problem that was primarily cardiac who then became unwell with an infective organism that came from an unidentified site for an unidentified reason. She also had a cardiac murmur and the difficulty that arose is deciding whether or not she had an infection within her heart which would account for her murmur and her presentation with an irregular rhythm. There was a possibility - in which case the diagnosis, the certain diagnosis of this condition is not always easy and there are situations where one has to treat empirically and look for a response (SHO3 58-79).

9.7.7 Noting the exclusion factors

Exclusions were prime considerations for all doctors. CE emphasised these in his approaches to diagnosis and teaching. He frequently asked for exclusions as a prelude to problem solving or as a means of inducing deeper thinking in learners. For example, in his UG teaching, 'What two things must we exclude?' or 'If you're stuck, what are the major exclusion factors as a starting point' (WT1 310-313; UG2 454).

The SHO referred to CE's use of exclusion in his management of an undiagnosed patient. The illustration includes an example of the team discussing various options:

> We do not think that she has an infection within the heart. No. But that's entirely, you know, that's fine. At the time the right thing to do was to consider that possibility very seriously and subsequently, if one is proved wrong, that is a good thing, that is good news. If one is proven wrong and one hasn't considered the possibility then you can end up with a very ill patient very quickly. So it was the right thing to do and he (CE) was eliminating that and it was good because it was something we came upon together... (SHO 398-114).

The HO made several references to exclusion of factors, both in the diagnostic process and in management, where a diagnosis might never be made (HO2 760-769; 799-818; 837). One example is given:

> Because I think the further on you get you realise you can't always make a diagnosis of what's wrong with somebody and if what you are trying to do is to help them symptomatically, then you can't say 'Right, I'm not going to treat you because I don't have a diagnosis' but what you can do is say 'Right, if I can't make a diagnosis then as long as I exclude the fact that (a) you've got a malignancy or (b) you've got some treatable condition that I'm missing, we can go on and just give you symptomatic relief (HO2 753-754).

Throughout all the observations, the need for test results, X-rays, and investigations, as means to exclude certain conditions, were too numerous to detail.

9.7.8   Categorical assertions

During a briefing session, an aspect of the verbal behaviour of the SHO taking the session in the absence of the consultant was named 'categorical assertions'. (WT1 26-32;61-70;245-250;261-270.) These assertions were strong comments or points, apparently made to emphasise the state of the patient or in the course of solving the patient's problem.

The statements contained positives and negatives about the clinical information given to the team when there was doubt about diagnosis and management. Delivered as provisos and asides or perhaps pearls of wisdom with reasons and explanations, these comments provided succinct, clear teaching points. For example, as he presented, SHO summarised with a definitive comment about renal failure:

> He's got renal failure...it's worrying... of 190-190...Digoxin's mainly renal clearance and somebody with renal failure should not receive large doses of Digoxin. It's amazing that his Digoxin level is so low... (WT1 26-32)

This feature in the diagnostic process, observed here as a form of thinking and commenting out loud as an aid to diagnosis, is close to the phenomena noted by Grant and Marsden (1983) as 'constraints' which

have 'the effect of reducing or closing the problem space' (p.125). When such statements are made with conviction and authority, their employment in the form of emphatic teaching points appears to be a mark of experience. It is how knowledge of medicine is acquired.

9.8   Match and mismatch of participants' opinions

There was near perfect agreement between the junior doctors (and the researcher's observations as pursued in interview questions) with regard to CE's reported skills and abilities. These were reflected in an extensive knowledge base and an excellent memory which enabled rapid recall of information and patient details. He had exceptional rapport with patients. Interaction with both colleagues and patients was often marked by a memorable emphasis and a sense of humour, undoubtedly individual traits.

Mismatch of opinion was recorded in both interview responses and working tape data. It occurred between junior staff and CE regarding management and drugs; and possible differences between CE and SHO on learning issues. Disagreement among team participants has already been cited (p.151 above), but there were instances where both the HO and SHO knew that CE's management was at variance with their own ideas. Alluding to a specific antibiotic which she had suggested but which had been turned down by CE on the grounds of causing less resistance, the HO said 'Now, I don't believe that ...but I couldn't say anything else. I suppose he corrected me on that because it wasn't what he wanted' (HO2 466-472).

In the SHO's case, one instance of disagreement was certainly known to CE:

> I think one of the things you may have picked up was when I laughed at the fact that he had sent somebody on to Digoxin - it related to the fact that for quite a while he [SHO] has been totally intolerant of using Digoxin in cardiac failure (C1 217-214).

At interview, SHO defended his decisions about a patient with the words:

> In fact the treatment that I instituted he [CE] would find controversial although a cardiologist probably would not, so there was that issue underlying it anyway - the fact that I knew he would disapprove of what I did, although in theoretical terms there was nothing to say that I did the wrong thing. And even if he did say 'I told you so' he could only have said so in a light-hearted manner. One could never have known that it would not be good for her (SHO3 33-46).

Two incidents of potential significance went apparently unnoticed by SHO. Both instances were revealed at interview on asking the SHO about personal learning outcomes on his ward round with CE. His words were 'I can't think of anything in particular that I learned' (SHO1 205-206). (He went on to comment on

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his pleasure that CE had not commented negatively on ward affairs in his absence.) The SHO view was partially endorsed by CE who said:

> I don't think he learned anything. He was largely telling me what had been going on in my absence. I think the patient in whom he possibly has subsequently most learned, is the patient who came in with diabetes. I think at that time, maybe in your absence, I might have been slightly more blunt (C1 355-364).

There is a clear indication in this comment that correction was affected by the researcher's presence, but the SHO, either deliberately or not, made no reference to a new learning experience.

In the second instance, CE had been very oblique in obtaining patient compliance and, although he actually said to SHO on the round 'I've used Warfarin to get him off alcohol' (FN 5.5.92), SHO missed the subtle behaviour saying 'I don't know. I don't think he says anything in particular that will induce people to be compliant...' (SHO1 181-191).

9.9 Charismatic influences and role modelling

CE was a considerable personality with a strong and charismatic style of leadership. He could be intimidating (the researcher experienced this aspect!) but he denied it in himself (C1 164). CE was committed to medicine and was articulate in discussion. The SHO said, 'CE is quite sensitive to the people he's teaching. He is a performer but he's less of a performer than a teacher, if you see what I mean' (SHO2 303-308).

The team's opinions about CE agree with the views of two pilot study interviewees and Spady's criteria for charismatic influences which include dedication and vocational enthusiasm (Table 1, p.49 above). Irby (p.36 above), in his search for CK, also acknowledged charisma as important to learners in medicine. Professional enthusiasm matters and an individual style of teaching is appreciated.

CE admitted that he had experienced memorable teaching of examination skills from both a senior registrar and a consultant, described as 'flamboyant and dogmatic' in the past (C3 429-431; C4 104-108, respectively). When positive attributes and skills are present, there is no reason not to follow role models.

9.10 Summary of the Case Study

9.10.1 Expert clinical CK characteristics

The junior doctors perceived that CE's clinical experience showed in: decisive patient and team management; the ability to absorb and collate information; perceptive listening; focusing on key issues; and advising appropriately. They also noted his memory for previous patients and a wealth of appropriately applied content knowledge. In diagnosis and management, his ability to select salient issues, point to exclusion factors, prioritise, and provide options were also cited. Experience, as in the pilot study (GM), also allowed greater risks to be taken in 'wait and see' management. These skills were supported by students' and the researcher's observations, the latter embodied in the questions asked to elicit participants' responses. Expert behaviours observed by the researcher, but omitted by other participants, were the ability to anticipate, and to warn against, future patient problems.

In his own opinion, CE distilled his clinical CK into 'following guidelines and listening and communication skills'.

9.10.2 The learning task

Clinical CK was confirmed as an outcome of experience, again defined by CE and as identified in the pilot study, as the number of patient cases seen. As the craft of medical practice develops and is modified according to the number of diverse cases seen, rotations experienced, and the examination system, the ways of passing on knowledge also change. In the team, knowledge was imparted in various ways including: specific methods of teaching UG clinical skills; observation; and self-directed methods. Approaches varied from the pragmatic and practical approach of the HO, to the SHO's more factual 'book-like' approaches which complemented his practical skills with acute patients, an important indicator of experience for the junior doctors. Expert teaching/learning strategies contrasted with these methods where the emphasis was on managed learning as opposed to teaching. However, this does not mean that junior staff always deliberately 'taught' those on the ladder below them. Learning by means other than teaching was becoming an increasingly important research issue.

The HO perceived aspects of the learning task as 'picking' up information. Similarly, the SHO referred to learning from 'scraps' of information, or 'little conversations'. These were valued experiences. These

trainees also measured themselves against increasing competence in skills which enabled them to diagnose and manage sick patients more simply.

Within the apprenticeship hierarchy, participants were exposed to a range of experiences, in varying contexts, acquiring different information and skills from constituent members in the process. The clear boundary lines in work delineated junior doctor responsibilities towards patients and each other. These embraced ethical 'rules' such as respecting the expert's province not to treat certain patients, discharges, and changes in drug management.

The case study endorsed the categories identified in the pilot study (ps). New case study (cs) categories can be added to the validation list. The categories identified over the first two phases are shown in Table 7 below.

Table 7 Categories identified in the Pilot and Case Studies

Clinical Practice (process)	Clinical Expertise (product)	Teaching/learning expertise (product)
emphasis on the history (ps)	superior knowledge (ps)	assertions (cs)
diagnosis by signs (ps)	application of knowledge (cs)	teaching by questioning (ps)
diagnosis by symptoms (ps)	leadership (cs)	teaching by telling (cs)
diag. by patt. recognition (ps)	less intervention (ps)	correction (cs)
diagnosis by exclusions (ps)	consideration of wider options (ps)	checking (cs)
prioritising (cs)	decision-making skills (cs)	management/facilitation of
	anticipation (cs)	learning (ps)

The case study allowed insights into some characteristics of experience in medicine, expert/novice differences, and approaches to practice and teaching/learning, across grades in one unit of apprenticeship. The findings needed to be substantiated in younger experts and some aspects of the research questions still required clarification. These were: reflection on practice and teaching/learning; how the diagnostic process was taught; and whether practitioners' actions were consistent with their explanations. The intention was not to probe how clinicians think in clinical reasoning, but to explain how their experience affected their approaches to teaching and learning the diagnostic process. However, given that diagnosing patient

problems is a central feature in medicine, there is a fine line between asking practitioners' views on this, and differentiating between these perceptions and thinking itself.

Denial of personal skills and participants' differences of opinion needed further evidence. Importantly, further information was needed about how clinical CK was passed on other than through the explicit teaching of specific skills. Therefore, a schedule with open-ended mirror questions was created for use in the paired expert/novice interview study which also retained an open-ended observation element.

CHAPTER TEN

THE INTERVIEW STUDY:

THE SCHEDULE RESPONSES

10.1 Introduction

The interview study research was carried out in the context of 6 ward rounds and 3 clinics with the narrower paired focus of 6 consultants and their respective SHOs. The research questions and progressive focusing (PF) issues were supplemented with a schedule using parallel, mirror questions for senior and junior doctors (Appendix B). An open-ended element was retained in each observation session to allow for responses to everyday events. Data accrued from 12 interview transcripts, 6 working tapes (approximately 40 patients cases of which 20 were transcribed), and field notes. The ward round is revisited before reporting the responses to the schedule questions. The relationships between the research questions, the schedule questions (italic), and the section headings are shown below.

Research questions and Progressive focusing (PF) issues	Section headings/*Schedule questions*
What are the relationships between clinical experience, work, teaching/learning and the ways in which CK about medical practice are passed on? How do expert and novice clinicians reflect on their experience in relation to their work and their teaching and learning activities? Denial of personal skills and attributes (PF)	10.3 Clinical experience: seeing more patients (*What does the term experience mean to you?* *What are SHOs learning needs at this stage?...and this SHO?* *What are you learning at this stage? Do you find any of this difficult?*) 10.4 Clinical expertise (*What aspects of your job are you good at passing on to young doctors?*)
Junior doctor error (PF)	10.5 Junior doctor error (*What kinds of mistakes do young doctors make? How do you deal with these?/Do you ever make mistakes? How are these dealt with?*)
What are clinicians' theories and perceptions of their teaching and learning	10.6 The concept of teaching (*What do you understand by the expression 'formal teaching'? What's good/bad about it? SHOs only; Tell me what's good about your consultant's teaching*)
Which beliefs do clinicians' hold about the current apprenticeship model?	(10.7) Beliefs about theory and practice (*Does medicine get simpler with experience?*)
Match and mismatch of opinion (PF)	Match and mismatch of opinion

10.2 The ward round structure

Unique events occurred during the fieldwork. For example, one ward round contained four drug overdose cases; another team experienced three sudden deaths in one week. Yet the rounds shared a common structure for managing patients which has implications for learning and theory building.

The average observed business round catered for approximately forty male and female patients inclusively and lasted either an entire morning or afternoon. The briefing session and the 'seeing' of ward patients were consultant led. In the former, the experts chaired the discussions in a side room dealing systematically with each case. They were supported by team members each of whom contributed according to their responsibilities and designated roles. Junior doctors and nurses informed consultants about new cases and updated them on the condition of existing patients. With the team's help, consultants made decisions about patients' treatment or circumstances. On the wards, they examined and communicated with patients, discussing their problems and the relevant management decisions already made. Cases were usually seen in the same order in which they were discussed or in the reverse order for administrative purposes, according to the order of notes on the trolleys and wards visited.

Consultants kept track of patients at briefings in various ways. Most kept a hand card with a few key words as reminders; one used a notebook; and two (as the case study consultant), made no notes. On the wards, patient records were in the hands of the SHOs, the consultants only looking at these and test results to check details. The implication is that the experts had all events under their control. There are four points here.

The initiation to this routine is well engineered in the UG period as the novice is inducted to the clinical world. Thereafter, this process appears to become the accepted norm and is taken for granted. Secondly, the staff briefing discussions, in medical terminology, are naturally different from ward doctor/patient interactions. Thirdly, the two parts of the round contain both similar and different learning/teaching opportunities, all of which are contingent upon administration and teamwork. Lastly, the regularity of this routine means that doctors can move between jobs and hospitals and, within reasonable limits, adapt very quickly.

10.3 Clinical experience: seeing more patients

(Q. What does the term 'experience' mean to you?)

10.3.1 Consultants' views of clinical experience

As in the case study, practitioners had initial problems in defining experience. This is evident in the words of one consultant as he tried to explain it . 'The trite answer is experience - and there is some truth in triteness' (6A 15-16). After probing, there was consensus agreement from all participants, either directly or indirectly, that experience equates with the number and diversity of patients seen.

One consultant commented on the potential of specialisation to narrow the scope of content expertise drawing a parallel with the case study expertise/experience differentiation. Two experts noted that, since consultants provide the continuity of care, often in post for many years, they are more likely to remember patients' previous admissions or to see them as outpatients. Memory therefore is two-fold: recall of actual patient personalities, and cases remembered as problems with distinguishing features and content variations. Thus, the further products of experience begin to emerge.

Consultants' views on experience resulting from cases seen are quoted below and form a basis for the discussion about the skills and behaviours which experts possess and demonstrate as a result of experience: efficiency, practical skills, pattern recognition, remembering clinical cases, speed of information recall, and the confidence to draw and comment on wider options in differential diagnoses were identified when seniors were asked to express their opinions.

The first and last statements below show the importance of knowledge stored in the memory; the third comment points to experience as knowledge of differences in the range and type of cases; the last statement is also a strong educational argument for apprenticeship learning and the ability to put previous experience into practice. All comments on experience are the result of experience.

> It's purely and simply remembering similar clinical situations and remembering the lessons of them (2A 206-208).

> Experience in medicine, I think, is just having been there, seen it, done it. The longer you've done it, the longer you've seen it, then the more experience you're going to have (4A 115-118).

> It's not just the number, but the number gives you diversity. So here you are covering a very wide spectrum and so you are not afraid to make pertinent points on a wider range... (5A 137-140).

> I think a lot of what I do is pattern recognition. That is, having seen it before, or something like it before, then I will often relate to the problem more quickly than someone who is coming to it for the first time. There is no substitute for experience (6A 17-22).

One consultant saw continuity of management to be an important element in experience:

> I think the main need is to see as many patients as possible...learn to deal with patients with the variety of conditions...the more they [junior doctors] see the better and they have to learn how things progress, the management of the patient from beginning to end really (1A 17-26; on SHOs needs).

Another senior doctor thought that experience was acquired through assimilation over time. 'I have been around for a reasonable length of time and I have just sort of assimilated the knowledge required' (4A 217-219).

10.3.2 SHOs' views of clinical experience
10.3.2.i Seeing more patients brings confidence and understanding

Younger doctors found experience could be quantified, qualified, and related to cases seen and not seen. One SHO cited his experience in common illness presentations such as chronic bronchitis and angina but his inexperience as omissions:

> I haven't seen a case of rickets...I think that's where you gain the experience, if you've seen patients with conditions, it helps you to understand it better (3B 288-290).

Generally, SHOs perceived experience to be accumulative in the diagnosis and management of diverse cases although they offered more individual views on how their inexperience, or conversely acquiring more experience, could be described. Experience resulted in different reactions, bringing one SHO less panic and greater confidence. His patients were managed more decisively and less haphazardly with more emphasis on priorities through the cumulative effects of the experiential process:

> ...the first time you are facing an acutely ill patient, you just panic. Whatever you learn just goes away, and you manage the patient in a haphazard way. But by going through this experience, you learn as you go along...I am far more calm now in dealing with say, cardiac arrest...the house officer would not know what to do because they are not experienced...it's like playing the piano (4B 30-40).

For another SHO, it brought increased efficiency and confidence coupled with the ability to work more efficiently with fewer facts and investigations. Although the evidence is slight, this is confirmation of the case study expert's ability to work with the minimum of information:

> Well, because you've seen it before, you've seen things often and you can decide quickly...you can just go on a few facts here and there and reach a decision very quickly and manage accordingly. Things which were difficult in the past become more easy...some difficult procedures, if you haven't seen them, you haven't done them and you're worried just in case you have to do them. But if you've done them before, you are not worried any more. You feel confident you can deal with it (5B 206-220).

10.3.2.ii The really sick patient

All six SHOs saw the recognition of sick and/or acutely ill patients as a result of experience. Two comments on SHOs' developed abilities to prioritise and manage sick patients were: 'I think that's the bottom line' and 'There is no substitute for actually seeing sick people and dealing with sick people' (4B 121; 6B 147-148, respectively). Another SHO linked sick patients with her memory of cases but indicated the diagnostic differences in patient presentations in the real world of gaining job experience:

> You remember people who were very sick or people who you were very worried about through the night or things like that...But again you don't really remember the things you actually might need to know in the future. You remember that they were very sick and you had to transfer them to ITU and there was a problem in getting them into ITU because they were full and they had to go to Edinburgh and you had to make umpteen phone calls and it took three hours...and the next time you might see somebody that was that sick and you would think immediately 'right they need ITU' but you might not be able to say 'Right, they're...because of such and such, therefore they need such and such treatment which has to be done in ITU' (2B 220-236).

Indirectly, these SHOs, as the one below, implied that, as a result of experience, they could now cope in a crisis.

10.3.2.iii Thinking like a clinician

A discussion about experience revealed something of the pilot study intuition (p.109 above) but also has a bearing on the recognition and management of ill patients. What appears as intuition may be the acquisition of greater powers of observation through experience and the effects of increased responsibility.

4B   You don't think like a clinician actually.

MM   What is 'thinking like a clinician?'

4B   You go up and see a patient - let's say when you see a patient - and you get a feeling something's not right - OK - let's say for example, the other day, I was in casualty seeing a patient - I saw a patient and she looked very well. That was not the case... not much ECG changes, pain is resolving, somehow I kept her, feeling from experience, this patient might not be well. And I am right and she had an infarction ... two hours later (4B WT 8.2.95).

10.3.2.iv Discriminating and asking for less help

Experience was perceived to bring the knowledge to discriminate and to contrast ways of working:

... it's certainly very useful, to work for different consultants. There is no one way of doing things and everybody has small differences in the way they deal with certain conditions. It is interesting to see that - and also the emphasis they put on it (3B 195-200).

One SHO, recognising the power of discrimination resulting from experience, found herself more able to make decisions about further investigations, medical or surgical intervention, or psychosomatic needs. These more advanced aspects of management, require a synthesis of patient information and case experience. For example; 'You need to be immersed in these patients (in a cardiology department) to work out their symptoms...' (1B 37-39). This SHO measured her progress in the number of questions she asked her consultant about patients. The progression was rapid, over four weeks, although this aspect was probably linked to personal competence and patient variability.

> ...when I first started, at the beginning of the month, I asked him (1A) about 80% of the patients. Now I ask him about 30% of the patients (1B 89-92).

10.3.2.v Recognising the boundaries of responsibility

The majority of participants agreed that juniors could only take some cases so far before help was needed. SHOs recognised their limitations regarding drug and management decisions. The examples below show their difficulties in reaching decisions. Investigating at the right level is a mark of experience:

> Well, what I would do if I thought maybe she had arrhythmia, I would send her home, but I might arrange a 24 hour (monitoring and see her as an) outpatient. But I wasn't sure if I should do that because it was just a one-off episode...shall I go ahead and do this on this lady or should I discharge her and wait and see how events... (SHO 5B 72-78).

> ...he (5A) will make a decision whether this chap needs to be investigated further or should we just not go ahead with further investigations...Well...... (5B 62-78).

> I do get stuck with patients. I'm only a SHO 1... I get stuck with investigations and where to go next (6B 25-29).

Asked to qualify what he 'got stuck on' this SHO alluded to the benefits of having seen more cases which may lead to less intervention and patients going home earlier:

> ...you are not sure what level of investigation they require. That's where someone who is more experienced is useful, because they have seen lots of this before and they know who needs to be investigated and who can be sent home with relatively few investigations (6B 34-40).

Deferring to seniors over drug changes showed another responsibility boundary although this depended on specific drugs and patient problems (HO, p.148 above). One SHO, when asked if she would change drugs on her own said confidently, 'Oh Yes, Yes' (2B 138). However, the demarcation lines in drug

administration are clear in the instances below. The second example also illustrates controlled measures to narrow the diagnostic possibilities.

> He obviously changes management. He'll say, 'Maybe we should put that patient on steroids', 'Maybe we should try a different antibiotic', 'No, I don't think it's appropriate to treat this' (3B 148-151).

> ...we started the drug on a clinical basis and on some investigations which wouldn't pin a diagnosis but would suggest these diagnoses. And she did improve. She started on Friday and now she feels better. So that was a decision I can't make...I wouldn't start her on that drug without consulting him (5B 105-112).

10.3.3 Learning needs and difficulties

(What are SHOs learning needs at this stage?...and this SHO?
What are you learning at this stage? Do you find any of this difficult?)

Schedule questions which pursued learners' needs and difficulties, overlapped with the features of experience and inexperience discussed above. For SHOs, no one issue stood out apart from the need to see more acute patients (10.3.2.ii above). They cited individual needs variously as: learning to do nothing or take more risks (1B;5B); use initiative (4B): and reassure patients more (1B). Perhaps deliberately focused as a survival mechanism or specialty rotations, SHOs had specific requirements in relation to their current posts such as the management of cardiac, respiratory, or diabetic problems. Other difficulties alluded to were: medical clinics (1B); learning facts (3B); and dealing with emergencies (4B).

Two consultants said that there was no formal assessment of needs (1A; 2A). There were four references to examination needs with three consultants (strangely from the same hospital) and one SHO noting that SHOs needed to pass these or to acquire the necessary knowledge. However, these requirements were not laboured. One consultant (5A) spoke of his foreign SHO's cultural needs. Feedback was not mentioned by either senior or junior doctors.

10.4 Clinical expertise

(What aspects of your job are you good at passing on to young doctors?)

10.4.1 Consultants' perceptions of their own skills

Denial of personal skills or the reluctance to qualify these arose in earlier phases and was substantiated in the interview study. Questions which sought to elicit experts' views about their own skills were, initially, invariably met with denial. For example: 'I know what I'm bad at' or 'you would have to ask somebody else about that'; (1A 88; 2A 272-276 respectively); 'probably nothing in particular' (4A 21).

The last interviewee, making the immediate connection to teaching skill, indirectly emphasised role

modelling and the need to be critical;

> I have never been much of a teacher. I don't teach a lot. Other people just have probably to look and see
> how I do things and if they like that they can accept it, and if they don't, then they can use that to teach
> themselves what not to do (4A 57-62).

However, an earlier question to the same consultant which did not solicit personal skills but was phrased

in terms of asking what his junior could not have done on the ward round, drew a different reaction:

> Couldn't have done? Make decisions really, on where the patients are going to go and how...and also
> reinforce the fact that what they (the team) had done was right. I don't change many treatments...(4A 7-
> 12).

The same question to another senior drew a different reply. Experience brings efficiency and speed but

expert and novice would get the same results:

> ...not a lot. I think we are probably talking quality, efficiency, time, but the end result, I think, would be
> the same (6A 308-310).

One straightforward admission of personal skill illustrating experts' abilities to grasp the whole situation

and prioritise (p.20 above) is shown in the words below:

> How to tie up a case - how to approach the individual patient. I think that is the thing. They (SHOs) have
> to make decisions which apply to the individual. Now they can't do that without experience. (Q. How do
> you help them?) Well to stand back and look at the situation as a whole. If someone comes in and they
> are ill...what is the thing that is reversible? What do you think the things are that are irreversible? (5A
> 102-113).

The denial issue touches upon the lack of reflection on personal skills which was evident in three

interview study experts: One senior said: '...its very difficult to be objective about that' [one's own

teaching] (2A 337-338; 4A 60). However, asked what he did well on the round, another senior was able,

after initial hesitation, to reflect on and comment on his performance on the round.

> Clinically I'm not sure. I think I have communicated, I got the message across to Mrs X about the
> importance of her not smoking. I think I managed reasonably well with Mr Y, the pancreatic carcinoma,
> to tell him there was something wrong but to give the impression that we can help him with it and
> certainly help with his pain. He is a worried man and he needs reassurance (6A 254-262).

10.4.2 Junior doctors' perceptions of their consultants' skills

All SHOs agreed that, as a result of experience, seniors possessed expert skills and knowledge which they

were able to apply, compared with the inchoate knowledge of junior doctors. Many responses related to

diagnosis and management and these aspects will be dealt with in separate sections to avoid repetition.

Experts' superior knowledge is summed up in the quotations below:

> ...just simply by attending his ward rounds and the clinics you tend to learn a lot because he is experienced, he knows a lot (5B 330-333).

Clarification of 'attending' led to learning from observation: 'I do learn a lot from just seeing how he manages people, these patients, simple things' (5B 335-337):

> I don't argue with him and say 'I think you're wrong, I think I'm right'. You go along with it because obviously they have got the experience and they know better (3B 167-169).

SHOs' valued experts who: structured teaching; kept things simple and relevant; did not talk down; taught to the learner's level (2B;4B;5B); made reasonable, quick and clear decisions (4B;5B;6B); approachability and communication expressed as 'good with patients' (1B;3B;6B). These are the characteristics which often appear in effective teaching questionnaire results (p.32 above). A more unusual appreciation detailed communication, history-taking and examination skills, and minimal intervention:

> I think (1A) is a good doctor because he's very good with the patients, he explains what's going on in terms they can understand, he doesn't go over their heads, he doesn't use long words, he basically puts it on the table and that's it. I think he's good because he doesn't over-investigate, he doesn't put people through a whole load of unnecessary tests for no reason, he's a good clinician in that he takes the history and examination and doesn't need loads of fancy tests unless absolutely indicated. I think he works well with the staff in the hospital, the nursing staff, and people working with him. I just like his style of medicine. He doesn't keep patients in hospital very long... (1B 360-374).

Integration of clinical skills is evident in the reply below which highlighted presentation as a means of assessment and gauging junior competence. Joint decision-making in learning and supervision are obvious. The junior's opinion is sought as a means of assessing knowledge. The comment referred to clinic work and the professional follow-up letter is included in the SHO's appreciation:

> ...if I see a new patient, he will go through the history with me. I have to present it to him formally - he will see the patient examination so that I am reassured I haven't missed anything and we will come to a plan of action with the patient still there. So we'll discuss 'What would you do?' And then he'll say 'Yes, I agree' or 'No, I don't agree' and 'Lets do this'. So the patient knows, I know, and the letter is easier at the end of it (2B 54-65).

10.5 Junior doctor error

10.5.1 Consultant perception of junior doctor error

(What kinds of mistakes do young doctors make?; How are these dealt with?)

10.5.1.i Error in clinical skills

This question aimed to explore inexperience and supervision from another perspective. The consultants' responses were mainly generalised although a few seniors referred to their own SHOs. A rudimentary classification of error emerged which did indeed lead to a different view of inexperience and trainees' needs. Three consultants said that SHOs did not make many mistakes and some management errors were considered part of the learning/experience process. Four error (or inexperience) categories were established: clinical skills (including diagnosis); management; therapeutics; and administration.

Three consultants cited junior doctor deficiencies in history-taking which included: not listening to the patient; paying inadequate attention to the presenting complaint; and paying insufficient attention to details. Giving long, irrelevant stories in presentation was cited by another consultant. Two examples of inadequate histories are quoted:

> History is taught in a rather structured way, that you ask this and you ask that, and so on. The idea of putting neutral questions to a patient and allowing the patient to, you know, say actually what they feel in their words...the history that you write down should actually be in the patient's own words. When it says 'main complaint at the top' it should be 'What's the patient actually complaining of?' (1A 216-224).

> Or if they have taken an inadequate history like 'security guard' or 'night watchman' or something like that. You say, 'What was he before he became a security guard?' because people don't have security guard as a career, they have been something else. He's probably been a miner for 40 years (2A 260-266).

Other responses resembled the Gale and Marsden 1983 work and that of Fraser in 1992 to include: failure to interpret findings; failure to interpret physical signs; not recognising the severity of illness or deterioration of the patient; lack of consideration of wider options (which has a corollary doing several things instead of following one pathway); over-diagnosis; and excessive intervention.

Miscellaneous potential errors, noted as a result of inexperience, included being over or under-confident, and not asking for help. Two consultants quoted wrong admissions as management errors and another two commented on the failure to take appropriate action and, even if assessment is right, not instituting management. This is clear in the instance below as is the safety valve of the ward round checks:

> ...if they have failed to take a detailed account of the problem or if they have failed to interpret their findings sensibly or if they have failed to take appropriate action even having made the correct assessment, all these things come out in the context of a ward round (2A 223-227).

The following wrong admission was not considered serious:

> Sometimes he has perhaps been bullied to take patients from the surgeons in the hospital, say with abdominal pain, who we wouldn't admit normally - they wouldn't be admitted under the surgeons. That's happened once or twice but I wouldn't classify that as a mistake (3A 255-260).

10.5.1.ii Management errors

Many of these errors were perceived to be part of the learning process and mainly constituted over-compensating in its various forms. For example, the majority of consultants gave as management mistakes: over-compensating; overlooking the obvious; over-managing; or over-treating. A cluster of management errors was identified by one consultant as:

> ...by them admitting a patient that perhaps didn't need to be admitted or not instituting management - in many ways it is usually that they over-manage something - they tend to compensate by doing several things rather than one thing (1A 69-73).

However, these errors, if they were errors, were seen by one consultant as less problematic than deciding not to treat in the first place:

> I think possibly they over-investigate and they are possibly too aggressive with certain forms of therapy, but I respect that because by doing that - it is easy for me to come along and say 'Look, well let's stop that'. It's much better to have done that than for me to come along and say 'Why did you not start that?' Right? So withholding and being slow to treat is far, far more dangerous in my opinion, than over-treating (5A 361-369).

10.5.1.iii Therapeutics

These were not mentioned by consultants, but comments made by SHOs illustrate the differences of opinion which occur in drug management.

10.5.1.iv Administrative errors

These figured in SHOs' replies. Only one consultant said that some juniors' pay insufficient attention to recording details or writing up who has been seen:

> They also don't realise sometimes the importance of recording or writing or saying who has been seen when. Because if you are asked a question 12 months later about what you thought, it can be very difficult to remember, if not impossible (6A 300-305).

10.5.2 Correction of error

Consultants were asked how they dealt with mistakes. Responses included: by example; informally; in work and non-confrontationally (1A; 2A; 3A); and audit (5A). Outright correction was mentioned: 'Just

point it out to them and tell them what I think they've done wrong. I think you have to tell them and you

have to go over it' (4A 160-162). Correction through demonstration was also given:

> I would always try and do it (correct) in a constructive fashion. I would try and - if something has been
> omitted or not done - I mean sometimes a rectal examination isn't done, this is quite common - I would
> make the point and say' I think you should do this because of' and then I would do it myself, demonstrate
> to them ... (3A 265-270)

These are, of course, abstracted explanations but they were confirmed by the SHOs who were asked how

their mistakes were dealt with. They spoke of being told or being corrected by demonstration: 'You learn

because he tells you, either what you've missed or, on examination, he might tell you 'can you hear this

murmur?' (2B 35-37). Where ignorance is present, the onus is on SHO to ask (3B FN 9.5.94). An

illustration of error correction on the job, without even specific teaching, shows the subtlety of learning

within good relationships of which even consultants may be unaware:

> He doesn't say 'right, what you did was wrong, you should have done this'. Normally what happens is
> you present the patient say on a ward round after you have been waiting [on take] and you say 'Right, I
> think this patient had this, and this, and this. And then you go and see the patient and instead of saying
> 'Oh well I think you've had a heart attack' he'll say 'I think you've got unstable angina' and you say
> 'Right' but he usually says that to the patient and you are there to pick it up. And if you disagree you can
> say this to him 'Why did you think that?' (1B 254-265).

10.5.3 Junior doctors' perceptions of their own errors
(Do you ever make mistakes? How are these dealt with?)

The nature of errors cited by seniors and SHOs gave rise to the most pronounced mismatch of opinion

between grades apart from drug treatments. SHOs either omitted, or were reluctant to refer to, personal

management errors. The SHOs' responses, often acknowledging the results of inexperience, tended to be

diagnostic mistakes and included: inability to pick things up and make a diagnosis; not knowing what is

important; poor diagnostic skills; and (only in one instance) forgetting management steps under pressure.

One trainee highlighted the worst scenario:

> But basically, unless you discharge a patient from a clinic who should not have been discharged, I mean
> there is very little you can do...(1B).

The SHOs commented on individual careless administration, e.g.: forgetting to check bloods, make

review or outpatient appointments, and writing up the wrong dosage. Responding to a question about

how drug mistakes were detected and perhaps emphasising the absence of drug errors in consultant

comments, one SHO said that only rarely did consultants find these out and that 'it usually hits somebody

else before it hits him' (SHO 2B 115). Two SHOs said that nurses would pick up wrong dosages or drug

problems (2B 134-137; 5B 148). Only one SHO confessed to a management error which highlights

theory to practice difficulties:

> ...the other day when I was on call, last week, a patient with cancer of the bone marrow came in with acute confusion, dehydrated. Now, I know from a textbook I need to check calcium levels...that's the first thing you look for but somehow, I forgot at the time because I didn't think about it and I don't see that many haematology patients - it's a haematology problem...if you ask me in the exam situation, I'll tell you to check the calcium level, but in the practical situation, when you are on call, you forget. Just little things like that which is quite important in the patient's management, although I did the right thing at the end...(SHO 4B 158-185)

It may be that SHOs are disinclined to talk about management errors and that this is a sensitive area

which touches at the heart of their professionalism and competence. One SHO ignored (at interview) a

management problem cited by her consultant although the issue had been discussed at the briefing. It

concerned an asthma patient, an overnight admission by this SHO (Appendix C, Case 3). The consultant

asked the next morning why the patient had not been sent to ITU. In the interim, the patient had

improved and the decision worked to the SHO's advantage but it was a potentially serious error of

judgement, in the consultant's opinion:

> I think I remember saying with that data, the patient should have gone to ITU. They didn't put the patient to ITU and decided to manage her here. Now, clearly these are often difficult situations, but as it turned out it was OK but I would still say the same thing - that it could have turned out differently - and that was an example of where I felt her judgement of how to manage the problem maybe wasn't ideal, but in fact it turned out OK. Quite often, other situations arise whereby you interrogate the SHO about their findings and you identify areas that they just haven't looked into (2A 230-246).

Five SHOs and one consultant (p.178 below) said that, at the end of the day (or words to this effect) that

the results for the patient, disagreements about drug preferences and management notwithstanding, would

have ended up the same.

10.6   The concept of teaching

(What do you understand by the expression 'formal teaching'?;

Tell me what's good about your consultant's teaching?)

10.6.1 Formal teaching characteristics

A question was inserted into the schedule to set the parameters of formal teaching from the SHO

perspective and as a background to providing more comprehensive explanations of teaching as a complex

phenomenon. Consultants were only asked about the formal aspects if they arose in the interview. Where

given, seniors' views corresponded with those of their SHOs, mainly in attributing greater depth,

preparation, and structure to formal teaching. Mostly, seniors perceived the latter to be more conclusive since it allowed time for questions.

The majority of SHOs described formal teaching characteristics as: sitting down, having a seminar or tutorial; taking notes; being asked questions and receiving explanations; and being didactic in style. Such teaching was time set aside, bleep free, structured, possibly topic-centred with slides. One SHO (1B) said it could be stimulating and catered for topics and issues beyond current ward concerns.

Questions about formal teaching almost invariably led to comparisons with informal teaching but it is simplistic to describe the latter as totally possessing the opposite attributes, although to an extent this is true where it was characterised as being non-didactic and opportunistic.

10.6.2 The 'work is not teaching' paradox

Commenting on the help she received from her consultant, one SHO said, 'well, he doesn't really teach. I mean you pick it up as you go along' (1A 319-320). Another SHO gave his views of formal teaching which focuses on learning in work. This explanation begins to get at the heart of clinical CK transmission:

> ...most people perceive formal teaching as a time set aside, bleep free, whereby the consultant actually talks to you about a certain topic. If you work in A and E department, casualty department, yes you get formal teaching. You can perceive teaching from another point of view whereby you go on a ward round, you see the patients, look at the problems and see what else can be done, or what mistakes you have done...that is teaching really. It is not formal teaching *per se*, it is informal-working-teaching - teaching as you go along and you learn and accumulate things (SHO 4B 288-308).

His consultant agreed in giving his admittedly biased version of learning medicine:

> I think the only way that people learn medicine properly is by doing the job. I don't think that they (SHOs) learn from reading a book. I don't think that they learn from sitting in a lecture theatre. They do learn from bedside teaching but that's partly doing the job (4A 246-251).

The problem with these explanations is that practical experience in 'doing the job' or even 'what is accumulated' are relatively undefined and unspecified. There is a general assumption that this practical knowledge, both in terms of content and method, is understood.

Prior to the ward round, the same senior doctor gave his conservative views of teaching in words which have significance for the discussion of this thesis. Much is to do with the focus on formal teaching as

opposed to learning. His perception of teaching appears to be centred on being able to question and provide answers. The discussion ran as follows:

4A   When I teach it's not for the patients and when I work, it is for the patients. So, if I do a ward round for example, and that is the example, working for patients...teaching would be a side thing you know - like 'What do you think is wrong with this patient?' and discussing the diagnosis.

MM   And do you not think that is teaching?

4A   Well, it's not formal teaching.

MM   But it's teaching.

4A   Yes, yes, everything's teaching (WT 8.2.95).

Two similar opinions were received. Consultant 1A, while discussing the warnings he gave junior doctors, said 'That example [given by MM], you were doing that in terms of how you are managing the patient rather than thinking you are teaching' (1A 117-119). Another consultant said that work is teaching but not 'didactic teaching' (2A 40-45) and therefore the picture is somewhat confused.

The spontaneous aspects of teaching were encapsulated in the following consultant's explanation of informal teaching but his words belie the skills in making judgements about learners' individual needs in varying contexts. Urgency and instinct may draw out the salient points:

Unpredictable - it is just what comes up at the time, what's in your head at the time, it may not be particularly instruction because it may not be comprehensive but it's just what happens to be an immediate reaction to a problem (2A 321-325)

10.7   Beliefs about theory and practice

10.7.1   Theoretical knowledge versus practice

Participants' observations showed significant differences between theory and practice and were often encapsulated in the theme that reading does not equate with practical experience of patients. In the words of one trainee: 'theory and practice are fairly different because, in reality, things don't always happen in

text-book manner' (6B144-146). Communication and an interest in people as well as knowledge and application differences mattered to one senior doctor:

> ...because you can be very erudite and have read a lot of textbooks and not much use to anyone because you are not interested in people (6A 27-31).

Practice was generally perceived to be the application of theory and there was no substitute for it. For example, 'I suppose practice is theory implemented' (6A 206). Another view emphasising human relationships was expressed as:

> ...anybody can talk theory, but it is very difficult to really talk the application of that theory in practice and how you deal with people - they are not theoretical (5A 455-459).

10.7.2 Uncertainty

Many senior and junior clinicians accepted that, in the diagnostic process, total certainty could not always be achieved. Uncertainty surrounded many undiagnosed patients but it appeared to be assuaged in prioritised management which is often of the 'trial and error' variety (see 11.5.5.ii). Learning to live with uncertainty is almost a professional hazard although a product of experience is tolerance of the problem:

> ...sometimes you wish that you could have all the answers, and you never do, because it's not that kind of illness, very rarely anyway. I mean sometimes it's cut and dried. Someone comes up with a valve problem, you hear the murmur...they have them replaced surgically, it's all very easy (1B 76-84).

> ...uncertainty is uncomfortable for all of us but, with more experience you will tolerate a higher level and you will recognise the downside of trying to obliterate the uncertainty. That is the fiscal cost, the discomfort, and the possible complications and side effects of making absolutely sure that this is or is not the case, can make it not a worthwhile exercise (6A 399-406).

The other side of uncertainty is lack of confidence, notably absent in the data. Paradoxically, junior doctors were confident about their limitations which indicate supportive team relationships. There were admissions such as: 'I do get stuck with patients' (6B 26); or 'I wasn't sure if I should do that...'(5B 75); or recognition of the need to ask ,'I wouldn't hesitate to go and ask him' (3B 101); or 'as soon as I'm out of my depth I go to him (the SR) and when he gets out of his depth he might go to Dr X.' (2B 178). The last comment is a tribute to consultant expertise.

10.7.3 Junior doctors and the management process

One feature was common to five SHOs but only one consultant - that in patient management, juniors broadly would do the same as senior doctors. This was said in various ways. For example, when medicine is not 'cut and dried': 'In a way your opinion is as good as anybody else because nobody knows the right

answer' (1B 885-88); or, in relation to differences of opinion: 'The consultants will sometimes change

your management or they might suggest an extra blood test or something like that' (3B 161-162); or 'It's

a situation where you can make two decisions and either would have been right' (5B 84-86).

SHO 6B was confident about his management: 'There are very few things that come in that you are

unsure' (119); his consultant, with the qualification that he (himself) would be quicker, agreed with his

junior '...but the end result, I think would be much the same' (6A 309-310).

10.7.4   Medicine has 'run-of the mill' qualities

Practice was perceived by some interviewees to become routine, or almost boring in the predictable nature

of events. This aspect was alluded to by the case and pilot study experts. Again vocational enthusiasm,

expressed with some embarrassment, is the antidote:

> ...but as time goes by, there is a danger that the practising physician can get bored with disease, which
> is why it is so important - and it sounds a bit twee for me to say this - but I believe it is important that we
> find people interesting (6A 193-198).

Two consultants (5A and 6A) expressed their experience and the replication of cases as statistics. One is

quoted:

> I personally on the ward, see over 1,000 cases a year, so if I have been here 17 years, I have seen 17-
> 18,000 acute cases. Contrast with outpatients, I see about the same again of outpatients. That is about
> 50,000 and add these two together - and if you take the diabetics which is my special interest - I would
> see the same again. So we are talking 70-80,000 people (5A 129-136).

Experience in these terms leads to practice becoming easier as one gets older for a number of reasons,

such as making decisions, stopping therapy, and speaking to relatives (5A 391-395). Another senior said,

'The issues change...superficially you can feel you have seen it all before' (6A 185-190). A fuller

description about this aspect is quoted below where, apart from easier decision-making, there is less

anxiety because experience has shown the way to adapt and make changes. The lack of reflection is

puzzling but may relate to speed of thinking and the ability to grasp the whole situation or problem:

> I think it gets easier. I think you don't have to reflect on 'Have you made the right decision?' 'Have you
> made the wrong decision?' Because, the more often you've done it and seen the outcomes, I mean - you
> modify your decisions in the future (4A 122-127).

10.8   Match and mismatch of opinion

As in the case study, management, diagnosis, and drugs provided the foci for juniors to disagree with their consultants. But this was not open disagreement. At interview, SHO 1B explained a diagnostic bleeding problem which also illustrates the way in which the system safeguards the patient:

> He (1A) thought it was due to teeth extraction and I think it wasn't, and I still think it wasn't. And he hadn't seen her when she came in and coughed up about two cartons-full of bright, fresh, red blood which to me, isn't blood that you've got at the back of your larynx...to be honest it doesn't make a lot of difference because if it was pulmonary embolism she has had a scan anyway....If it was a chest infection which I thought contributed to it and which I wrote in my discharge summary, then she was on antibiotics (1B 433-448).

SHO 2B commented on 'situations where we've had different ideas on the importance of the different diagnoses'. She went on to cite different priorities in tackling multi-pathology problems such as arthritis or lungs in the elderly (2B 150-155). For SHO 3B, drugs were noted as causing problems: '...you may not put them on steroids. That's always a bone of contention...or antibiotics, it's very much a case of personal preference (3B 157-158). Contrary to the norm, one SHO perceived his consultant to order too many tests.

10.9   Summary of the schedule responses and progressive focusing issues

Experience was confirmed by all participants as the number and diversity of patient cases seen. Participants perceived experts' experience showed in: superior content knowledge stored in the memory; the ability to retrieve it and use it appropriately; intimate knowledge of patients resulting from continuity of care; speed of information recall; and efficient patient management. SHOs valued consultant efficient management, quick decisions, and lack of intervention in treating patients. SHOs measured their experience against competence in dealing with acutely ill patients; easier, more confident management; greater discrimination powers; asking for less help; and investigating at the right level. Theory and practice differences were sharply contrasted with SHOs emphasising learning from the real world where patients do not present in textbook manner.

Four categories of trainee error were identified: in clinical skills where consultants emphasised poor history-taking; management mistakes where over-compensating in various forms arose; therapeutic problems only noted by SHOs; and administration errors. Generally, SHOs did not admit to making

management errors. Consultants' skills in judging the balance between giving juniors responsibility and allowing them to learn by their mistakes appears to be undervalued by both parties. Although juniors could articulate experts' skills, consultants again denied or were reluctant to discuss these.

The last two chapters have enlarged upon the clinical expertise which experts possess as a result of their experience of patients and practice. However, the emphasis on explicit teaching to pass on their knowledge and expertise, has given way to a predominant view of clinical CK acquisition in the PG period through experiential learning by doing, and watching experts in action. This conclusion, coupled with the significant finding that some consultant physicians did not regard their work with patients as teaching, was a breakthrough in beginning to answer the fundamental question about how CK in medicine is acquired.

Chapter Eleven

The Interview Study:
Learning from Experts at Work

11.1 Introduction

Progressive focusing on how and when learning occurred rather than teaching led to increased attention on the ward round as the locus for the treatment, review, and discharge of patients. Within the framework of established clinical methods and teamwork, the co-ordination and magnitude of this process in daily hospital life cannot be over-stated. The staff experience it, but do not 'see' it, and much of their actions are taken for granted under the cover of work and caring for patients. This chapter, in which the remaining eleven validation categories are developed, explores the clinical work of experts on their rounds and how their SHOs learned from this process.

11.2 Experts' actions resulting from experience

11.2.1 Communication with patients

As in the case study, the researcher observed that all doctors showed effective communication with patients. They introduced themselves and greeted patients, bending down to make eye level contact and giving information in understandable terms. They conducted humorous, easy conversations while touching patients and giving reassurance. Covered by two SHOs in the understated but loaded phrase as 'being good with patients', expert communication skills were integrated with diagnostic and management procedures. This is illustrated below where the consultant explains forthcoming management to a patient recently diagnosed with heart failure and in the process, finds out about her personal problems. In addition to showing concern and giving the patient hope, he emphasises the team's contribution in his use of 'we'.

> 5A   So there's a lot we can do. You'll be on water tablets, possibly on other tablets. You came in just yesterday - you'll be here all of this week till we sort you out.
>
> Pt.   Will I get home at the weekend?

5A   I would hope so.

Pt.   Because I've got a handicapped son I bring home for the weekend.

5A   Well, you've got to be fit to look after him now. Where is he when you say he gets home?

Pt..   He's at ---house.

5A   He may have to stay there this week.

Pt.   He only comes home on a Sunday...I don't bring him home.

5A   Who brings him home?

Pt.   He comes back along with a taxi - he's a borderline...he's got phenylketinuria.

5A   Really! He didn't get the diet started early enough I guess in those days.

Pt.   No, he's too old, he's fifty-one.

5A   (nodding) Alright. I'd hope you'd be home for Sunday, home and well (FN 13.2.95).

11.2.2 Examination skills

Bedside management was a dynamic phenomenon requiring skilled orchestration. Patient examinations were invariably simultaneously integrated with questions to probe the history and social details, rapid checking of drug schedules, and giving directions to the team. SHOs did not comment on seniors' expertise in examination skills, possibly taking them for granted. Researcher notes recorded that patient examinations, mainly cardiovascular and respiratory but occasionally abdominal or limb oriented, were always performed by the consultant. Consultants selected interesting features to share with SHOs, apparently simply by knowing what would be useful. Four examples illustrate that expertise consists in having finger-tip knowledge and using it appropriately. The first interview sequence illustrates a consultant's reasons for the short but vital exchanges which are predicated by 'have a listen' and his SHO's reactions to these (FN 8.3.92). Theory and practice are two distinct entities in this graphic account:

Nobody can tell you what mitral stenosis sounds like. They can say it's a low rumbling diastolic murmur, but until you hear it for yourself you don't know what it is. It's like saying the Victoria Falls are magnificent, they are beautiful - you can see pictures of them but until you are there and you feel the spray and you hear them plummeting to the ground and you see the rainbows coming up, you don't know what it is like.

I won't teach on physical examination unless I'm teaching for an exam or unless I am teaching undergraduates. I won't say 'This is how you do it' But what I will do is, after I've examined a patient, I might say 'Have a listen, consolidation' (4A 280-327).

The assumption in this hypothesised example is that the learner has previous knowledge about consolidation as a complex condition and that there is tacit understanding between participants which makes deeper introductions and explanations redundant. (CV2, who validated the findings, explained among other things, that in consolidation, the air entry passages are occluded, they are not patent.)

Although the example above was hypothesised, an incident happened on the round to back up the truth of this consultant's words. He did ask his SHO to 'have a listen' to a chest. The interview extract is quoted:

MM   Do you learn when Dr X says 'have a listen?'

4B   Yes.

MM   Is it confirmation?

4B   I would say reinforcement. I wouldn't say 'learn' in that sense, I would say reinforcement of what I know so that it solidifies in my mind and sticks there. Sometimes if you say 'I know this' but you might ignore or overlook one little point...which might be important (4B 145-153).

'One little point' can be an outcome, or reinforcement, of learning. The consultant's selection and assumptions were right.

The next example illustrates expertise in asking numerous questions during a fluent examination. The consultant, sounding an elderly patient's chest, asked rapidly, 'How's your eating?, bowels?, how's your head?. The end result was initial conservative treatment and not to have barium tests. 'Go for nutritional correction and assessment' (6A FN 15.3.95).

Another example concerned a drug overdose case as consultant 3A asked the patient numerous rapid questions about breakfast and eating while conducting shortened neurological tests. After taking the pulse, he said, 'Hold out your hands' before asking the patient to track his finger to test the visual fields. Almost at the same time, the consultant asked the team if there were expressions of suicide yesterday and

said to the SHO 'Give the GP a ring' (FN 11.7.94). Examination, checking, and follow-up measures occurred in quickfire succession.

The analysis now turns to further evidence of what the six expert clinicians did as a result of experience and the impact their actions had on learners.

11.2.3 Listening, collating, synthesising, prioritising, and summarising

During the briefing discussions all six experts, taking many views into account, listened, collated, interpreted, summarised, and prioritised information. This apparently sequential process in practice (it may well not be sequential in clinical reasoning and is not to be confused with the latter) was in response to SHO or nurse presentations. The learning potential was contained in **what consultants actually said and did**. This included: asking for clarification; probing for additional information and omissions; checking histories; giving succinct summaries of problems; and finalising decisions about patients. Consultants, with consummate skill, performed reductionist, synthesising exercises on a mass of detailed information and brought it to prioritised, manageable proportions. For example:

> Your predecessor (to Nurse) admitted her...did a very good admission - 61 year old lady - multi-system complaints and she's got headaches -aches- she doesn't feel well - she's lost weight - she's got poor appetite - and as to why...doesn't understand all these...the differential diagnosis we discussed was connective tissue disorders (5A WT 13.2.95).

Consultant 3A explained the process in what may be an aspect of 'reflection in action' (pp.56-57 above). He enumerated a series of self-posed questions to be answered under pressure, reminiscent of the language contrasts experienced in the case study:

> You have got to, very often, sort of think on your feet I suppose and the pressure on beds being such, you have to try and prioritise things. Is this a serious problem? Is it self-limiting? Is the patient better or not? These are the questions that I ask. Does the patient need to stay in hospital? Can they go home? Is this a major problem or not? Has the patient now fully recovered? (3A 419-428).

11.2.4 Storage and retrieval of knowledge

It does not necessarily follow that experience equates with a good memory but the data further point to the experts' abilities to absorb, store, recall, and use relevant information quickly, as exemplified in the previous chapter and the Grant and Marsden (1987) research. Such information was seldom gratuitous and was usually highly appropriate to the work or current problems. One consultant, qualifying his experience said:

That is, having seen it before, or something like it before, then I will often relate to the problem a little more quickly than someone who is coming to it for the first time (18-22).

Given that consultants are very often in the same hospital for years, providing continuity of care, it is hardly surprising that they remember actual ward or clinic patients. Self-admissions of the benefits realised in a good memory included 'You can recall. I personally on the ward see over 1,000 patients a year... (5A 128-130; see p.179 above). 'Of course you need memory for pattern recognition' (6A 182; 313). Of the two SHOs who recognised the beneficial effects of memory, one commented:

> ...it's like he's got a sheet in there somewhere with all their details. He's very good from that point of view. And details like their social history, their home circumstances, which I've forgotten - I can't remember it - who else is living with this patient at home and who the GP is and how much they smoke and used to do as a job 50 years ago. I can't remember that. He does (3B 182).

Another SHO, realising the more efficient management resulting from a good memory, said:

> He knows almost all his patients. He can remember them quite well... and we don't have the notes but Dr X knows the patient. He knows his history, his previous problems and then he has a certain way of dealing with these problems. Knowing the background, he can organise in a better way their current treatment (SHO 5B 249-260).

11.2.5 Experience in the diagnostic process

11.2.5.i History-taking and asking the right questions

All six experts emphasised the importance of history-taking including: asking the right questions; controlling the patient; and paying specific attention to the presenting complaint, thereby reinforcing the case study expert's views. All six were also skilled questioners, often extracting precise and valuable information from apparently simple questions when probing the history. Questioning determines the interaction and the work process, often when probing presentation omissions. History details come from sources other than the patient:

> ...the most important information, I think is the patient presenting. Why have they come to hospital? What has gone wrong to bring them to hospital?...I usually like to read the GP's letter because I want to know what happened at home or why the GP has been called because I find that very useful. Then I listen to what the team have to say about the patient. What was the patient complaining of?...then there may be some key issues, like from their past medical history...(3A 161-174).

The ability to ask the right questions is a mark of experience:

> Experience enables you to ask questions which your team may not have asked because they might not have thought to ask which you know may be particularly relevant to certain problems through your past experience and knowledge' (3A 70-74).

Standard questions were used when a clinical pattern was sought. This aspect was alluded to by an SHO: 'He asked the standard questions which you normally would' (4B 257). A consultant alluded to reverting to standard questions when a diagnosis was elusive (11.5.5i below). At interview, consultant 5A was asked 'Do you diagnose a lot through asking set questions?' The response was, 'Oh yes, very much, and you must do that, because if the story doesn't fit - if this chest pain, for instance, it doesn't fit...we will discharge them...' (5A 294-299). The same consultant asked a student set questions which may also be construed as seeking a pattern:

> He didn't get the gist of my questions because there are certain characteristics of breathlessness, of heart disease, that would lead you to say it was most likely to be heart disease than any other reason (5A 283-287).

11.2.5.ii Diagnosis by clinical signs and symptoms

References to clinical signs and symptoms permeated researcher and participants' observations and working tapes. Four consultants and three SHOs, when enlarging on the diagnostic process, cited either signs or symptoms or both of these as part of the diagnostic process. Several examples will be illustrated:

3A He's interesting isn't he?

3B Yea...SOB [shortness of breath]... really pink...spit...fever.

3A Certainly he was producing purulent sputum wasn't he? He looked toxic and he had the clinical signs of a man with a prosthetic mitral valve then he suddenly developed say an early 2-3-4 diastolic murmur when we examined him on - [leafing through notes].

3B Saturday.

3A So I think it's important he should have an echocardiogram today. We've intensified his antibiotic regime - how's he been M? (to nurse). Nurse comments on sleeping. (WT 11.7.94)

In the case below, the ECG and the symptoms were still to come but management had been decided:

> We have made a decision today, that she will be a diet-controlled diabetic and we'll follow her up...although she hasn't had the echocardiogram as yet, we can't hear any murmur really, but we will follow her up as an outpatient to make sure that she settles (5A 205-211).

The third example comes from 5A's teaching points to students concerning a patient's arrival on the ward. He described the patient: 'signs - cold, clammy...systolic of 80, rapid, irregular heart rate, so they saw her and then next day they were able to see her sitting up very much better' (FN 13.2.95). And the researcher asked why a patient who had had convulsions was asked to put her chin on her chest, the consultant's explanation was:

> She had had at least one (convulsion), probably two, and at that age you are looking for some evidence of something focal to spark it off and infection can be one. So, if she's got a sore neck, as she was suggesting, I want to know if she can put her chin on her chest and it stretches the meninges which, if they are inflamed, it is very sore (6A 374-380).

11.2.5. iii Exclusion factors in diagnosis

Many questions and investigations were designed to exclude certain factors as a diagnostic tool. 'Putting in the negatives' is part of history-taking, leading to the formation of clinical patterns and exclusion factors. As precautionary measures prior to surgery, patients may be asked if they have had jaundice, diabetes, anaemia, rheumatic fever, or tuberculosis. Participant SHOs, when presenting from case notes and giving information about patients, and consultants when summarising, made it clear which clinical signs and symptoms were not present (e.g.: Appendix C, Case 4).

Confirming the case study evidence, on .several occasions, senior clinicians sought exclusions as essential features in the management of diagnosed and undiagnosed cases. Part of this process is 'screening out', an aid to deciding and prioritising. For example, for the sake of efficiency and without the need for a full examination on each patient:

> So with each problem that is presented, I will try to focus on a number of different things and ask myself 'Is this, this, and this present or absent?' (6A 58-62).

The same consultant, who relied on his SHO to screen out, went on to elaborate on tests which prove normal:

> Somebody who has a stroke, it is important to know that they are normal tensive and their glucose is normal and perhaps that their lipids are normal. In other words, that they have no evidence of accelerated vascular disease for which I should be intervening in various specific ways. So a normal test is often quite important (6A 64-71).

Other exclusion instances were: 'We might say "lets rule things out"' (4A 45); and '...you have to prioritise and say to the patient what we need to exclude' (3A 129). Three SHOs (1B, 3B, 4B) confirmed use of exclusion in diagnosis and management. For example:

> We see a lot of people coming to the clinic with abdominal pain and you can do a certain number of tests and rule out a few things (3B 255-257).

11.2.5.iv Constellations of factors

As an extension of signs, symptoms and exclusions, pattern recognition was taken to be where clinicians either compiled clinical information or brought together, either at interview or on the ward, a constellation of factors to aid, or give an example of, diagnosis. Analysis was not to probe their clinical reasoning but to interpret interview comments and to relate these to what they asked and did on the ward round, or said at interview and in discussion.

Clinical questions and decisions were generally perceived to come about by matching stories with investigations and summarising information. The process was deliberate in order to move on the work and decide about treatment. Questions or comments were also perceived to be related to previous experience and used to confirm or negate ideas or evidence. For example, one consultant used the expression 'it doesn't fit with the clinical picture' (2A 64-65).

Another consultant said, in words reminiscent of Gale and Marsden's' forceful features' and prediagnostic interpretations which centre on broad categorisations (p.61 above):

> ...you sort of rank or prioritise or focus on certain pieces of information which are key or critical to the patient's problem - like if they have prolonged chest pain, then that's the most important fact from the history (3A 154-158).

Another expert's version of drawing together clinical details was given in explanations about the negatives in histories. In the example below, signs, symptoms, and behaviours, are reminders of previous experience:

> As an example... he presents with weight loss and haemoptysis, I want to know whether or not he's a smoker. If he's not a smoker, I think it's important to tell me because, if he's presenting with weight loss and haemoptysis, I immediately start to think of bronchogenic carcinoma. If he's not a smoker, that makes it less likely and therefore maybe I should be going off in other directions to look for causes such as tuberculosis (6A 95-105).

This consultant also thought that experience of one case **might** help to solve another problem which may appear as using the memory bank of cases to recognise similar situations. His words express an individual opinion:

> So they [the team] need to know the test was positive so that in future, when they see someone like that, they'll think 'Oh yes, Mr V. - maybe this other chap's got SVE.' That's how clinical medicine works (6A 1775-178).

Experience of many cases stored in the memory was perceived, from researcher observations and expert opinions, to lead to the consideration of wider options. The experts did not close down on the diagnoses but kept options open, looking for alternative interpretations. An individual perspective of experience with implications for using different ways of diagnosing as appropriate, is given below:

> It (experience) manifests itself in relation to I guess symptom recognition, pattern recognition, so that you know, when you are faced with particular symptoms or physical signs when you examine the patient that this implies particular types of diagnosis. It enables you to ask questions which your team may not have asked because they might not have thought to ask which you know, may be particularly relevant to certain problems through your past experience and knowledge (3A 64-74).

This extract points to different ways of diagnosing different problems, primarily for this consultant, through pattern recognition, signs and symptoms, and asking questions unavailable to less experienced doctors.

One other quotation shows the consideration of options and also the significance of correctly interpreting results as seminal features of experience. In response to the question 'Did he (4A) ask anything that you didn't think of asking?' his SHO said:

> Yes...the patient with dehydration and UGI - I didn't think of biliary tract disease. I just didn't think of that. But he sort of pointed to us...by looking at the blood test, because in my opinion the blood test was just mildly abnormal and I would have ignored it but he thinks that these changes might be significant...In that way I do learn something, because sometimes you might just ignore things that might be important (4B 264-275).

11.2.6 Experience in the management process

11.2.6.i Experts as decision-makers

All interviewees recognised that effective decision-making was a key aspect of team leadership. Decisiveness had many dimensions: in setting the agenda for patients and the team; in drug therapy; in catering for 'the whole patient' in an holistic approach which co-ordinated all aspects of care; and summarising patient details on the wards for the benefit of the team and the patient. Three examples of decision-making will be given. The first quotation shows junior doctor uncertainty, an appreciation of his own limitations, and the wisdom to 'wait and see'. An expert already has all the necessary knowledge and skill. The reply, in response to a question 'Do you ever get stuck?' also illustrates a trainee's difficulties with drugs:

> Yes, yes, you do find you do have problems stopping a drug or trying a new drug or altering the dose of a drug. There are so many things in medicine which are sort of halfway, either you don't do anything or you do something about them, something positive or just look and wait. So you need somebody who is experienced to tell you which direction to go (5B 354-361).

The second example was a response to a question about what the consultant did well on the round.

Perhaps efficiency here makes the SHO's work easier! Speed and decisiveness are two entities:

> Well, he was very, very quick. He makes quick decisions and basically he was decisive. He knows what is going on with the patients, because in the day-to-day ward round, you need to get things done... (4B 61-64).

The third example illustrates that experts make the final decisions which also act as a control mechanism. Junior doctor limitations are set against senior certainty and authority but the former's knowledge is often disclosed by suggesting the correct way forward.

> If I am unsure about things, that is when I will ask him questions. I will summarise something and say I'm not sure whether you will want to do a barium enema here or not. We have booked one provisionally' (6B 161-165).

11.2.6.ii Anticipation

A clear sign of experts' behaviour was their sense of anticipation or 'looking beyond' (5A 178) which contributed to and enhanced their leadership and supervisory roles. Ability to anticipate problems in advance had three functions: safeguarding the patient by asking SHOs to follow up specific issues; cautioning SHOs to be alert thus training them to foresee problems; and in management efficiency (indirectly saving time, effort, and money: this aspect was not mentioned and is a researcher inference). The SHOs usually made written *memos* about these instructions, either in their own or patients' notes.

The consultants issued these warnings at briefings, at the bedside, or when just leaving the patient, in very short directives such as: 'We should just review her X-rays from that point of view'; 'get a report - just make sure that...'; 'watch out for...'; 'we're just going to have to watch that...'; 'look out for that'. An example from the field notes also shows joint decision-making:

> 6A (to his SHO) What about a few days of anti-steroidal? What about paracetamol then for pain? ...look out for that (alkaline phosphate) and if its raised do a PSA' (FN 17.3.95).

The warnings were generally part of the management process, appearing to ease the work of the ward. They acted to caution the junior staff and act as reminders in patients' interests. Potentially, warnings were not totally altruistic since they helped to safeguard consultants' responsibilities towards patients.

11.2.6.iii The simplified management route

There were at least three instances where Consultants were inclined to go for more obvious solutions to problems and less complex management compared with their SHOs. The latter did not comment on this aspect. Commenting on errors, one consultant said 'they (juniors) often overlook the obvious' (4A 150). Experts' reasoning, divulged in guidance or directions, was often couched as advice during work. The first example, relating to a patient's INR treatment (International Normalised Ratio, now replaced by the British Scale which refers to the baseline pro-thrombin time) shows the simple route in the need to achieve patient compliance:

> 1B When she first came in, it was 1.5 on her loading dose of 3 for two days...we gave an extra mg. and then it started at 10 on the level. That night we were going to put it up to 4 each day - that immediately brought it up to 2.5.

> 1A I would try and keep it simple. I wouldn't give her 3 and 4 on alternate days. Three or four mgs. - she's not very good on her compliance. (Appendix C, Case 2)

Two other examples, from different consultant rounds were used in validation (Appendix C, Cases 4 and 10). Simpler management may be a sign of expertise and experience rather than an idiosyncratic behaviour.

11.2.6.iv Conservative treatment: 'wait and see'

Seniors' confidence to 'wait and see' and/or to treat conservatively as noted in the case study, was substantiated in the interview study, where, in half of the experts interviewed, less complex management was associated with less intervention and conservative treatment. For example: only to assess an elderly, ill patient's nutritional state (6A FN 15.3.95); or to give antibiotics as 'meddlesome' in a dying elderly patient (6A FN 15.3.95). A consultant described his management in these terms: 'Maybe I just only see the obvious and undertreat' (4A 151). The significance of 'just only' is a mark of experience in prioritising, skilled reasoning, and responsibility factors.

The following extract illustrates a number of integrated features, including: the confidence of experience; expert knowledge; the importance of the history; set questions; and minimal intervention in the 'wait and see' approach:

> Oh yes, very much, and you must do that [ask set questions] because if the story doesn't fit - if this chest pain, for instance doesn't fit...we will discharge them - if they have a very, very good history, I will forget what the test shows and I say. 'No, sit tight, watch them a bit longer' (5A 296-301).

11.2.6.v An holistic approach to patient care

There are two interpretations of 'holistic'. One is that, without exception, all senior doctors encompassed the social and emotional influences on patient health. The other meaning is that they also, in the same process, catered for the totality of their patients' problems and did not confine themselves to a narrow medical perspective. Both of these concepts are present in the explanation below as a true reflection of practice:

> I was just thinking about her treatment, how long she would need to be in hospital. She was unmarried, living with her boyfriend, she had an 18 month old child. Who was looking after them? ...was the baby viable? Was it growing effectively? Was there any problem with her pregnancy? Was any of the treatment we were giving her contra indicators in pregnancy (3A 454-462; and Appendix C, Case 5).

Another example of total patient care in this consultant was:

3A   Is she able to swallow?

N   She's able to swallow.

3A   Is she able to walk?

N   Just a wee bit and it takes two like.

3A   She's being referred to the OT and Physio? (agreement)

3A   We'd better organise a scan for her...(WT 11.7.94 190).

Another consultant spoke, in a hypothetical example, of how he maintained an interest in patients as individuals; '...so quite often I'll ask someone where they come from, what they do, if they are retired, maybe get into the golf or whatever they do play (6A 217-220). In practice, one consultant did ask a patient how he was going to react to retirement (1A 3.5.94).

Another example shows holistic to be a deep approach to a problem:

> What I was saying to the registrar was that he should probably be looking beyond just saying that it is heart failure and treat - and say what is the underlying cause of the heart failure. Now he has to go back and think of the consequences (5A 178-180).

11.3 Working with experts

11.3.1 The 'we' factor

Hospital medicine functions through teamwork which serves as a control mechanism for the profession and a medium for patient care. Teamwork underscored practice and its function was acknowledged and appreciated. While the constant use of 'we' in explanations to the researcher can be explained as informing a lay person, its use in professional interaction and practice was constant. Decisions were taken collectively at ward rounds, engaging mutual support in the process. Experts encouraged thinking in juniors by using phrases such as 'what should we do?' Involvement in the decision process was patent in phrases such as 'what I think we should do...' Explanations such as 'what we did/or do' permeated interviews and observations. One consultant made deliberate involvement part of his teaching/learning strategy:

> So I think the final decision is not just mine, it is really a consensus round, a discussion, and I think the way to do it is to say to the junior doctors 'What do you think?'

Communication in one team was so refined and subtle that the consultant vouched for work relationships which existed, at times, on codes and cues and few words:

> 'X' knows what I want so will often provide it without being asked or will allude to it - the answer is there without the question and that can be difficult to follow (6A 272-273, 280-285).

Five consultants expressed confidence in their SHOs. (This is not to say that the sixth SHO lacked ability, only that it was not commented on.) The following sample of comments were typical: 'S', I think is very good, he maybe needs to learn that he is better than he is' (6A 231-233); 'He's a very, very sound, safe doctor' (5A 346); '...he's an extremely able, intelligent, conscientious, junior doctor who works very hard and who shows a high level of knowledge and clinical skills' (3A 245-249).

SHOs were skilled in making presentations. On the wards, the experts relied on, and trusted, their juniors, demonstrating the fine line of judgement which exists between close supervision and learning the job through experience. It also showed that reciprocal learning occurs in team relationships

11.3.2 Moving between teams and units

The capacity of junior doctors to be flexible towards individual consultants' different management styles was a clear finding confirming 'ecological adaptiveness' or flexibility towards different units (Zeichner *et*

al., p.17 above). Experts' variation in management approaches displayed individuality, drug preferences, and of course specialty expertise. These differences were appreciated by five of the SHOs. Examples illustrate various aspects of this feature, including diplomacy. The second SHO also points to learning from example:

> There are little differences from team to team. Certainly, for instance, with regard to antibiotic treatment, some people are more keen to give intravenous antibiotics and that has sometimes been the case when patients coming in have had their medication altered the next day because the consultant on call wants to do things slightly different to the previous consultant you worked for who told you 'this is the only way'. Little things like that...its very useful to work for different consultants. There is no one way of doing things and everybody has small differences in the way they deal with certain conditions. It's interesting to see that (3B 1887-199).

> You know for example, at this stage what each consultant would want for a first fit or what each consultant would want for something else. You learn by their example, by what they did last time. You do it next time for them (2B 44-49).

Another SHO alluded to the process of gaining experience and the style of leadership with the words 'if you've been here long enough you know' (5B 214). He also said, referring to his senior's expertise 'He is interested in diabetes so if we have any diabetic patients in the ward here, working with him, I have learned from seeing how he manages them' (5B 135-138).

11.3.3 Working with patients: the clinical process

There are two factors here. One is the actual clinical process, unvaried in its routine and infinitely varied in its approach to individual patients, which is the main vehicle for gaining experience in caring for patients. All participants were unanimous in saying that learning occurred in work. 'You do basically learn on the job' (6B 135). Another junior doctor variant demonstrating the subtlety of learning as opposed to teaching was:

> You learn by going on the ward round and listening to what they then decide is wrong with the patient on the ward round, and they are telling the patients, so you pick up that by speaking to the patients (1B 267-271).

Theory and practice differences also play a part and the contrast between reading and doing were noted by three senior and two junior doctors:

> ...in order to put into practice what you've read in books, you have got to be on the ward and do it actually because what you know in your head, when you read the book, you may think you know it, but when you are actually facing the situation you forget things (4B 7-12).

The second factor is how involvement comes about. As Lave and Wenger theorised (pp.7-11 above), the senior team members actively structured their decision-making to enable juniors to make contributions to

patient care. In so doing, they of course assessed their juniors. The first extract shows how a consultant asked his team about treatment. A sense of humour again prevails:

1A   Do you think we should be doing an ultra biopsy?

1B   Well, we could do but would it show anything?

HO   They'll see her in the Western General on Thursday.

1A   That's fine - send her home. She's much better isn't she?

HO   Yes - steroids - cure all eh?

1A   Maybe they'll help stressed residents as well! Maybe we should try that!

HO   What stressed residents?

1B   (serious comment) Maybe they've helped the cerebral oedema (WT 3.5.94).

The second example from the same round shows conferring with the team and passing on expert knowledge in the work process. The exchange is with the HO and, although there is no direct praise from 1A for the correct answer, the affirmation 'Yes - we would do nothing, right' was a form of positive reinforcement.

HO   You said the Americans were going to do a lobectomy but I don't think that would do anything.

1A   What would we do? She's got poor LV function.

HO   We would do nothing.

1A   Yes - we would do nothing, right...Well the congestion - look at the size of that - that gives you an indication, if you've got any pulmonary congestion at all, the diameter of the upper lobe vein should be increased by greater than - well whatever that is (measuring by eye) about 3...it's slightly distended (WT 3.5.94).

The management interaction, in which patient care both structures and anchors learning through involvement, is shown in the extract below. The consultant summarises before asking the team's opinion. There is praise *in absentia* for a nurse! (See also p.185 above.)

> 5A   Your predecessor (N) admitted her...did a very good admission, 61 year old lady - multi-system complaints and she's got headaches -aches- she doesn't feel well - she's lost weight- she's got poor appetite - and as to why...doesn't understand all these...the differential diagnosis we discussed was connective tissue disorders. We brought her in on Tuesday and worked her up until about Thursday/Friday and the question is ' Could we leave her?' This is what we discussed. What do you think about leaving her H? (SHO) Do you think it was right to give her steroids?

> SHO   Yes.

> 5A   I'll bring her back quickly...if we get all her tests done today, there's no reason why she can't get home tomorrow...hold her for two to three days...

> SHO   ...on the steroids...

> 5A   When you've got all results in hopefully...give them to me because I'll deal with her.

Deliberately involving the team is an expert action or behaviour to encourage learning and stimulate interest in patient problems and their management. SHOs appreciated its benefits at interview but did not refer to it as a skill. But do the consultants see this involvement as a skilled aspect of the job, or teaching, or neither? This issue will be addressed in the Discussion.

11.3.4 Learning medicine through staged procedures in diagnosis and management

11.3.4.i   The staged process

Virtually all observation sessions and interviews contained examples of procedural methods meaning that there was a logical, sequential process in dealing with patients. This process took many facets. In the context of describing his work on a ward round, one consultant explained:

> ... if everybody understands what's going on with the patients and where they are meant to be going and
> how they are meant to be treated at the end of the ward round, then I would say that I've achieved that
> satisfactorily... I think today's ward round probably, you know, made some progress...what's wrong

with everybody - if not the diagnosis, then at least what the problems are and how they should be treated and what arrangements for these patients should be (4A 23-33).

Probing the teaching of the diagnostic process, the next researcher question was, 'If you don't have a diagnosis, how do you set about doing that?' The reply highlights the emphasis on history and examination; routine investigations, and exclusions. Actions were prioritised:

> Investigate them. I mean, sometimes the diagnosis itself -if we've got a confused old lady, then sometimes, you know, we don't really need to make a specific diagnosis. We might say, 'Let's rule out things we can treat like a urinary tract infection and then see how she gets on'. So sometimes the diagnosis itself isn't definitively imperative - you know, we don't really need it. But, I mean, if we don't have one, then we'll just go through the standard history, re-examine the patient, look at the routine investigations and see if we can get a clue and then investigate further if necessary (4A 39-52).

One consultant explained a sequence of events or way to approach a case which entailed: the skills to pace activities; prioritised, procedural steps; exclusion mechanisms; and width of options in differential diagnosis. It also teaches how to tackle a complex management problem in depth.

MM   But you were also saying, 'just watch out, we had be careful'. Now this is teaching, yes?'

5A   Oh yes, I think it is teaching the pace at which things are done, teaching how you put your principles that you've read in books into practice. You can't do everything at one fell swoop. There is no urgency. Get her better from her heart failure - that is one. While you are waiting for her to get better, check up with echocardiogram that you are not missing some occult or silent valve disease of the heart... (183-194).

These interview excerpts illustrate that there is a point where diagnosis and management meet and are but two sides of the same coin. In the procedures followed with very ill patients, undiagnosed patients, and also those partially diagnosed, it was observed that clear procedural methods were employed. In undiagnosed patients, the 'staged process' which is part of the clinical process, and indeed part of the craft of medical practice, was evident in steps to exclude factors and, where necessary, carry out appropriate tests and investigations. For the profession, these will be all too obvious, and again taken for granted, but it is from the discussion about such cases that junior doctors learn about the pros and cons of medicine and which is the best plan in given circumstances.

The staged process is also part of 'trial and error' management or pragmatic decision-making where the eventual outcome is not totally clear. For example, in dealing with an undiagnosed case:

4A   How's her renal function?

N   Cystitis...

4A   The only other thing is whether she's actually had septicaemia because she's got these LFTs. We just have to think query septicaemia, query colonitis, query renal tract infection. Did her renal culture grow anything? (WT 8.2.95).

Another example of accepting that certainty is often elusive and where trial and error operates came in an SHO's explanation about experience and management:

> But often you are not absolutely right and you have to wait until you see the follow-up. If you see a patient and you reassure them that there is nothing wrong with them, they go away and you don't hear from them again, you hope and assume that everything is OK. If they come back then you know you were wrong. If you see a patient and your clinical judgement is that the pain is significant and maybe go on and do a further investigation to prove that and it comes back negative or positive, that either confirms or goes against what you thought (1A 47-59).

The same SHO, discussing certainty and uncertainty in medicine, also said 'most of the time, it's all a bit - well, let's try this and see if it works and try and do that' (1A 83-84).

11.3.5 Learning from watching and listening to experts

SHOs learned by observing experts at work. For example:

> Well, just working with him, watching how he works, how he manages patients in general, the sequence of events he follows... I have learned a lot just by watching how he thought, how he decided whether this patient would benefit from an oral drug (5B 127-141).

Another SHO maintained that her learning was 'mostly by example' (2B 44). Yet another said her learning was not by teaching but by participating in 'how he does things' (1B 327).

Much of the observed learning/teaching was in the form of commentary on events and cases. The phenomenon of non-stop commentary on and about patient affairs occurs purely in work and therefore it is not conceived as teaching by most participants. Because of this, it lacks close analysis.

During ward rounds, the consultants assimilated information from junior doctor presentations about either new admissions or ward cases. Discussion usually ensued as the consultants took cognisance of team views. Part of their thinking was disclosed as they interpreted this information and three consultants professed to airing their thoughts aloud.

11.3.6 'Thinking aloud'

During discussion, experts voiced their thoughts out loud, exposing the team to prioritised diagnostic and management decisions in an evolving process within patient care. Verbalising thoughts does not account for either discarded information or the reasons for discounting it, but it is some measure of displaying thinking processes. It is also indicative of patient treatment essentials. The distilled outcome is available as the management decision. One consultant said:

> I think in the context of a ward round, I'm doing that [interpreting information] largely for my own benefit. I'm probably just thinking aloud, summarising it. You saw the format of the ward round...lots of data is presented to me and basically, I have to summarise that in my own mind to two or three essential points (2A 113-119).

And later:

> I suppose we feel that if we do it in a vocal way, we may be helping others to understand what our thought processes are (2A 134-136).

In response to a question asking if the diagnostic process was consciously taught, one senior, apparently collating the signs into a pattern, said:

> I think I am, probably because I often think out loud. When I'm thinking, I'll often say what I'm thinking. Like I would say "I think this lady has come in with shortness of breath - you've said she's got heart failure - but the signs are of consolidation. So you know it's much more. She's got a cough with green spit, it's much more likely that she's actually got a pneumonia rather than heart failure'. I tend to speak it through (4A 85-93).

Another consultant when asked about 'thinking aloud' replied:

> Oh, I do it all the time....you have three different grades of doctors with you plus the nurse, you have to think aloud (5A 217-221).

Because of case unpredictability, the outcomes of commenting aloud, for example teaching, or advice, or the staging process itself, are unprepared and spontaneous, pointing to readily available expert knowledge which can be appropriately directed. Learning in these contexts occurs though active (or possibly passive) involvement in patient discussions and in the constant sharing of ideas as experts take cognisance of team views.

11.3.7 Assertions and teaching points

Doctors were perceived to use assertions in two ways; to 'close the problem space' as in the case study (p.158 above); and, in the process, these often became strong, emphatic teaching points which almost appeared as aphorisms containing factual information. An example of the first usage occurred in the undiagnosed pregnancy case (Appendix C, Case 6) where facts are assembled to clarify the position. After an orientation with C3's words 'So we've got to think of pro-thrombic problems', SHO3 asks 'Are pregnant women more hyper-coagulant?' The consultant's response focuses and directs the next diagnostic stage with the emphatic words:

> They said to me but I can't remember, the obstetricians saying that they had looked at the series and **less than 1% of women in pregnancy get a deep vein thrombosis** (WT 11.7.94).

Another example came in discussing the dizzy patient where the SHO was inclined to go for the more complex option (Appendix C, Case 4):

SHO   I didn't actually do...extensors... but she's got real nystagmus. It does sound like Menieres to me.

C3   **Too young - she's too young.** If it's anything, she'll probably have acute labrynthitis (WT 11.7.94).

The second usage, as an assertive statement, is perhaps clearer to interpret. For one consultant, statistical, numerical teaching points were part of his teaching style as well as signs of his experience. Consultant 5A said: 'If someone has an amputated toe, there's a 50% chance they'll die in five years if they're diabetic'; and 'Stokes Adams', syncopal episodes or faults caused by a disturbance in rate or rhythm, is never due to cardiac valvular abnormality'; and, in making comments about bypass surgery and patients getting home quickly if no complications, he said: '...when they come back to hospitals, abdomen not opened, not nauseated, can eat, not like abdominal surgery, they can get home 10 days post op (FN 13.2.95).

These succinct teaching points were not always in the province of this one consultant; another said 'sinus rhythm is not always dead regular' (2A FN 4.5.94). An element of putting the knowledge of diagnostic probabilities into practice may also be in evidence in these examples.

11.3.8 Bite-sized' learning

11.3.8.i 'Bits of wisdom'

Five SHOs described their learning variously as 'bits of wisdom'; 'tit-bits'; 'snippets of information'; 'little facts'; 'minor points'; 'things picked up'. This corresponds to the case study SHO's 'scraps of information' (p.137 above), and again there was an initial tendency to deny learning with an almost dismissive attitude but there was also an appreciative aspect.

Contrasting factual learning with ward learning, an SHO said 'It's just a little bit from here, a little bit from there. I find it quite useful' (3B 66-67). SHO 3B explained, that when he was alone with his consultant:

> He (3A) will pass on little snippets of information and it is just snippets. He won't give a lecture. He won't just stop at the patient and tell you all about this condition and everything he knows about it. He will pass on little facts (3B 37-41).

SHO 4B said:

> If you're talking about teaching on a ward round, you're looking at real different diseases, little bits, minor points of varied diseases, and you learn from it...practical points which you need to know on a ward (4B 306-314).

An extract from an interview is quoted showing that the acquisition of small pieces of new information is highly regarded:

> MM   What did you learn today on this ward round?

> 6B   Not a lot.

> MM   When you learn something new, is it factual information or the result of a diagnosis?

> 6B   It's often a bit of both. If it's something which I've never seen before or just read about but never seen before, you learn a lot because you are actually having to deal with it. And you learn tit-bits here and there. For example, the gentleman who had had an oesophageal stent put in... (an explanation followed; 60-69).

11.3.8.ii 'Picking things up'

This form of knowledge acquisition was common and tended to go with the 'bits' of gleaned information above. SHO 1B spoke of learning from the registrar:

...because he's very interested in renal medicine and he'll start telling you about something which is getting slightly more formal than just picking it up as you go along on a ward (1B 287-292).

Another SHO, commenting on learning to deal with sick patients and the need for practical experience, said: 'You don't pick up exactly what to do just by reading text books' (6B 150-151).

Learning for one junior doctor had to be immensely practical, specific, and personally relevant: 'The learning that you pick up tends to be very specific, it's for that patient, at that time, with that blood result' (2B 188-200). Practical information and skills were valued.

11.3.9 Learning from supervision: checking

The team was observed to be a managed, controlled, hierarchical system which safeguarded patients, maintained professional interests, and provided learning opportunities. This was achieved through a number of checks and balances in supervision which took various forms: seniors checked case notes, discharges, and clinic letters; consultants offered reminders and chased up details. 'He's very careful, he chases up on everything' (3B 74); 'Because you see him several times a day and he will just remind you.' (3B 81-82). Consultant 1A, responding to a question about the assessment of junior competence, said:

> Well, mainly in how they deal with the patients and by reading the letters once they have written them...I don't sort of say 'Right before this letter goes out I want to read it' sort of thing, but in practice they're always through there anyway so you quite often see what's going on (1A 52-62).

This compares with another consultant (2A) who read all the juniors' letters:

> He reads every discharge and every clinic letter that I write and if he disagrees with something, he'll put it on my desk with a wee sort of sign arrow beside it saying 'please discuss' (2B 121-124).

Supervision occurred as seniors made decisions about drugs which SHOs were unable to make and in interaction with colleagues and patients:

> ...you sort of find out interacting with them, their level of knowledge, their skills at the bedside, their competence, their effectiveness as communicators with yourself, with the nurses, the patients. You observe their behaviour (3A 205-209).

Assessment of SHOs was constant throughout all work activities but there was one special mention of the importance of admitting days:

> In the course of the ward round, particularly on ward round after admitting days, it's clear they've been shaky on how they managed that particular patient, we might then ask about that in more detail really (1A 62-66).

Checking on juniors' communication with patients and relatives was another observed factor. 3A asked his junior about a cancer patient with the words 'Did she understand the implications of the diagnosis?' (3A FN 11.7.94). Consultant 1A asked his HO if he had conveyed good news to a family (1A FN 3.5.94).

11.3.10 Learning from feedback

Clinical feedback comes through patients who either get better, stay the same, or get worse. Their follow-up in clinics, re-admissions, and audit also provides feedback. Feedback also occurs, as has been noted above, in seniors' reactions to juniors' decisions and work with patients. The importance of clinical feedback was recognised by all participants:

> ...like giving him feedback on the lady who went for the angiography. So it is one thing to suspect a diagnosis, but it is important to make sure that the junior staff have the feedback and the follow-up (6A 162-166).

Junior doctors spoke of re-admission and discharge summaries as feedback. For example, 'If it's something significant, the problem will come back and she'll get referred back to us (1A 133-135); or '...he reads the discharge summaries, so his input would be maybe a week after the patient has gone home' (2B 118-120).

Because of the research focus in looking for positive features, only one SHO said that individual performance was not commented upon and there were no general complaints about feedback on personal performance. However, there was only one instance in the fieldwork of outright praise for an SHO who answered a difficult chemistry question about hydrogen to be rewarded with the words 'you clever man!' (6A 15.3.95). Positive reinforcement did not feature in the observation.

11.3.11 Learning from charismatic influences and role-modelling

Three experts mentioned their gratitude to previous teachers. Valued teachers pass on positive characteristics reinforcing that role modelling plays an important part in medicine. Five seniors emphasised personal example as a key feature of leadership. Two experts are quoted. The first highlights vocational interests (as the case study expert); the second reinforces simplicity as a virtue in teaching:

> I think most of us follow the line of our own experience of training and you remember people you worked with that you learned from and you also remember the folk that you didn't learn anything from...The main thing about the people that I learned from were two things really. One was that they had a continuing and obvious enthusiasm still for the job. Even although they were quite senior, they would

go along with you to a patient and, with a certain degree of delight, demonstrate to you what they thought was wrong and were intrigued and fascinated by the problem-solving aspect of the clinical situation. And just to see them really interested and enthusiastic about that, you listened to them (2A 166-183).

I had good teachers. It wasn't just X. I had Y. I worked with very senior people of international reputation and they didn't make things complicated. The opposite - they made it very, very simple (5A 73-80).

Individuality and different styles and strategies, appealed to SHOs. These facets are part of charismatic attractions, particularly in the previously defined vocational sense. Furthermore, 'being good with patients' is a coveted role. Two individual approaches illustrate, respectively: an individual numerical style; and one consultant's emphasis on GPs' referral letters.

There are five causes of heart disease: ischaemic, hypertensive, rheumatic, thyrotoxic, acute viral infections of the heart, idiopathic cardiac myopathies. There are five ways that heart disease presents, singly or in any combination: chest pain, breathlessness, palpitations, pulmonary embolism, sudden death (FN 5A 13.2.95).

I've worked for consultants who asked for the GPs' letters and I thought that was a very sensible thing to do and I've sort of taken that with me and I use that (3A 187-190).

11.4 Summary of craft knowledge acquisition

The interview study showed that clinical CK, at the SHO level, was acquired in three main ways: through experts' actions in teamwork and the clinical process; through consultants who deliberately engaged their juniors in patient care thus managing their learning while managing the patients; and through junior doctor learning rather than teaching. The SHOs learned through the experiential work process of patient care which is highly valued. However, while they appreciated consultant expertise in diagnoses and management, they did not acknowledge seniors' skills in involving junior doctors in these processes.

Younger experts possessed the same clinical skills and abilities as the case study consultant. Junior doctors learned from expertise which included: a wide spectrum of content knowledge; the ability to draw on a rich memory store of many diverse patient cases; the ability to select, synthesise, and prioritise information; and to notice and solicit missing details. In patient care, experts acted decisively and effectively, paying specific attention to listening to patients and history-taking. In the diagnostic process, five out of six consultants considered more options. In general, experts intervened less and there were indications that three consultants used a more simplified approach to management. Three experts risked a 'wait and see' approach to patient care.

Experts' teaching was characterised by: anticipating, and issuing warnings about problems; providing control in patient care; spontaneously capitalising on learning opportunities afforded by patients; exercising judgement and tolerance in supervision; and giving clinical feedback. They emphasised teaching points and left key messages.

Experiential learning through clinical practice has dominated this chapter and specifically, what happens in the structured clinical process of patient care. Learning rather than teaching has been sharply in focus. The conclusion is that the diagnostic process, at the PG stage, is not taught other than through the process of looking after patients. The emphasis at this stage is on individual selective learning from expert actions.

The above conclusions were drawn from the further identification of the subsequently validated categories shown in Table 8 below.

Table 8 Categories identified in the Interview Study

Clinical Practice (process)	Clinical Expertise (product)	Teaching/learning expertise (product)
team involvement	holistic approach	(no new categories developed)
importance of presentation	summarising skills	
continuous commentary/ interaction	simplification of management	
thinking aloud		
succinct condensed language		
clinical feedback		
uncertainty		
the staged process		

We turn now to the discussion of the findings.

CHAPTER TWELVE

THE DISCUSSION

12.1   The relationships between the phases

In addition to the development of validated categories, many issues which featured in the second and third phases were apparent in the pilot study. These included an early definition of experience as the number and variety of patients seen and effective communication with patients. Managed teamwork at the bedside, the reluctance to discuss personal skills, and the effects of role-modelling and charismatic influences all arose in the later phases to a greater or lesser extent. With the exception of 'empowering patients', a feature found only in the case study possibly resulting from the extended fieldwork period and specific leadership beliefs, all expert characteristics and many junior doctor issues identified in the case study, were substantiated in the final phase. This is a tribute to the case study consultant's expertise and range of skills.

Because of increasing evidence build-up, and the strength and prevalence of categories arising over the research process, the Discussion integrates all phases. The chapter is structured around answers to the research questions (p.65 above), beginning with responses to the methodology questions a and b and closing with suggestions for further research and development. The questions are inserted, where appropriate, as an orientation to the Discussion.

12.2   Methodology: limitations of the study

> a)   Can CK research principles be used to describe and explain what medical experts do well in their practice and teaching rather than adopt a deficit approach?

12.2.1   A brief reminder of the methodology

Using natural inquiry methods, the study aimed to provide new descriptions and understandings of clinical teaching and learning. CK research principles (p.15 above) were incorporated. Participant observation, interviews, and progressive focusing, were the basis of the three-phase emergent design. Paired, expert/novice relationships within apprenticeship formed the framework for all interviews. Undergraduate

and PG teaching/learning were represented with increasing emphasis on the latter. The study did not encompass the didactic teaching of clinical and communication skills. However, descriptions and interpretations of these in practice were included.

12.2.2 Criteria for the successful application of CK research principles

In principle, the research set out to be non-evaluative, but in a sense a truly non-evaluative researcher stance, even if there was no intention to report on teaching inadequacies, may be unattainable since comparisons are inevitably induced. Deliberately, expert senior practitioners were selected to induce a non-threatening stance and to afford descriptions of teaching excellence. However, in seeking to portray the best approaches to clinical teaching and learning, the investigation perhaps created a false picture of reality. These are valid criticisms which can be offset only by emphasising that the research was carried out against the normal background of caring for patients and teaching.

The success of this study rests on five criteria developed by the researcher:

- The research uncovered new perspectives on professional values and attitudes to practice

- The research provided descriptions and exemplars of practice

- The research gave insight into how the novice doctor becomes professional

- The research revealed a particularly medical educational, as well as a general educational, view of clinical teaching and learning

- The research made it possible to identify issues for further research and development.

12.3 Teaching strategies and tacit knowledge

b) Can tacit knowledge and teaching strategies be articulated to provide descriptive examples of clinical teaching and learning?

12.3.1 Individual teaching strategies

Participant and researcher observations yielded examples of teaching excellence in the case study expert's approaches to UG teaching which contained explicit aims and objectives, key messages, summaries, and written feedback on clerking and presentation. Exceptional skills were illustrated in making learners think and in motivating them. He used adroit two-part questioning skills and he imparted specialised information about the physical examination. In his approaches to teaching, he displayed the expert's ability to depart from the norm and demonstrate unconventional, innovative teaching methods (Glaser 1976, p.52 above).

The case study consultant's clinic teaching was memorable for allowing students space and time while giving undivided attention to the patient. When teaching skills and clinical CK become integrated in practice, the learner is the recipient of a crafted delivery of the craft. Thus, as has been shown throughout the study, the CK of medicine becomes inseparable from the CK of teaching it but these different crafts possess discrete skills and content.

In the interview study, the PG focus and shorter time with each team allowed fewer individual expert PG teaching/learning strategies to be described. Those reported included: an aphoristic style of emphasising teaching points and leaving key messages; keeping teaching simple; subtle means of gaining compliance through humour and rapport with patients; and one expert's recourse to seek out GP referral letters and use them in management.

12.3.2 Tacit knowledge

The articulation of tacit knowledge is more complex and difficult to explain. Asking about tacit knowledge means asking about how its qualities and characteristics will be recognised. Any answers must come from participants' explanations or from strong research evidence and neither of these is available. Therefore, the research failed to achieve full answers to this question. However, a number of clues can be followed by asking what tacit knowledge was accessible and when was it used, although ultimately it is impossible to plum the depths of the tacit dimension.

At its most simple, 'tacit' means understood without being stated. Thus, interaction can take place without words and there can be shared understandings without explanations. At this level, the fieldwork allowed examples of tacit exchanges between clinicians. Tacit understandings were apparent in the brevity and nuances of clinical interactions. For example, no explanations were given after the signing 'have a listen' or the word 'consolidation' in the interview study (p.184 above). Explanations were unnecessary because the participants understood the message or the reasons for the illustration and words were redundant (see also Appendix C, Case 7).

In such circumstances, where the teacher shows confidence in the learner, the onus is generally on the latter to follow up any remaining questions. It is neither fruitful nor sensible to give long explanations about clinical details when the implications are well understood. On the wards, tacit understandings are often associated with poor prognoses. Tacit or coded language about very ill or dying patients is part of

medical culture. This may well be an indeterminate aspect of practice as described by Atkinson (p.44 above).

There is a place for tacit understanding in not giving vacuous feedback. In supportive relationships, the learner often knows that the job has been well done and tacit approval may come in a glance, with a touch of the hand, a nod of the head. Non-verbal communication conveys the tacit message of reinforcement and encouragement. Conversely, a mistake not highlighted but treated by subtle means, may achieve the same results as a lengthy verbal correction. Such tacit understandings undoubtedly exist and have a place in close working relationships. However, they should never become an excuse for the absence of well directed individual feedback and teachers must discriminate. The corollary is that SHOs were not heard to praise their consultants openly. Perhaps the situation should be remedied both ways.

Educationists are disadvantaged in being unable to understand many physical signs and symptoms and exchanges about patients. While this disadvantage may be counterbalanced by the ability to explain other clinical activities and phenomena, it is unlikely that professional tacit knowledge can be explained, if it can ever be explained at all, outside the profession. One access to tacit understandings, particularly those concerning the transparent or taken-for-granted aspects, is to look at the consistency of clinicians' accounts of practice. This issue will be addressed in 12.11 below.

12.4   The experiential process within apprenticeship

1. Which beliefs do clinicians hold about the current medical apprenticeship model?

12.4.1   Learning by doing

All participants agreed that learning by doing on the job within the apprenticeship framework was the only way to learn medicine. No alternatives were expressed. Theory and practice, although related, were perceived as two distinct entities with the latter contingent on learning from more experienced clinicians in the context of caring for real patients. The fundamental belief is that the two 'norms of responsibility and experience', consisting of the technical and indeterminate knowledge, or the practical and theoretical clinical skills of the competent doctor, are only attainable through observation, practice, and supervision (Friedson; Atkinson *et al.*, pp.43-44 above).

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12.4.2 'Seeing patients'

All participants perceived experience in medicine as acquiring and possessing knowledge through seeing many diverse cases and acquaintance with the range and spectrum of disease. Conversely, not having seen examples of illnesses or diseases were construed as inexperience. The inference from the data and observations is that 'seeing patients' is an all encompassing phrase and a loaded concept which apparently embraces everything from admission to discharge, communication, diagnoses, investigations, and management procedures. It means participating in life-and-death decisions with patients and their relatives while sharing successes and failures with them and clinical colleagues.

Expert clinicians gave distilled accounts about their perceptions of practice which revealed both the perceived basic necessities required to practise medicine and the implication that they possessed these skills or attributes. In general, these can be summarised as the ability to follow guidelines and communicate with patients, possession and application of intelligence and commonsense, and vocational interests.

The experiential process, which includes assimilation of the hospital culture and environment, consists of many activities other than exposure to patients and their problems. Continuity and progression in patient management were viewed as important elements in gaining experience. Junior doctors measured professional competence and experience against the confidence and ease with which they dealt with emergencies and very sick patients. This professionalism does not happen over night but over time, with each experience building on previous lessons learned, leading to greater proficiency and asking for less help. However, having gained experience, work can become routinised, even 'run-of-the-mill' although it makes the job, and particularly decision-making, easier.

There was acknowledgement from several experts that expertise narrows with increased specialisation while ageing, combined with experience, was perceived by some to facilitate speaking to patients and relatives about sensitive issues and asking embarrassing questions.

12.4.3 Boundaries in work

2. *How does the hierarchical structure of apprenticeship in hospital medicine affect teaching and learning?*

The role boundaries were determined by the career ladder and these imposed constraints on what was done by whom in relation to patients. Most of the limitations to which participants referred appeared to be unwritten codes of practice although some principles may have been stated in written and verbal advice on induction to the job. Only the case study expert mentioned a strict ethical demarcation line concerning the decision not to treat certain patients. Otherwise, the junior doctors commented on their own limitations about which drugs they would and would not administer, and when they would and would not discharge a patient. The system appears to operate on a number of self-limiting rules without stated principles but strictly adhering to the hierarchical structure in referring upwards to consultant level. Participants appealed to the nearest line of authority for help although not all ward problems reached expert level. These were often sorted out at a lower level by other team members, including the nursing staff.

The case study HO found it easier to approach her SHO because, not unnaturally, she did not wish to be seen as inadequate by her consultant. References matter. Lack of knowledge about cases also went upwards emphasising that, not only do experts have a superior body of knowledge on which to draw, but that the responsibility rests with them. However, knowledge about practical procedures was likely to be in the province of middle-grade doctors who had more up-to-date skills to deal with these and with emergencies. Such apparently unwritten ways of working testify to the hierarchical system operating in hospitals and the limits of professional responsibilities. The system of supervision in overseeing and checking letters also endorsed line management.

There are insufficient data to discuss fully the effects which different grades have on the teaching/learning processes beyond those reported in the case study and the aforementioned work/boundary limitations which have safeguards for all. The contrasts provided by experts' superior knowledge skills compared with junior doctors' admitted limitations are obvious.

12.4.4 Conclusions about apprenticeship

12.4.4.i The strengths of apprenticeship

The concept of decentering, or distributing the locus of control away from the leadership, can be viewed as a distinct advantage in the medical apprenticeship model (Lave and Wenger, pp.8-9 above). It was quite

clear in the case study, that all team members taught or passed on information in various ways according to their level and abilities. Within a unit, and extending to the parent hospital, a mass of expertise, representing a spread of knowledge and skills, exists. This can be interpreted as the deep and valuable resources possessed by a community of practice, reinforcing the notion of shared responsibilities for learning which are dispersed among all practitioners. The strength of a medical community is that all constituent members contribute to learning which is often reciprocal in nature. Furthermore, the work/learning tasks are inseparable, emphasising the collaborative, interactive aspects of close relationships (Rogoff 1991, p.7 above). It would also be true to say, that although participants valued the activities of practice, these appeared to be often taken for granted or transparent.

Viewed from these perspectives, apprenticeship has been shown to be a sophisticated, complex, but flexible medium for gaining experience. The most striking conclusion about it as a learning model, is its comprehensiveness in its propensity to cater for multiple forms and approaches to teaching and learning, particularly in relation to the social context of knowledge acquisition within a community of practising professionals. The model caters for individuals at different levels of expertise, skills, and abilities. Through its structure and personnel, theory and practice are integrated at all stages of training.

When apprenticeship works well, its potential within practice to safeguard patients and younger doctors within the responsibility limits imposed by the profession, endorses its claim to be the only way to acquire professional knowledge and experience. Charismatic positive role models are especially influential and valued.

In addition to appraising the strengths of apprenticeship, a number of things have become clearer through the research process, starting with the fact that, although the research impetus came from the need to illuminate clinical teaching, the research has been driven, through constant refocusing, to put increasing emphasis on the learning process in apprenticeship and the model's capacity to foster and nurture this facet of clinical CK acquisition. Professional know-how is not always passed on, nor acquired, through teaching.

12.4.4.ii Weaknesses in apprenticeship

Since apprenticeship is a powerful medium for facilitating learning and controlling junior members of the profession who, by their own admission, need its support and guidance, learners are vulnerable.

Weaknesses in the model lie in the following:

- senior lack of competence in either the CK of medicine or the CK of teaching (where the latter is interpreted as the transmission of professional know-how and its associated generic knowledge and teaching skills)

- poor leadership

- faulty role modelling and the perpetuation of the same mistakes in approaches to work and teaching/learning

- fragile links at any point in the professional hierarchical chain which may interfere with an open teaching/learning relationship

- senior control of syllabi leaving little or no room for choice in learning content

- authoritarian control

- allowing too much responsibility too early

- the system may mask the need for the management of teaching and learning in the mistaken belief that learners will learn in any circumstances; or that 'osmosis', or being present, or participating in patient care, will suffice without teaching skills.

12.4.4.iii A new theoretical perspective on apprenticeship

Using grounded theory, it is possible to integrate the themes and issues in the research findings using Spady's typology (p.45 above). Four major dimensions of apprenticeship learning have been identified, each of which is associated with specific concepts. The dimensions are: the traditional; the experiential; the expert; and the charismatic.

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The 'traditional' dimension, in addition to the clinical culture and hospital environment, is associated with the well developed professional clinical methods or process by which patients are seen and treated. Assimilation and appropriation of the clinical involvement in 'seeing patients' belongs to the 'experiential' dimension which largely comprises watching, trying, doing, and learning from mistakes through direct experience of patient care. Major contributions to the experiential dimension are: senior practitioners' deliberate engagement of learners in making decisions; and interactive exchanges, either implicit or explicit, which form part of teamwork actions in presentation, discussion, and diagnostic and management activities. Learning from supervision also belongs in the experiential category.

The 'expert' dimension encompasses the broad range of skills, abilities and superior knowledge which are manifested in experts as the products of the experiential process and from which novices benefit. Experts' expertise results from their individual experiences. Lastly, the charismatic dimension and role-modelling have been shown to be important in learning medicine, particularly when associated with leadership, credibility and earned respect (see also 12.5.12 below). Communication, which has not functioned as a separate entity in the research but has been observed to be fundamental to all interaction between patients and among colleagues, is common to all four perspectives.

As with the Spady typology, these dimensions can be combined to produce two broader perspectives: the 'traditional-experiential' represents the institutional or social aspects of practice; and the 'expert-charismatic' forms the individual perspective, illuminating personal skills and attributes. The main thrust of this theory is that the teaching/learning processes in the medical apprenticeship model are sustained and controlled by different forms of authority. This notion permeates and acts as an anchor for much of the ensuing Discussion.

12.5   Gaining clinical experience

> 3. What are the relationships between clinical experience, work, and teaching and learning, and the ways in which CK about medical practice is passed on from experienced to less experienced individuals?

This section is prefaced by a brief discussion of the learning theories found in this study, partly as a follow up to the literature review, and partly as a background to explanations of apprenticeship learning.

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12.5.1 Learning theories in apprenticeship

As might have been anticipated, concepts from various theories were found to co-exist within the apprentice system. Primarily, it conforms to experiential learning principles as expounded by Kolb (pp.53-55 above) in its provision for 'concrete experience' during which the learner is transformed and changed. In medicine, this occurs through working with patients both individually and as part of a team. The knowledge acquisition process is as important as the knowledge itself.

Gagné's cumulative aspects of knowledge acquisition (p.51 above) relate to the increasing levels of complexity which the novice clinician experiences through the UG and junior doctor years. Paradoxically however, at expert level, more experience appears to make the signal aspects of practice, the communication, diagnostic and management processes, simpler, less complex, and more integrated. The early years are strictly controlled by the profession through sequential accreditation processes. Apprenticeship, as a model, synthesises theory and practice, but, as this study has shown, it takes time to assimilate and to put into practice what has been learned. Practice does not keep pace with theory in the early years.

Adult learning principles (p.54 above) are largely ungeneralisable to medicine apart from preparation for further examination work which has predictable effects on content and learning approaches. Within these constraints, there is some self-directed learning in terms of personal motivation and the management of learning. All participants were highly motivated in vocational terms but this was to be expected as a result of sampling effects and using senior participants with known clinical and teaching expertise. 'Trial and error' methods were observed only in the management of undiagnosed and difficult cases where, under strict safety measures, patients were given drugs on a trial basis. This aspect, which surely comes from accurate knowledge of the probabilities and risks involved, was rigorously controlled by the senior doctors and all learned in the process.

This study showed that the SHO participants had no control over learning content in the relevant medical rotations. The ageing population and disease patterns, so obvious on the wards, meant that experience of patients was dominated by common strokes, cardiac, and respiratory problems, often in elderly presentations. There were few unusual patient cases in this study. This leads to a sound basis for general medicine and is the basis of future specialisation, including General Practice, but obviously it limits

experience of different case presentations and management. The real effects of the elderly in long stay wards, which sharply contrasts with day-surgery and short-stay care, still remain to be fully analysed in relation to medical education in general.

12.5.2 Learning from expert behaviours

12.5.2.i The retrieval and application of stored knowledge

Experts showed a superior knowledge base and extensive memory resources, both of which they brought to bear on cases. This was reflected in their ready answers to juniors' questions, their knowledge about pertinent drugs, and a deeper source of information about diseases. They could also recall actual patients and their individual circumstances, partly as a result of job continuity. These attributes are consonant with the findings of cognitive psychology theories in expert physicians as outlined by Gale and Marsden (p.p.58 and 61 above), and issues relating to continuity of practice by the same authors.

12.5.2.ii An holistic approach

Two meanings can be extracted from the observations about expert actions or characteristics in relation to this concept. Firstly, the consultants were able to grasp problems in their entirety as described by Benner (p.20 above). 'Salience', as this was termed, was prominent in experts' reactions to SHO patient presentations on ward rounds. Secondly, the experts catered for the totality of patients' problems and their socio-psychological and socio-economical situations. This is usually termed treating the 'whole' patient.

Both interpretations of 'holistic' were simultaneously integrated within communication, diagnosis, and therapy. In quickly grasping the whole problem, the experts were able to weigh the pros and cons and make judgements accordingly but not without taking team opinion and the 'whole' patient into account. Expertise, in this sense, meant the ability to cast attention over a diverse range of issues and people and to provide answers or possible solutions.

12.5.2.iii Authority in leadership

All participants recognised that, with experience, came increased confidence, efficiency, and decisiveness in decision-making which showed in less haphazard management. A number of other factors rest on this consensus opinion. Experts' authority was observed in their control of ward discussions. In addition to summarising individual patient cases, the ward was managed in terms of patient admission and discharge, or 'letting them go home', a significant event for patients which alleviated the bed situation. Consultants

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clarified patient transfers to and from other hospitals while liaising with GPs and other internal or external physicians.

12.5.2.iv Presentation and summarising skills

These seminal and increasingly significant skills belong to the ward round dynamic. Action ensued from SHO presentations as they informed their consultants about patients, or from consultants' summaries as they put forward sequentially the main points of the case. Through acute listening faculties, and displaying the ability to focus and absorb salient details, the experts were able to perform two very important functions: they prioritised issues; and they made decisions. Prioritising and deciding usually followed questioning, probing, discussion, and commentary on cases. Presentation is instrumental to the discussion process (12.6.3 below). Atkinson (1995) has confirmed the strategic importance of the presentation in the production and reproduction of medical knowledge.

12.5.2.v Succinct condensed language

The use of language was an unmistakable part of researcher observations as the means of interaction among colleagues and in patient communication. In the former, the use of dense concepts shortened and sharpened all exchanges as already discussed (12.3.2 above). Primarily, concepts conveyed the precise state of patients' health in records, presentation, and discussion.

There was a marked use of language contrasts. Experts were observed to decide and manage according to various broad language contrasts (Lemieux and Bordage, 1986, p.62 above). They were also articulate in using succinct language fluently and economically. Cases were: emergencies, life-threatening or not; acute or chronic; diagnosed or undiagnosed; patients suffered from single or multi-pathology diseases. The conditions were either: reversible or irreversible; mild, moderate or severe; treatable or not. Important basic questions were, 'Am I missing something which is treatable?' and 'Is this reversible or not?'

The importance of these questions cannot be underestimated in learning medicine. Use of language contrasts focused priority management decisions, particularly the extent of investigations, and highlighted key case features. Juniors adopt the same style of reporting. Minimalist, but expressive language, also contributed to tacit understandings about patient prognoses and progress in team interactions. This aspect will also be further discussed in 12.6 below.

12.5.3 Learning from supervision

The research emphasised the variety of ways in which SHOs were supervised but particularly the possibilities afforded by 'post-waiting' or 'on take' nights. These are particularly fertile occasions for teaching and learning in which consultants had good opportunities to assess their juniors and to discuss diagnosis and management. Conversely, it was when the SHOs had to prove their competence in the absence of the consultant. On other occasions, consultants frequently asked their SHOs about tests and investigations. This not only supplied necessary information but served as reminders and another form of supervision and assessment.

Interestingly, the fact that consultants kept constant checks on their SHOs' letters, discharge correspondence, and administration, as commented on by a number of senior and junior interviewees, does not appear to be conceived as teaching. It is work.

12.5.4 Correction of error

As reported, SHOs were told directly about their mistakes if the situation warranted. Regrettably there were few recorded examples illustrating that consultants corrected juniors in very subtle ways such as leaving the mistake or the incident itself to be the teacher. But it did happen. The consultants were reported to say that non-confrontational methods were effective and the SHOs' comments substantiated this aspect. Learning from mistakes was clearly experienced, with seniors not always finding out when errors occurred. Nurses may play a more important role in this than is recognised. The significant issue is the extent to which, within the team structure, serious errors do not occur. Error prevention in warnings and reminders curtailed and controlled juniors' mistakes emphasising seniors' authority and regulatory powers. The hierarchical structure has restraining influences.

12.5.5 A system of tripartite assurance

Both field notes and SHOs' comments noted that senior clinicians issued reminders to, and checked up on, their juniors. Being able to anticipate and guard against complications appears to be an expert characteristic serving many functions. Checking up and warning juniors is also part of successful management which is not entirely altruistic. The researcher's inference from the data is that, as the senior clinician warns the junior doctor, the patient is protected. The junior learns from the cautionary words and

is also safeguarded. The senior, to a certain extent, makes safeguards and ensures that instructions and recommendations are carried out and that the ward functions efficiently with the minimum of error. This all adds up to a unique tripartite assurance system.

12.5.6 Feedback

The intention to portray only good practice should debar critical comments. However, the absence of positive feedback to SHOs, even when they had done commendable work and had proved themselves to be able and knowledgeable, was so marked that a comment is necessary. The reporting has already pointed out the differences between clinical and generic feedback with the former occurring constantly in patient monitoring and in audit practices (pp.150 and 204 above). What was singularly lacking, was feedback on personal performance during work. (Praise was recorded three times during the whole fieldwork, with two of these instances coming from the same consultant in the interview study - and only one of these was in a face-to-face exchange.) Why is this the case? There are three possible explanations.

The first is that the clinical tradition sees it as unnecessary and that, in the absence of negative criticism, all is well. The second is that, within good relationships, tacit feedback occurs and that frequent spoken praise is redundant. As already noted (p.210 above), endless expressions of 'well done' or similar comments become meaningless. The third explanation is that clinicians cannot give feedback skilfully. For example, they were not heard to say 'You managed that patient well. Perhaps if you had done such and such....' or 'That was a good presentation. Perhaps you could have stressed....' In this way, both the criticism and the performance are targeted and the learner can take messages away feeling better from the occasion. Using more refined, positive approaches instead of either no comment or only negative words, would lead to more balanced encounters, opening up opportunities for discussion. Hargreaves et al. (1997) have delineated seven ways of giving feedback while linking it with assessment of performance.

12.5.7 Effective teaching characteristics

Individual skills and strategies were demonstrated in the ability to exploit the patient and the clinical situation to benefit learners. Specialised clinical skills were displayed in paying close attention to the history and giving helpful hints and specific teaching points on examination. According to the SHOs, experts shared identifiable common skills. They were able to select, and impart, relevant information at the right pace and level. On ward rounds, this meant addressing the diverse needs of patients, staff, and

students simultaneously. They summarised ward round management decisions, and they left learners with key messages. They made appropriate teaching points about cases and conditions.

Schön has recourse to the arts for his coaching analogies (p.56 above). In aesthetic, practical activities, the differences between teaching and coaching are well established practice. Coaching is the stage beyond basic teaching. Because of attuned observation, specialised content knowledge, and cognisance of the learner's strengths and inadequacies, expert teachers can identify problems and suggest improvements. Being able to impose individual nuances while making teaching points enlivens the learning process making it memorable, but this is straying into the effects of personality on teaching and into another study.

12.5.8 Experts' use of concise teaching points

Many observed teaching points focused on the common, known features of conditions in the context of new patients with classic presentations. The ubiquitous chest pain or breathlessness were associated with certain features. Atrial fibrillation was recognised by other well known factors. Over time these specific points appear to become part of the teaching repertory. They can be applied to different patients as indications of the same disease or condition. They contribute to the differential diagnostic process.

Many of these teaching points were found in UG teaching, for example how to recognise what happens in orthnopnoeia. The converse of this factor probably underlies the interrogative, factual questioning using set questions, which is so common in clinical teaching. Knowing these teaching points helps experts to focus on what is missing from presentations leading them to ask for specific, absent details. Having 'seen more' and 'done more' and having a larger memory store on which to draw, experts made authoritative responses. Their experience was also perceived to bring the qualitatively different explanations and points to each case as described by Grant and Marsden (pp.61, 153 and 185 above).

Assertions were perceived to be strong statements or more emphatic versions of teaching points. One of the products of experience is that it is possible to be judgmental about patients and their chances of survival. The probabilities have been experienced. These pronouncements appeared in various forms such as: '...too young to have Meniere's disease'; or as statistical possibilities in the case of the diabetic patient's prognosis (p.201 above). Such statements were made with conviction and, presumably, can be amassed only over time and with comparative knowledge. Regrettably, there were few examples of

assertions offered in the process of reaching a diagnosis or closing the problem space as described by Gale and Marsden (p.157 above).

Experts' explanations were enhanced by literature references or memories of previous experiences, often of the same patient (e.g.: Appendix C, Case 1). Thus, although a common core of knowledge as set teaching points operated, the experts' teaching drew on a rich and personal experience of cases. This was observable in their depth of knowledge which was readily available. If they did not know, they said so, exhibiting another mark of expertise.

12.5.9 Bite-sized learning

That junior doctors professed to learning from small pieces of information, almost conversational asides, which they classed as 'scraps' of information, 'little things' or 'bits of wisdom', was one of the main research observations. It was first noted in the case study SHO's explanations and reinforced in the majority of SHOs' comments in the interview study. There are several possible reasons for this. During work there is little time for excessive concentration other than on patient administration and consultant directives. Therefore, only small pieces of new knowledge, which are often regarded as gems of information, are likely to be assimilated. Literally, there is no time for lengthy explanations and survival in getting the work done is the main concern. Secondly, learned in the relevant and precise context of specific cases, the hints, facts, methods, or whatever, are more likely to be remembered.

Thirdly, there is the distinct possibility that, as experience grows, concomitant with the growth of examination knowledge, junior doctors already know most of the requisite theoretical and practical day-to-day knowledge. Grant and Marsden (1988b) found that there is remarkable similarity in the primary knowledge bases of differing grades, including consultants, when applied to solving certain problems. Therefore, familiarity with common problems and conditions may mean that junior doctors can afford to be selective about new knowledge. They know what they need to know.

Fourthly, while small amounts of new information can be absorbed, excessive factual knowledge may be rejected. Student learning theorists maintain that large amounts of factual knowledge are not retained in the memory (Entwistle 1981, 1984). Lastly, learning is likely to be appropriated if it is useful, interesting, and stimulating and the choice tit-bits are often just that.

circumstances as a result of experience. Experts act on intuition, or a sense of alertness, or the ability to view the problem as suitable for experimentation. They perceive the time variable to be important, particularly when rapid problem-solving is at stake. The ability to deal flexibly and responsively with specific needs, or to react to predictable and unpredictable circumstances, shows resourceful and knowledgeable reactions and a readiness to respond to varying circumstances.

12.9   A comparative view of clinical teaching and learning

Of all the clinical teaching research reviewed, the Irby studies (pp.35-36 above) have the closest affinity with this study. He also explored clinical teaching by illuminating the approaches of known expert teachers. Using methods similar to this research, he also included a standardised response to a patient case. His mainly UG oriented work was based on teaching rounds and specific meetings, thus giving formal teaching a more prominent role. It is this last factor which is most likely responsible for some interpretational differences in comparison with this study.

Both studies agreed that: experience is the biggest determinant affecting teaching; clinical experience is interpreted as knowledge of many cases (termed by Irby as 'a broad array'); the role of presentation has particular significance. Both studies are in accord about experts' skills and abilities to conduct ward rounds which have dynamic properties, and which simultaneously involve learners. Ward rounds make multiple demands and expertise lies in the corresponding multiple responses which are brought to bear in experts' quick reactions to the context, the patient, and the problem. Experts direct their teaching to individuals with varying needs. Understanding error and learners' misconceptions, they adjust and modify their approaches accordingly. Both researchers agreed that the absence of feedback is an intractable (Irby's word) problem. Noting that experts issue reminders, Irby has said that this provides scaffolding and support for learners. This constitutes a more benevolent and generous interpretation of the attributed early warning assurance system interpreted in this research.

Irby found credibility critical to juniors' acceptance of the senior role. This possession and application of skills and competencies has a direct parallel with Spady's concept of legitimised control and sapiental (knowledge and expertise) authority as already discussed (12.6.2 above). Irby also found that all his experts, as those in this study, shared certain characteristics including a deep knowledge of internal medicine with the concomitant Socratic qualities of enthusiasm and commitment to teaching. Both

12.5.12 Learning from role modelling and charismatic influences

The charismatic influence associated with authority is a central construct in the Pendleton *et al.* (1990) view of the consultation and the doctor-patient relationship (p.29 above). Authority was part of his triple anthropological perspective - sapiental, moral, and charismatic - although the charismatic connections with religion and medicine no longer obtain. The GMC (1993) also endorses the powerful influences of the teacher.

The profession believes role modelling to be a powerful teaching mechanism which it undoubtedly is when accompanied by positive characteristics. Certainly, the consultant view was that juniors should learn by example, a view that as the data showed, stemmed as much from their own learning from past memorable role models as current educational beliefs.

The sense of mission and vocational interest in patients as people which all the experts in this research displayed, endowed them with charismatic qualities which enhanced their individual teaching styles and approaches. Consultant ability to communicate with patients and possess individual rapport were held in high esteem. The junior doctors' expression 'being good with patients' is a summary phrase covering a host of different meanings and circumstances. The words appeared to encompass all aspects of treatment, including a vocational emphasis. Seeking compliance as an expert skill, was not commented upon by junior doctors but this may constitute a tacit, taken-for-granted aspect of management since it is both common knowledge and good practice to win patient co-operation.

12.6 Clinical practice

12.6.1 Situated learning in teamwork

As observed, clinical medicine functioned through shared work experiences about everyday patient care in which both implicit and explicit learning and teaching were situated within the Lave and Wenger legitimate peripheral participation (LPP) framework (pp. 7-11 above).

It is in teamwork, the means of caring for patients, that these authors' theories and concepts come into their own, seeming almost to be tailor-made explanations for learning medicine. The *raison d'être* for learning on the job in the presence of more accomplished practitioners was that learners, of varying skill and ability levels, participated in all decisions but their responsibilities were limited by their experience

and their position on the apprenticeship ladder. In a fully participant role, but insulated and protected from excessive responsibility for patients, the learners were progressively inducted into the job of caring for patients. They were subjected to the totality of the environment, the patient, and the patient's problems.

LPP as a theory, may give more credence than the accepted norm, to learning from simply being present and being party to the work of senior experts. The counter argument is that merely being present does not guarantee that learning takes place. In medical parlance, 'learning by osmosis' is the term for acquiring knowledge from watching and listening to seniors at work or participating passively in the clinical setting. Often this method is not well regarded, largely since it is held as a substitute for explicit teaching or coaching (Hargreaves *et al.*, 1997). The case study expert circumvented this position by prior structuring of observation, task allocation, and giving well directed feedback in his UG outpatient teaching.

The team unit was a powerful, effective mechanism for the transmission of values as well as theoretical and practical knowledge. Learners were enabled by more senior exponents to make sense of their experiences which were motivational as well as instructional (Lave and Wenger *ibid.*; Resnick, p.6; Rogoff, p.42 above). Teamwork was also perceived to foster the appreciation of, and allegiance to, collective responsibilities, affording the paternal and mentoring relationships which are essential components in gaining confidence and meeting individual needs. The experts in this study knew these needs very precisely.

12.6.2 The importance of authority and control in apprenticeship

The role of authority in clinical practice is pivotal to the way in which apprenticeship functions since it is closely associated with control of clinical events. It seems no accident that both Spady and Lave and Wenger use ' legitimate' in their theories. The word implies that it brings certain rights as well as keeping things 'in the right'. Acts are justified in, and by, the system. In this way, apprenticeship maintains its traditional role of controlling and safeguarding the patient and the profession (Lane, p.5 above).

Further to the four dimensions of apprenticeship outlined above (12.4.4.iii), Spady's notions of classroom authority and control can be applied to the apprenticeship model where the teacher depends on the legitimised authority of earned respect to function effectively (p.46 above). In medicine, authority and

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control of the team is only possible through the respect earned from seniors' personal clinical competence and teaching expertise. The idea is that, fundamentally, learners can withhold approval of the teacher thus essentially controlling the teaching/learning processes in a form of imposing sanctions. Control is 'legitimised' in the sense used by Spady, by juniors who respect seniors' desirable and valued competencies and the expert authority associated with superior knowledge and experience. The junior doctors in this research respected their seniors because they knew more about medicine and could advise when they 'got stuck'.

12.6.3 Learning from practice

12.6.3.i   The clinical method

Within the super-structure of hospital management and ward organisation, the infrastructure of the clinical method or process was the forum for clinical and communication skills. Effective learning took place in an integrated dynamic. The clinical method is fundamental to all practice, beginning with the formal UG approach to patients (e.g.: greetings, shaking hands, asking for permission to examine), and extending to all communication, diagnostic, and management procedures. Learning and teaching took place within this regulated distinctive framework. Although patients differed, and differed markedly in their presentation and problems, there was an ordered sequence from admission clerking, through discussion procedures which began with presentation and ended with decisions made, to all follow-up and requisite documentation stages.

Within this framework, learning was largely determined by three aspects of the clinical method: presentation, the discussion process, and what has been termed here 'the pragmatic pathway'. These aspects, rooted in work, appear to have become occluded. They are taken for granted to the extent that they become transparent. Through organised and routinised work with patients, experts transferred their skills and knowledge to learners. It is what actually happens and what is said in this process that demands our attention.

12.6.3.ii   The discussion process

The ward rounds were characterised by three features of experts' skills which effectively led to continuous learning opportunities or conversely, non-stop teaching. Firstly, consultants' comments about cases were intermingled with pertinent questions which often reverted to asking about the presenting complaint and

the history as well as seeking updated information. They appeared to know what information was missing, presumably because of their grasp of saliency and their memory and experience of previous cases.

Secondly, as the consultants deliberated, they were often, as some said, clearly 'thinking aloud'. (This phenomenon was first noted in the case study by the HO in a different context (p.135 above) and was instrumental in categorising the case study SHO's comments as 'assertions' in the collation of case features at a briefing session.) The action of speaking to the team while piecing information together in explanations or summarising or deliberating, may have its roots in learning by commentary in the Greek tradition (p.3 above). The formal case presentation is the other form of learning from commentary in which learning from experience is passed on by extracting important features from the case.

In the interview study, thinking aloud was more in the province of experts and served to emphasise key case features and set the work agenda. It invariably disclosed the pros and cons for discussion prior to action as the working tape excerpts show. Also, as part of practice, thinking aloud may reveal considerable clues to expert clinical reasoning processes. The products or the outcomes of expert thinking aloud, which would not happen without the team's presence, emerge in discussion as deliberations, questions, requests for further information, and eventually prioritised decisions. The third important feature of the discussion process was that the senior doctors deliberately asked the team for opinions. This has considerable implications.

12.6.3.iii Engaging the team

Asking 'what should we do?' emerged as a critical factor in inducing co-operation and deliberately involving the team. Engagement of the team, a skill experienced in apparently conscious and unconscious expert behaviours, resulted in making the team think. It also, in subtle ways, cleverly lead to individuals having ownership in decision-making as promoted by Lewin (p.53 above) as well as inducing efficient line management. As wise leadership, it created an effective, open learning environment, again as advocated by Lewin (*ibid.*) and taken up by Kolb (pp.53-54 above), and was fundamental to structuring the learning process in delegating and sharing responsibilities.

The SHOs either did not notice this aspect or took it for granted. Significantly however, they did not refer to authoritarian leadership but acceded to consultant authority, either because their seniors had the ultimate

responsibility for patients or because they acquiesced in idiosyncratic leadership decisions due to their position on the team.

Engendered discussion also offered opportunities for reciprocal learning with instances of consultants freely asking advice from team personnel such as the registrar, pharmacist, and their SHOs. These incidents permeated ward interactions and were perceived to be part of the supportive relationships and the exceptional rapport between senior and junior physicians. (Both clinical validators remarked on the rapport among participants which was apparent in the transcripts).

Engagement of learners as a feature of consultant behaviour has an important message for questionnaire item construction, responses, and subsequent interpretations. Questions which ask junior doctors about teaching on the wards may disadvantage consultants. In this study, although the SHOs appreciated and valued the experience of learning through team involvement, at no time did they perceive this as consultants' skills in team management and creative learning opportunities. It is also questionable how many consultants are conscious of their skills in this area.

12.7   Perceptions of practice, teaching, and learning
4.   What are clinicians' theories and perceptions of their teaching and learning?

12.7.1   Attitudes towards theory and practice

Participants perceived some marked differences between theory and practice. In the case study, these differences were strongest in the contrasts between the UG and PG fields where responsibility for patients was most marked. This is to be expected. However overall, some interesting threads permeated the interview comments, testifying that theory bore no relationship to practice. Both senior and junior doctors perceived certain work routines to become more straightforward, or easier, with the growth of experience, although two interview study SHOs saw practice as commonsense. Practice, conceived as the experiential process rather than theory, is much more influential on individuals in relation to their job. Most valued is the knowledge acquired from working with others in the clinical setting. This aspect has been emphasised by Yinger and Hendricks-Lee (1993) who argue that:

> Knowledge is not solely a matter of mind and person but one of relationship and place; Learning (becoming knowledgeable) chiefly involves acquiring conversational abilities and repertoire that allows one to establish and maintain a functional relationship with one's environment; Good teaching creates opportunities for learners to think and act in relation to various aspects of the environment (systems) and models appropriate conversations and relationships (*ibid*. p.101)

The more common responses contrasted clinical reality and book learning. Apart from self-posed questions, there is little problem-solving in theory and certainly no communication. People can be good at theory but unable to apply their knowledge. Practice was stressful in emergencies. Practice meant accountability for decisions and errors. Practice demanded integrated knowledge and actions. In general, theory learning was an individual exercise whereas practice was a communal, shared activity, full of the job elements which contribute towards becoming professional. Another SHO view of practice was typified in finding beds, writing letters, communicating good and bad news, and interacting with colleagues.

Various comments attested to the differences between patients who presented as people compared with theoretical accounts, emphasising the need for practical experience with real patient cases who present differently. The case study expert stressed this early in his UG teaching with four different presentations of cardio-vascular problems (p.119 above). Problem choice and knowledge of methods are part of clinical teaching expertise and integrating them in practice (Norman, 1988).

Theory may be tentative but it does not contain uncertainty about decisions or patients. A number of participants throughout the research knew uncertainty in issues which were never 'cut and dried'. Students are exposed to uncertainty as an endemic issue in clinical medicine and it appeared to be accepted as part of the job and the learning process. The research analysis made a clear distinction between the clinical uncertainty which prevailed in a patients' diagnostic position, and potential clinician uncertainty about diagnosis and management. The latter was not experienced in this study. Junior doctor uncertainty was more a case of knowing their limitations.

What is perhaps remarkable is that although examinations, taught courses, and literature have their effects on practice, there were virtually no explanations from participants about their application in practice (only some mention of their necessity). The use of theory appears to be taken for granted in that participants did not talk about it although they are dependent on it. It seems that the incompatibility between theory and practice may even out with experience, becoming less marked at senior levels when effort is expended on acquiring new knowledge about the job and what that entails. At more senior levels, that which is theoretical stabilises, whereas some practical aspects, such the SHOs' skill in practical procedures, decays. However, as more knowledge is acquired, more is unused, and experts seem able to work with essentials and weigh the pros and cons of fashion with greater dispassion. This does not always mean that they are

right compared with junior doctors in a steep learning curve and this leads to differences of opinion about practice.

12.7.2 Examples and explanations of practice.

When the clinicians explained their work or their actions at interview, they mainly had recourse to using very common physical signs and/or symptoms as examples of practice such as pain, cardiac signs and symptoms, breathlessness, and weight loss. These illustrations emphasise the need to see and to experience manifestations of illness and disease, and that such knowledge is incomplete unless it combines both aspects of Ryle's knowledge 'that' and knowledge 'how' (1949), both of which are incorporated into the expression 'professional know-how'. Only practice with actual patients can do this in medicine. The metaphor of Victoria Falls, used by one senior doctor to explain listening to heart sounds, said it all (p.183 above).

12.7.3 The work/teaching paradox

12.7.3.i Work is not teaching.

We come here to an important research interpretation which has implications for the service-training dimension and for apprenticeship teaching and learning. It is significant that Dunn *et al.* (p.36 above) found that experts, after carrying out a simulated patient case, were unable to comment on the teaching content of the task. The researchers said that this might be due to the fact that the question came too close to their own clinical reasoning about the case. While this may be true, the findings in this study would also claim that these experts thought they were 'working' on the task and did not readily see it in teaching terms. The fact that experts in this research did not construe that they were teaching when they were working has many implications.

Because caring for patients was perceived as work, a number of participants did not label it teaching although they realised the learning potential in apprenticeship. This finding arose from expressions such as 'I do not teach my junior staff. I give them an opportunity I think, in which they can learn and that is not teaching' (CE); 'When I teach it's not for the patients and when I work, it is for the patients' (3A); 'He doesn't really teach me' (1B).

Although the case study expert recognised the power of facilitated learning which is most certainly an advanced teaching skill, most of these comments would seem to stem from excessively narrow perceptions of teaching which are constricted due to the formal and informal distinctions. This leads to an unnecessarily rigid and impoverished perspective of the teaching process. Apparently, clinical teaching has to contain formal, possibly didactic, elements before it is recognised as teaching.

This contrasts sharply with the conviction that real learning takes place in working with patients. A few experts in this study tended to see teaching as a discrete activity which resulted in a diminished notion of teaching itself and their own teaching skills. Also it was perceived to lead to the inability to articulate these in the first place since their actions in work have neither been fully analysed nor articulated.

12.7.3.ii When teaching becomes coaching.

The changes in consultants' attitudes towards UGs who were largely taught what they should know for qualification and professional purposes, and towards PGs in a work environment, were striking. In the latter case, because over time certain knowledge has been acquired, it is much more a question of selecting incidents or events to reinforce or emphasise more esoteric aspects of diagnosis and management. This is the coaching element of Barrows and Schön (p.56 above) when it is a question of building on, and fine-tuning, the present level of clinical skills.

12.8 Reflection

5. How do expert and novice clinicians reflect on their experience, their work, and their teaching/learning activities?

12.8.1 The context for reflection

Schön's ideas (1987) have been very influential on professionalism, both in providing new constructs and in revisiting old ones for analysing values and practice. It is possible that his reactions to American college curricula which were perceived to be out of step with professional requirements in the inability to reconcile theory and practice issues (similar to Flexner 1925) are less applicable to apprenticeship in medicine where learning skills and gaining experiential knowledge within intern and shadowing relationships is the norm. Schön seems to argue for the very relationships which can be found in traditional day-to-day clinical discourse about patients and watching senior clinicians at work with their juniors. Medicine already works on coaching procedures.

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12.8.2   Reflection-in-action

In the sense used by Schön, 'reflection-in-action' was perceived in this research to be work-oriented in the constant review of patients and their treatment. Schön said himself, that his starting point for this concept was 'the competence and artistry embodied in skilful practice' (1987, preface). In this context, he meant that reflection was held to be thinking about, and analysing what is happening, simultaneously. The dynamic of the ward round can be interpreted as a theatre of action in which the consultant synthesises many clinical tasks while demonstrating diagnostic and administrative competence. Reflection -in-action happens simultaneously during work.

An essential feature of practice is the day-to-day review of patients' tests, investigations, and their responses to treatment. The team must review and consider every decision. This embraces evaluative and judgmental discussion which results in reflection about the patient's condition and progress. Beyond this primary stage, the even more evaluative audit, which may be seen as 'reflection-on-action' takes over, possibly resulting in changes, either medical or administrative, in practice. In ward work, there is often no time for personal reflection which might even be counter-productive to decision-making and getting through the work.

Schön's ideas about reflection-in-action did not directly illuminate clinical teaching in this study. The reasons for this seem to lie in the fact that much about the cognitive aspects of clinical reasoning still remain to be disclosed. Any reflection existed only within patient diagnosis and management discussion. It was interactive, and among master and novice clinicians, it was not personal. (This, naturally, excludes reflection on personal competence on performance outside the remit of this research.) Since work was not construed as teaching, the 'thinking on the feet' aspect of reflection emerged only as changes and decisions about patients and their treatments. If doctors do not believe that they are teaching in these circumstances, then it is hardly possible for a reflective stance about teaching approaches or techniques to take place. This does not mean that it should not take place but within the time constraints of the average ward reflection-in-action about teaching, is impractical. The later reflection-on-action in relation to teaching is another matter which will be taken with the recommendations.

Eraut's theories (p.57 above) are more apt for the clinical setting because he questions the word 'reflection' in favour of explanations of action which depend on skilled responses to situations and

circumstances as a result of experience. The expert acts on intuition, or a sense of alertness, or the ability to view the problem as suitable for experimentation. He also sees the time variable as important, particularly when rapid problem-solving is at stake. The ability to deal flexibly and responsively with specific needs, or to react to predictable and unpredictable circumstances, shows resourceful and knowledgeable reactions and a readiness to respond to varying circumstances.

12.9 A comparative view of clinical teaching and learning

Of all the clinical teaching research reviewed, the Irby studies (pp.35-36 above) have the closest affinity with this study. He also explored clinical teaching by illuminating the approaches of known expert teachers. Using methods similar to this research, he also included a standardised response to a patient case. His mainly UG oriented work was based on teaching rounds and specific meetings, thus giving formal teaching a more prominent role. It is this last factor which is most likely responsible for some interpretational differences in comparison with this study.

Both studies agreed that: experience is the biggest determinant affecting teaching; clinical experience is interpreted as knowledge of many cases (termed by Irby as 'a broad array'); the role of presentation has particular significance. Both studies are in accord about experts' skills and abilities to conduct ward rounds which have dynamic properties, and which simultaneously involve learners. Ward rounds make multiple demands and expertise lies in the corresponding multiple responses which are brought to bear in experts' quick reactions to the context, the patient, and the problem. Experts direct their teaching to individuals with varying needs. Understanding error and learners' misconceptions, they adjust and modify their approaches accordingly. Both researchers agreed that the absence of feedback is an intractable (Irby's word) problem. Noting that experts issue reminders, Irby has said that this provides scaffolding and support for learners. This constitutes a more benevolent and generous interpretation of the attributed early warning assurance system interpreted in this research.

Irby found credibility critical to juniors' acceptance of the senior role. This possession and application of skills and competencies has a direct parallel with Spady's concept of legitimised control and sapiental (knowledge and expertise) authority as already discussed (12.6.2 above). Irby also found that all his experts, as those in this study, shared certain characteristics including a deep knowledge of internal medicine with the concomitant Socratic qualities of enthusiasm and commitment to teaching. Both

studies showed that positive role models, stimulating teaching styles, and individual approaches made considerable contributions to clinical, as to all, teaching. Irby's experts were also able to draw on a large repertory of activities, analogies, and resources which were deployed with little effort.

Irby has described how experts display their knowledge in making specific, pre-planned points about illness scripts (cases, conditions, diseases) which represent cases in the memory. He uses the phrase 'set structures to the conversations' (1992, p.637). Fundamentally, this is consonant with the use of set teaching points in this study. Irby makes the point that known factors about illness scripts can readily be applied, indeed with automation, thus cutting down on cognitive effort. When scripts are known, the information is readily available but when cases are less well known, experts have recourse to use more reasoning and to thinking on their feet. This gives rise to Irby's statement that clinical teaching is both improvised and scripted.

Irby describes team interaction as 'conversations', which has its parallel in the emphasis on discussion and discourse within the routine use of clinical methods in this study. However, he neither describes nor comments on this as the phenomena 'thinking aloud' and 'continuous commentary'. He does say however, that in articulating ideas about practice, 'They (experts) often make explicit their own implicit or tacit knowledge and reasoning' (1994b, p.952). This study has focused on consultants' actions, as well as what they say (their decisions about patients), but the fact that two researchers agree that reasoning is disclosed in discussion or conversations has implications for asking not how, but how much, tacit knowledge and expert reasoning are revealed in the clinical reasoning process in ward work.

Both research programmes referred to the same clinical reasoning research which sees the diagnostic process as a staged process, initially using hypotheses arising from rapid pattern recognition to diagnose patient problems, before resorting to more complex reasoning for difficult cases (Schmidt *et al.*, p.66). Such a process involves rapid retrieval and matching of information about previous patients. Irby's experts, as those in this research, described their thinking about the diagnostic process in terms of 'fit', 'holistic pattern recognition', matching patient 'profiles', or 'reconstructing a picture'.

In this study, the management decisions ensuing from discussion, point to the staged procedural process, both when the diagnosis was known and unknown. While this staging may exist without pattern recognition, the expert clinicians (and clinical validators) in this study spoke of 'goodness of fit' or signs

and symptoms which conformed to, and/or gave confirmation of, clinical patterns or pictures. This reasoning, often appearing as salient data gathering and amassing significant details in the style of 'forceful features' (Grant and Marsden 1987), facilitated either the diagnostic process or the management process, or both of these. However, as noted earlier, this does not account for discarded information in reasoning. Certainly the consultants were imposing a pattern on what was being said or found and rationalising events in the process (Grant and Marsden, p.61 above).

Contrary to Irby's contention that the clinical learning environment is unstructured, this study found it to be highly *structured* through hospital routine, and standard clinical methods and procedures. Presentation itself, structures clinical activities. Strangely, Irby seems to contradict himself in his admission of 'standardized formats for ward rounds, consistent ways of allocating time, structuring case discussions, use of canned presentations, and use of generic questioning strategies' (1992, p.636) all of which are consonant with the descriptions and findings in this thesis.

Contrary to Irby's finding that pre-planning was a feature of his experts' teaching, in the average ward round in this study, there was no evidence of planning. Irby found that his attendings pre-planned the round. They assessed learners' needs, set priorities for the use of time, and made decisions about which case to highlight. In UG teaching, this may be more a feature of checking in the corridor to avoid seeing the same cases or using teaching orientations as advance organisers (Ausubel 1963) rather than extensive pre-planning. Only in the case study expert's UG teaching, which was not a full ward round but teaching based on selected ward patients, was there evidence of pre-planned teaching. Planning tends to belong to structured teaching and this is incompatible with the usual round, even if it is a designated teaching round. In this research, experts knew about ward patients in advance, having been pre-warned about circumstances in the briefings. However, there was no evidence that this was transferred to any teaching on the ward. Consultants made comments in direct response to patient conditions as presented, either at the briefing or on meeting the patients on the ward. However, Irby has not emphasised the differences in the two parts of the round and the corresponding effects on learning.

12.10 The diagnostic and management processes

6. How is the diagnostic process taught beyond the acquisition of basic skills?

12.10.1 The diagnostic process

The most important statement about this question that can be made from this research is that at no time was the diagnostic process taught as a distinct entity other than in the UG period through the application of clinical skills and technical knowledge. PG interviewees simply did not comment on how the diagnostic process was taught. This is very significant. How did they learn if not from teaching? Apart from being advised by seniors, they appeared to learn from their own existing knowledge of clinical skills and actions, and putting these and theory into practice. They also learned from consultants' decisions about patients.

In general terms, it was possible to connect several points that Benner and Glaser (p.20, p.50 and p.52 respectively above) made about expert action with actual consultant diagnostic practices on the wards. Consultant actions were (at face level) fast, precise, and confident. They were able to process information from different team personnel and deal with irrelevancies, stripping things down to essentials. This tells us only how things appeared in practice, not how it happened in their thinking processes, although there was some small evidence in one SHO's comments on experts asking fewer questions, substantiating this feature of expertise (Gale and Marsden, 1984).

Features of the ways in which experts perceived their diagnostic practices have been reported, for example diagnosing on the basis of signs and symptoms, using exclusion factors, and describing versions of pattern recognition. These approaches are broadly in agreement with those as explained by Elstein and Norman (pp.60 and 63 above). On several occasions, the data showed that experts were inclined to opt for the commonest causes and conditions, but they also considered wider diagnostic options when compared with junior doctors. One consultant's style was to quote statistical, probability issues in relation to prognosis and diagnosis.

12.10.2 The staged process or the pragmatic pathway

SHOs commented on, and coveted, decisive management as a feature of expertise and they took away messages from demonstrations of competence in this area. Management, like the other PG clinical activities, was to be experienced and assimilated rather than explicitly taught.

Watching medical professionals at work gives the distinct impression that practice has a logical order. The UG fieldwork emphasised the systematic, orderly observation and teaching of clinical signs, history-taking, and set sequences in the examination of systems. The students were taught to present their findings logically and precisely. Procedural actions took place in a number of ways according to case severity. The ward round routine, and the methods used to discuss each case in turn did not vary. Nor did the procedures for dealing with undiagnosed cases. Management was observed to be procedural, staged, and sequential. In practice, this meant taking a series of prioritised measures such as: making the patient comfortable or administering pain relief; reassuring the patient; excluding factors or limiting the differential diagnoses; and instigating investigations to provide more answers.

With difficult and often undiagnosed cases, a staged process was followed according to the pragmatic decisions indicated by the case study SHO (p.156 above). This agrees with the clinical reasoning theorists (Schmidt *et al.*, p.59 above). There was acknowledgement of uncertainty and acceptance that a final diagnosis might never be known. These management steps are part of clinical methods and appear to be taken for granted by the profession. Therefore, depending on the case, the diagnostic process is learned through the staged management process.

The majority of all interviewees said that experts intervened less in management. Fewer said that consultants were prepared to take risks in 'wait and see' approaches to patient care. Learning to do nothing is a sign of experience and possible clinical maturity. However, this has to be tempered with one consultant's stated preference that, where junior doctors are responsible for patients in problematic situations, it is better to treat than not treat.

Whatever the method of diagnosis, and there seemed to be many approaches, the knowledge used to diagnose cases was integrated and specific. In the integrated sense, it appeared as condensed or compiled, rich networks of knowledge (Lemieux and Bordage, pp.62-63 above). On the wards, discussion about drugs and patient reactions to treatment were major aspects of care. In these instances, expert knowledge appeared to be deep and specific. Experts had readily available advanced knowledge about drugs and their effects, presumably superimposed on more elementary biochemical and pharmaceutical knowledge.

12.11 Congruence in participants' actions, teaching and learning, and explanations of practice

7. Are clinicians' theories of teaching and learning consistent with their practice?

12.11.1 Words are consistent with practice

Irby found congruence in what experts said at interview about their 'knowledge, reasoning and action' and what they did in practice; their comments agreed with what their students reported and what his transcripts of rounds verified (1994a, p.339). These findings concur with the evidence in this research where descriptions of practice were congruent with what actually happened on the wards. In this thesis, researcher observations of expert behaviours and actions were confirmed (or originally cited) by SHOs and in their interviews. What experts said they did, they did in practice. This means that, contrary to Schön's views, theories-in-action were congruent with espoused theories-in-use but Irby does not make this connection.

12.11.2 Denial of personal skills and attributes

In all three phases, most questions which directly solicited personally valued skills or attributes, were fielded with difficulty by participants apart from two of the ten experts who were comfortable with discussion about these. However, as the evidence showed, it was much easier to relate values to work when experts were articulate, responsive, and generally more able to comment on their diagnostic competence and management efficiency and in which they clearly took pride. Explanations about the inability or reticence to discuss personal skills are elusive and it may be either that the profession is unused to being open to what amounts to personal appraisal in these terms, or that the general tendency is to be critical most of the time, resulting in suppression of personal attributes and effective teaching characteristics.

The problem becomes more acute in relation to teaching within the service/training dimensions because a more comprehensive analysis of how learning occurs in work, both in terms of method and content, is required before teachers can locate their own strengths and weaknesses within its framework. Such an analysis would make reflection and feedback more precise.

12.11.3 Match and mismatch of opinion

A number of miscellaneous issues which are connected in the need for further research come together under this heading. Firstly, it must be said that participants' opinions on most questions agreed rather than disagreed, but this was within the constraints of describing only good practice and articulating excellence in work and teaching. There was consensus agreement between seniors and juniors about the need for practical experience and all that it embraces, as illuminated by this research. There was also agreement among SHOs about their consultants' skills and expertise, and in their perceptions of formal teaching. The so-called 'informal' aspects as described here are not sufficiently understood by either grades.

Differences of opinion occurred mainly in perceptions of error but with two provisos. There were insufficient data about how errors were corrected since senior explanations, outwith the context of real mistakes, did not adequately cover their approaches to correction. Secondly, the classification of error identified in the study (p.172 above) is naive and over-simplified and ultimately unsatisfactory because it largely depended on hypothetical examples of junior error.

Nevertheless, focus on errors as needs brought history-taking to the fore as a very complex skill. Throughout the research, experts emphasised history-taking in listening to the patient, taking cognisance of the patient's story, asking neutral questions, and the importance of the presenting complaint. Learning to control the patient in the history was perceived as an advanced communication skill. That history-taking was cited by senior doctors as error at SHO level, demonstrates the weaknesses in this area.

More information is required about two management issues, the areas causing most disagreement between senior and junior doctors. The first concerns drug choices, and the second concerns the opinion of a number of SHOs that they would have got the same results as their seniors with regard to certain instances of patient care. Both of these issues need much greater substantiation and evidence as a basis for future discussion.

12.12 How craft knowledge in medicine is passed on

12.12.1 The recapitulation of the argument

The clinician's task is to diagnose and manage patients' problems. This requires professional know-how or the craft knowledge of medicine. However, there are inadequate descriptions and explanations of how this knowledge is passed on in apprenticeship. The aim of this research was to provide these.

The research began by accepting that a considerable body of knowledge already existed about the teaching of clinical skills such as history-taking and the examination of systems. The quest to find substantially different interpretations and descriptions about how experts passed on their knowledge required the correlation of four main threads.

In relation to expert and novice clinicians, the research had to: 1. clarify what constituted CK in medicine; 2. elaborate on the role of experience; 3. illuminate apprenticeship; 4. explain the ways in which clinical CK is passed on. These inter-related issues represent the complexity of professional practice confronting senior physicians in everyday ward routines, clinical practice, and teaching/learning activities with junior doctors and students. In fulfilling their roles, the expert participants in this study demonstrated their expertise in all of these areas. It is possible to make some strong claims about the nature of clinical expertise in work and teaching as a result of the expert characteristics disclosed by the research. These have been summarised (pp.127-28; 160; 180-81; 205-6 above) and will not be repeated here.

Craft knowledge in medicine may be relatively easily defined in common parlance as the knowledge, skills, and attitudes required to practise medicine. However, elucidation beyond this phrase requires a daunting list of content and values which often defies curricular theorists. The task of this study has been to clarify how apprenticeship, as a learning model, facilitates the acquisition of this theoretical and practical knowledge, particularly in the PG period.

Experts' skills and individual expertise are the products of their experience, perceived to be knowledge of many diverse patient cases. However, in their work, experts drew on different kinds of experience: knowledge of medicine; hospital organisation and management; practical skills; a deep knowledge of learners and their clinical requirements; different strategies and approaches to teaching; and their own individual expertise in medicine and teaching. They used and integrated all of these in dealing with patients, colleagues, and students.

Apprenticeship experiential learning is a powerful medium which accommodates learners at different developmental levels, from novices with limited responsibilities, who are party to teamwork discussions at the bedside or elsewhere, to the coaching of junior doctors according to their experience and abilities. The model also allows for varied relational experiences, with participants learning from each other according to their place in the career structure. The system facilitates the integration of work, safe

practices, and teaching/learning through patient care. According to the level and experience of the trainee, apprenticeship is able to change its role to cater for different needs and approaches to the teaching/learning processes.

The apprenticeship model is sustained through the clinical and teaching expertise of senior practitioners who adjust and direct their knowledge appropriately. The twin concepts of learning by doing, and teaching by doing, safeguard all participants within apprenticeship and are the key to medical CK knowledge acquisition.

12.12.2 How clinical CK is passed on from expert to novice

The CK of medicine and the CK of teaching it co-exist in a symbiotic relationship: the former is acquired through the clinical process and in working with senior practitioners; the latter embraces its own terminology, understandings, and concepts which are acquired through similar means. A knowledge of both crafts is required for effective clinical teaching.

Both the crafts are the products of experience and the experiential process. The manifest range and diversity of the expert's skills are transformed by individual experiences into individual versions of various kinds of craft knowledge. As experience grows and skill fluency increases, these may become more individualised and identifiable in idiosyncratic clinical practices and teaching. Thus all forms of CK, like skills and abilities, can vary qualitatively from practitioner to practitioner. The research has shown that there is a core of clinical CK which is available as specific teaching points. Teaching also possesses a core of concepts which can be shared and discussed to improve performance, the quality of service, and education.

Knowledge to teach draws on generic, pedagogical theoretical and practical skills such as how to plan teaching, supervise, give feedback, and provide reinforcement, as well as a knowledge of learners' individual needs and development. Knowledge of medicine is only partially passed on in teaching, being transmitted without explicit aims, objectives, and pedagogical structures, through tacit understandings and as a result of situated learning and shared experiences. Particularly in the PG field, experiential learning comes more sharply into focus. The tacit dimension remains to be fully explained but it may be assumed to be linked to the clinical reasoning process and decision-making where understandings between clinicians about diagnosis and patients are not always made explicit. Tacit teaching also takes place,

probably increasingly so, as professional knowledge of practice is revealed and depth of meanings are established in the work process. The craft (skill) of imparting the craft (method and content) applies to all professions and is embedded in the expert practitioner creating a teaching/learning synergy.

Elaboration of the Spady analysis of authority provides a theoretical framework for teaching and learning in apprenticeship which has hitherto been lacking. This framework embraces two main constructs, the second of which has two parts: clinical practice; clinical expertise and teaching learning expertise. To these can be added a third dimension which has always carried credibility in medicine, that of a charismatic approach. These constructs were derived from grounded theory and the relevant categories validated. They are now depicted within an overlapping, rather than linear, framework in Diagram 2 below. The diagram also shows that they are firmly rooted in apprenticeship.

Clinical Practice

Experiential learning in 'seeing patients'; learning through putting clinical skills into practice; learning from participating in teamwork, presentation, and discussion; sharing decisions about diagnosis and management; the staged process

Social
Traditional - Experiential

APPRENTICESHIP

Individual
Expert - Charismatic

Expert clinical expertise
superior knowledge; an holistic approach; legitimised competencies in diagnosis and management
Expert teaching expertise
knowledge of learners and their development; preparation; setting objectives; individual strategies; supervising; questioning and feedback skills:
(*expertise in curricular theory and assessment**)

Charismatic influences
positive role modelling characteristics; an enthusiasm and commitment to medicine; leadership qualities

not in this study

Diagram 2:
The components of clinical craft knowledge and teaching craft knowledge integrated in the social and individual perspectives of apprenticeship

12.12.3 Clinical CK acquisition: the 'Traditional-Experiential' and 'Expert-Charismatic' dimensions of apprenticeship

Learning to be a clinician is achieved through participation in work based on ethical, often with legal connotations, codes of procedures. Cognisance must be taken of the effects that the patient's presence and needs have on all participants. This aspect of medical knowledge has its roots in the authority of

traditional approaches to the patient, and routine, highly developed methods of clinical practice. The latter consists of the distinctively clinical skills of observation, history-taking, and the physical examination which are required in diagnosis and management. The case presentation, the means of exchanging information about patients, is central to practice. In a unique learning dynamic, the craft knowledge of medicine is passed on in the interaction of clinical discourse and commentary about patients. In this experiential process, experts facilitate juniors' engagement and ownership in the work process while passing on their knowledge and expertise.

Learners acquire their knowledge through the expertise of senior practitioners which is acquired through experience of both medical practice and teaching, leading to expertise in both fields. Clinical experience of many patients is manifested in a range of skills and individual approaches which experts bring to bear on practice and educational activities. Novices legitimise the teaching/learning processes through their recognition of expert competencies and the authority of earned respect. Although not included in the validation process, respondents commented on the charismatic and positive role-modelling influences which make powerful contributions to teaching/learning activities, particularly when associated with vocational enthusiasm and the authority stemming from strong leadership.

12.13 Further research and development

There are three possible dangers at this time of higher specialist training reforms. The first concerns the continuity which currently exists, even to a limited extent at trainee level, in both patient care and senior/junior supervisory relationships. Any changes to the present structure of this continuity may damage this delicate balance to the detriment of the whole system. The second lies in the ways in which new perspectives on learning have emphasised the context of socially and communally acquired knowledge. At a time when this aspect is taking on new meanings and research and developmental interests, it would be unwise for medicine to dilute apprenticeship in the quest to achieve greater structure which may not be the real issue at stake. Thirdly, this study has shown that pedagogical interests are well served without setting aims and objectives and without a didactic emphasis. Learners learn from conversations, small bite-sized explanations, and in brief words and asides which contain the essential information and hands-on knowledge. Within this framework, they already set their own agenda, reflecting a different form of self-directed learning than has been previously understood. If this is so, with guidance, they can do more about imposing their own structure on content rather than have excessive amounts laid

down in pre-determined measures. It is not the structure of apprenticeship which is in doubt, but deeper understandings of practitioners' skills and the ways in which apprenticeship learning are construed, that are at stake. While experience itself cannot be the only teacher, neither are formal training and excessive amounts of teaching the answer to the problem. Learning has been shown to be a highly individual, selective enterprise which depends on variable content needs. Experiential learning, if properly understood, makes it possible to reduce the service-training conflict. Individual learning and subsequent feedback are largely determined by work. These principles have been developed by Grant and Marsden in service-based learning (1992).

Given that studies which parallel this research would be welcome in order to strengthen generalisability and to substantiate or refute the findings in general, a number of specific research topics arise from this study.

1. It is important to gather more information about the ways in which senior clinicians perceive their work in relation to teaching and learning. Research is needed to qualify the finding here, that some doctors do not think they are teaching when they are working and yet doctors in training are clearly expected to, and do, learn from the process.

2. This issue impinges on doctors' abilities to acknowledge and improve the strengths of their own skills in practice and as they relate to individual teaching/learning activities. Is denial or reticence to air personal skills and abilities an idiosyncratic finding or does it extend to the profession at large? Any research about this issue would also allow insights into the nature of reflection in the practice of medicine and how it affects feedback and motivation. Positive feedback skills and appraisal techniques should be the subject of all educational development work.

3. This research has highlighted, that at the PG level, the diagnostic process is a learning rather than a teaching task. The findings share similar concepts with clinical reasoning experimental research. This has happened through the exploration of experience and experts' skills from the teaching perspective. For example: the data warranted interpretations of experts' memory powers in terms of storage, retrieval, and application of knowledge; that experts make qualitatively different responses to questions compared with novices; that participants alluded to, or gave versions of, pattern recognition, exclusions, and probabilities in the diagnostic process. There were also very tentative indications of 'closing the problem space' as they occurred in thinking aloud and commentary

about patients. It is this last aspect, 'thinking aloud', which requires research in teaching/learning activities. In the past, the results of clinical reasoning research have been applied to teaching. It is possible that teaching and learning can shed some light on clinical reasoning. What happens in *commentary and discussion in the action of patient care is worthy of future attention.*

4. Junior doctor errors, and seniors' responses to these, warrant a full investigation. Apart from a more intensive classification of error which would facilitate coaching and correction, there is an anomaly between the findings in this study which found that some junior doctors said that they would broadly do the same, and achieve similar results, as their seniors with regard to management, and yet inexperience is manifested in a number of administrative errors, including wrong drug dosages. Mismatch of opinions between grades about the usage of drugs is a related issue. Another concerns the number of errors which were connected with inadequate history-taking at SHO level. More accurate information is required in order to correct history-taking deficiencies at UG and PG levels.

5   The weaknesses in apprenticeship (p.214 above), although not the primary concern of this research, must be addressed. Medical education must embrace a wider, more comprehensive, approach to the rich concepts involved in apprenticeship learning and teaching. All clinical teaching and training programmes should make this their priority.

6   The research did not set out to be a defence of apprenticeship but it finishes on this very note. The identified values and advantages must not be lost at a time when the system is vulnerable. Because of decreased junior doctor hours arising from 'The New Deal' and developments in higher specialist training, teaching at SHO level is becoming more compressed and structured. While there are undoubted advantages in this, there are also dangers. Although there is a drive towards learners setting their own objectives and agenda, teaching may become more teacher-centred and didactic by being constricted into shorter time scales. Didactic teaching is not at the heart of apprenticeship which offers unique opportunities for diverse forms of teaching and learning. These should be recognised and strengthened. Nor are there quick, easy ways towards learning to teach. The craft knowledge of teaching needs its own apprenticeship.

Apprenticeship, perhaps, will not need to be re-invented but simply recognised and valued as the informal, interstitial fabric of medical education within which the visible formal structures function (E.G. Buckley, 1995).

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APPENDIX A CASE STUDY OBSERVATIONS AND INTERVIEWS

Grade		Observation Event	Venue	Interviews			
Senior				Consultants	SHO	HO	UG
Consultant		research preparation	office	2*			
Consultant +	SHO	ward round		1	1		
Consultant +	HO	ward round		1		1	
Consultant +	UG3.1	ward round & tutorial	tutorial room				1
Consultant +	UG3.2	clinic		1			1
Consultant+	UG2	ward based					1
Junior							
SHO+	HO	ward round			1	1	
SHO+	UG3.1	ward round			1		
SHO+	UG3.3	clinic					1
			Totals	5	3	2	4
			Total Interviews	14			

In these audio-taped preparatory interviews, the case study consultant explained his views and approaches to teaching and medicine.

Questions for consultants

1.   What does the term 'experience' mean to you?

2.   Does medicine get simpler with experience?

3.   What are SHOs' learning needs at this stage?

4.   And this SHO...?

5.   What aspects of your job are you good at passing on to young doctors?

6.   What kinds of mistakes do young doctors make?

7.   And how do you deal with these?

Questions for SHOs

8.   What does the term 'experience' mean to you?

9.   Does medicine get simpler with experience?

10.   What are you learning at this stage?

11.   Do you find any of this difficult?

12.   Tell me what's good about your consultant's teaching...

13.   What do you understand by the expression 'formal teaching'?

14.   What's good / bad about it?

15.   Do you ever make mistakes?

16.   How are these dealt with?

APPENDIX C INTERVIEW STUDY VALIDATION EXCERPTS

The Interview Study

Excerpts from Working Transcripts, May 1994-June 1995 and summaries of the clinical validators' (CV1 and CV2) comments. Context: ward briefing sessions.

Strong categorisation similarities used by CV1 which parallel the researcher's previously defined categories and issues are underlined; differences noted by CV1 are in italic print. CV2's comments are included where given in discussion, with actual words in parenthesis. Again issues not picked up by the researcher are in italic print. Context (unless stated otherwise), ward briefing sessions with Consultant, SHO, HO, and Nurse present.

Case 1. A multiple sclerosis patient

C1	Mr C was diagnosed to have multiple sclerosis although he's been coming to the clinic for a while and he had just come with an inferior infarct, uncomplicated. He's a 40 cigarette-a-day man so it doesn't seem as if he'll manage to stop.
HO	Wonder if he'll stop?
C1	From his infarct point of view, he's had an uncomplicated infarct with...he's had good reperfusion. He would come in on Saturday I think ? (HO said '30th') so he's probably going to be ready for home tomorrow.
Nse.	We were just checking that he's had some rectal bleeding but we thought it was just Haemorrhoids
C1	Right
Nse	...and protein in his urine which upset the main issue
1A	Right, OK
Nse	He's up and about fine
SHO	Was he written up for Heminevrin or something that he might have been taking at home?
Nse	He's on 3 tablets, 3 times a day (loud door banging)...he's walking about with it right enough
C1	Why do you ask about Heminevrin?
SHO	Alcohol
C1	I thought his alcohol problem was away in the past
SHO	I agree (laugh!) But I just remember that - them mentioning that he was on it
C1	Originally, when he first presented, he presented with ataxia and it was eventually attributed as an alcoholic peripheral neuropathy - but it's just got progressively worse and his MRI scan which - the report is in there -- is apparently typical of sclerosis - that's it there, you've gone past it - ventricular high signal lesions best seen in one distribution, partly typical of sclerosis. They don't give any pictures... (laughter!) You'll just have to take their word for it .
SHO	Is he followed up by the neurologist?
C1	No, No, OK. (3.5.94 Tape 000-038)

Validation

Case 1 CV1

The consultant's skill is in making a <u>succinct presentation making it possible</u> for the nurse to offer extra information; the action then moves to what does not fit the case and the consultant takes on board new information and re-focuses the discussion. Consultant skills include: <u>clarifying</u> *aetiological factors* in a complicated <u>presentation</u>; picking up cues; and placing events in context and *in a continuum*. The excerpt illustrates how information is put together in practice as opposed to in a text book.

Case 1 CV2

CV2 noted <u>the 'rapport' between the consultant and SHO and consultant attentive listening to the team</u>

Case 2. Female patient recently returned from USA with haemoptysis and other complications; partially diagnosed

C1	There's all the volume on Mrs X from America - as part of their investigations she had a nodule in the right upper lobe and they wanted to follow that up. If she hadn't left America, she would have had a broncoscopy and maybe even a lobectomy as well. Maybe we should just review her X/Rays from that point of view. She was last here six months ago - she's on a big range of treatment. I see she hasn't actually had her INR checked for 3 months
SHO	When her tooth was taken out, they just stopped it - and started it again at 10 on the level - when she first came in it was 1.5 on her loading dose of 3mg. for two days... gave an extra mg. and then started it at 10 on the level. That night we were going to put it up to 4mg each day - that immediately brought it up to 2.5. We were thinking of giving her 3 or 4mgs alternate days to see if that...
C1	I would try and keep it simple. I wouldn't give her 3 and 4 on alternate days. Three (3) or 4 mgs. ... if anything happens. She's not very good on her compliance (3.5.94 Tape 048-060).

Validation

Case 2 CV1

A very different case in which the noticeable elements were the very direct practical management situation and the SHO's theoretical approach. <u>The consultant simplifies the management plan and imparts knowledge directly</u>.

Case 2 CV2

A case in which the history is important and where they are really beginning again. They are reviewing the X-rays and taking it from there. They are doing it in a staged process and checking all aspects of the case.

Case 3. Partially diagnosed female patient: a puzzling asthma case

Context Case 3 : 'post-waiting' ward round briefing session with Consultant 2, SR, SHO, HO, student, and nurse, present

C2	So it was mild to moderate rather than severe?
SHO	Yes
C2	Peak flow?
SHO	Peak flow was a 100 and ... wasn't very good. Her PO2 was only 7...4.8
C2	That's interesting. X/R's clear - a PO2 of 7 is out of keeping with the rest of the picture
SHO	...7.8, haemoglobin 14, ESR 54. The only thing I've noticed is her BM is a bit up and she's got sugar in her urine
C2	So how will you manage her? (said to the team) Why do you think she's so hypoxic when everything else is pretty minimally disturbed - you have to accept that - except that everything else is fairly mild?
SHO	Yes. Was the gas fairly straightforward?
C2	Yes, Oh yes
SHO	she a smoker Her chest's not deformed really is it? ... She 's got...slightly...
SR	We didn't actually say what her gases were on previous admission. I don't think that they were all that good actually
C2	Is? You've seen her before? (said to SHO)
SHO	Non-smoker, but again I don't know how reliable her history is
C2	So she doesn't have other - er - unrelated hypoxic lung disease?
SR	The only other thing is that she's working in a condenser factory...
C2	What's a condenser? (explanation indistinct)
C2	Right, OK - So, it's only slightly curious she's so hypoxic. Did you repeat the gases on oxygen?
SR	They weren't actually 35% by the time we got back to see her
SHO	Previously, her PO2 was about 11 with a CO2 of 4.5
C2	That's what you would expect with asthma - so, she's inappropriately hypoxic for the other indices of severity. What else would you think of?
St	She's got an infection? (Student response)
C2	Infection - but there's no evidence of that - She's not got any moaning
SHO	She's not had any chest pain or anything like that
C2	Pulmonary embolism would be the other wouldn't it?
SHO	She had a couple of episodes of haemoptysis several years ago but not since then
C2	So we're slightly...so if the test doesn't fit in with the rest of the clinical picture, and you can't think of a good clinical reason for the slightly aberrant test result, you're usually pushed to repeat the test, or the test is wrong. I'm not suggesting it's the operator but it could be all sorts of things between him taking blood and someone in the ward taking the phone call for the result (4.5.94 Tape 000-061)

Validation

Case 3 CV1

A clinical presentation where the details do not fit with the clinical diagnosis and in which the consultant challenges the SHO to consider possible causes of a feature which does not fit the provisional diagnosis. The learning or message is not to let things slide unnoticed and not to accept test results too readily. *According to CV1, this exchange was a clear example of the hypothetico-deductive model of clinical reasoning, the effectiveness of which depends on how rigorously it is applied and tested.*

Case 3 CV2

'In this case, the patient has a pattern of signs and symptoms which do not go together - they are looking for a pattern of signs and symptoms which go together and her's don't...diagnosis by signs is what they're doing. The signs are the PO2 and the peak flow and looking at the chest to see if it is deformed which it isn't'. They are checking that the patient hasn't got an infection and is a non-smoker. *The SHO is making a differential diagnosis of why the PO2 would be 7'. The patient is not as ill as previously but areas of doubt remain. The process is being taken back before going forward.*

Case 4. Undiagnosed female patient who was admitted with dizziness

SHO	No visual symptoms, no headache - she had been seen in casualty yesterday she had postural hypertension and that's why she had been sent up but we haven't been able to document that she's got a postural drop - but certainly when she stands, last night when she was standing up, she was feeling very unwell and had to lie down again. She's much better this morning.
	Examination is fairly unremarkable. I think we detected a nystagmus...she's apyrexial, fairly under stress in her home... (discussion with nurse about patient's ability to get to toilet and Consultant asked about the patient's nystagmus and her ability to turn her head around)
SHO	I didn't actually do...extensors... but she's got real nystagmus. It does sound like Menieres to me
C3	Too young - she's too young. If it's anything, she ll probably have acute labrynthitis
SHO	Acute labrynthitis, OK (discussion about patient's blood pressure and social history: C3 continued to probe the history
C3	And she'd been out to the pub and felt giddy there - that's what she says
SHO	She wasn't drunk
C3	Did you do a blood level alcohol?
SHO	No
C3	And if somebody is falling down and they've been out to the pub, I think if I were you, they might be intoxicated!
SHO	That's true - I mean - I was told she d been out to the pub so I was expecting that but she wasn't drunk
C3	I think it's a bit much - if someone goes to the pub - they couldn t have been feeling ill before they went to the pub - it's very unusual if they did
SHO	That's true (laugh!)
C3	She's better this morning as well

SHO   Yes
C3   I think it's always worth while taking the glucose ... because you don't need to get the alcohol measured when they're in
       A&E and you can return the next day routinely and if its not causing a lot of additional expense to the ... if was high - if
       the glucose was high - we'd be home and dry to suggest intoxicated...we could try to ... her... so she's better this morning?
       She might be able to get away
SHO   What age does Menieres usually present?
C3   Well, it's elderly - it should be a disease of the elderly - it's not alcohol induced! (laughter! 11.7.94 Tape 050-082).

Validation

Case 4 CV1

The key feature here rests in identifying important non-text book factors in a history. The case represents
the real world in which patients present. The consultant advises on the *practical use of time in
investigating a clinical problem.* After the SHO's 95% correct summary, the validator *commented on the
lack of positive reinforcement from the consultant.*

Case 4 CV2

The symptoms are the dizziness; the simplification is in going for the obvious diagnosis first. The case
again emphasises team rapport

Case 5. Male patient with severe oesophagitis but with other undiagnosed problems

C3   What have we found then? That he's uraemic isn't he?
SHO   He's uraemic
C3   To what sort of level?
SHO   His creatin has gone up - his creatin is 620
C3   That's why he's being sick
SHO   So we're getting all these tests
C3   So we're getting an ultra-sound scan?
SHO   Yes
C3   We're not sort of giving him anything that's hetero-toxic are we?
SHO   Unless it's one of the anti-fungals? I'm...
C3   He's taking lozenges isn't he? I don't think we can implicate anything there unless Amphoteracin (?) Do we have a
       previous urea? Do we have a urea or creatin from six months ago?
SHO   No
C3   Is there anything in his urine...any sediments? proteins? The other thing was - didn't he have a high sedimentation rate?
SHO   A 100, yes
C3   So that - right - we have a little...he has...Bence Jones (Nse) - make sure that we check his calcium - get an ultra-sound
       of his kidneys and bladder - I mean, it looks like he's uraemic and that's the cause of his nausea and vomiting - and we
       should give him some regular ... his calcium
SHO   Yes
C3   But his albumin is low
SHO   Yes slightly - 33
C3   Alkaline phosphates high?
SHO   No.
C3   You'd expect an elevated alkaline phosphase but not in myeloma. You don't get any osteoblastic activity. You get lytic
       spots but no new bone formation which is osteoclasts not blasts - so alkaline phosphate is normal in myeloma but in bony
       secondaries is high but not in multiple myeloma - Part 1 MRCP question. OK. So it looks like we've got to investigate Mr
       X's renal failure, so let's do those things before you ...and take it from there. He's not the sort of chap, I imagine you
       would dialyse...I wouldn't have thought so...so let's find out what's going on anyway, whether this is reversible or what's
       happening (11.7.94 Tape 116-148)

Validation

Case 5 CV1

Another case in which the consultant identifies a key investigation in differentiating between two possible
diagnoses and *the pathophysical basis of the test.* CV1 emphasised the consultant's skills in the 'sharing'
of ideas and how, in the gradual clarification of the case features; he 'engages' the SHO so that the latter's
contribution is recognised *and they come upon a solution together.*

Case 5 CV2

*The patient has renal failure and is beyond dialysis but the team is in the process of finding out what's
going on; in outcome, maybe can do nothing.*

Case 6. Young, pregnant woman with a deep vein thrombosis but the underlying
cause is unclear

C3   So we've got to think of pro-thrombic problems
SHO   Are pregnant women more hyper-coagulant?
C3   They said to me but I can't remember, the obstetricians saying they had looked at the series, and less than 1% of women
       in pregnancy get a deep vein thrombosis
SHO   Right
C3   It's unusual. So we've got to ask ourselves 'Why has this happened?' So I think we ought to just check her sedimentation
       rate and do a prothrombic screen - there's no family history and I would just confine myself to doing these things. I
       would give her 7 days intravenous Heparin and then convert it to 'bd' subcutaneous Heparin - I would give her something
       like 12 and a half thousand units 'bd' and, I guess we're sure to be running on about 30,000 units a day at the moment...I
       don't know what she is?
SHO   ... 40,000

C3   I think, if someone's had an extensive venous thrombosis, they need to have IV Heparin for at least - if you give it for anything less than three days, we know it's ineffective. I think, if someone's had more than a carping (?) thrombosis, they should have it for a minimum of five days. And if someone's had a large... or vein thrombosis, I'd give Heparin for seven days. That's what I would do

SHO   Seven days?

C3   Yes

SHO   And start Warfarin after about three days?

C3   Well, I think that they should be adequately Warfarinised by the end of that period of IV Heparin - and I think that the obstetricians were going to organise another scan for her - were they not M? (appeals to nurse) - a growth assessment scan, that's what they said to us. Who's looking after her first child? Is that Mum? Do we know what's happening? (11.7.94 Tape 116-193).

Validation

Case 6 CV1

The main points here were the need to contain investigational enthusiasm within reasonable limits (experts intervene less); and an holistic approach emphasising the practical aspects of patients care and social constraints.

Case 6 CV2

This case is a difficult one to follow and shows, in the uncertainty, the team involvement 'asking the nurse this and that'. *Patient has DVT and pregnancy is a cause but there may be a pre-disposing cause. It may be that she has something in her blood. For future management, as good practice, and in case she gets pregnant again, the team is looking for the added cause.*

Case 7. A male patient with terminal cancer and other undiagnosed problems/

C3   It's a mitral valve he has, hasn't he?

SHO   Yes - Star Edwards mitral valve

C3   Because, obviously if he developed an early diastolic murmur, that would imply that he had aortic incompetence not preliminary failure of the prosthetic valve?

SHO   That's right

C3   You'd be expecting a mitral incompetent murmur. His mitral valve has recently be had a perivalvular leak - so if we're saying he's got shortness of breath ... is more than acute, he's got acute carditis hasn't he? He's ill -and he develops a murmur quickly. That's an acute carditis

SHO   Right

C3   Sub-acute...chronic...I think we've done a lot of blood cultures. We don't know whether he's a... and we're organising and echo...important to confirm are we right in what we are Is the valve working properly? Is there major dysfunction of the aortic valve? (discussion of atrial fibrillation, and drugs including increasing diuretics)

C3   Repeat blood tests today. Are we prepared?

SHO   Yes

C3   OK (11.7.94 Tape 230-285).

Validation

Case 7 CV1

An example of direct teaching which demonstrates consultant confidence in the SHO in that the latter can take on board the rapid teaching. It also shows consultant knowledge of the learner's needs in not supplying full information. In CV1's words 'Shorthand type exchange ("if not this then that") with the consultant *leading knowledgeable junior through the likely pathophysical causes* of the clinical problem and agreeing the next action. The case illustrates a route in clinical reasoning; and consultant checking on SHO activities.

Case 7 CV2

The consultant's actions were described as 'chasing them along'. In this case, it's not certain what's going on either. *'There is an ill patient about whom they're having to decide what they can do for him - treat him - to make him feel better. The consultant wants it done - this person is ill'.*

Case 8. A male patient with diagnosed anaemia and other undiagnosed problems

C3   Mr X is a very anxious man isn't he M? (question addressed to nurse). What have we got that we? - the objective findings we have are; 1. he is anaemic with an iron deficiency anaemia, that's correct?

SHO   Correct

C3   2. He gives a history consistent with melena

SHO   Mmm

C3   He has received non-steroidal inflammatory drugs in combination

SHO   Which caused the melena and episodic...

C3   he's got a weak and clumsy right arm?

SHO   That's correct

C3   I think with signs of upper (?) motor neurone lesion, he's had a stroke he's got a bruit on the left and he smokes. Altogether, how is he when he talks?

SHO   He's not - he's not irritable...

C3   The things we've got to be certain about are; Does he have an ulcer and has he bled. So we must get them today. Has he had a stroke? So I guess we ought to organise another scan. We might be surprised to find - to see multiple infarcts. Let's check his sedimentation rates - he's on oral iron. We've stopped his iso? for the moment. And let's get the physio to see him in view of his weak right arm M. Anything else? (there followed discussion about communication with the patient's family (11.7.94 Tape 299-359)

Validation

Case 8 CV1

The excerpt shows efficient exploration of the problem, including the *rapid* identification of key features and definition of the important investigations to confirm the diagnosis. The case also illustrates the formation of a treatment plan which is based on prioritising and is action oriented.

Case 8 CV2

The patient has black stools, the clinical sign. Anaemia may be caused by an ulcer or drugs or both and the team is uncertain about whether the patient has had a stroke. The staging is in deciding to have another scan to find out if it is multiple infarct or a stroke. The consultant 'thinks aloud because the team is there; he would not do this otherwise.

Case 9. Elderly male patient with a stroke

Context: at the bedside

C5	The tongue is the only muscle where you can see fibrillation clinically with the naked eye - you can actually see individual fibres fibrillating. Well, where do you get fibrillation? (question to SHO). Upper or lower motor neurone?
SHO	Lower motor neurone
C5	Right...other muscles away from the tongue - you don't call that fibrillation - you call it?
SHO	Fasiculation which is multiple (physical examination with signs followed continuing below)
C5	That's the first thing you do - if the tongue's small and it's fibrillating, then it's lower motor neurone. Now for any type of upper or lower motor neurone lesion, if you've got a 12th on the left, which side does your tongue deviate to if you push it out?
SHO	To the left
C5	Right - to the side of the lesion. You've got an unopposed action of the right, just pushing it... to the side (13.2.95 Tape 207-247)

Validation

Case 9 CV1

This case is the only example of the traditional tutorial exchange in which the junior's knowledge is tested. The excerpt could almost be an oral 'short case' for the MRCP examination. CV1 drew attention to teaching style.

Case 9 CV2

The case provides a clear contrast from Case 8 in the physical signs.

Case 10 Elderly, very sick female patient with kyphotic chest.

Context: at the bedside

C5	Keep her gently hydrated on that and wait and see. Put the drip in eight-hourly.
SHO	I think now it's five-hourly
C5	Five? That's odd. Why not six?
SHO	At the weekend it was five-hourly
C5	Just keep her on six-hourly - one dextrose, one saline (13.2.94 Tape 019-024).

Validation

Case 10 CV1

This case shows a characteristic detailed treatment plan in which practical aspects are set out. The expert shows a willingness to *compromise* and achieves simplicity.

Case 10 CV2

This patient is dying and the 'wait and see' is read as non-intervention.

Case 11. An elderly female cardiac patient

Context: at the bedside

SHO	She's a 65 year old lady who has atrial fibrillation, fast, thyrotoxicosis...treated with Carbimazole till...1967 - no murmur I can hear at all and that's about it - not hypertensive, no ischaemic heart disease...she's back
C6	What did she come in with now?
SHO	AF
C6	Oh, I see
SHO	(She's) not lost any weight, particularly not thyrotoxic, no goitre, no murmur
C6	Just AF
SHO	Just AF and dizzy with it...rate about 160
C6	So has she been digitalised?
SHO	Digitalised, yes. Does she need an echo?
C6	Well let's see what her TSH is. If her TSH is normal, she probably won't have an echo
SHO	OK (17.3.95 Tape 082-117)

Validation

Case 11 CV1

This case shows consultant *rapid* checking on diagnosis and treatment - "that which is set up by the juniors is correct" and demonstrates the consultant's supervisory role and his efficiency. The SHO has also been efficient, has looked at features and causes, indeed has done a 'superb job', raising the absence of positive reinforcement. The expert gives advice and guidance.

Case 11 CV2

The 'wait and see' in this case was 'waiting to see before deciding. The team has the signs but a differential diagnosis for AF. Exclusion factors matter in this case.

APPENDIX D INTERVIEW STUDY DATA

Experience

consultants		1A	2A	3A	4A	5A	6A
perception of experience							
remember previous clin. cases			206-208	74-84		138-140	174-178
apply knowledge		23-26	203-208	74	201	452	312
	'see' many pts.	17-26		333-336	115-118	128	
	variety of pts.	17-26		25-27;251	266-269	138-140	25
memory/knowledge recall				413-420		128	20;213-215
knowledge of patients				18;60;325		130	181-183
mgt. process.	continuity	17-26					
	cont. of care	133-135	206			128	
experience as patt. recognition				64			17-22
effects of experience							
	less intervention				150-152	365	39-41
	exp. narrows		347-355				
	as confidence				123		336
	as prob. detection				31		20
	recognise illness			231-239		109	
	whole pt. care			380;434		161-182	34-35
	listen/hist. taking	221-224;239		158;163			
	listen/interpret		111	64;103			
	ask right quest	227-229	171;222;258	64-74		289	61;80-95
	ask set quest.					289-296	
can tolerate uncertainty							399-401
diag. process	observation		89-93	65-79			312 PS
listen/control patients		244-249		158			
	history	222;239	258-271	171;163;296	331	299	
	physical exam.	39-46		435	281;325-327	261;289	372-380;385
	efficiency					365;312-313	37;41;312
	accuracy		lab. 64-79		drugs 201	171-174	
screening or	exclusions			126-130	44	197	60;116;329
	investigations						
	diff. types of diag.			68;452			
	patt. recognition		64-74	65-69;406		283-287	95;110;153
		essential features 131	key pieces of info 155				50;174;313
	clinical picture		50-52			284;296	375-380;407
mgt. process	specialist help		279-281		170-174		
	summarise	MM 102	113-125			254	
	know immed.		325		123		20
	decision-making			as PS 55	mgt 8	110-125	309;312
	prioritise		125-132	126;154-158	31	164-182	34-36;61;94
	routine/process			420-430; 456,476	21-52; 65-68	109;165;189; 205	407-418
	options	181-184	19;64;246	70;405;413	90-93	141	
	simplify		key points. 341	com. cause 414	150;149	60;109;351	
	wait & see				150-152;46	171;197;300	
	warnings	MM 108	lab. 60-80				
	anticipate					168;179-182	312
experience and management		variety, continuity 17-26;	spec'skills	experience problem solving/mgt	learn.on job.	cultural	
SHO needs	examinations				130	149;343	240;244
	problem solving			15-21;51		stand back 317	231
	to listen	248					
	have confidence						244

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Experience

SHOs		1B	2B	3B	4B	5B	6B
perception of experience							
remember. previous clin. cases		297	232		140-144	251	
	'see' many pts.	44;74;107	210	285-290	133;299-310	206-210	37
	variety of pts.	297					
	less intervention	374;366		cons. (more intervention)	235-245	60;238	39;359
	best management	335-340				sequence 150	
not asking	as confidence	38;90-92					
	confidence	203-205	175			practical procedures 204;215	
uncertainty accepted		79;202;451	170-175	267			
uncertainty expressed		47	160-180	99-101		74	26;128;357
work on fewer facts and investigations and think quickly						206-210	
	intuition	234-235			WT 116+		
	cont. of care				136-137	257	
remembering the context			220-232				
immediate context important		297	86;208	25	136		
experience brings less pressure					36	204	
diag. process	observation	234					
cons. knowledge of cases		297	35-39	115-119	169;269	139;257;333	69
	history	368	55	178	241;257		
clinical signs and symptoms		243;456	37	25	117;257		
	physical examination	valve problem		have a listen	listen		
		murmur 82		94	145-146		
picture or pattern recognition			first fit 46	115			
diagnostic accuracy		260					
screening or exclusions		102;106;111		232-247;253			
mgt. process							
	investigations		14-18				
	decision-making				266-275		
	efficiency						34
'whole'	approach	335-340	154			214	
	prioritise	30-42;106			125		
	routine/process	95;131;336	151		125 pts.		
	options	218-219		121	270-271	107	
simple (straightforward)		335-340					
simplify	management						31-35
	wait & see		remind 81-82		75;239;359		
	warnings						
the process	works	50;130;440					
needs		experience	experience	experience	experience	experience	experience
very specific context		21-23	208	25	30;43-45		
specialty needs		21-23			43-45		
acute management/sick patients		23;55;385	221;231	112	22;30;105	214	130-131;149
					119-124		
learn to take risks		85-86					
learn to discrim/weigh evidence		35-37					
learn to do nothing		40				75-78	
learn to use initiative					120-121		
learn to reassure patients		108					
	examinations	P. Health 191	MRCP 96	222			

Learning

learning		1 A	2 A	3 A	4 A	5 A	6 A
transparency	work exp.	117-119		307-310	246-251	implied	implied
relevance	learn. context	24-26	227;346	15-29;310	247	eg;190	eg;345-346
supervision							
the clinical process		270-276		310;315;330	257;260	39-43;169	
deal with	patients	52			65		
	wardwork				12;		
	notes					245-248	
checks	letters	53-54;228		166;185-190			
	re-admission	269					
	clinic letters	57					
	checking on SHO investig.						40
feedback		269				audit	
	through pts.	271-276				376-385	165;423
assessment is non-stop							
	nothing formal	49;67;74	159				
	patients			214		317;341	
	mgt. shaky	64-65					
	on wards		226-227	202-215			
	on take	63					
	presentation		124	100-105			75-77
assess.non-stop		52;63	227	205-217			
assimilation over time					214-219		
correction	"tell them"				160-163		
	work	269		265-270			
	discussion	272		281	(asking) 302		
	self limit.		247-250				
	example		269-271	84;267		69-70	
	non-confrontational		270	265-271;281	160	439	
	no system	267					
cons.skills	K. of Learners	75-78			325		
	K of needs						
	fine tuning	36-39					
judgement	of level	173-176					
role model.	example		166-170	84;187;226	59-62	69;228;439	
	charisma		339	355			
	vocational		175				
	demonstration		178		59-62		27-28
	diff.styles				69-74		
t.pts	key points		341-346	85-95		260-275	141
	simplification					21;51;80	
management	priorities		118-120	111;124;136			
safeguards	protocols	271-273					
	guidelines			476			
problem-solving aspects			51-53;180	70-74			59
discussion/commentary							
	interpreting		111-116				
	verbalising		100-110	115;389			
	think.aloud		115;188;200		85-93	220	
	assertions	mainly WTs					329
	summarising		115-125	154;420	230-325		
	deciding		117-118			235	
specific points (bits)			344				158

Learning

learning	SHOs	1B	2B	3B	4B	5B	6B
transparency/relevance/ work experience		258-265	1-23; 187-191	249-257	298	162-164	135-136
supervision	in context	323-324;457	207-210	64-67		27;162-164	
the clin.process "doing"		419	21;55	75-79	169	110	35
work with patients		52-58	53-63	134	34	60-70	135-136
	on take	231					
	watching	action 327	44			139;331	
	learning from mistakes	53;86	76	390	300		49;91
	trial/error	47-53;84-86					
	asking ques.	203;263-265	175-177	13	101	112-113	123-129;162
feedback	informal						no feedback
checks	re-admissions	48;134;226					117
	letters	48;53;133	121;195				
	through pts.	48;53;259	20-23	63	136-140	192	
	being told		36		169		
	follow-up	48					
	role modelling	255-265;360	48				
learning bites				21;41;61;119	152;312		68;74
selective learning		218;263;270+	208				
picking things up		263;270-273					74;151
		291;396					
assimilation/osmosis		273	75				
discussion/commentary		88	124	149-153		143-146;150	
	listening	267-271					
	presentations	298	39;58-59			47	89-101
	confirmation		56				88-89
	re-inforcement	253	38				
cons.skills	mgt.process				148	35	
	fine tuning			119		129	47
	coaching	335-340	35	116;149			
	ckecks		53-64	23;81-82			
	summarising	(no comments)					
	sharing	88;294	38-39	142-143		126-128	105-106

Teaching

cons.	1A	2A	3A	4A	5A	6A
views formal teaching						
preparation/on topics		296;302	40-44			
detailed/ objectives		325;161				
didactic		35-45		325		
time for explanations	(indirect.)165	26	30		92	140;162
narrows with experience		350-355				
reflects specialised interests		280;290-292				
should be 'simple'; logical					20;79-80	
bedside teaching			15-30;48	250	40-44	
work is teaching		45-53		187-194		
work is not teach.	117-159;131			97-108	28-30	
views informal teaching						
no discuss	90-93	20-24				
no quest.	170-172					
brief no explan.	90;165-172	25-30;331				
not comprehensive	88-93	331				
assumptions	90-93					
not didactic/		35-44				
no prep. unstructured		296;300				
spontaneous	ad hoc	298;324				
unpredictable		298;324				
lacks conclusions		25-30;331				
cons.	32-45			294-304	107;317	162 feedb.
no stress in teach.	139				415	

SHOs	1B	2B	3B	4B	5B	6B
views of formal teaching						
didactic			46	bleep free		
time for explanations	313		49-51	282-285		
structured on topics	sharing exp.		47	291		
sitting down notes	279;282		45	282-285	149	
width/depth diff. from practice	313		50			
asking quest. /not telling	397;401	34-35				
content diff. from wards	315-316					
views IFT						
sharing exp/	303					
focuses mind			60-64		162 context	
'inserted'			53-54			
valued consultant attributes						
personal superior K.	19-21	180	25	62-63;88	275;334	69
memory			175-178		249-260	
good historian	368	55	178		47pres.compl.	
diagnostic skills					95	
approachable	92;203;339	176-180	13;101			162
patients no over interv.	366-369		178-183		59	39
min.hosp.stay	373					
teamwork	371					
commmunication skills	378			98		10
'good with pts'	361		178-183			8
constant/regular checking			81-82			
supportive					281	
confidence	377				120	
efficiency direct/decisive	364/375			61-62	58	21
good teach				89		
teaches at level, simple, relevant				91-98	336	
provide/select. information			39-41	98;154		

Theory

Theory and practice		1A	2A	3A	4A	5A	6A
patients	differ	20-23			75-80	457	30-31;201
or work	in context				255	62-63	
run of the mill		131-135					195;212
statistics/numbers						132-135	198-200;213
practice is staged/must be simple						55-64	
feedback	later; in work	266-270					
	re-admission	276					
	on wards		277		126	385-388	162-166;175
	continuity	20-26					
(coaching)	phys.exam.				325-331		
	lab.example		60-80				
bookwork		20-23			248		
people/good at theory not practice							30-31
knowledge	application	20-26		326-333	246-255	186-190	
clinical skills					280-282		
medicine not cut and dried				323-333			
medicine gets easier					122-127	392-395	185-186
learning in context			346	25-29	280-290		
illustrations	physical signs	retina	signs	symptoms	signs/sym	symptoms	wgt.loss 94
to MM	symptoms	murmurs	pink colour	pain	s.o.b.	pain	stroke 65
		40-45	82-87	131	85-94	260	biochem.

SHOs		1B	2B	3B	4B	5B	6B
patients	differ	120 whole pt.		261	56		146
or work	in context				134;176		
	run...mill			125			
practice is staged		re-ad.225	66	120-121	125		
med. gets easier							202-204
bookwork			104;200				
people/good at theory not practice					7-12;172		
exam.not day-to-day work			100-101	facts212-220			
med. not cut and dried		78-79				357	
	uncertainty	47;86;452		263-267			
		87-88					
theory to practice problems		112-116			forget 6-12		
					160;170		
med.icine is common sense		210-214					141
medicine in pract.is different		306					
no problem solving in theory		112-116				text.books false idea	146-147
what is difficult		medical clinics		learn facts	emergencies 30		
		134-136		209	mgt. steps14		
					mgt.haphaz. 33		
exp. =theory into practice					180-185		
illustrations given	physical signs	valve/ murmur	cardiac fail.	breathless	cardiac arr.36		prac.proc.
to MM		81-84	9	117	breathless 117		68-69
	symptoms	242			haem.mgt	arrhythmia	
	pain/angina	breathless/ asthma			160-185	67	

Findings

consultants		1A	2A	3A	4A	5A	6A
denial	own skills	88;105		hesitancy	57;212		
	negatives	89	277-278				
	ask another	88	272	354			
	transparency	105					
admitted skill in mgt and		appr.oach to a case		78	8;65	50-56;102	254-262
lack of reflection		115-120	90-97;277	353	21		
does reflect on own teaching						51-55	345-346
reflect.in action (work)				418-420			
cons. error	assumptions	90-94					general292
junior error or inexperience							
inexperience in problem-solving				222			
	wrong admiss	69;261		255-261			
	over-complicate				149		
	over treat				146-147	361	
	over manage	72				362	
	over diagnose				152		
	over/under confident						297
	lack focus	73;259					
	no options	185	243-246				
	not instit.mgt.	70-71	225				
	inad. history		255-260	72			
	no details		220;245	255-260			
wrong/not asking neutral questions		218-222		227-229			
	do not listen	213;220;248					
	inadequate notes	231-234					
	irrelev.pres.		121-122	399			
	wrong diagnosis	226					
	fail. interpret		223-224	231-239			
	not asking			225			
	not recognising illness			235-239			
	omit. physical examination			267			
	poor recording						300-302
undertreat more dangerous						365	
junior management.same							308-320
tolerant views of error				229	250-255		
language				prolonged 157		reversible	accelerated
				self-limiting		irreversible	69
				426		acute 113;130	
misc							

Findings

SHOs		1B	2B	3B	4B	5B	6B
the 'method' works		86-88	12-17;64-65	160-165	177	84-88	125
Juniors would do the same		86-98	8;55;117		177	84-88	118-127
	agree mgt.	210;242-250	18-20;155			84-88	
mgt.covered/system works		440-448	147-157	160;201			100-106
junior error or inexperience				over-investig.271			
do not 'pick' things up		215					
no major mistakes made		210	107;117-118	160-165		186;195	
	admin.error						
	forget			136			
thrown' if out of context				133-147			
	inexp. in PS	219					
	wrong admiss.				162;182		
	over-complicate				165		
	cont.						
	over treat						
	over manage						
	over.diagnose						57-59
	lack focus						
	no options	220					
	wr.mgt.				165	180-185	
	not instit.mt.			157drugs			
wrong ques.	inad.history						
	no details						
	wr./neut.q						
	do not listen						
	no diag.made	218-219					
	irrelev.pres.						
	fail.interp.	219	36	156			
	not asking						
	not.recog.ill						
	omit phys.ical examination		36				
	poor recording						
	wrong dosage		110-111				114
correction	non-confront	255	35-36	149			91-93
in patient/explanation in work		230;253;260	120-127	149-151			100-107
being told			35-36		169		
by example		255-265;360	48				
disagreement							
	drugs			157			
	disagree diag.	433-448	149				
	disagree/mgt		154-155	271			
nurses find the mistakes!			134			198	
language		life-threat.132		emergencies	mildly ;significant		
	significant 55;457			121	270;272		

LPP		1A	2A	3A	4A	5A	6A
examples	'we' factor	95-105	2-6;25;131		183	161;303-314	124;164-178
team involvement		(implied)	70-71	92-97;171	224	205;312	407-418
taking account of views				170	192-193	235;312	
listening/responding				171		303-314	
involving the juniors			44	171		311-314	
role boundaries							
mgt.	decisions						
trust in SHOs		154-161		209-210	262;292-304	36;341	231;307
	basic skills	31-36		245-249	266		320-325
	spec. train.	39-42					
	no mistakes	258-259		249	192-193		
reciprocity	learning		0-9	58-61		123-125	
	thinking						116;276-285
	codes						272;280-285
create confidence				135-140			44-46;320
	tacit approach	165-172	35-40				271;283-285

SHOs		1B	2B	3B	4B	5B	6B
examples	'we' factor	462	39		211;225	99	119
team involvement		210;462-464	39;93	115	210;230	105	
		130;294	39	115-116		101;126	98
sharing experience and decisions		294	18-23	75-79;140	136-144	58-70	119
		335-340	55-63				
role boundaries			7		199-203		153-166
respect seniors decisions		232-240		148;167		361	50-51
not to discharge		224				can.dis.80	
can only go so far			5;15;19				
drugs			138-139			110;112	
ecological adaptation			48-49	188-194	217		
specialty knowledge		23-27	215	201-203	46;85	135-136	
immediate context			84-87				
	style		45	188			
positive learning environment		462-464					

Apprenticeship learning

CLINICAL PRACTICE	EXPERIENCE	CONSULTANT EXPERTISE IN WORK AND TEACHING
what happens on the wards	**seeing patients**	**clinical expertise**
expert control of the team	the immediate context	expert superior knowledge *
constant review, assessment, care	admission and discharge	expert memory of cases and
of patients in the clinical process	acute and sick patients	retrieval of information
the team in action *	**the nature of SHO learning**	listening and responding
presentation *	transparency/on the job	interpreting and focusing
the 'we' factor	accumulative and continuous	explaining
role boundaries	learning	prioritising *
reciprocity and sharing	being responsible	summarising and deciding *
deciding together*	learning from discussion,	simplifying management *
principles of procedure	commentary, and interaction *	anticipating and warning *
guidelines	**the diagnostic process**	consideration of wider options *
protocols	observation	'wait and see' (take risks)
the staged process*	emphasis on history *	less intervention *
ecological adaptation	examination skills	**supervision** assessment of
styles	'have a listen'	competence
leadership *	**the management process**	checking *
specialities	uncertainty *	**coaching**
trusting the juniors	continuity of care	treating learners as individuals
creating confidence	learning about drugs, tests,	knowledge of learners'
in the juniors	investigations	development
in the team	holistic approach *	varying teaching skills
in the patients	**learning through patients**	creating a positive environment
	asking for help	**the charismatic factor**
	trial and error	role modelling
	learning from mistakes	example and demonstration
	learning from being right	
	being told and corrected *	
	learning to take risks	
	learning to discriminate	
	self-directed learning	
	learning to be critical	
	learning 'bites'	
	selective learning	
	the immediate context	
	examination preparation	
	feedback	
	generic feedback as	
	+/- reinforcement	
	clinical feedback through	
	patients*	
	letters, notes, records	
	admissions and discharges	

* Categories investigated in the validation process for use in data interpretation.

APPENDIX F RELATIONSHIPS BETWEEN INTERVIEW DATA AND VALIDATED WORKING TAPE CATEGORIES

Experiential Learning Open Coding —>		Axial and Selective Coding	Expert Actions <—Open Coding	
SHO Interview data	**Interview Data**	**Validation Categories**	**Consultant Interview Data**	**Theoretical Application**
working to guidelines and ethical protocols	on the wards seeing patients	1. team involvement		
constant review assessment care of patients	the immediate context the clinical process	2. importance of presentation		
putting clinical skills into practice	teamwork team interaction role boundaries	3. continuous commentary / interaction	listening responding; interpreting explaining,	
learning on the job reciprocity and sharing				
gaining confidence	learning from presentation and discussion deciding together	4. thinking aloud	prioritising deciding summarising	**Social context of clinical practice**
continuity of care	admission and discharge seeing acute ill patients	5. succinct condensed language	tacit meanings ' have a listen'	
learning from letters, notes, records	learning about drugs, tests, investigations	6. clinical feedback		
		the diagnostic process		
		7. emphasis on the history	listening to the patient the presenting complaint	
		8. diagnosis by signs	asking the right questions	
		9. diagnosis by symptoms	consideration of wider options	
		10. diagnosis by exclusions		
		11. diagnosis by pattern recognition		
theory and practice are different	dealing with uncertainty medicine is not 'cut and dried'	12. uncertainty		
		the management process	holistic management	
		13. prioritising		
		14. the staged process		
		15. superior knowledge	superior knowledge 'expert grasp of the whole'	**Individual context of clinical practice**
ecological adapation leadership styles speciality differences	picking up' information osmosis learning bites self directed learning	16. application of knowledge	expert memory of cases and retrieval of information	**Consultant expertise**
		17. holistic approach	continuity of care	
		18. summarising skills		
		19. leadership	gaining compliance and empowering patients	**Charismatic dimension**
	asking for help not asking for help	20. decision-making skills		vocational enthusiasm role modelling learning from positive attributes learning from example and demonstration communication with patients and colleagues
		21. consideration of wider options		

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Interview data	Interview Data	Working Tape Validation Categories	Interview data Consultant characteristics	Theoretical Application
	asking for help	22. less intervention	'wait and see' take more risks	
	learning from trial and error	23. simplification of management	supervision skills	
	learning from mistakes	24. anticipation	warn and antcipate	
	learning from being right	25. assertions	teaching points	
		26. teaching by questioning	individual questioning strategies and approaches	
	learning from being told	27. teaching by telling	individual strategies	
	learning from being corrected	28. correction		
		29. checking	checks and balances	
creating confidence and positive learning environment	learning from +ve and -ve reinforcement on performance	30. management/ facilitation of learning	knowledge of learners keep things simple leave key messages engaging juniors in management motivation strategies coaching	

APPENDIX G

CATEGORY EXAMPLES FROM THE WORKING TAPE CASE EXCERPTS

1. team involvement

Cons. 3 The things we've got to be certain about are: Does he have an ulcer and has he bled? So we must get them today. Has he had a stroke? So I guess we ought to organise another scan. ...and let's get the physio to see him (Case 8)

2. importance of presentation

SHO 6 She's a 65 year old lady who has atrial fibrillation, fast, thyrotoxicosis, treated with Carbimazole till ..., no murmur I can hear and that's about it - not hypertensive, no ischaemic heart disease...
Cons. 6 What did she come in with now?
SHO6. AF
Cons. 6 Just AF?
SHO 6 Just AF and dizzy with it (Case 11).

3. continuous commentary/.interaction

Nurse He's up and about fine
SHO 1 Was he written up for Heminevrin or something that he might have been taking at home?
Nurse He's on 3 tablets 3 times a day...
Cons.1 Why do you ask about Heminevrin?
SHO 1 Alcohol
Cons. 1 I thought his alcohol problem was away in the past (Case 1)

4. thinking aloud

Cons. 3 You'd be expecting a mitral incompetent murmur. His mitral valve has recently ...he had a perivalvular leak- so if we're saying he's got shortness of breath...is more than acute, he's got acute carditis hasn't he? He's ill... (Case 7).

5. succinct condensed language

Cons.1 ...he's had an uncomplicated infarct with...he's had good reperfusion.(Case 1).

6. clinical feedback

SHO 3 He's uraemic
Cons. 3 To what sort of level?
SHO 3 His creatin has gone up - his creatin is 620 (Case 5).

7. emphasis on the history

Cons. 1 Originally, when he first presented, he presented with ataxia and it was eventually attributed as an alcoholic peripheral neuropathy- but he's just got progressively worse... (Case 1)

8. diagnosis by signs

Cons. 3 I think with signs of upper motor neurone lesion, he's had a stroke...he's got a bruit on the left...

9. diagnosis by symptoms

Cons. 3 I mean, it looks like he's uraemic and that's the cause of his nausea... (symptom consistent with the diagnosis; Case 5).

10. diagnosis by exclusions

SHO 3 No visual symptoms, no headache... (cons. asked about patient's ability to turn head round)

11. diagnosis by pattern recognition

Cons. 3 Is there anything in his urine? ...any sediments? proteins? The other thing was - didn't he have a high sedimentation rate? (SHO 3 A 100, yes)
Cons. 3 So that- right - we have a little...he has...Bence Jones (Nse) - make sure that we check his calcium - get an ultra-sound of his kidneys and bladder - I mean, it looks like he's uraemic and that's the cause of his nausea and vomiting... (Case 5)

12. uncertainty

Cons. 2 So, we're slightly...so if the test doesn't fit in with the rest of the clinical picture and you can't think of a good clinical reason for the slightly aberrant test result, you're usually pushed to repeat the test or the test is wrong (Case 3).

13. prioritising

Cons. 3 (It's) important to confirm - are we right in what we are...Is the valve working properly? Is there major dysfunction of the aortic valve? (Case 7).

14. the staged process

Cons. 3 OK. So it looks like we've got to investigate Mr X's renal failure.. So let's do these things...and take it from there. I imagine that he's not the sort of chap you would dialyse...I wouldn't have thought so...so let's find out what's going on anyway, whether this is reversible or not (Case 5).

15. superior knowledge	**Cons. 3** You'd expect an elevated alkaline phosphase but not in myeloma. You don't get any osteoblastic activity. You get lytic spots but no new bone formation which is osteoclasts not blasts - so alkaline phosphate is normal in myeloma but in bony secondaries is high but not in multiple myeloma...(Case 5).
16. application of knowledge	**Cons.3** I think that if someone's had an extensive venous thrombosis, they need to have IV Heparin for at least ...if you give it for anything less than three days, we know its ineffective. I think, if someone's had more than a carping (?) thrombosis they should have it for a minimum of five days. And if someone's had a large...or a vein thrombosis, I'd give Heparin for seven days. That's what I would do (Case 6).
17. holistic approach (treating the 'whole' patient)	**Cons. 3** ...and I think that the obstetricians were going to ask for another scan for her were they not M? (to nurse)...a growth assessment scan, that's what they said to us. Who's looking after her first child? Is that Mum? Do we know what's happening? (Case 6)
18. summarising skills	**Cons. 3** ...the objective findings we have are: 1) he is anaemic with an iron deficiency anaemia, that's correct? (**SHO 3** Correct.) 2) he gives a history consistent with melena. (**SHO 3** Mmm.) He has received non-steroidal inflammatory drugs in combination...
19. leadership	**Cons. 5** Keep her gently hydrated on that and wait and see. Put the drip in eight-hourly (Case 11).
20. decision-making skills	**Cons. 3** Make sure that we check his calcium -get an ultra-sound of his kidneys and bladder (Case 5).
21. consideration of wider options	**SHO 3** I didn't actually do extensors...but she's got real nystagmus. It does sound like Meniere's to me. **Cons. 3** Too young- she's too young. If it's anything, she'll probably have acute labrynthitis (Case 4)
22. less intervention	**Cons. 6** Well let's see what her TSH is. If her TSH is normal, she probably won't need an echo (Case 11)
23. simplification of management	**Cons. 1** I would try and keep it simple. I wouldn't give her 3 and 4 alternate days. Three or 4 mgs. (Case 2).
24. anticipation	**Cons. 3** We might be surprised to find multiple in -farcts. Let's check his sedimentation rates. He's on oral iron, we've stopped his iso...for the moment (C. 8)
25. assertion (as closing the problem space)	**Cons. 2** ...a PO2 of 7 is out of keeping with the rest of the picture (Case 3).
26. teaching by questioning	**Cons. 2** ...so she's inappropriately hypoxic for the other indices of severity. What else would you think of? (Case 3).
27. teaching by telling	**Cons. 5** The tongue is the only muscle where you can see fibrillation clinically with the naked eye (Case 9).
28. correction	**Cons. 3** And if someone is falling down and they've been out to the pub, I think, if I were you, they might be intoxicated? (Case 4).
29. checking	**Cons. 1** Maybe we should just review her X-Rays from that point of view. She hasn't actually had her INR checked for 3 months (Case 2).
30. management/facilitation of learning	**Cons. 2** So, how will you manage her (said to team) Why do you think she's so hypoxic when everything else is pretty minimally disturbed? (Case 3)

APPENDIX H CASE STUDY PHASE TWO TEACHING

CE with Phase Two students, St. 1 and St. 2, before and after a ward session (audio-taped in a corridor).12th May 1992

First Extract
(before the ward)

CE I want you to tell me in two   7
   paragraphs ...   8
   clear learning objectives
(after the ward)

St1 ...a 66 year old lady with a   10
   long history of smoking. She   11
   has a seven year history of   12
   emphysema, presented to   13
   outpatients clinic with   14
   three five min episodes of   15
   ...blindness of the right   16
   eye...right hand   17

CE Full stop! can you put these   19
   three five min. episodes   20
   into some form of   21
   chronological order?   22
   presentation skills
Second Extract

CE It is quite interesting- you   50
   see, she didn't go with   51
   these symptoms- she went   52
   with her chest and in the   53
   course of conversation told   54
   the doctor...?'   55

St2 She said she took a cold   57

CE She took a cold- and she   59
   came up to the outpatients'   60
   department. Do you know how   61
   the doctor treated her?   62
   repetition of content words -
   usage to form in next question
St2 ...   64

CE For the cold in her chest?   66

St2 She said she got steroids   68

CE She got steroids. Now that   70
   actually might have a major   71
   bearing on the natural   81
   history of some of the   82
   things which were presented-   83
   you know-which caused the   84
   eye presentation...I was   88
   listening to you and I   89
   thought at this period of   90
   time, you allowed her to   91
   speak and I was very   92
   encouraged by what you found   93
   out.- She came up to see Dr   94
   Munro yesterday and...'   95
   praise

St2 She got all sorts of   97
   tests...sent home again   98

CE She got all sorts of tests-   100
   and-you see-sent home again   101
   and   102
   use of 'and' to make the students
   think
St1 ...Sister made an   104
   appointment at the Western   105

CE Two appoinments at the   107
   Western   108

St1 One for a scan   110

CE One for a scan - and one for   112
   a special neck test and -she   113
   was told that she had a   114
   funny noise in her neck...'
CE No - you mightn't find that   136
   but you are going to hear a   137
   bruit. If a patient presents   138
   like this, what is your   139
   working diagnosis?   140
   Describe...transient loss   141
   of vision...   142

St1 ...a "TIA?"   144

CE A TIA...special terminology   146
   this particular form of TIA.   147
   What other questions   148
   would you want to ask   149
   somebody presenting   150
   with TIA - some of   151
   which you know, some of   152
   which I have not   153
   allowed you to know?   154

....

CE Can you have a   207
   cardiodvascular - cardiac   208
   cause for a TIA   209

St2 She might be arrythmic?   211

CE What questions can you ask?   213
   Do you have any arrythmias?   214
   (laugh!)...   215
   communicating with the patient
ST2 Do you have any   217
   palpitations?   218

CE There is a list of questions   220
   you could ask but   221
   palpitations is very high up   222
   on the list. Remember, you   223
   are always asking - 'the   224
   priority is?'...'Am I   225
   misssing something which is   226
   treatable?'   227
set questions

Interview with CE after Phase 2 ward based teaching 12th May 1992

First extract

CE   ...on several previous times, I had been teaching on much more classic cardiovascular disease from what I was trying to do which was to show that cardiovascular disease can actually present in a variety of apparently non-cardiovascular ways. So that was the purpose of the exercise. I mean, why I chose those patients, it so happens that I saw three of them the previous day - they chose themselves. There was a thread - you know - when I thought about the thread...

MM   Do you always teach that way, almost thematically?

CE   No, I don't think so. I think one - thematically? Well, Yes and No. It depends on what you mean by thematically. I try with Phase Two to leave them with relatively simple major messages... if you are teaching clinically - you know - you might take a system, you might take a physical sign, you might take something and try and teach so that there is at least a recognisable continuity...

MM   And what were the take-away messages for that particular group of students?

CE   Well I tried to go over with them at the end...the most important thing ... cardiovascular disease doesn't necessarily present in a classical sort of way and secondly, that when you are thinking about any disease process you have actually got to think beyond the disease process...

MM   Can you explain to me how you conducted the session?

CE   ...normally there are six students, there were five. The intention was to make them take a history in pairs. Often an individual student I think - is actually, funnily enough, more intimidating the very presence of another student is reassuring, but I think as they become more senior the converse is true they don't like performing in front of their colleagues...so the first part of the exercise was for them to take three separate histories from three rather different patients...and them to present them... (C3 43-134)

Second extract

CE   ...the art of history taking is listening to patients ... asking questions ... So that would be the first thing I was asking them to do. The second thing I was asking them to do was to summarise what they thought was important from the patient's history before they had actually muddied the history ...

MM   You were very encouraging with these students when they were presenting the case. Have you ant idea how you did this?

CE   No' (laughter!)

MM   ... you were very encouraging because you asked them certain questions but you dragged it out of them by saying 'And?' 'And?' and each time they told you something else.

CE   What I was trying to do is to demonstrate to them how you should take a history.

MM   But you were very clever, this is how you did it. At least I thought it was very clever.

CE   Yes, fair enough, but I mean there is the other side to it I don't know if it was all meant to be encouragement, I think it was actually to say ... and when the patient stops, you say 'And?' rather than start asking questions and I was doing it to them ... I knew they knew a lot more ... it was using the system, the technique, that I think they should use with the patient (C3 233-296).

Third extract

(Physical examination of the spleen)

MM   I wonder if you could explain to me what particular teaching points you were putting over with this physical examination?

CE   With that, I think you are looking for things which don't exist. When you are watching a student, you often know whether they are ... you... can tell and my recollection of that was that when they said ... they clearly hadn't. They hadn't, because you get that kind of bump-effect on the hand.

MM   How did you help them to find it?

CE   By telling them what to do.

MM   You told them to map it out?

CE   ...it was a lass wasn't it? ... (Yes) She was saying that she was feeling the spleen and she hadn't got to it. OK. What I said and what I said I recall, my recollection of what you just said was - if the spleen is that big you've got to map it out... OK... If it isn't that big, you've got to get in until you are right up to the costal margin.

MM   And you also provided some unconventional wisdom about how to curl the fingers?

CE   It's only unconventional because there are a few people who don't realise how good it is. (C3 329-410)

APPENDIX J ETHNOGRAPH CODING

Abbreviation		Abbreviation	
CONS or C	Consultant	HO	House Officer
SHO	Senior House Officer	UG	Undergraduate
AUT	Authority (CAUT/SHOAUT)	GTSK	Generic teaching skill
APP	Apprenticeship	IFT	Informal teaching
ATT	Attitude	JOBCON	Job conflict
AUT	Authority	K	Knowledge
CATEGASS	Categorical assertion	KOFL	Knowledge of learners
CHARIS	Charisma	LEA	Learning
CLINR	Clinical reasoning	MED	Medicine
COMSK	Communication skills	MGT	Management
CON	Conflict	MGDIFFS	Middle grader differences
CONFD	Confidence	MUTLEA	Mutual learning
COR	Correction	ND	Need
CT	Clinical teaching	OPEN	Openness
CTVAR	Variations in CT	PRESSK	Presentation skills
CTCHAR	CT characteristics	PRIORSER	Priority of service
CK	Craft knowledge	PT	Patient
CSK	Clinical skills	REPREFS	Repeated references
CSKHIST/CSKPE/ CSKMGT	Hiistory, phys.exam.	SAFEG	Safeguarding, keeping options open
CVSELF/ SHOVSELF/ HOVSELF	View of self	SUBT	Subtle teaching
SHOVC	SHO view of consultant etc	STRAT	Strategy
CVMED	Consultant view of medicine SVM	STRUCTT	Structured teaching
DEN	Denial	SUM	Summary
DIFFS	Differences	T or TEA	Teaching
ERRORS	Errors	TACTIC	Tactic
EXP	Experience	TEAMINV	Team involvement
EXPEXP	Expertise with links to Experience	TREATPT	Treating the patient
EXAMREF	Reference to exams or exam teaching	UNCERT	Uncertainty
FEED	Feedback	UNDIAGPT	Undiagnosed patient
FT	Formal teaching	UNSURE	Unsure
GROUP	Group	USEPT	Using pt to teach in subtle way
RO	Research ommission		

Questioning

ATLS	'Advanced teaching/learning skills'	ATLSpr	probing
ATLSph	phrasing	ATLSfac	facilitating
ATLSloc	locating, context placing	ATLScor	correcting
ATLSdev	developing the clinical issues	ATLSprs	putting under pressure
ATLSext	extending the student	ATLSQF	questioning flow

CE with Phase 3 student (UG3.1) on a ward round

#-ATLSPH   #-ATLSLOC

CE   'If I said to you one of the   274   Individual two part
causes of bi-lateral pleural   275   phrasing of question
calcification is tubercle, what is the   276   and locating the problem
other...?   277-#

UG3.1 Asbestosis   279

#-ATLSDEV   #-ATLSEXT

CE[That's the answer...and what   281-# extending the problem
would you expect to see in asbestosis,   282
which he hasn't got, on his chest X/R?   283-# making the student
                                                     think

#-ATLSF   #-ATLSDEV `

UG3.1 On the chest X/R you would see   285-# facilitating
mm...mm, plaques round about   286   developing the
the...pleural plaques   287   clinical issues

CE   He's got pleural plaques, but   289   taking the story
where do you actually see them? There's   290   forward
somewhere you characteristically see   291
them in asbestosis?   292-#

UG3.1 (You) usually see them at the   294
base   295

#-ATLSCOR   #-ATLSF   #-ATLSDEV

CE   (You) see them on the   297-# correction
diaphragm....which is unusual   298   facilitating
...much more likely to see them apicaly   299 · continued
                                                      development

....

CE   Well, if you're stuck, start with   310   facilitating
the...major exclusion factors, you   311
know...what is the group informed...is   312
there an age limit?   313-#

#-ATLSLOC   #-ATLSCOR   #-ATLSDEV   #-ATLSEXT

UG3.1 Well, I don't think experience of   315-#
the elderly...I'm   not sure.. I   316
think there is an age limit there   317

CE   Yes, yes OK ...what's your   319   setting the context
Edinburgh age limit?   320   testing knowledge

UG3.11 I'm not sure, 75 or 80   322

CE   I think 70...I would qualify that   324
by saying that that doesn't mean   325
                                               326

$-ATLSSUM

CE   So you've immediately got...   347   accepting and
you're immediately dealing with a group   348   correcting framing
(mmm) within 12 hours of onset (right)   349   the next question
of what you think has been their   350   summarising
infarct, age 70 or less, and then   351   probing knowledge
you've got other exclusions...such as?   352-#-$ continued pressure

UG3.1 If they've had it before...   354