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The influence of experience and expertise on how surgeons prepare to perform a procedure

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Abstract

Background: There is a paucity of literature describing how surgeons (either novice or expert) mentally prepare to carry out a surgical procedure. This paper focuses on these processes, and is part of a larger piece of research based on the Royal Australasian College of Surgeons (RACS) Clinical Decision Making model.

Methods: Interviews were conducted over a 3-year period with registrars, trainees, fellows and consultants in the Department of Surgery at one large regional hospital in Victoria. Analysis began from the first interview with no pre-conceived codes. Emerging themes were drawn from participants' interpretation of their experiences. Further information was obtained during discussions in theatre while patients were being prepared for surgery.

Results: The findings show that the process of rehearsal changes as a surgeon gains more experience in a procedure. A 'novice' relies on external sources of information, for example textbooks and videos. After participating in a number of similar procedures their reliance gradually moves to their own sensory memories. Surgeons at all levels of experience discuss their preparations with peers, colleagues, senior clinicians, and where appropriate, with members of other disciplines.

Conclusion: These findings offer insight into how surgeons, at different levels of experience, prepare for a procedure. These understandings have the potential to improve the teaching and learning of this essential component of surgical practice.

Introduction

Clinical decision making (CDM) has long been recognised as a core competency of surgical practice.^{1,2} In 2003, Royal Australasian College of Surgeons (RACS) Council approved Judgement—CDM as one of then nine competencies (now 10) required of all Trainees and Fellows.^{3,4} In the following years, each of the RACS Competencies, including Judgement—CDM, were further defined and revised in two booklets developed to establish training standards across the full spectrum from novice to competent and proficient, and to provide a guide for assessing and developing trainees and fellows.^{5,6}

During 2012–2013 senior representatives from RACS, as well as the Royal College of Physicians and Surgeons of Canada, and the

Royal Australasian College of Physicians (the Tripartite) formed a working party to explore ways to improve the teaching and assessment of CDM. The resultant four-stage model provides visual images to describe and explain the complexity of CDM. Those four stages of CDM are: (1) diagnosing and managing a patient; (2) preparing for a procedure; (3) monitoring the progress of a procedure; and (4) reflection and analysis. These four stages are not unique to surgery, as they can relate to any complex medical intervention.

The first of these stages has been researched extensively for several decades across a range of medical disciplines,^{2,7,8,9,10} with some more recent attention being focused on stage 3.^{11,12}

The focus of this paper is on the second stage—preparing for a procedure. In developing the concept map of this stage (see Fig. 1)

the expert surgeons and physicians in the Tripartite Working Group talked about what they needed to do prior to performing a procedure, or other clinical intervention, about which they were not entirely confident. Their ideas were juxtaposed with pertinent material drawn from a range of research areas including processes of thinking, information gathering, metacognition, and mental, visual and tactile rehearsal, anticipation and brain functioning.^{11,13,14,15}

Preparing for a procedure is possibly the least researched area of CDM and, even within research published in this decade, there is confusion of both definition and priority. For example, whilst one group of authors claim that there is no established evidence supporting the value of rehearsal,¹⁶ others state that preoperative planning is essential.^{17,18} Some of the research supporting the value of 'mental practice' to enhance the learning of surgical technical skills also acknowledges the importance of learning to process perceptual information.^{19,20}

Conscious preparation to carry out a procedure may be very brief—or very detailed—depending on the prior experience of each surgeon, how recently and/or frequently they have performed the procedure, the patient's condition and the time available. Preparation can involve revision of clinical knowledge such as anatomy and pathology, review of technical skills, mental rehearsal of visual images and tactile experiences, as well as anticipating problems and discussions with peers and seniors.

Methods

This research is based on constructivist grounded theory in which the focus is on an interpretive understanding of participants' meanings and the ways they construe their experiences.^{21,22} This approach requires the researcher to immerse themselves in the context, and the data, so that the participants' narratives are clear in the final research outcome.

Data are accumulated through on-going interaction between the researcher and the participants throughout the duration of the research. Analysis began from the first data collection and continued until saturation was achieved, that is, until no new themes or insights were found. There were no pre-conceived codes or groupings into which the data were classified; rather the researcher frequently read and re-read through the transcribed interviews, looking for and identifying code words, emerging themes and categories that revealed the individual participants' interpretation of their experiences. For example in this analysis words such as 'reading', 'steps', 'visualising' and 'talking' were found to reoccur in a number of transcripts, indicating shared experiences between a number of individuals.^{20,23} However, saturation was not dependent on frequency alone because the researcher was also searching for indepth understanding of the meaning which participants gave to those experiences.²⁴

Unlike traditional quantitative research requiring large numbers and/or random sampling, in qualitative research participants can be

Fig 1. The RACS model of stage 2: 'Preparing for a procedure' is a representation of thinking processes required to prepare for an operation and consider the range of eventualities which may ensue.

Table 1 Descriptions of preparing for a procedure: 'Novices' and 'experts'

\$\$\$	Preparation	Steps	Consultation	Patient complications
Registrar 6 Novice	Read up—the gross anatomy and the anatomy of the surgical exposure of the region		Talk to surgeon whom they are assisting	Is the traditional operation applicable to this particular patient and their pathology?
Registrar 7 Intermediate		Running through my head what sort of steps I am going to need to do	Have a conversation (with the consultant) about what parts of the operation they want me to do	
Trainee 1 Novice/Intermediate	Read up—look at videos—just to get some technique on-line	Each operation has key steps for performing including structures that need to be preserved	Talk to colleagues. Getting a second opinion	You need to be able to anticipate what are the potential pitfalls before embarking on the operation
Trainee 4 Novice	Look at surgical atlases	Textbooks that explain it step-by-step		
Surgeon 2 Expertise		As I am scrubbing, I mentally run through all the steps again		
Surgeon 3 Expertise	I rehearse in the shower or when I am lying awake in bed	I am picturing myself actually doing it and what I am going to do next	Talk to colleagues and peers	If it is a difficult operation, I think about what may go wrong for that particular patient
Surgeon 4 Expertise	I actually visualise myself doing the operation	Where am I going to put my hands when, what am I going to push, where, and what I'm expecting to find where		I anticipate anomalies. I also anticipate what am I going to do if I am wrong—it is not the diagnosis that I think it is
Surgeon 5 Expertise			Talk to other disciplines—anaesthetist/cardiologist/oncologist	

small in number and purposefully selected from a specific group, or groups, which are most relevant to the problem being researched.^{25,26} In this study, the interviewer needed to draw together participants who had surgical experience across the spectrum from least to most. Participants in this part of the larger study included seven junior registrars,* 10 accredited General Surgical Trainees, two Fellows† and five consultant surgeons (with experience of up to 20+ years) all of whom were working in the Department of Surgery at one regional hospital in Victoria. All of the participants were recruited by email invitation sent out by the Department Secretary.

Over a 3-year period, the first named author interviewed participants individually, and either individually or in groups in theatre whilst a patient was being prepared for a procedure (approximately 60 h). She also spent approximately 120 h as an observer/researcher in the general surgery operating theatres with ethics approval and permission from the hospital and surgical teams. Three quarters of the procedures observed were either laparoscopy (17—two

converted to open) or colonoscopy (13); the others were thyroidec-tomy (5), tracheostomy (4) and an open colorectal operation (1).

Results

Findings show that the processes of rehearsal change as a surgeon gains more experience in a procedure. In this study there is no over-all categories of 'novice' and 'expertise', rather that for each procedure a 'novice' is person new to and/or inexperienced in that situation, and that 'expertise' involves knowledge and judgement based on considered experiences. This definition also allows for different individuals progressing through these processes at different rates and with different emphases.

The processes of rehearsal changes as a surgeon gains more experience in carrying out a procedure. This progression from the first time of performing any procedure to becoming confident and competent is reflected in a variety of ways: in the kinds of resources used, the thought processes involved, the people with whom they consult or discuss their planning, and the extent of their consideration of the specific patient and/or potential complications.

In the early stages of learning to carry out any surgical procedure, a 'novice' needs to rely on external sources of information, whether they are text based, video, peers and colleagues, or supervising surgeons. After being personally involved in a number of procedures a novice internalises those experiences (becomes 'competent') in ways which enable them to switch to rehearsing using a

* Also known as a hospital medical officer (HMO) usually year 3–5 after medical school. These registrars are planning a career in surgery but have not yet been accepted onto a training programme.

† Fellows of the Royal Australasian College of Surgeons (FRACS) who have completed their general surgical training and are gaining further supported and supervised experience (usually for 1–3 years) before taking on a specialty or consultant appointment.

range of sensory memories, with less reliance on external sources of information. Growing expertise also enables a surgeon to better anticipate potential complications, consider contextual issues relating to the specific patient, their condition, co-morbidities and/or specific anatomical structures and to plan for contingencies. This reflects the journey towards ‘mastery’.

Within these generalisations, there are also individual differences. For example, whilst some registrars and trainees acknowledged the importance of considering the patient, other registrars/trainees appeared to focus much more on the sequence of steps (see Table 1).

Discussion

The results demonstrate that, whilst there are individual differences in development, there is a progression from novice to expert in the way in which each individual prepares to carry out a procedure and that, with experience, comes the capacity to draw on a range of sensory memories in order to consider more precisely what that particular procedure involves for that specific patient.

In the participants’ descriptions there is also support for the underlying principles of the RACS model—that with increased experience an individual’s preparation for a procedure involves a wider range of cognitive processes than is found in most of the literature on preparation and rehearsal,^{20,24} as it involves anticipating potential problems and considering options.

Perhaps because there is little literature addressing the complexity of the processes involved in preparing for a procedure, very few of the participants in this study had ever been taught these skills, the processes involved, or the language to explain them. Despite this, all of the surgeons involved in this study spend time with their trainees and registrars asking them about the extent of their experience with the forthcoming procedure, explaining to them what the procedure will involve, and/or reviewing with them the steps they need to follow. This common approach may explain the registrars’ and trainees’ focus on sequence and steps (Table 1).

However, there appears to be little focus on a novice’s sensory development, sensory awareness and/or their development of sensory memory. This means that there may be an opportunity to expand preparation discussions beyond the techniques and/or steps involved, to include open ended questions about the novice’s level of sensory awareness relating to the type of operation. Surgeons could also assist in this development by sharing their individual approaches and encouraging registrars/trainees to try similar techniques.

Training to anticipate differences in a patient’s anatomy, or changes in procedural approach, is another area which could be enhanced. Any specific challenges which might be anticipated given the patient’s prior history and current co-morbidities are usually discussed during team or department meetings. Unfortunately, younger team members may be excluded from these because of their ward duties. If that is the situation it is important for senior members of the operating team to discuss these issues with their juniors and to encourage them to consider contextual and patient-specific issues, and alternative plans.

The major limitation of this study is that it is small, being conducted in only one large hospital in regional Victoria and the data being collected by one individual. To address the potential of biased interpretation the data were shared with two external supervisors. However, verification of these findings requires similar research to be conducted by other researchers, in other settings.

Another possible limitation is that whilst the interviewer had limited knowledge of the experience of the junior participants in any procedure; however, she did assume some level of expertise in each of the consultants. This could be interpreted as potential for bias.

Ethical approval

WC received Ethics Approval from Barwon Health Human Research Ethics Committee (17/1) for the larger study on 31 May 2017.

Author contributions

Wendy Crebbin: Conceptualization; data curation; formal analysis; investigation; writing-original draft. **Glenn Guest:** Supervision. **Spencer Beasley:** Data curation; supervision; writing-review & editing. **Stephen Tobin:** Supervision; writing-review & editing. **Robbert Duvivier:** Data curation; supervision; writing-review & editing. **David Watters:** Resources; supervision; writing-review & editing.

Conflict of interest

None declared.

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