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## ABSTRACT

The progression of qualified surgical nurses toward capable proficiency was examined in an ethnographic study during which 25 nurses, including 4 who transferred to other wards, were observed to determine whether social mediation affects the process of proficiency development. The nurses were observed for 18 months. Data were also gathered through invited observations of episodes of skilled behavior during which sequences of digital photographs of the nurse practitioners' actions were taken and knowledge maps linking scientific knowledge to nursing tasks and processes were sketched. After the observations, the nurse practitioners shared their reactions to the photographs and knowledge maps in post-observation interviews. The following were among the key findings: (1) the cognitive capacity for multiple representations of knowledge use enables engagement in the changing array of patient problems and the provision of solutions; (2) capable practitioners create and sustain their performance through strategies for emotional control that are transmitted directly to patients; (3) postqualifying newcomers are less able to project the practical implications of deliberative practice; and (4) collaborative working accelerates newcomer recognition of significant clinical signs during routine working, thereby giving newcomers access to distributed knowledge within settings characterized by a skill mix algorithm of 60% health care assistants to 40% qualified nurses. (Contains 18 references.) (MN)

**Knowledge Elicitation and Techniques  
of Representing Nurse Practitioner Knowledge Use:  
Establishing Capability and Social Integration within Busy Nursing Contexts**

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American Educational Research Association

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**45.03 Division I Symposium: Learning Communities and Communities of Practice in Healthcare Settings: The Meanings and Values of Two Popular Concepts.**

**Title:** Knowledge elicitation and techniques of representing nurse practitioner knowledge use: establishing capability and social integration within busy nursing contexts.

**Key words & phrases:** Knowledge Elicitation; & Naturalistic Methodology; & Cognitive Techniques of Representation; & Nursing Expertise-Capability.

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**Abstract**

This paper describes a study of progression of qualified surgical nurses toward capable proficiency within one setting using participant observation within an ethnographic approach and how that process was fostered by social mediation. Practitioners face many questions in relation to expertise and practice development. How can professionals understand and develop capability and expertise? What knowledge is used and developed? How does work culture impact upon capability and performance. Researchers are challenged to develop valid new research strategies to investigate these phenomena. Two distinct methodologies were used: eighteen months participant observation; and invited observations of episodes of skilled behaviour followed by knowledge interviews using heuristic devices as mediating artefacts. These artefacts allow the individual to explore current and potential representations of their knowledge within a variety of contexts. Establishing the cadre of local fluent capability within the ward presented the opportunity to explore newcomer progression featured within one milieu. A year on this was extended to include the progression experiences of four capable transferees working in other acute units within the hospital to explore how they and their colleagues handled the change.

The mediating artefacts represented clinical knowledge of the practitioner in an encapsulated form in which it might be shared. The digital photographs spurred the visual memory, prompting deeper reflexivity than questions might have done. Secondary analysis of these episodic accounts aimed to discover relations among representations of fluent work; analysed according to degree of fluency, use of deliberation, the nurse's level

of experience, situational recognition, and the degree of guidance provided by anticipated outcomes shared among capable staff. The dual methodology provided a unique perspective on factors affecting access to learning opportunities: the disposition toward learning of capable practitioners; the system of work allocation on the ward; individual dispositions toward the constraints of context; historical factions, loyalties and allegiances; and the availability of expert tuition from expert nurses.

### **Summary**

The cognitive capacity for multiple representations of knowledge use enables engagement in the changing array of patient problems and the provision of solutions. Expertise entails an effortless propensity to formulate various representations that match a particular case requirement, a repertoire of ready - to- go templates refreshed through contemporary updating. It acknowledges regular and unusual aspects of cases by pausing to deliberate, whilst responding to familiar cases with fluent, uninterrupted action. Recognition primed decision-making (Klein 1989) provides the platform for fluent action. Capable people create and sustain their performance through strategies for emotional control that are transmitted directly to the patient. Fluency is not readily articulated, being a taken for granted attribute of domain familiarity. By contrast capturing deliberative practice is easier, newcomers may experience degrees of anxiety and embarrassment. They hesitate or interrupt an otherwise fluent event sequence to seek, deliberate, question. Post qualifying newcomers are less able to project the practical implications of deliberative practice. Experience had taught more capable practitioners to reflect, articulate and pace new knowledge acquisitions within a deliberate learning framework. They used self knowledge to regulate and modify risk and opportunity within practice engagement, within a context of explicit negotiated supervision.

Collaborative working accelerates newcomer recognition of significant clinical signs during routine working, a process which secures newcomer access to distributed knowledge within settings characterised by a skill mix algorithm of 60% health care assistants to 40% qualified nurses. This is the constrained nursing context where patient dependency is accelerated by better surgical techniques, and qualified mentorship or any kind of supervision is thin. Young and inexperienced ward leaders are no match for patriarchal surgeons and executive nurses concerned to meet their corporate targets in difficult political resource climates; within such a crucible, the local concerns of clinical nursing have a still small voice and go unheard.

**Knowledge elicitation and techniques of representing nurse practitioner knowledge use: establishing capability and social integration within busy nursing contexts.**

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The principal aim of this research was to study the progression toward capability of newly qualified surgical nurses, and how that process was fostered by social mediation. I used two distinct methodologies: eighteen months of participant observation whilst working as a nurse; and invited observations of episodes of skilled behaviour followed by knowledge interviews using heuristic devices as mediating artefacts. Access to the ward and invitations to observe (with patient consent) were granted in return for free labour between episodes and whenever the ward was exceptionally busy. The ethnographic data was analysed using Strauss' (1987) paradigm analysis; and the resultant accounts of ward activities, culture and performance were checked by participants. The study followed the working lives of 25 nurses, including four who transferred to other wards, tracing the challenges they faced in acute busy settings.

Two forms of mediating artefact were used to facilitate knowledge elicitation, interviews and the co-construction with practitioners of representations of their expertise. The first was a small knowledge map linking scientific knowledge to nursing tasks and processes sketched immediately after observation: this followed the format developed by Eraut et al (1995). The second was a sequence of digital photographs taken during the episode itself, and subjected to immediate censorship by the patient. Post-interview accounts of episodes, supplemented by revised maps and relevant photographs, were checked by the practitioners on the following day. The 52 accounts were then analysed according to type of task, degree of fluency, use of deliberation, the nurse's level of experience, situational recognition and the degree of guidance provided by anticipated outcomes.

The dual methodology also provided a unique perspective on factors affecting access to learning opportunities: the disposition toward learning of capable practitioners; the system of work allocation on the ward; individual dispositions toward the constraints of context; historical factions, loyalties and allegiances; and the availability of expert tuition from specialist nurses.

The concept of a "capable nurse" can be aligned with Benner's (1984) concept of "proficiency". It implies that a nurse is capable of independently meeting the nursing requirements of all but the most unusual patients admitted to their ward; and that their normal routine actions are fluent rather than hesitant. Studying progression toward capability requires the unraveling of the complex integration of skills and role knowledge and the many influences on learning at work. I focused on the biomedical knowledge, because its acquisition and transformation in action are both highly valued and poorly understood in clinical settings. The findings drawn from these dual analyses illustrate how learning skills and sustaining roles occurs within an ascending perspective of self-knowledge and self-control. Acquiring know-how entails both developing proficient individual action and understanding its contextual value and meaning within a wider

community. “It’s better to be told straight out, this needs changing, that is good. It’s better to be told directly about the effect your work has on other people” (Fn. Sept97p8). The affective component of capability is privately mediated by conscious meta-processes that increase self-control and hence self-esteem.

### **The ethnographic approach 1**

Access at the official level was agreed in return for free labour and a promise of anonymity for the hospital. Initial fieldwork engaged me in three discrete processes:

- Learning the normal ethnographic processes of immersion through participant observation and field relations;
- Clarifying the intended methods and ethical protocols concerning patients and staff;
- Updating my own practice through various local initiation processes during a ten week period prior to receiving approval.

I worked an unpaid honorary contract and was viewed as a putative ‘insider’ during the research application. Continuity of institutional access was never assured, as key gatekeepers changed. At ward level access to clinical episodes and patients was negotiated daily. Participative observation was experienced as less intrusive when I became a team member. I was careful not to assume access to particular episodes of care, particularly because nurses were so open toward observation, “We’re so used to her, we don’t notice any more..... She’s our shadow,” or “She’s the one who writes everything down”, adding ironically, “we don’t mind, we have no secrets here” (Fn:May97).

I adopted a data recording system described by Schatzman and Strauss (1973), in which observational (ON) methodological (MN) and theoretical (TN) notes are prefixed separately for each recorded event. Thus, observation activity or events are prefixed ON; the method notes and my reflections on how well things were going with the method or the research tools were prefixed MN. Any theoretical insights within the field work, or indeed external theories in science or social science, that might help me interpret my experiences were recorded under the prefix TN. These distinct perspectives in constructing a text are advantageous for the ethnographer whose initial competence for analysis is not yet developed: the convention allows distinction among the types of data recorded. Later, when deeper into the work, the analyst can make keener inferences if these distinctions are preserved. As this kind of text builds up, it takes on a chameleon character, becoming what Jackson (1990) has called a liminal text, whose content is constantly available for interpretation and re-interpretation

Early fieldwork was less explicitly governed by analysis than methods texts suggest, ordered more by my developing intuitive perceptions of participants, their response to tensions generated through their work, local relationships and the wider influence of the hospital and NHS organisation. Gradually I created a number of representations of

relationships within the fieldwork, constructing a liminal text account of daily observation (Jackson *ibid*), lots of visual displays (Miles & Huberman 1994), and a representative rule governed coding system (Glaser & Strauss 1967). The circumstances surrounding the 52 knowledge elicitation episodes were also included in this ethnographic data.

The scarcity of human resources was assumed as a ‘given’ and uncritically accepted in this context, raising problems for the analyst as to how issues relating to the impact of political criticism and fiscal policies might be appropriately articulated. Their significance and impact needed to be understood in relation to the issues arising within the ward itself; because understanding the relationship between roles and resources was a necessary precursor for explaining progression toward capability in that context. I remained perplexed for many months about how the dual methodologies would come together to articulate features of progression and how to elucidate and interpret putative explanations of intra-professional and inter-professional group conflicts. Moreover, power differences also tended to be taken for granted, although they affected nurses’ individual and shared dispositions, their working climate and the hospital wide management of resources. For example, a transferring capable nurse recalled competition over clinical progression as follows:

Nurse “Yes, I am at peace with myself because I know it’s a learning time, and I can see I am getting there and there is no competition, no one is ..... it’s so different to upstairs ..... There was a huge row between me and Z when I got the senior grade and she, from a degree course, did not. Mine was an inferior training in her eyes, at that time, and we had a tremendous row. You knew about this row, surely?”

Researcher “No it didn’t register, I knew she had arguments with a number of people but no more”.

The analytic approach involves two levels of coding. First, open coding starts with small units of data meaningful in and of themselves. These are then expanded using a paradigm rule where the researcher must think through relations between conditions, interactions among the actors, strategy and tactics, and consequences. The results of this analysis constitute an expanded or contextually dense unit, which is then given a name to characterise it, i.e. a conceptual code to identify it. Thus open coding is not intuitive but an intensive analytical production of concepts, a questioning process that is explicit and essentially contestable. The usefulness of assigned codes are confirmed or denied in subsequent usage. Coding begins a process of identifying conceptual relations within the data. The following coded units inferred staff expectations of the senior sister’s openness and leadership.



**July 97**

**A Ward meeting without dialogue(coded ERH, expectations of the role holder)**

**Condition** Sister chaired the ward meeting in the small ward office near consul, not in the comfortable sitting room, we sat huddled together in the small space. Two telephones were bound to constantly disturb the proceedings. Information flowed from Sister in a paced but crisp delivery. The form of the meeting was information followed by instructions and requests.

**Interaction** Sister invited discussion regarding the issue of a complaint about the ward's "off duty" requests and favouritism in shift allocation. This complaint had been made to the temporary ward manager by one of the staff. She did not wait for a response to the invitation, but went right on to say she hoped to quash any notion of favouritism, she was happy to respond to duty requests but could not cover the ward if everyone was off at the same time. Her communication was given in a flat, unmoving way. There was a stony silence and a lot of eye contact.

**Strategies** Perhaps (1) to eradicate a misunderstanding, and (2) to set the record straight; but there was no attempt to appeal to a sense of camaraderie.

**Consequences** People continued to hold private views of the rostering. Trouble was brewing and it erupted in the following month when 9 individuals took annual leave at the same time. In the meeting her position as a leader was not strengthened by the 'discussion', because none took place.

These open coded units of data are then intensively compared with each other for similarities and differences in order to recombine them. Team meetings and other interactive episodes indicated the restricted communication style of the young senior sister and the resentment it engendered. This second stage, in which the researcher builds up a system of meaning distinct from the chronological field record of events, is called axial coding. Open coded units on communication, morale, administration and leadership contribute to expectations of the key role holder in the axial cluster below.

**Axial cluster: recombined open units of data coded 'expectations of the role holder'**

- \* Staff meetings are informational and one way
- \* Leader is easy going - behaves like one of the girls
- \* Insecurities expressed about organising and meeting duty roster deadlines
- \* Unresolved summer holiday conflict leads to duty roster chaos
- \* Implementation of un-discussed changes to team nursing system leads to anger and doubt
- \* Lack of public acknowledgment or congratulation for examination success
- \* Leader withdrawn, emotionally tight and feeling lonely in the role
- \* Leader expresses fatalism and has a stress related illness
- \* Complaints that the temporary senior manager does not give enough support
- \* Christmas roster is a struggle; providing cover and reserving 16% of staff budget to pay for agency work



\* Traditional norms for senior leaving party are ignored as leader puts a personal engagement first

The decision to include or exclude an open coded concept was reached by asking how it enabled an explanation in a recombined category. The object of putting the data back in new ways by making a connection between a category and its sub-categories is to create categories worked out in terms of their salient properties, dimensions and relationships, thus giving them richness and density (Strauss and Corbin 1994). Recombination of data categories integrates conceptual properties, narrowing the focus and refining the effort. Later the relationships between key categories have to be argued and supported with analytical evidence to establish explanatory order, what is to count. Key relationships among the selected explanations are contestable and were subject to critical appraisal by participants both during and after fieldwork.

While the axial cluster above contributed mainly to my analysis of leadership, another cluster focused on relations between nursing tasks and the ward environment that defined what counted as competent performance.

### **Axial clusters in the task-environment category of text analysis**

- ◇ Skill acquisition
- ◇ Skills practiced by qualified nurses
- ◇ Intravenous work
- ◇ Problem solving in care
- ◇ Decision-making - routine co-shaping & checking of decision-making
- ◇ Running things

The first five sub-categories provided the context for the knowledge elicitation episodes discussed below, while the sixth category “running things” reminds us that ward management is a distributed role that requires a leader who can manage the distribution of management responsibility.

### **The Ward Context**

The ward “team” is a haphazard collection of semi-permanent nurses who work an integrated day and night shift rotation. They are a tight knit group of domain custodians who have worked between one and ten years, before and after marriage and childbirth. This raw and sometimes sharply distrustful group, split along traditional lines of allegiance, work their daily practice together. They recognise individual strengths, weaknesses, clinical limitations and shortcomings, creating trouble and spite when it suits them. They bob on the unpredictable ebb and flow of staff resources in shifts normally led by one capable nurse, two progressing nurses and an experienced health care assistant. Together they care for 30 dependent, often elderly and extensively dependent, surgical

patients. The established skill mix of 60% untrained to 40% trained nurses, creates a scenario where paper qualifications mean less than domain shared experience. Newcomers to gastro-intestinal surgery, pushed to the limits of their personal knowledge, felt grateful for the coaching and guidance provided informally by the health care assistants, “they are deeply familiar with the work and can see when problems occur. They are very good and can teach me, so I learned from them” (fn:Dec97). But the onus is on the newcomers to engage, participate, share observations, use their initiative and ‘shout’ when their clinical recognition indicates that they lack the capability to decide what to do or to implement what they or others have decided.

In this vortex newcomers were required to work collaboratively. It was not an explicit negotiation but an implicit transaction: helpful coaching in return for labour. Newcomers who failed to engage in the routine basic work became excluded and made an early departure; because receiving informal support, orientation, and guidance was essential for those at the margin of coping. Lone practitioners and mavericks caused concern because they practiced outside a cooperative knowledge exchange and therefore required constant surveillance. This reduced team efficiency instead of spreading the load, and therefore could not be tolerated. “This is all about pulling together in a team through some difficult situations” (Fn.Dec 97p3).

It was in the interest of semi-permanent staff to contribute toward empowering the progressing newcomer in order to experience the immediate return of coherent teamwork. Another motive was to enhance ties of mutual loyalty with a potential future shift coordinator; because full-time qualified nurses moved quickly up the hierarchy, whilst capable part-time staff nurses and health care assistants remained low down. The official justification for this policy was disclosed by a departing nurse executive: “Staff nurses get paid the same hourly rate so if we said you can work between 9am and 3pm and have the same prospects, I wouldn’t be able to get people out of bed in the morning to work early and late shifts. What incentive would they have?” (fn: Int.June 97)

Team meetings and other interactive episodes indicated the restricted communication style of the young senior sister and the resentment it engendered. She was acknowledged in the wider community as clinically excellent and an authority on early stoma management. The post demanded administrative ability, with communication and leadership skills that exceeded those of a quietly confident, young clinically competent F grade. But her premature elevation to it provided no preparatory time for her to develop these additional abilities nor the confidence that goes with them. Specialist nurses and former ward sisters commented that: “Older nurses have presence and use it to good effect with consultants.... providing a balance and stability which helps nursing to hold its ground (fn: Nov 97)”

Following transferees to other wards in the same hospital showed how good leadership generated stability and lifted the professional horizons of those at work by providing an ideological perspective to ‘the way we do things here’, and by developing the structures to support clinical learning within routine and predictable organisational constraints. Their

impact can be observed in the everyday etiquette and demeanor of work transactions, by visual orderliness and collaborative familiarity within the constellation of actors, and visual wall displays that assign and acknowledge the staff. This contrasted with the climate generated by a novice leader who had yet to understand the attributes and expectations of leadership; and who lacked any form of support from senior managers preoccupied with team deviance and local conformity to hospital protocols.

Within the ward, the representation of this context and the discourse about practice and about 'what goes with what in the ward-world' is a shared, public, negotiated system of signification, affirmed through activity, embodied in routine, spoken in local terminology, and reified as 'the way we do things here'. Clinical protocols are socially sanctioned and socially applied, because any practice community relies upon publicly agreed meanings. However, my ethnographic evidence made it clear that as much of that meaning was shared through actions as was shared through language. Hence the difficulty of trying to describe or prescribe practice through detailed verbal protocols.

### **Knowledge elicitation and representation**

The methodological challenge in creating mediating artefacts is to engage the practitioner in a verbal analysis of the relationships between any form of (multi-sensory) knowledge and action in a particular working context. The first type of artefact was based on the work of Eraut et.al (1995) who devised a heuristic matrix to represent the clinical knowledge of capable practitioners to mediate discussion during knowledge elicitation interviews. Capable practitioners were invited to reflect upon the interrelationships between their declarative and procedural knowledge and to distinguish their situated use in either shaping actions in response to relevant knowledge (coded R) or interpreting knowledge to fit the action (coded U). Practitioners were then asked to reflect on the specific case and decide whether the knowledge they identified was simply applied (coded 1), adapted to the case situation (coded 2) or used to design problem solutions (coded 3). Thus I hoped to engage in on-the-spot practitioner review of current knowledge use.

However, my assumptions were too ambitious. Capable practitioners could not readily articulate their stock of knowledge and know-how in the form of heuristic if-then interrelations. They found it difficult to express knowledge embedded in fluent action. Getting them to use their own words proved disruptive and unworkable and they asked me to sketch a rough heuristic based upon my initial observation before our discussion. The post event discussion of relationships, focused on motive as well as knowledgeable action, opened up their encapsulated knowledge; and this was further facilitated by the introduction of a palm sized auto-focus digital camera to improve my capacity to record the huge amount of procedural and conversational action taking place. This recorded 'choreography' of the event sequence of each episode triggered the visual recall of elements of the action and intensified engagement in the review process itself. Replay of images placed the participant in the primary analytical role; in contrast to the selective pictorial data criticised in methods texts for their emphasis on researcher selectivity.

Together we co-constructed the heuristic relationships between declarative and procedural knowledge as they talked through and discovered new connections in their knowledge use. Mediation using these roughly sketched matrices and digital stills images triggered discussion of encapsulated knowledge and provided an exploration of their linguistic representational capacities. I had methodological worries about the impact of co-construction and joint knowledge representation, but decided that my relations with practitioners would encourage rather than discourage their critical participation. Comments taken from the text illustrate discussions with a dual focus on clinical knowledge and a meta-cognitive self-awareness. Any increase in personal awareness has a potentially transformative impact on self-esteem and critical control.

Q: "I noticed you did not touch the lower part of the mid-line incision, why?" A: "Because I thought it was granulation and moist, I saw no reason to disturb it. Now I'm thinking about it, a gauze dressing on top was not optimum. If I were doing it again, I would put a piece of moist Kelto-stat on it" (fn:Nov 97-map21).

"I have to stop and work it out, I have to stop and think and it's when I do that, that things get missed. The routine stops because I have to concentrate on one thing and more experienced people seem to do it smoothly, almost without thinking" (fn:Sept 97)

"We don't have the correct width of spigot (closure top)". Capable response, "Well, you just have to adapt it the best way you can, ram the connector into the oxygen tubing you have!" (fn:May 97).

Mediating artefacts allow the individual to explore current and potential representations of their knowledge within a variety of contexts. The process acknowledges the dynamic progress an individual is making toward capability. The theoretical links are underscored and the meta-cognitive processes are made explicit, rather than scrutinised through conventional social mediation (Vygotsky 1978)

Participant responses shaped the development of the elicitation method. Practitioners provided written commentaries to accompany their completed maps and the role of prevailing contextual interpretation became apparent in what they wrote, "We are all used to you, so we know we said these things, that you didn't make it up. But, it sounds so rough, cold, without consideration (fn: Oct 97)." The conditions of interpreting knowledge relations in the map depend on how the practitioner interpreted the context, and action cannot therefore be interpreted separate from an interpretation of the context in which the action arose.

Methodological note (fn: Oct 97) - Immediate recall of context is important when asking practitioners to consider how they use knowledge because it (original text: provides additional information to) enriches their translation of action - the nurse reflects on and accounts for actions in context. Without context memory she might be distressed by the interpretation of language she 'appeared' to use inappropriately. Three experiences of constructing the heuristic matrix alone, hours after the contextual features are eclipsed, led individuals to want to interpret their activities in the light of what they would regard as 'ideal nursing behaviour/ disposition/ response to patient

need.’ Action stripped of context had shocked them, and they had felt, independently, the need to write (2) or tell me (1) of the discomfort of the reading process.

## Secondary analysis of episodic accounts

The secondary analysis aimed to discover relations among representations of fluent work within the community of practitioners. So the 52 accounts of knowledge use were analysed according to type of task, degree of fluency, use of deliberation, the nurse’s level of experience, situational recognition and the degree of guidance provided by anticipated outcomes shared among capable staff. The accumulated accounts were then sorted into predominant and overlapping secondary processes; technical activities of a routine surgical nursing nature, problem solving and decision making. Assigning nursing interventions to predominant types reflected local views of practice, as recorded in fieldnote texts, digital images and data from validation interviews. The “ types of work” list illustrated in Table 1 formed a route directory for other tables and its assumptions about primary and secondary characteristics of the work within the locale were checked once more by participants. This particular sample includes only episodes focusing on capable practitioners:

**Table 1: A sample of the knowledge maps of capable practice.**

Map no.	Title of Map	Technical	Problem solving	Decision making
1	Urinary catheterisation female patient with student observer and assistant 17/4/97	✓		
2	Teaching drug round -Male undergraduate nurse 21/4/97	✓	☆	☆
3	Packing a pilonidal sinus excision 5”x 4”x 4”	✓	☆	
4	Removal of a redivac drain 8/5/97	✓		
5&6	Teaching patient to change colostomy bag for the first time 12/5/97	☆	✓	
7	Irrigation of forchett sinus secondary to bowel disease 6/6/97	✓	☆	
8	Adapts the drainage of a T tube from the hepatic duct 18/6/97	☆		✓
9	HDU patient refusal as 6 bedded bay full; SN argues her point with Consultant 21/9/97			✓
10	Swabbing a Central line 8/10/97	✓		
11	Shortening wide-bore abdominal drain 8/10/97	✓		
12	Initiating decision-IV fluids for pre-scope diabetic patient 9/10/97		☆	✓

Footnote: ✓ = primary processes and ☆ = secondary processes

- Technical work accounts focused on procedural event sequences, wound and intubation and extubation work, intravenous fluids and colostomy work: 25 of the 52 episodes had a primarily technical focus and 12 had a secondary technical focus.
- Generic problem solving occurred in technical work, education and leadership: 13 episodes were primarily problem solving and 11 episodes had a secondary problem solving focus.
- Decision-making occurred within technical work, education and leadership: 14 episodes were primarily decision related and 2 had a secondary decision focus.

This preliminary sort enabled further analytical matrices to be developed to elucidate general characteristics of fluency, deliberation and capability. Apart from Table 1 above, these tools were devised in pairs, one to examine the range of manifestations of fluency, deliberation or capability, the other to map it against the practitioner's grade and experience. Those used in this study are listed in Table 2 below. These analytical matrices are conceptual tools that help us to think generally about the characteristics of learning to work in socially endorsed ways. Participants' collaboration in verifying this analytical process provided a degree of confidence in the validity of this approach.

**Table 2: Tools devised for an epistemological analysis of progression**

<i>Name of tool</i>	<i>Analytical perspective</i>	<i>Comments</i>
1 Types of knowledge	Designated technical, problem solving & decision making	An activity list where types of knowledge overlap
2 Fluency analysis	Selecting maps where actions & process were fluent interrupted or hesitant	Activities delineated by researcher & confirmed in participant verification
3 Aligning fluency with time in grade	Looking at relationships between fluency, grade and capability in mapped work	Participants articulated their expectations of grade and experience
4 Deliberation analysis	Identifying the triggers of deliberation in activities of a fluent, interrupted or hesitant character	Activities delineated by researcher subject to participant verification
5 Aligning deliberation with time in grade	Looking for generalisable aspects of the relations between deliberation and grade	Judgments about experience subject to participant verification
6 Performance capability through expectations of routine work	The expectations of capable staff in relation to learning skills in practice, coaching & legal practice	Expectations made explicit in participant checks
7 Performance capability and grade- analysing & projecting what expectations are made of capable peers	A general expectation of routine work for core activities	Subjective - their 'insider views' of core work capability, denoted through application of a numerical weighting

The fluency analysis tried to capture what is usually encapsulated and tacit by analysing the general characteristics of fluency revealed by the 52 individual accounts of very different nursing episodes. Each map was examined for fluency, interruption and hesitation. Digital images and the notes within the cells of the map assisted the decision to infer mapped activity as fluent, interrupted and hesitant. Spoken responses were often written on the map cueing some discussion afterwards. Practitioners sometimes returned the knowledge maps with appended notes the next day. Practitioner maps, photographs, written responses and observation notes contributed to the inferred level of fluency. Fluency inferences were supplemented by text review grounding individual inferences within an ethnographic account of the context. Such working across dual methodologies provides checks and balances for general inferences.

The fluency matrices illustrate general issues about progression that are independent of the individual performer and event, suggesting that a fluency diagnosis might search for the following phenomena:

- ⇒ Progress of partial recognition,
- ⇒ Recognition without concomitant knowledge of solutions,
- ⇒ Examples of mis-recognition and inadequate or omitted action solutions,
- ⇒ Self-monitoring, a characteristic of more advanced clinical learning, providing explicit self-pacing toward delimited goals, and
- ⇒ The interactive and inclusive role of a local capable community who provide inclusive dialogues and demonstrations bridging knowledge gaps which emerge during engagement.

### **Features of capable practice: fluency and shared meaning**

Fluency requires a capacity to recognise and respond to features within particular clinical episodes. Individual responses are tacitly determined through recognition of what is significant within a situation (Klein 1989). Shared practice introduces new practitioners to the process of recognition primed decision-making as instanced by more capable practitioners who recognise and respond to situations and include newcomers in the engagement. Episodic memory retains the accumulated repertoire of signs and symptoms in tacit rather than explicit memory so recognition and action solutions remain embedded and unarticulated (Hovarth et al 1996). Instance-based implicit knowledge may remain encapsulated in particular case experience that is not consciously recalled without the context in which recognition primed action occurred. Alternatively, semantic memory retains general, impersonal and decontextualised knowledge that transcends particular episodes (Tulving 1972).

Traffic between episodic and semantic memory transforms our embedded knowledge into retrievable general memories, a process which relies on our reflexive notions of the context; that is our capacity to represent features of the clinical context from within deep familiarity - smell, touch, feel, sensory representation. These are complex but logical

reasons why meta-cognitive links with situational fluency depend on representational understanding, being able to ‘mentally’ recreate signs in the character of context. The balance between implicit and explicit knowledge and meta-processes remains contentious (Dienes & Altmann 1997; Berry 1997).

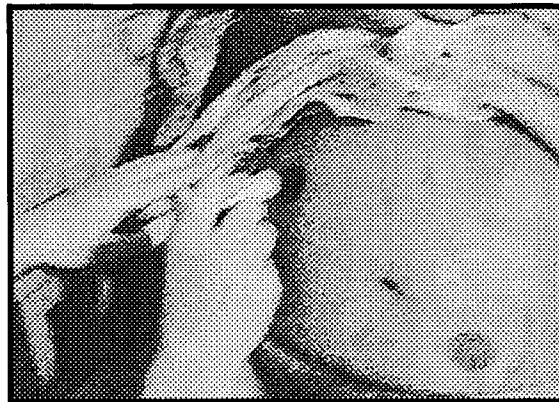
Domain expertise is shared among team members who have worked together for several years within the practice context and share a province of meaning (Berger and Luckmann 1966). Here knowledge is public, specific and useful in particular contexts. Some senior sisters took a view that “skills travel” (fn: Jan98) and basic principles of nursing engagement transfer, but specific local practice is bounded by shared meaning, interpreted through particular taxonomies that relate to clinical signs/ clusters of symptoms and reified through (rude) local maxims which represent meaningful aspects of work. Developing an understanding of medical language and acronyms used everyday, and grasping routine and local specialist knowledge is an initiation to shared public domain language.

The cognitive capacity for multiple representations of knowledge use enables engagement in the changing array of patient problems and the provision of solutions. Expertise entails an effortless propensity to formulate various representations that match a particular case requirement; a repertoire of ready-to-go templates refreshed through contemporary updating. It acknowledges regular and unusual aspects of cases by pausing to deliberate, while responding to familiar cases with fluent, uninterrupted action. Recognition primed decision-making (Klein 1989) provides the platform for fluent action. Fluent practitioners do not expend unnecessary energy worrying or struggling with representation, remembering how something is clinically framed, what it is called, or which way round it is orientated; because they are perceptually orientated in action contexts. Their goal in working unsupervised is to link self-paced feedback to ongoing action, thus sustaining confident activity. Thus, when extending routine fluency they use deliberative and reflective strategies to monitor the effects of altered performance, and to comprehend the performance implications of integrating fluent and new interventions. A capable practitioner undertaking a different type of urinary catheterisation technique unaccompanied after induction is “concerned to think it through carefully and give him the patient the idea I had done it thousands of times before. I thought, well this shouldn’t be a problem, but then... we’ll see how we go (fn:Mch 8 98)”.

The pictures below illustrate an episode where a sixty year old man awaiting emergency abdominal surgery for obstruction has his abdomen marked for the position of potential colostomy and ileostomy stoma sites. The nurse drew two oblique lines to mark potential sites, using the hip and pubic bones as reference points and avoiding zones where skin creases might prevent prosthesis adhesion. The process was made more difficult by the gross abdominal distention and, save requesting the man to stand and sit to ascertain the position of the crease lines, she remained silent throughout.



Picture 4-13 Recognition primed decision: selecting site for gut stoma



In keeping with these observations, the heuristic map below reflects capable and deliberative decision analysis.

Map no 27: A Registered Nurse Grade G marking the abdomen for position of a possible colostomy/ ileostomy in a patient with an obstructed GI tract

Areas of knowledge	Establish oblique lines between anatomical referents to mark skin	Rotating Pt. through normal range of movement to establish crease lines	Supportive dialogue	Assess patient capacity to absorb information & to make informed decisions
Anat & Physiology of small & large bowel	U3			
Optimum 'to surface' position for stoma & adhesion drainage system		U3		
Visualise anatomical bench marks to establish potential sites		U3		
Psychological needs of pre-op. patient			U3	
Acute obstruction of bowel				U3

**Accessing Knowledge**

R = Appreciating the relevance

U = Understanding & interpreting

**Using knowledge**

1 = Simple application

2 = Situation adaptation

3 = Problem solving

Invited reflection on episodes of work within the clinical setting led to personal exploration of knowledge use and heightened attention to effective interventions. The dialogue during the co-construction of a knowledge map revealed the encapsulation of personal knowledge within embedded clinical situations. Thus mediated representations

open up and objectivise situated knowledge and bring it under critical control. They stimulate discussion of the potential ‘takes’ on a situation and a new examination of the approach, the resources, the interpretation of the evidence and the appropriateness of routines.

### **Newcomers’ progressive capability at work**

The features of newcomer work were developed through comparing the evidence from capable and newcomer practice. Progressing newcomers may experience deficits in knowledge in the form of affect, feelings or emotions leading to action. This may include withdrawal from the situation. Know-how is learned through a sustained engagement in unpredictable and often frightening aspects of clinical practice where the partially capable practitioner recognises but cannot respond without a second more capable opinion. Engagement is negotiable, some practitioners may try to extract themselves whilst others stay and sort things out. Willing involvement in routine ‘slogging work’ is highly valued and essential for developing capability; but there is an emotional price to pay for sustaining the engagement when things get rough. Capable people create and sustain their performance through strategies for emotional control that are transmitted directly to the patient. The direct implications of self-control are captured in this remark from the Macmillan sister:

“ I would be certain Imogen would do what she said she would do, she would come back. She would not leave me alone, and that would mean a lot if I was very ill.”

Self-control is a dynamic state that links reflexive thought, knowledge, self-confidence and intention, which themselves are being developed in the clinical context through deliberate attempts to pace learning and enhance awareness. Emotional anxiety is created when newcomers are ‘flung in at the deep end’ and expected to cope in unfamiliar landscapes without the experience to either act or meaningfully consult.

*Zero recognition:* “ I was asked to go into room 1 (high dependency bay) and just get on with it. I had never, ever seen such sick people in my life, in ones, never mind 6 of them. The pumps kept on screaming, even when I unplugged them, and people kept on saying, ‘can’t you shut it up dear’ and I had to say no. I was petrified. (fn: Int.Dec 97)

*Newcomer perspective:* “When I came here the nurses kept on talking about 30s, I thought what are 30s (30 milliliters of water hourly). Senior nurses are so specific about what can be drunk after surgery, they have to be and it’s excellent. At hospital X, we had six consultants and each one did things differently (fn: Int.Dec97)”.

*Capable transferees:* “The problem becomes one of loosing confidence in yourself and constantly questioning, am I doing the right thing (fn: Int.Aprl 97).”

When newcomers start to get familiar with the context, training maxims take on a new meaning. Memorised theory is not a precursor of knowing what to do in a clinical

problem. Clinical know-how is learned by participating in the creation of solutions within a shared context of capable practice. Partial capability recognises some signs but not all, and problem solutions tend to be slow and deliberative. Transformation from slow deliberation toward rapid, instantaneous action is a progressive graduated learning process. Using a software analogy for this explanation, attentive recognition within clinical work primes the memory to 'down load' graduated decision-action templates (Boreham 1989) within instance-based episodic memory. Sharing nursing experience within a capable array of routine solutions gradually increases the newcomers' capacity to organise their clinical recognition of signs and solutions within episodic memory.

The developing practitioner does not articulate these templates or have any awareness of them other than through 'feeling states' primed by a particular (sensory-motor) clinical encounter. Templates are refined and expanded through repeated opportunities to use new knowledge in the shared context. Representational memory capacities depend on the number of instances in the episodic memory; fluency and multiple representations take months or years to construct.

This was my first job so I have learned a lot here including management of the ward, staff, discharge planning and referring. I've learned a lot about drugs, epidurals and patient controlled analgesia and internalised it. I can now advise on pain relief, medicine dosages and clinical skills These I am confident about. I can recognise when patients are flat, when shock is manifesting itself. I've learned an awful lot about gut surgery and a fair bit about most general surgery. I don't know a lot of detail about the physiology and surgical reconstruction, so I accept a description like 'they've replumbed it all' However, in terms of techniques to maintain patients I can do distal loop wash outs, nasogastric tubes, you get skilled at doing it over the years (fn:Int. Nov 97).

Seniors and peers note evidence of ascending fluency, revise their judgment of the individual's competence and begin to extend the individual practitioner's repertoire through the allocation of advanced work. Patterns of work allocation both confirm the senior nurses' view of an individual in the hierarchy of practice and affirm individual self-confidence.

Engagement in a shared domain of knowledge like gastro-intestinal surgery situates the newcomer within a group of skilled practitioners, some of whom are Health Care Assistants. In this resource-limited environment team morale enhanced collaborative working and shared roles. Team members who shared the practical knowledge of the specialty collaborated in teaching and assessment. Although it was contentious, semi-permanent members were canvassed for their impressions of newcomer aptitude and contributed to the sentiments of written reports and references. They were not a harmonious or peaceful group but, within the limited nursing resources of 1997-8, their collaborative solidarity and teamwork supported most newcomers' progress along a demanding trajectory toward capability within the domain.

Capturing deliberative practice is easier than capturing fluency. Newcomers deliberate engagement and ask questions in seeking solutions. They may experience embarrassment at not knowing some routine aspect of activity, and signed this by having to “grab someone to show me.” Despite a willingness to articulate what is known in relation to the demands of context activity, time to reflect was always limited. Capable transferees were more able to project the practical implications of deliberative practice. Experience had taught them to reflect upon the learning process, whereas newly qualified nurses often experienced emotional responses in role acquisition that inhibited their ability to reflect. Capable transferees appeared to predict a time frame for clinical progression.

*Coded knowledge elicitation and Skills acquisition:* “ I am good at the easy things, but with the big stuff, that takes time. You get quite nervous about being in charge of someone whose breathing is compromised, at first it makes you sweat, but the regular staff ‘know’ and can tell when it’s a usual response in the post op phase or when it’s something to worry about. I can’t, to me at the moment it’s all worrying. And then she and the HCA laugh together. The Health Care Assistant recalls how much she feared working in the major post op HDU area of the ward, room 1, when she started 4 yrs ago, “Now, it’s everyday, I’m used to it” (fn: Jan 98 H&N)

Those who practice with partial capability offer quite a lot of fluent ability, as well as less understood aspects of work; and in these situations newcomers rely on disseminated knowledge for transforming the norms of their practice.

### **Recognition triggers, embedded signs and deliberation**

Triggers that posed a challenge or disjunction within a recorded event sequence were sought, wherever practitioners deviated from the activity path encapsulated within domain norms. The observer and practitioner together were able to identify triggers leading to deliberative thought within the event sequence. Perceptual triggers are single or clustered precursor signs, recognised as a departure from the anticipated pattern of events. The recognition of a trigger sign elicits a response from a practitioner, often expressed as a feeling state, “it makes you sweat....”. It is visual recognition (not verbal) of a departure from the expected manifestation, course or process. Recognition associated with signs precedes the ability to act to ameliorate the problems; and capable staff acknowledge a newcomer’s capacity to recognise and report observations in advance of their ability to action a solution. Initial clinical recognition mediated through dialogue, is socially confirmed by others. Recognition may have an emotional impact, particularly on the newcomer who lacks the knowledge to find a solution.

“You could be excellent at theory but useless in practice. They ... might be able to tell me the patient is cyanosed but not tell me what to do about it. In that situation they would tell someone else, who would have to sort it out..... That someone else would be scared, I .. we are all scared (fn: Mch 99).”

Know-how is essential for establishing a decision pathway contingent on recognising embedded signs. Recognition is the first and crucial step in the action, and therefore precedes any capacity to initiate self-directed learning within a setting. Integrated context knowledge is highly regarded in acute practice because it illustrates the accomplishment of discrete yet interrelated learning processes; there are not one but several stages in closing the recognition-decision learning cycle.

### **Transferring practitioners learning transactions: meta processes in governing safe progress within new settings.**

Whilst getting closer to internalising antecedent and prospective representations of clinical action the individual “taps into” and uses the intellectual property and meanings of the collective and integrates personal knowledge and action within the community of practice. This ‘to and fro’ integrates individual and collective aspects of knowledge and the individual becomes ‘one of us’. Newcomers are deliberative; they seek and acquire the required knowledge and skill, and gain perspectives on local goals and expectations, in order to secure their practice life within the new context. The seeking process is mediated by negotiated social integration and deepening ‘inner’ recognition of what is significant within the array of professional processes that characterise local practice.

Q: How important do you think moonlighting into the Operating Theatre Recovery Unit has been for the development of your clinical expertise and the continuity of your senior staff nurse grade?

A: “It allowed me to see what its like and to do it, socially and professionally,..... to see if it might be a move I could make. I did two shifts a month. I could not do more. I knew the people, and they knew me from the patient hand-overs I received on post-operative patients from X ward, the biggest cases. They knew I was in charge of the ward on days and nights, and that means something, and then lately, I suppose for a year, they knew I was going down there to work. So they knew me socially too..... So, yes, I knew them and they were sure of my skills by the time of the job interview. .... (fn: Rec.March99)

Collaborative working accelerates newcomer recognition of significant clinical signs during clinical routines, a process which aligns a newcomer’s perspective, effort and effectiveness. Working in a strange setting puts a perceptual strain on the experienced newcomer who readjusts by participation in exemplary practice. It is in the interest of the semi-permanent staff on the shift to assist this process and increase efficacy, safety and economy of effort. However this enabling process may remain tacit in a resource stripped workplace when the skill mix limits practice to the crudest level of service provision.

*Observational note* -“Settling into the new specialty involves revising your ability to prioritise”, and she gives an example of her worry over a patients fluid balance based on the former norm perspective, “Don’t worry”, said the doctor, “ he’ll drink later”. “The gastro- intestinal focus is on immediate fluid replacement, whilst down on Head & Neck.....”(fn; Jan98).

*Observational note* - 'Spontaneous teaching over the kettle: The A/E doctor was making coffee for sister and himself, chatting to newcomer about the management of myocardial infarct, and she was apologising for not doing baseline pulse and blood pressure, just an EKG on the first man we transferred to ITU. He was explaining the role of streptokinase, aspirin, diamorphine and maxalon, his role and her role in doing the observations and preparing drugs for administration... delivered in a light, collegial fashion' (fn: feb98)

The exigencies of patient dependency and human resourcing may mean that a newcomer initiates an intervention they are unable to complete or omits an intervention when capable supervision is absent. Interruption and hesitance punctuate the event while solutions are worked through. Simple, but unfamiliar, practice issues command attention: "I am 'working through' in my mind exactly the steps I will take in the procedure (fn:8Oct97)". Engaging in the practice of colleagues leads to an exchange of the tacit 'givens' encapsulated in the phrase "the way we do things here". Significant omissions arise in the work of those with minimal consolidation who transfer into settings where comprehensive observation is necessary because there is more than one potential diagnosis. The emotional consequences are considerable and, unless supported, may provide the motive for early departure from busy settings where supervision is too thin.

*A 63year old woman with neck pain:* "I did her obs and they were fine, we were busy, you know how it is, and although I should have done the EKG at that time, I checked her from time to time, but I let it lapse for a couple of hours and then she was talking about going home. The Dr. said, where is the EKG and I said I hadn't done it yet...." Let's do it and then she can go home".... I did it and straight away I saw that she had an elevated 'T' wave and I knew she had infarcted. I showed the Dr. immediately and we are making arrangements to Strep her (fn:A/E May98)".

Partial capability is a stressful experience for more capable practitioners who transfer from a familiar setting where unreflective rapid capability is second nature. Their new deliberative learning trajectories put them into an uncomfortable gear, and they express partial knowledge situations as "confidence knockers (fn: May 98)" and they "wonder if I will ever make it, will I ever get there? (fn:Mch98)". Eraut's (2000) model linking speed to mode of cognition demonstrates the relationship between instantaneous recognition, instant response and unreflective but deeply familiar routine action leading to instant application of a clinical solution to a problem. Rapid cognition leads to rapid decisions and rapid and part-reflective action. Where hesitation and deliberation go together, the interruption may indicate a novel situation or partial understanding.

**Table 3: Time-Frame, Mode of Cognition and Type of Thought / Action**

<i>Thought/Action</i>	<i>Mode of cognition</i>		
	Instant/Reflex	Rapid/Intuitive	Deliberative/Analytic
Reading of the situation	Pattern recognition	Rapid interpretation	Deliberative/Analytic
Decision-making	Instant Response	Intuitive	Deliberative with some analysis of discussion
Overt activity	Routinised action	Routines punctuated by rapid decisions	Planned actions with periodic progress reviews
Metacognitive processes	Situational awareness	Implicit monitoring. Short, reactive reflections	Conscious monitoring of thought and activity. Self-management. Evaluation

Eraut (2000)

Intensive care supervisors recognised deliberative delay and took over as necessary. Emotional consequences of these over-ride situations depended upon reflexivity. Supervisors worked constructively with hesitant behaviour, confronting avoidance and increasing engagement. Dips in performance confidence were anticipated by mentors who recalled personal experience of transfer, “after a couple of weeks, wham, I was on the deck, I felt completely deskilled (fn:ITU March 98).” Supervisors know when to push reticence toward engagement, ‘he says he is pushing her now to take on the things that she can, and when she expresses reservations or fears, he confronts it with a cajoling response, to enable her to build confidence through experience’ (fn:ITU March 98p11).

“Medical management decisions are made quicker in ITU, infusion rates can be changed minute to minute. It requires confidence to understand the parameters of case management decisions and initiate the changes they request. Last week on nights, a patient was having IV adrenaline, then it was changed to Nor-adrenaline. The patient was completely in my care, except at the point of making the IV drug calculations. The supervising nurse in charge stepped in and took it from me, ... she knew I would be slow to calculate, and it had to be instant and right. She took the responsibility upon herself, and I was left knowing why ... and I saw it as support. They always know down here, when your limits are reached, and they are ready to step in and take over (Fn.: ITU May98p11).”

The new ITU nurse appended calculation maxims on her pocket calculator, as Benner’s model predicts a novice would do. Evidence of maxim driven, hesitant engagement and interrupted fluency point toward a deliberative activity sequence in the early stages of her progression. These characteristics are confirmed in the text analysis. In four months she is competent to deliver routine independent care under the scrutiny of an experienced supervisor, “I used to feel ‘oh, don’t leave me but now I’m fine” (fn:ITU May 98).

Familiarity mediates a steady and successful learning process toward a projected year of orientation.

I began to conclude that senior clinicians moving into new areas share many unnerving experiences with their less experienced counterparts, but through increased reflexivity and self-monitoring they 'travel with a different view', negotiate role partiality with confidence. They construct a safer practice platform for concurrent practice and knowledge transformation.

*Observational note: Head & Neck Unit*

I have a lot more to learn but many of the principles of basic surgery transfer, the skills are recognising the local-specific implications of them in these patients. You don't use the same skills in pain management because the patients rarely have 'patient controlled analgesia' pumps or epidural pumps. They may, but it's very rare. Working here is therefore simpler in that respect.....

I am building up my skills and confidence. On night duty I am in charge and then I have to get on and do it, be a bit confident. I take things slower, and I make time to think it through. I am slower than other people because I have to have time to think it through. I try one tiny bit at a time (fn: May 98).

Careful supervision occurred in the Recovery Unit and the Intensive Care Unit. The Head and Neck transferee began her introduction prior to transfer by working odd days of Bank overtime where she made the limits and boundaries of her practice known. Then after transfer she negotiated frameworks for safe progression. Transferees experienced marked differences in the conditions of their transfer, particularly in the amount of mentoring and supervision they received; the decisive factor was not their level of prior experience but what the new ward felt able to provide. Thus capable practitioners transferring to intensive therapy areas received more supervision than a post qualifier with only one year of ward based experience who moved to Accident & Emergency. Recruitment difficulties in A&E led to planned mentorship being abandoned, so she became one of three trained nurses on the accident room shift with low or non-existent supervision.

### Summary

The cognitive capacity for multiple representations of knowledge use enables engagement in the changing array of patient problems and the provision of solutions. Expertise entails an effortless propensity to formulate various representations that match a particular case requirement, a repertoire of ready - to- go templates refreshed through contemporary updating. It acknowledges regular and unusual aspects of cases by pausing to deliberate, whilst responding to familiar cases with fluent, uninterrupted action. Recognition primed decision-making (Klein 1989) provides the platform for fluent action. Capable people create and sustain their performance through strategies for emotional control that are transmitted directly to the patient. Fluency is not readily articulated, being a taken for granted attribute of domain familiarity. By contrast capturing deliberative practice is easier, newcomers may experience degrees of anxiety and embarrassment. They hesitate or interrupt an otherwise fluent event sequence to seek, deliberate, question. Post qualifying



newcomers are less able to project the practical implications of deliberative practice. Experience had taught more capable practitioners to reflect, articulate and pace new knowledge acquisitions within a deliberate learning framework. They used self knowledge to regulate and modify risk and opportunity within practice engagement, within a context of explicit negotiated supervision.

Collaborative working accelerates newcomer recognition of significant clinical signs during routine working, a process which secures newcomer access to distributed knowledge within settings characterised by a skill mix algorithm of 60% health care assistants to 40% qualified nurses. This is the constrained nursing context where patient dependency is accelerated by better surgical techniques, and qualified mentorship or any kind of supervision is thin. Young and inexperienced ward leaders are no match for patriarchal surgeons and executive nurses concerned to meet their corporate targets in difficult political resource climates; within such a crucible, the local concerns of clinical nursing have a still small voice and go unheard.

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1 A more detailed account of this methodology can be found in Fessey (2002)



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