Short title: Surgical education and training

Full title: Surgical education and training in an outer metropolitan hospital: A qualitative study of surgical trainers and trainees

Authors

Debra Nestel, Department of Surgery (Austin Health), Melbourne Medical School,
Faculty of Medicine, Dentistry & Health Sciences, The University of Melbourne
Jennifer Harlim, HealthPEER, Faculty of Medicine, Nursing & Health Sciences,
Monash University

Melanie Bryant, Department of Leadership and Management, Faculty of Business and
Law, Swinburne University of Technology

Rajay Rampersad, Paediatric Surgery, Royal Children's Hospital

David Hunter-Smith, Plastic and Reconstructive Surgery Group, Monash University

Bob Spychal, Department of Surgery, Frankston Hospital, Peninsula Health

Corresponding author:

Professor Debra Nestel

Department of Surgery (Austin Health), The University of Melbourne, Austin
Hospital, PO Box 5555, Heidelberg, VICTORIA, Australia, 3084

Email: dnestel@unimelb.edu.au

Phone: [+61 3 9496 5482](tel:+61394965482)

Abstract

Introduction

The landscape of surgical training is changing. The anticipated increase in the numbers of surgical trainees and the shift to competency-based surgical training places pressures on an already stretched health service. With these pressures in mind, we explored trainers' and trainees' experiences of surgical training in a less traditional rotation, an outer metropolitan hospital. We considered practice-based learning theories to make meaning of surgical training in this setting, in particular Actor-Network Theory.

Methods

We adopted a qualitative approach and purposively sampled surgical trainers and trainees to participate in individual interviews and focus groups respectively. Transcripts were made and thematically analysed. Institutional human research ethics approval was obtained.

Results

Four surgical trainers and fourteen trainees participated. Almost without exception, participants' report training needs to be well met. Emergent inter-related themes were: learning as social activity; learning and programmatic factors; learning and physical infrastructure; and, learning and organizational structure.

Discussion

This outer metropolitan hospital is suited to the provision of surgical training with the current rotational system for trainees. The setting offers experiences that enable consolidation of learning providing a rich and varied overall surgical training program. Although relational elements of learning were paramount they occurred within a complex environment. Actor-Network Theory was used to give meaning to emergent themes acknowledging that *actors* (both people and objects) and their interactions combine to influence training quality, shifting the focus of responsibility for learning away from individuals to the complex interactions in which they work and learn.

Keywords:

Actor-Network Theory; Surgical education; Surgical training; Practice-based learning; Thematic analysis

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Introduction

Social, economic and political pressures influence the organization and delivery of surgical care. Within this context, the provision of surgical education and training is also impacted. The Royal Australasian College of Surgeons (RACS) proposes a significant increase in the numbers of surgeons in training during the next ten years in order to maintain current surgeon-patient ratios in 2025 (Royal Australasian College of Surgeons, 2011). This projection focuses attention on the provision of high quality training places and the capacity for surgical training in less traditional sites.

In Australia, surgeons are trained through the RACS. The surgical training program is usually commenced in the third to sixth year following graduation from medical school. Since 2003, the RACS has adopted competency-based training inspired by the CanMeds framework (Frank, 2005) and in 2012, RACS published standards for nine competencies (Royal Australasian College of Surgeons, 2012). Surgical trainees rotate through posts, which vary between six and twelve months, and undergo a number of assessments during their 5-year training program, including work-based assessments and an exit Fellowship examination.

In theory, making clear what competencies are expected of surgical trainees should facilitate quality assurance of training programmes inasmuch as trainers and trainees both know what is expected. Competencies are well suited to surgery where

much of the craft of surgeons is observable and therefore measurable. However, issues with competency-based education have also been raised (Dornan & Nestel, 2013; Kneebone & Nestel, 2010). The RACS provides guidance for accreditation of training sites with clearly articulated requirements. The underlying principle of the accreditation process is to ensure that training sites provide learning environments that facilitate the training of safe and competent surgeons (The Royal Australasian College of Surgeons and The Specialist Surgical Associations and Societies of Australia and New Zealand, 2008). With these contemporary pressures and accreditation processes in mind, we undertook a qualitative study of surgical trainers and trainees, exploring their perceptions of the degree to which an outer metropolitan hospital has capacity to deliver high quality surgical training. Our research questions addressed surgical trainers' (supervisors) and trainees' experiences of surgical training in an outer metropolitan hospital.

There is a growing literature on surgical trainees' experiences of training. Some seek to measure the specific facets of the learning environment, especially targeting the operating theatre (OT). For example, Mahoney et al. (2010) sought to validate the Surgical Theatre Educational Environment Measure (STEEM) with Australasian surgical trainees. Relevant for this study was that most surgical trainees were satisfied with their OT environment, satisfaction was higher in senior trainees than juniors. Kieu et al. (2015) used individual interviews to explore surgical trainers and trainees' experiences of learning surgical competencies in the OT. Relationships between trainers and trainees were important for learning and competencies varied for in their ease of teaching in the OT. Cope et al. (2015) also used individual interviews

to explore learning in the OT and reported sensory semiosis, previously unreported as an important means by which trainees made meaning from “signs”.

Moving away from the OT, Hillis et al. (2015) surveyed trainees and fellows on the relative importance and prioritisation of the nine surgical competencies described by the RACS. The results showed that trainees and fellows placed importance on “individual skills rather than on achieving a common goal”.

Surgical training largely occurs in the workplace. There are many practice-based theories to make sense of such learning. Nestel and Burgess (2014) describe how the theoretical concept of Communities of Practice (CoP) has relevance in surgical training. A feature of this concept is the notion of *legitimate peripheral participation* in which trainees are over time drawn centrally within the community by being offered meaningful participation. Fenwick and Dahlgren (2015) describe how socio-material theories offer valuable insights since they do not privilege human activity over the setting. For example, in Actor-Network Theory (ANT) (Latour, 2007), *actors* (people or objects) comprise a *network* (the relationships of the actors) with people and objects having potentially equal importance (Bleakley, 2012). The ways in which the *actors* relate meaningfully (the quality and quantity of alliances) are the basis for promoting learning (Bleakley, 2012). ANT shifts the focus of investigating learning from individuals to the setting in which the *actors* are located. Latour (2007) also described concepts of *mediators* and *intermediaries* with respect to the nature of relationships between *actors*. *Mediators* promote dialogue while *intermediaries* offer monologue (Bleakley, 2012) with networks developing and innovating when *actors* act as *mediators*. Bleakley (2014) has used ANT as a

methodological lens to examine teamwork in the operating theatre. Ibrahim et al. (2015) have recently described how ANT helps to make sense of preparatory actions of orthopaedic surgeons undertaking complex elective surgery and made recommendations for its use in supporting trainees.

Methods

Our research question asked: *What are the qualitative experiences of surgical training in an outer metropolitan hospital?* We considered this question to be best answered by qualitative research methods (Crabtree & Miller, 1999; Creswell, 1998) as they allow the exploration of a complex phenomenon from the perspective of a particular group of people (Sarantakos, 1998). Data were collected using individual interviews (Sarantakos, 1998) with trainers and focus groups (Barbour, 2005; Morgan & Spanish, 1984) with trainees. These methods were used to seek insight to the experiences of surgical training in the specified context. Complementary topic guides were developed for trainers and trainees, reflecting the overarching research question (Figures 1 & 2). Interviews and focus groups were carried out at the hospital at times that were convenient for participants.

The study was conducted at a public health provider located 40 km from the capital city. The 800-bed hospital provides a wide range of services including obstetrics, aged care, rehabilitation, emergency and intensive care, oncology, psychiatric services, surgery and *hospital in the home*. Surgical services include the provision of general, orthopaedic, plastic and reconstructive, ear, nose and throat, urology, paediatric, vascular, gynaecological, and thoracic surgery. The hospital participates in surgical training of accredited registrars (trainees) of the RACS in most specialities

and is a university teaching hospital. Surgeons are almost all part-time or with just four full-time appointments. Most surgeons at the hospital are Visiting Medical Officers (VMOs), that is surgeons in private practice who also provide medical services in a public hospital. The Department of Surgery offers an academic research programme for medical students, trainees and surgeons.

Our intention was to purposively sample interviewees from a list of all surgical staff (trainers) (n=52) at the hospital to reflect experience, specialty and interest in education. Although 52 surgeons were eligible to participate, only four agreed. Ethics precluded us to seek reasons for non-participation. However, that most surgical staff are part-time or VMOs, have other hospital commitments and work outside of the hospital, contributed to the low level of engagement in the study. Interviewees came from general surgery (n=2), orthopaedics (n=1) and plastics (n=1). Only one surgeon was full-time at the hospital, they were aged between 42 and 51 years of age, three were male and one female with 23 as the median number of years since graduation from medical school.

Focus groups were conducted at least four months after rotations commenced ensuring participants had experienced surgical training in the specific context. All accredited trainees were invited to participate (n=20). Fourteen trainees participated in three focus groups. They were aged between 27 and 39, thirteen were male and one was female, and seven was the median number of years since graduation from medical school. Ten trainees were on a general surgery program while there were two in orthopaedics, and one in each of plastics and urology.

Interviewers (DN, MB) and the focus group facilitator (DN) were experienced in qualitative data collection. Interviewers knew some of the interviewees (consultants). The facilitator did not know the focus group participants. Interviewers and the facilitator kept field notes. Interviews and focus groups were audiotaped, transcribed and de-identified. Participant checking was offered but not taken up. Data collection resulted in 214 minutes of interview and 199 minutes of focus group data. Interviewers reported a willingness of trainers to share their experiences. Trainers appeared to respond to questions with ease and honesty. The focus group facilitator noted trainees' enjoyment and empowerment with the opportunity to share their views although some initially seemed less confident than others to speak frankly. As the focus groups progressed, reticence disappeared. The interviewers and facilitator reported the need to keep participants focused on local (specified context) rather than broader surgical training experiences.

The research team was comprised of surgeons (RR, DHS, BS) and researchers (DN, MB, JH). Two surgeons were consultants (DHS, BS) and one a trainee (RR) and all worked at the hospital in which the study took place. DHS is a plastic and reconstructive surgeon, twenty years post-surgical training. He has a mixed academic and service appointment, spending 0.4 Full Time Equivalent (FTE) in the public sector and 0.6 FTE in the private sector. DHS performs general reconstructive plastic surgery with a special interest in reconstructive microsurgery and hand surgery. DHS has a 0.9 FTE clinical load with 0.1 FTE of research and education. BS is 24 years post-surgical training and is an upper gastro-intestinal surgeon. He has full-time public hospital appointment with a 0.4 FTE in clinical work and 0.6 FTE in administration, education and research. RR is at the midpoint of his training in

paediatric surgery and has a full-time clinical load, which includes elective and emergency caseload with on call. At the time of the study in 2014, three of the researchers (DN, MB, JH) were employed by Monash University.

Using thematic analysis (Braun & Clarke, 2006), two researchers independently analysed transcripts (DN, MB) and then discussed their findings with the whole research team enabling interrogation from multiple perspectives. Themes were clarified and summarized. All transcripts were then reviewed a second time to check for accuracy and disconfirming evidence (DN, JH). The different perspectives of the research team enabled robust interrogation of data.

Institutional ethics approval was obtained for the study. Text is de-identified and pseudonyms used to aid reading.

Results

We start by presenting the findings in relation to the question of whether training needs were met in an outer metropolitan hospital and then offer four overlapping themes derived from the data - learning as social activity, learning and programmatic factors, learning and physical infrastructure and learning and organizational structure.

The outer metropolitan hospital as a training site

With the exception of one trainee, all study participants considered that this site offered valuable training opportunities. The exception related to a trainee whose specialty was about to lose accreditation and therefore was unable to continue training

at this site. The RACS accreditation process had identified this particular specialty training program as unsatisfactory.

Trainers described the value of the site for trainees who were proactive in their learning, with trainers who were mostly interested in education, in a culture of training supported by administration, with an “*encyclopaedia of patients*” and that the site worked most effectively to consolidate training.

“I think by and large almost with every specialty ..., they’ve got some very dedicated trainers, very interested. Good clinicians who feel that training is an essential part of their normal working life... I think the vast majority are good trainers, but that’s not uniform, within and between specialties. But by and large I think it’s very good... the environment is good for it, the patient[s], ... in terms of their pathologies is ideal. For medical training, in its entirety, but certainly within surgery it’s fantastic, both in terms of the elective and emergency component. The socio-economic groups of the patients... with some relatively late presentations of diseases... the interaction with the local GPs [family medicine doctors] as well ... which is another essential part of medical and surgical education. (Trainer 4)

“... this is a really good bread and butter hospital... I think it’s best for surgical trainees to come here after they’ve begun. So in the middle of their training... they come here for six or 12 months in the middle of their training, and they get to operate on common stuff... they do a lot of elective hand surgery, elective reconstructive surgery, elective bowel surgery, elective orthopaedic surgery, lots of it. It’s a very nice cohort of patients, it’s got a

good waiting list structure, it's not that busy after hours... a good solid, consolidating, general unit, but it's broader than that..." (Trainer 2)

And from trainees too, there was an overwhelming sense of the site offering valuable training opportunities that challenged preconceived notions of the role of such hospitals in surgical training, offering trainees a sense of “accessible” trainers and preparing trainees for their future practice over and above meeting training program requirements.

“... I've probably been here longer than anybody here [looking around the participants in the focus group], because this is my second consecutive term in this hospital. In the larger hospitals, there was always a perception that hospitals like these are supposed to be just where you learn to cut and sew and tie. And then you go back to the bigger hospitals, the centres of excellence to be taught about the bigger operations, so I think I sort of went into starting here at this hospital with that perception... I've obviously learnt that it's a lot more than that... you're not seconded out here just to pick up foot soldiers' skills, but rather it's a continuous process. So my expectations have changed, appreciating what this hospital can do, and it's right up there with any other hospital ...” (Focus group 1)

“... I've had some pretty good experiences here... two of my bosses here are solely located here and are staff specialists... they are always available to do regular rounds or whenever you need some advice, they're in the hospital to give it and can help you, can be on site and see patients with you or review

scans with you. So I think from, on our unit there is a good experience to be had there and some good mentoring takes place.” (Focus group 2)

“That this hospital is not only [about] surgical education... but it’s also career focused as well. What areas you may choose later on, how to set up a practice, those other things that we may not necessarily think about whilst we’re a trainee in a large hospital... You get a fairly close relationship with those consultants you work with ... they will provide advice and really do act as mentors ... and invited to their houses and you really get to know them, not just as surgeons but also as a colleague...” (Focus group 3)

Learning as social activity

Trainers and trainees described learning as social activity with relationships paramount – in various combinations of trainer-trainee, trainee-trainee and other professional relationships. Variable commitment to surgical training was noted by both trainers and trainees and about each other. Some trainers were considered to have high levels of enthusiasm and teaching capability.

“They all have a very strong commitment to training, [one of the specialties] working here, being on call, coming in, running journal club, running educational sessions. One of their members is currently [in a leadership role] for the state, they’ve got an examiner in their group, they’ve got a strong [training-orientation], they’re active in research. It’s a strong organization, now a strong group, now the whole of surgery needs to be like that, not just one group. So that’s what the whole of surgery needs to be like.” (Trainer 2)

“It’s really obvious coming here that the department is really enthusiastic and interested, and without wanting to name names, it’s coming to like the research meeting and seeing how sort of Professor Henchard is approaching that [surgical issue]. And Professor Fawley as well, particularly those two, and maybe Mr Knight in your department as well [looking to another trainee in the focus group]. People who are just obviously really interested in building something out here.” (Focus group 1)

The relatively small faculty facilitated close relationships and approachability.

“... I’ve always got someone Professor Henchard in the hospital. I can just chase down and ask. And they’re very approachable, and I can ask them about things that aren’t necessarily, strictly speaking their problem. It might be someone else’s patient, but because they’re around, they make themselves available for advice, and things and it’s nice having that sort of backup and support. And of the several consultants I guess there’s a mixture of styles, and some of them are more just coming in for the operating lists and available by phone. And others are sort of very hands on, and doing their own ward round on a daily basis, and having a mixture of those things is good.” (Focus group 1)

Trainers and trainees both identified that development in trainers’ teaching skills were needed. Trainers also expressed a need for more “pro-active” learning approaches by trainees and that *“there’s a bit of give and take between the trainees and the trainers”*. When trainees diligently prepared for learning and operating they

were granted more opportunities. Trainees' pro-active learning was also illustrated by the formation of an informal study groups.

"... we're planning to sit the Fellowship exam next year. And the plan for the second half of the year and certainly for the start of next year will be to meet for one hour per week in study group to be reviewing topics and also questioning each other on Fellowship type questions in the role of an examiner/examinee." (Focus group 2)

Learning and programmatic factors

Although trainers and trainees reported sufficient access to an appropriate case mix (except for one trainee in the speciality that was losing accreditation), when asked about deficits in surgical training elective operating was identified although not unanimously.

"We don't get enough elective operating.... Registrars need a combination of elective and emergency stuff and we don't get that at the moment." (Trainer 3)

This trainer emphasised the need for trainees to achieve logbook numbers as early as possible in the term.

"...they do achieve the numbers that are required per term. I think it's good to keep those targets and actually make sure that they do because the overall, I mean, overall thing about the College is that you do need to have fulfilled X amount of this, that and the other by the time you sit your Fellowship and you do get a fair bit of grief if you haven't,. we might not do it this term but I'll catch up next term, I don't think is a good idea because next term, you know,

might be some other issue and people might get sick or need to have exam leave or whatever.” (Trainer 1)

Weekly Department meetings were designed to support learning. Some trainees valued the site for the opportunity to consolidate learning from previous rotations while others reported overwhelmingly superior learning experiences at this site. For example,

“...Mr Robinson [trainer] ... has set up a special clinic, where I go off with one consultant, and we have our own little special clinic off to the side in a separate facility. And that guy sees five patients, and I see two, and they’re all new patients who no one’s seen before, and...over the three hour clinic we just go through those seven patients... [its] just golden time. I reckon in the last three months I’ve seen more patients and had more teaching than I had in the previous four years before now.” (Focus Group 1)

Trainers and trainees reported that some competencies were directly taught (medical expertise, judgment, clinical decision-making and technical expertise) while others (professionalism, scholar/teacher, health advocacy, management and leadership, collaboration and communication) were indirectly or not taught either at this hospital (or at other sites). In response to inadequate support in developing the scholar/teacher competencies, the Department implemented a research program.

“In terms of one aspect of surgical training that has been relatively deficient here, but we’ve been correcting, is just about the attitude and the principles of research and how important that is to education, and so [thereby], well we’ve

done that in ... as much a non threatening way as possible, and with good results.” (Trainer 4)

This trainer noted an indirect approach to teaching about professionalism and health advocacy although it is unclear how the teaching (and learning) occurs.

“... most of the teaching is hands on in theatre. One of my beefs is honesty and professionalism in young registrars. So [I] push that a little bit more and I suppose, ... you do emphasise that [honesty and professionalism] when you see things transgress with your own registrars here. Health advocacy, you know, we push that in the registrars but hopefully they see that from example. All right. But I’m a big one for professionalism and I think that’s something that is so under rated these days.” (Trainer 3)

Trainees reported a similar focus on some surgical competencies and did not detect differences from their experiences in other rotations.

“I wouldn’t have thought the teaching, for me, has been any different from what I would see in other hospitals. It’s really just through example. We’ve all seen these headings [competencies] and, you know, key areas that the College [RACS] would like us to achieve as surgical trainees and as surgeons, but it is very hard to teach, say, communication. I think that’s something that you learn from seeing it done well and you equally learn from seeing it done badly. So I think that’s something that you just, you just learn through the experience of how things are done.” (Focus group 2)

Some trainees wanted more feedback, more structured learning and this trainee expected more operating.

“I think when I come to either a country or a regional hospital, my expectation is that it’ll be a more hands on sort of experience than I might get in a bigger city hospital. So when I come [here], I expect to be first in line to do a lot of the surgery, a lot of the operating.” (Focus group 1)

Learning and physical infrastructure

Overall the clinical infrastructure was suited to surgical training. Notable features that supported training included sufficient numbers of beds and OTs with satisfactorily equipped clinical environments. Trainers spoke of the refurbishment and expansion of the hospital. However, trainees reported few dedicated facilities with limited study and meeting spaces, no clinical skills laboratory and very limited simulator resources. Few trainees had used the library since most resources were accessible electronically. Trainees felt strongly about the need for an improved study environment while trainers felt strongly about the need for skills laboratories and simulators.

“ [would like] an area where it could be a sit down area, like almost like a coffee room or something, where you can have a verbal interaction between the trainer and the trainee. About the next patient, or what happened with the last patient... Part of the, the communal space that we have here, in an open plan fashion, is supposed, it was basically designed to have a number of kind of hot desks, where registrars and residents could come and sit. And either learn or interact with other members of the surgical department, in terms of like our research team etc.” (Trainer 4)

Learning and organizational structures

Trainers and trainees indicated the profound impact of organizational structure on learning. Depending on specialty, trainees are afforded learning in outpatients.

“We have outpatient clinics that are solely designed for trainees to assess patients and then present them to consultants on a weekly basis... The only difficult aspect of the position here is that there’s a huge volume of patients to be seen and a large number of referrals that are made and the on call is one, between one and two to one in three. So that can get a bit taxing but we certainly, we’re not short of any patients to be seen and we’re not short of cases.” (Focus group 2)

The relatively high number of VMOs accentuates the relatively small number of trainers when compared with larger training hospitals.

“... It’s difficult to do things properly if you don’t have, don’t allocate enough time to do it, and there is a growing population, a very small number of providers for services down here. So [surgery] it’s run by a whole bunch of VMOs, ... and we have big demands outside of the organization, so it needs a commitment...” (Trainer 2)

An overarching organizational commitment to education was important and in evidence.

“I think this organization’s pretty good. Because it embraces the junior doctors across the board quite openly, in terms of their commitment to education, and also it’s quite young in being a teacher of undergraduate

students. And that in itself, that is a big, ... that's also a major component of the very well developed surgical training units [at larger training hospitals]. Because they've got, because the trainee has a major part to play in the education of the junior doctors, and the medical students, and that's part of his or her medical training as well." (Trainer 4)

Finally, this trainee describes the impact of *safer working hours*. RACS recommends 60 to 70 hours weekly for surgical trainees (Royal Australasian College of Surgeons 2013). Trainees at this hospital worked within the recommendation.

"When you're working non-safe hours you're in the hospital a lot more, you're doing a lot more operating. You're doing a lot more emergency operating...And moving away from that it takes a lot of that away from you, and if I compare my...log book from the last six months of non-safe working hours to the few months here so far, I'd be progressing at a slower pace in terms of the actual amount of operating...But I've noticed here with safer working hours a real change in how awake I am during the day and how...I have so much more sleep now. That's really noticeable and I'm sure that helps to retain information." (Focus group 1)

Discussion

Surgical training in this outer metropolitan hospital offers rich and varied opportunities for learning including but not confined to the *consolidation* of learning. Trainers' and trainees' experiences largely revealed complementarity. While rotation through clinical sites remains part of surgical training, trainers and with the exception of one trainee, all strongly supported the site as valuable for learning.

The four interrelated themes provided insight to the elements that characterised the experiences of which *learning as social activity* was highlighted. Although this is well illustrated by socio-cultural learning theories (Billet, 1996; Wenger, 1998), collectively the four themes reflect the complexity of the environment in which surgical training occurs. Hillis et al argued for the practice of medicine to be rethought more broadly (Hillis et al., 2015) while medical educationalists too have argued for the widening of perspective to make sense of learning (Bleakley, 2006; Regeher, 2004, 2010). Although there is evidence of several practice-based learning theories in our findings, we were drawn to ANT.

In this study, *actors* include the trainers, trainees, patients, surgical programme (including competencies), safer working hours, log books, study groups, OTs and more. Their interactions or alliances were well illustrated in our data. Firstly, in an OT, at a moment in time there are multiple actors – trainer, trainee (perhaps other trainees and sometimes ‘competing’ for operating experience), a patient, other members of the theatre team and surgical equipment. This network is replicated in other theatres simultaneously and, is indirectly connected by other staff and equipment requirements etc. Secondly, in the Department of Surgery, there are examples across a wider time frame too - weekly meetings, research activities, formal and informal learning groups. The numbers and types of actors in the OT and the Department are only those represented in our data but there are likely to be more in reality. Thirdly, there are other settings such as the wards and outpatient departments and the clinics where new patients were seen. The *actors* and their relationships are repeated in each of these settings but with minor variations.

Although this metropolitan site is bounded, surgical training is part of a broader network of health service, of RACS curriculum, and much more. The value of ANT shows how this site offers opportunities for surgical training that in the trainees' experiences were not necessarily available at larger hospital sites. Trainer, trainee and patient relationships were characterized as dialogic, the relationships facilitated in clinical settings by factors such as trainees' level of access to operating and to seeing patients in wards and outpatient departments. That trainees identified this site as a place for consolidation of learning represents the importance of viewing their experiences as part of a complex larger network affirming the value of this rotation.

Our findings confirm those described in the literature and reported earlier, that access to operating leads to satisfied trainees (Mahoney, Crowe et al. 2010), that relationships, especially trainer-trainee are important for achieving surgical competencies (Kieu, Stroud et al. 2015) and that communication for learning in the OT is so much more than the spoken word (Cope, Mavrovelli et al. 2015). Our study adds to the literature by including both trainer and trainee perspectives on training, of highlighting the importance of trainer-trainer, trainer-trainee and trainee-trainee relationships and extending the investigation of learning beyond the OT.

By using ANT, the study surfaces the interactions of human and non-human *actors* and the importance of designing mediaries to promote their connections resulting in high quality training experiences. The strengths of the study include its qualitative nature seeking insights from trainers and the trainees with whom they work. However, there were also limitations. The sample may not be representative, especially the trainers who are characterized at this site by their part-time

appointments or VMO status. We did not explore all stakeholder perspectives in the surgical education process such as other OT staff, patients, medical students and administrators. Participants, especially trainees may have felt unable to share their views freely although interviewers/facilitator notes suggest otherwise. The interpretive analysis may have introduced biases. However, the iterative analytic process together with the different stances of each member of the research team was likely to go some way to mitigate biases. Additionally, ANT is often used as a methodological lens. However, we preferred to undertake thematic analysis and then consider our findings in the light of ANT, an approach recently described in Ibrahim et al. (2015).

Conclusions

In summary, surgical training is feasible in this outer metropolitan hospital for most specialties and is best viewed as part of a continuum of learning in practice. By including both trainers' and trainees' perspectives on training, our study has added the importance of the myriad of social relationships - trainer-trainer, trainer-trainee and trainee-trainee – in surgical training and extended the investigation of learning beyond the OT. Our study also documents how surgical training was strongly influenced by non-human factors too. When viewed through the lens of ANT, the emergent themes show a complex network of human and non-human *actors* whose mediator-oriented connections are essential for high quality surgical training. We recommend this site privilege its strengths as experienced by these participants (e.g. the myriad of personal relationships, the focus on competencies less explicitly *taught* in larger sites – professionalism, health advocacy, and, on planning future practice etc.) all while *consolidating* learning. Since this study was exploratory, future research could adopt methods that document what actually happens in surgical training rather than what

participants' state happens. Observational studies followed up with participant interviews (Ong, Dodds et al. 2015) or video reflexivity studies would capture site specific surgical training in action, in various settings, at different time points. With both methods the researchers engage with the participants to make meaning of the experiences. This would enhance tremendously our insights to this complex network of practice-based learning.

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Figure 1: Topic guide – Surgical trainers (Individual interviews)

1. What do you think constitutes an ideal environment for surgical training?
2. What resources are necessary? (Trainers, patients, educational materials, simulators, study groups etc.)
3. What are your expectations of surgical training here?
4. What are the strengths of surgical training here?
5. What areas need development?
6. How important is clinical supervision for surgical training?
7. What are your experiences here (clinical supervision)?
8. What support do you need to improve the surgical training you provide?
9. If one change is to be made to surgical training here, what would you want it to be?
10. Are there specialty specific needs in surgical training (besides the obvious)?
11. What structured learning activities do you provide?
12. What are your expectations of surgical trainees?
13. What motivates you to actively teach?
14. What constrains your interest in teaching?
15. To what extent do you get feedback from trainees on your role as a teacher?
16. Surgical competencies incorporate a range of knowledge, attitudes and skills. The College of Surgeons has adopted the CanMeds model of competencies that includes: professionalism, scholar/teacher, health advocacy, management and leadership, collaboration, communication, medical expertise, judgment, clinical decision-making, technical expertise. Spend some time thinking about these categories of competence.
 - a. To what extent do you consider this breadth of competencies in your teaching?
 - b. How do you teach these competencies?
 - c. Is this the best way?
 - d. Can you suggest alternative approaches?
17. What impact do you think safer working hours is having on surgical training?
18. Do you have experience of simulation to support surgical training? If so, what do you think about it? Is it something that could be used here?
19. Is there anything else you think would be helpful in developing surgical training here?

Figure 2: Topic guide – Surgical trainees (Focus groups)

1. What do you think constitutes an ideal environment for surgical training?
2. What resources are necessary? (Trainers, patients, educational materials, simulators, study groups etc.)
3. What are your expectations of surgical training at this site?
4. What are the strengths of surgical training at this site?
5. What areas need development?
6. How important is clinical supervision for surgical training?
7. What are your experiences here (clinical supervision)?
8. Did you have a choice to train at this site? Why have you chosen to undertake surgical training at this site?
9. If one change is to be made in your surgical training here, what would you want it to be?
10. What specialty (craft) specific needs do you have?
11. What structured learning do you experience here?
12. What other programs do you attend?
13. How satisfied are you with the feedback you receive on your progress?
14. Surgical competencies incorporate a range of knowledge, attitudes and skills. The RACS has adopted the CanMeds model of competencies that includes: Professionalism, Scholar/teacher, Health advocacy, Management and leadership, Collaboration and communication, Medical expertise, Judgment, Clinical decision-making, and, Technical expertise. Spend some time thinking about these categories of competence. What specific competencies do you think you need support with? How are these competencies taught here? Is this the best way? Can you suggest alternative approaches?
15. What are the features of regional training programs?
16. What impact do you think safer working hours are having on your training?
17. Do you use simulation as part of your training?
18. Is there anything else you think would be helpful in developing surgical training here?

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Author/s:

Nestel, D;Harlim, J;Bryant, M;Rampersad, R;Hunter-Smith, D;Spychal, B

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