

Near-Peer Coaching to Enhance Operative Learning

An Educational Innovation for Surgical Training

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Objective: To design, implement, and evaluate a near-peer coaching model to enhance operative learning in general surgery training.

Background: There is an urgent need to maximize operative learning in surgical education. Trainees find barriers to operative learning difficult to navigate and often sacrifice educational opportunities for the sake of impression management.

Methods: A prospective cohort study was conducted over a 6-month period following design and implementation of a trainee-led near-peer coaching model; "SPICE" (Set goals, Plan, Imagine, Comment and feedback, Evaluate and reflect). Semistructured interviews were conducted to explore trainees' experiences of the model.

Results: Twelve trainees participated in the study. The near-peer coaching encounters provided trainees with the psychological safety to be honest about learning needs, validated insecurities, and mitigated the pressures associated with impression management that consistently shaped consultant–trainee relationships. Trainees described improved operative performance, increased self-confidence, and a greater ability to adapt to the unexpected. Trainees adapted the use of the SPICE model to conventional consultant–trainee dynamics, which facilitated learning conversations and negotiation of operative opportunities. On a broader scale, trainees noticed an improvement in the teaching culture of the unit, describing that the use of the model legitimized the importance of perioperative learning conversations and increased consultant enthusiasm for teaching.

Conclusions: Near-peer coaching created a unique psychological safety that facilitated authentic reflection and goal setting and improved trainee confidence. The benefits of the SPICE model were translated to other contexts and facilitated entrustment in conventional consultant–trainee relationships.

Keywords: general surgery, intraoperative learning, near-peer coaching, surgical education

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INTRODUCTION

The operating room is a uniquely challenging learning environment. Noisy and unpredictable, educational interactions must occur amid time pressures, complex interpersonal dynamics, and the emotional impact of surgery.¹ Trainees find it difficult to navigate these contextual barriers and impose structure on their learning.² Furthermore, as trainees construct and negotiate their evolving surgical identity, the hidden curriculum teaches the importance of confidence and certainty,³ making it difficult to express vulnerability.⁴ Lack of self-belief and imposter phenomena⁵ are common and so trainees often sacrifice educational opportunities for the sake of "impression management."⁶ The combination of increased administrative workload, diluted operative experience, and growth in the breadth of technical elements has resulted in the majority of graduating trainees being unprepared for independent practice.⁷ Hence, structured and innovative approaches to operative education are urgently required.

Near-peer learning utilizes the social and cognitive congruence of peers to promote a constructive educational relationship. Experts may have difficulty understanding trainees' cognitive problems and learning needs, whereas a trainee at a similar level may have a better understanding of these specific challenges and practical solutions.^{8–10} Furthermore, the near-peer dynamic may foster a greater sense of psychological safety than traditional educational relationships and hence allow a more open feedback dialogue with respect to knowledge gaps and areas of uncertainty, leading to better identification and correction of errors.¹¹ It may also have powerful motivational effects and enhance feelings of self-determination and a sense of agency,¹² especially when trainees assume the role of the teacher and begin to genuinely believe in their own expertise, enhancing the

development of their professional identity as the surgeon.^{12–14} Although the efficacy of near-peer learning has been demonstrated in a variety of contexts,⁸ we could not find applications reported in operative learning.

The role of coaching in a surgeon's continuing professional development has received increasing focus in recent years.^{15,16} Whereas teaching constitutes a directive transfer of information for skill acquisition and is reliant on conventional hierarchical paradigms, coaching is learner-driven and relies on trust, authentic reflection, and nondirective feedback.¹⁷ Coaching is based on the premise of experiential learning theory¹⁸ that states progress requires deliberate practice,¹⁹ iterative experience, and reflection.²⁰ In the context of surgery, coaching has been reported to have relevance to several domains,²¹ improving both surgical skill and confidence.²² Despite having been shown to enhance skill acquisition in surgical training,²³ coaching is currently not formally utilized in surgical education and operative learning in Australia.²

To utilize the benefits of coaching in a near-peer paradigm, we designed the SPICE model (Set goals, Plan, Imagine, Comment and feedback, Evaluate and reflect; Fig. 1), which aims to provide sufficient scaffolding to embed useful educational frameworks in trainees' approaches to learning. The SPICE model is based on robust pedagogical principles, integrating several educational theories and constructs that have immediate relevance to operative learning (Appendix 1, see <http://links.lww.com/AOSO/A390>). Informed by the core tenets of adult learning principles²⁴ and coaching theory,²¹ the SPICE model is designed to facilitate effective goal setting²⁵ and deliberate practice,¹⁹ while utilizing mental training²⁶ and the cognitive construct of a shared mental model.²⁷ By facilitating a structured near-peer

coaching interaction within trainee pairs (near-peer dyads), the SPICE model is learner-driven and tailored to self-identified learning needs. It is designed as an adjunct to the conventional consultant–trainee teaching structure that remains available to trainees and aims to enhance agency in learning. In this study, we aimed to explore the experiences of trainees in engaging with the near-peer coaching model and to understand its impact on their approach to operative learning.

METHODS

Ethics Approval

The University of Melbourne Human Ethics Advisory Group approved the study (2021-22125-22077-5).

Context, Setting, and Participants

Twelve surgical trainees in the department of general surgery at a tertiary teaching hospital (level 1 trauma center) were invited to participate, representing the entire general surgery registrar cohort during the 6-month study period (June–December 2022). Participants ranged in seniority from unaccredited registrars (postgraduate year 3–4 after medical school) to final-year accredited trainees (postgraduate year 8–10 after medical school). In Australia, surgical residency training incorporates informal prevocational training (up to 6 postgraduate years), “unaccredited registrars,” followed by a formal “Surgical Education and Training (SET)” program (5 years), “accredited registrars.” To become an accredited registrar, unaccredited trainees must have accrued the requisite clinical experience and be selected for accredited training.

After obtaining ethics approval, we conducted a 90-minute interactive workshop that explored relevant theoretical concepts, led by B.P.T.L., A.J.P., and E.M., and attended by all participants. Trainees currently receive no formal teaching on education theory. Therefore, we presented succinct summaries of the theoretical concepts within the SPICE model. The workshop included a role play of a learning conversation using the SPICE model for a familiar operative context. We anticipated that difficulty in structuring the educational interactions may pose a barrier to engagement and therefore provided a copy of the SPICE model in an easily accessible visual format (Fig. 1), available both online and as an image to save on a smartphone. Trainees were invited to participate in the study and completed a brief questionnaire to define their demographics and clinical experience. All eligible trainees opted to participate and were encouraged to use the model within a near-peer dyad at least once per week.

When using the SPICE model, trainees were asked to form a dyad that was practical and appropriate for a particular operative procedure. Participants completed the first 3 components of the model prior to the procedure (setting appropriate and achievable goals, planning the operative steps and agreeing on the educational component of the procedures, and imagining the detail of the training task as a structured mental rehearsal). If possible, participants were encouraged to perform the procedure together. If not, the “coach” was encouraged to observe the “coachee” performing the procedure. Following the procedure, trainees engaged in a feedback discussion, structured with an advocacy–inquiry stance.²⁸ This prompted the process of reflection, considering operative performance, strategies for improvement, identification of necessary scaffolds to acquire the next level of skills (zone of proximal development²⁵), and future goal setting. The dyads were flexible, with trainees engaging with multiple other trainees at different times depending on rostering and availability. Dyads formed organically and were not directed by the investigators. During the study, all trainees engaged in dyads as both the coach and coachee.



FIGURE 1. SPICE model (Set goals, Plan, Imagine, Comment and feedback, Evaluate and reflect) infographic.

Three months after the introduction of the SPICE framework, a second interactive workshop was conducted. Attended by consultants and trainees, it explored experience with feedback discourses, as well as strategies to enhance feedback literacy. Both workshops were attended by all participants.

Throughout the 6-month intervention period, the surgeon investigators (A.J.P. and B.P.T.L.) provided educational support for participants. This included answering questions about the SPICE model, helping with framing advocacy–inquiry discussions, and providing opportunities for participants to debrief informally about their experiences with near-peer coaching. This was considered an important aspect of ensuring a culture where near-peer dyads were valued for operative learning.

Data Collection

Following the 6-month intervention period, we conducted semistructured interviews with trainees to explore their experiences with near-peer coaching, the educational intervention, and using the SPICE model. An interview guide was developed based on a comprehensive review of the literature, with input from all authors (Appendix 2, see <http://links.lww.com/AOSO/A391>). Interviews were conducted by either A.J.P., B.P.T.L., or D.N. on Skype (Microsoft, Redmond, USA) and verbal consent was obtained. Each interview lasted 45 to 60 minutes and was conducted in a private setting with an audio-recording. Initial questions explored the trainee's experience with learning in the operating theater (OT). Subsequent questions focused on their approach to operative learning, barriers to learning, and factors and strategies that allow them to better access learning from supervisors in the OT. The semistructured interview format allowed modification or addition of questions to explore themes as identified. Recordings were transcribed by an independent transcription agency. All transcripts were checked for accuracy against the original recordings and were deidentified prior to analysis. Eleven of the trainees (92%) completed the semistructured interview at the end of the study period. A data corpus of 586 minutes of recorded interviews was analyzed, resulting in the identification of 314 extracts, which were initially grouped into 56 codes.

Data Analysis

The research team included 2 practicing surgeons (A.J.P., B.P.T.L.), 3 university professors with PhDs in health professions education (D.N., E.M.) and sociology (S.K.), a surgical trainee (J.N.C.), and an external researcher (M.G.). Two transcripts were individually coded by A.J.P., B.P.T.L., D.N., and E.M. to establish a preliminary coding framework, using thematic analysis.²⁹ The themes were discussed with all authors and a final coding framework was negotiated. We used an immersion/crystallization approach,³⁰ examining data in detail with intermittent periods of reflection to identify and articulate themes and subthemes. Investigators A.J.P. and J.N.C. coded all transcripts, and investigators B.P.T.L., D.N., and E.M. independently coded 2 transcripts to ensure agreement between investigators. Regular meetings allowed iterative refinement of the thematic structure in a constructivist paradigm.³¹ Sample size was evaluated for data sufficiency, which occurs when new information from additional participants produces little or no change in the findings, which occurred after 9 interviews.

RESULTS

Twelve surgical trainees participated in the study. Demographic details are summarized in Table 1. The SPICE model successfully facilitated near-peer coaching interactions and could be incorporated into the clinical workday without the need for consultant (attending) surgeon guidance. Trainees reported

engaging in a near-peer coaching interaction approximately once per week during the study period, and no issues related to compromised clinical efficiency arose. Near-peer coaching dyads formed opportunistically; however, trainees gravitated to other trainees of a similar training level.

Following the semistructured interviews and thematic analysis of the data, we identified 2 main themes: “jamming backstage: psychological safety of the near-peer dynamic,” and “spillover effects: permeating benefits from engagement with the SPICE model in other contexts.” Representative quotations are listed in the corresponding tables.

“Jamming Backstage Before Playing Center Stage”: Psychological Safety of the Near-Peer Dynamic

Shedding the “Cloak of Competence”: Honesty About Learning Needs and Uncertainties

The near-peer relationship provided a novel learning environment for trainees, in which they felt they could be honest about their learning needs and uncertainties (PS1,2). Reflecting on conventional consultant–trainee interactions, trainees described a reluctance to display vulnerability and felt they needed to always display the most polished version of themselves (PS3,4). They experienced a pressure to perform in front of their consultants that took priority over their educational agenda, and as a result, trainees were reluctant to engage in exploratory learning, preferring to maintain the “cloak of competence” (PS5) (Table 2).

Removing the Power Dynamic to Improve Exploratory Learning

Within the near-peer dynamic, trainees could “let it all hang out.” Near-peer coaching discussions evolved organically and facilitated a unique opportunity for exploratory learning (PS6,7). Such in-depth exploration of operative scenarios was seen as analogous to musicians “jamming backstage” before the “center-stage performance.” They were able to relax and dedicate their cognitive resources to learning, asking questions, and exploring scenarios that they would not feel comfortable discussing within the power dynamic of the traditional consultant–trainee relationship (PS8,9) (Table 3).

Reducing Cognitive Overload for Improved “Center-Stage” Performance

The opportunity to rehearse in the safety of the near-peer environment resulted in improved operative performance (PS10),

TABLE 1.
Study Cohort Characteristics

Demographics	Number of Participants (%) N = 12
Sex (% male)	7 (67)
PGY, median (IQR)	8 (6.5–9)
Training status	
Unaccredited (Pre-SET) trainee	4 (33)
Accredited (SET) trainee	8 (66)
Age group (y)	
26–30	4 (33)
31–34	3 (25)
35–39	3 (25)
40+	2 (17)

IQR, interquartile range; PGY, Postgraduate year.

TABLE 2.

Psychological Safety: Shedding the Cloak of Competence – Honesty About Learning Needs and Uncertainties

- PS1: “The more junior you are, you don’t have that confidence that you know that procedure very well... I think you tend to be a lot more comfortable with your peers, a lot more open to asking questions about what you’re doing and probably less fear of appearing to be foolish”
- PS2: “I think the model is helpful for people to be more honest about their learning needs...they feel open enough to actually say, “Wait, I’m not actually really sure. I kind of know how to do this...But I’m actually not a 100% sure. Can you just remind me if my setup is correct,” or whatever. That’s helpful. Because you can honestly say, “I think I know most of it, but I need help to get it right...” ...you can more authentically explore what you’re having trouble with, when you’re with the peer relationship, rather than with the boss, where you just want to put your best foot forward”
- PS3: “It’s a chance for me to learn in an environment where I don’t feel as much pressure to perform or [the need] to present myself in the most professional, polished way possible [as I would] to a boss”
- PS4: “I probably put too much weight on external perception. I think it does bother me ...I’m worried about doing a poor job, like as in, not doing a good enough job and not being [seen as] competent... Just general insecurities, every level, I worry about what consultants say to each other about me, what consultants think of me”
- PS5: “I think the fear that the juniors would have in talking to the consultants in lots of depth would be misrepresenting things that they would think they should be expected to know.”

TABLE 3.

Psychological Safety: Removing the Power Dynamic to Improve Exploratory Learning

- PS6: “Even with people who are much, much more junior, they’re very comfortable in those discussions. It can vary from as simple as how you’re going to hold an instrument to as complex as your complex intraoperative decision-making. Depending on how much time we’ve got to discuss, we might go into different aspects. Whereas I think if you were to have this sort of discussion with a boss, you’d have to have...pre-thought of something...so it might not be as organic.”
- PS7: “I wouldn’t want to mentally rehearse with the consultant something that they would expect me to know and that I also know. Even with some fellows, if you say something that’s a little bit stupid, they’ll just immediately shut you down.”
- PS8: “I feel more confident in questioning my peers than I do my consultants. And I think that’s not to say that I don’t feel comfortable questioning my consultants, I do. And I think there’s good dialogue to be had there. And sometimes they have different viewpoints from experience, which is good. But I feel more comfortable in discussing and exploring things during the operation with my peers”
- PS9: “I would say it’s probably more comfortable with a peer, from my point of view, it’s a different relationship, where there’s less of that power dynamic. You can have a bit more of an honest conversation about where you feel confident or not confident, what you’d like to learn or get more out of. Whereas sometimes I think with consultants, I think especially in surgery, there is a little bit of that ‘how much confidence can you show someone’, [which is interpreted as] your level of competence.”

TABLE 4.

Psychological Safety: Reducing Cognitive Overload for Improved “Center-Stage” Performance

- PS10: “I think from that point of view, is that because it’s people that are around the level, the whole process is more informal, and everybody is a lot more comfortable. And I think that brings out better performance in general.”
- PS11: “I feel more comfortable and competent at troubleshooting, particularly because I also know what my colleagues would do in exactly the same situation, so I know the repertoire of things that I could do to troubleshoot and that this is what someone at my level also would do... and I’ve (already) thought about for each situation.”
- PS12: “It helps to have discussed the plan A, B, and C for the tricky spots before you start. I think because if you’re junior and you haven’t done a lot, it’s easy to blank out if you haven’t done that. Okay, this isn’t working well, I barely know how to do plan A, so I definitely don’t have a plan B for this. The talking about this beforehand is good.”
- PS13: “I found that if I could take some of that cognitive load out of knowing what (to) do next and just focus on the action (through mental rehearsal), (I) can just work on the technical skills.”
- PS14: “I would find something a bit difficult, lose confidence, and then I’d probably give it up too quick or too easily. Whereas now (knowing my peers have similar doubts) I will persist a bit more and now I’m much better if the boss is scrubbed with me. I will persist... it has translated, not just from that one section of an operation, but into the whole operation and moving forward, getting more and more confident, getting quicker, all those things, that’s really helped me.”

as trainees described increased self-confidence and ability to adapt to the unexpected, reassured by the knowledge that their peers would handle the situation in a similar way (PS11). It also helped to minimize the effects of cognitive overload in unfamiliar situations (PS12,13). Through recognizing that their peers had similar knowledge gaps or self-doubt, they were able to be more confident in their trainee persona, which facilitated the development of their evolving professional identity (PS14) (Table 4).

Motivation for Teaching and Learning

The near-peer dynamic also had motivational effects, both for the trainees’ own operative learning and for teaching, as they interacted with junior trainees in the role of “the coach” (PS15). The flat hierarchy mitigated feelings of insecurity that previously impacted trainees’ confidence in teaching and allowed greater educational focus (PS16) (Table 5).

Spillover Effects (SE): Permeating Benefits From Engagement With the SPICE Model in Other Contexts

Opening Educational Dialogue and Creating Opportunities: Agency and Intentionality in Learning

Trainees valued the structure of the SPICE model and described widely permeating benefits to other learning contexts. They adapted the use of the SPICE model to conventional consultant–trainee dynamics and thought that the model provided the language and the structure to scaffold important learning conversations in the OT (SE1). Previously, trainees struggled to lead these discussions for fear of appearing pushy or disrespectful and found the model helpful in providing the framework to negotiate operative opportunities (SE2). This facilitated trainee agency in learning, gave them a sense of permission to actively drive the initiation of intraoperative learning discussions, and prioritized the educational components of a procedure (SE3) (Table 6).

TABLE 5.**Motivation for Teaching and Learning**

PS15: "I think it's motivated me... and for teaching. It triggered that in me, that I can apply all these (techniques) to teach people better. And I've always known that was part of my weakness: verbalizing and teaching others in simpler ways. And I find that this project has made me more conscious about methods to give feedback and to teach better."

PS16: It (the model) allows an open conversation... It changes that frame of mind from "I'm feeling insecure," to, "Great. I've got an opportunity today."

TABLE 6.**Spillover Effects (SE): Opening Educational Dialogue and Creating Opportunities, Agency and Intentionality in Learning**

SE1: "I think it's a great framework to be able to have these discussions... it opens that dialogue that you can continue during the operation. If you've spoken about a specific point, then in the operation when you notice something changes, you're like, 'Can you tell me why you changed that?' or 'That's the point that you were talking about. That's that critical step in the operation.' 'How'd you get to that plane' ... [the model] opens up that dialogue."

SE2: "I think if you approach [asking for operative opportunities] with the framework, it comes across a lot more respectful in a way... It allows it to not be coming across as pushy or aggressive. It just allows it to come across as a true learning focus ... everyone has a different preference... It's a personality thing I think as well... I think having a neutral framework helps overcome those barriers. Some people are good at being assertive. I'm intuitively not like that. If the boss starts the operation, I'm never going to say, 'Can I do this?'... the structure of that model makes it easier to have those conversations... just negotiating operative opportunities. That's something that a lot of people have said they found useful, just how to have those discussions."

SE3: "The times where you use that model [with the consultant]... it's essentially like saying 'even if you are not, I'm using this as an educational opportunity, this is what I want to get out of it, even if we're just having a discussion about how it's going to go'. So, I do think it's a handy tool to refocus the conversation on education. I suppose we're adults, and we should be able to ask for what we want or expect out of it... I think it's ... just finding the right way to ask... I'm still learning. It's just so hard, but I did find it a lot easier the last six months, for sure."

TABLE 7.**Spillover Effects (SE): Aligning Expectations Improves Entrustment, Confidence, and Performance**

SE4: "[the model] is really useful particularly to just get everyone's expectations on the same page beforehand. I think that's where the real power of it is... that you're adjusting expectations and you're recognizing your limitations."

SE5: "I think the boss was less likely to intervene because they knew where I was heading, what I was doing... When you're supervising, it's the unpredictability that's the risk... And so if you've got someone who's predictable and following the steps that they've said they're going to follow in a clear way, then you are less likely to [take over]. You're more likely to trust them"

SE6: "I think that's how the model helps to get more opportunities. It helps the discussion... 'this is what I want to do, this is how I would do it. This is my skill set, and what I'd love to learn'... it is a good way of getting more chances to operate rather than being passive... Like for example, yesterday we had a small bowel resection with a consultant who I'd never worked with before... I (initiated the discussion) and he asked me to talk me through how I would do the anastomosis ... I think if I didn't have the chance to have that preoperative discussion with him, he probably just would've done the whole thing."

SE7: "[establishing a shared mental model] shows entrustability, in some ways. You show that you know... that I've read up on cases, I've watched videos, or I've been paying attention the last time he did something, and then I can talk through the steps, or I can even question like, 'Oh, I noticed last time you did this, but I was wondering... I saw this approach instead'... it's easier for him to give me the chance to operate"

SE8: "It was so eye opening... it all of a sudden dawned on me how all of these things... the structure and preparing... they so influenced how I performed in [the operating] theatre. It was like a revelation."

Aligning Expectations Improves Entrustment, Confidence, and Performance

One of the key benefits they described was the value of aligning expectations (SE4) and the positive impact this had on the subsequent operative learning experience, with increased levels of entrustment (SE5). Trainees noticed that aligning expectations preoperatively helped to mitigate the perceived risk of entrustment and thought that consultants were less hasty to take control of the operation (SE6). Trainees recognized that the use of the model helped them to demonstrate their knowledge and preparedness to operate with their consultants (SE7). Following these discussions, trainees felt more comfortable knowing exactly what their role would be and were often afforded operative learning opportunities that they considered they would not normally have had. This led to a self-reported improvement in their operative performance (SE8) (Table 7).

Prioritization of Education: a Culture of Teaching

The benefits associated with the use of the model extended beyond individual consultant–trainee interactions. Trainees commented that the teaching culture of the unit improved as operative education received greater focus in general (SE9,10) and that the model legitimized the importance of the perioperative learning

conversations (SE11). They also remarked that when they initiated these discussions, they noticed an increased enthusiasm for teaching by their consultants, who would also begin to initiate the dialogues, as it became a "regular" component of the operative dynamic (SE12,13). Furthermore, trainees found the structure helpful in navigating the more challenging social dynamics, both among trainees and consultants, allowing them to restore focus on a particular learning goal and put aside any interpersonal issues that may otherwise impair educational interactions (SE14). They also felt that the use of the model enhanced the investment of the consultants in their development as surgeons (SE15) (Table 8).

Enhances Feedback and Reflection

As trainees became familiar with the feedback structure of the SPICE model, they were able to increase the frequency and the quality of the feedback they received from their consultants (SE16,17), as well as improve their own reflective practice (SE18). Furthermore, they appreciated the specific teaching on education theory and strategies to facilitate engagement with the near-peer coaching model, reflecting that it would be beneficial to formally incorporate education theory into their surgical training (SE19) (Table 9).

TABLE 8.**Spillover Effects (SE): Prioritization of Education, a Culture of Teaching**

- SE9: "[With the model] we'll try and talk through the steps, talk through the expectations, talk through technical aspects that we are concerned about or things that we could improve, things that we want to focus on. So, I think that the culture of the unit for the junior staff has been changed from having this opportunity. Whereas previously it might have been that we opportunistically talked about aspects of the surgery, it wasn't quite at the forefront of our mind."
- SE10: "So I think surgical training with the operative environment should be the same... if you provide structure to that learning... people will be actually thinking this is a learning environment... So there's goals and there's things that we want to do. And then there's an opportunity to reflect on that... it can only improve those interactions and those experiences. I can't see a downside to it. Except for finding the time. But that's not a downside. We just need to make time."
- SE11: "Just trying to make that opportunity to have a five-, ten-minute discussion with the person, because five or ten minutes can make a huge difference in that person's intraoperative learning... we [the registrars] are doing our best to incorporate the conversations that your study was looking at... and understand how valuable that can be... I'd love it for it to get to a stage where it's almost as protected as the timeout... I think there is an opportunity to do it."
- SE12: "Which then actually feels quite good, because it's like, 'Well, you were paying attention this whole time'... it then allows [intraoperative teaching discussions] to become a more natural process that even the consultants would then initiate, rather than you having to do it. It becomes more of a regular normal process."
- SE13: "(The model) adds an extra layer of teaching. Instead of (previously) just going into operating theatre and just hoping to do something or to do part of the operation and being disappointed when you don't, or operating in silence and you don't really learn the finer points of the surgery."
- SE14: "I see it changing... definitely... There's not that kind of sharp elbows approach to operating. Tends to be a bit more shared around and, Oh, yep. I can do that now, so why don't you have a go, because you can get the experience and then you can do it, as well, and then we can all move on."
- SE15: "I do think that (when using the model) inherently that they're (the consultants) a bit more invested in you. So even if it is the limit of my ability at that time (and they need to take over the operation), they take the time to explain and show me how to do it... and (more likely to) let me try it again next time."

TABLE 9.**Spillover Effects (SE): Enhances Feedback and Reflection**

- SE16: "I think it's been difficult to get feedback throughout the last two and a half years... [it is] not something that we previously would have asked for. So, before this study, I wouldn't have spoken to [a trainee] or [consultant] and said, 'Oh, would you be able to give me feedback on how I do this procedure?'"
- SE17: "Each case, you can actually see some improvement, rather than waiting until midterm and end of term... I'm probing actively for the specifics... I'm trying to get more out of it, rather than [accepting] 'Just keep doing what you're doing thing', because that's the most frustrating part of feedback."
- SE18: "I don't really reflect on cases, honestly. I have maybe reflected once in a while if a complication happens, or if I'm possibly worried about something. But... after this near peer learning thing, it prompted me to get feedback, and think back about the case... and what I can learn."
- SE19: "I think that [relevant education theory] should be more actively taught rather than just relying on it being picked up by osmosis... I think that would have been really, really useful. I feel like that should be something that's taught at trainee weekend. We get taught all this knowledge stuff, but the technical skills and how to learn we don't get taught very well."

DISCUSSION

This qualitative study explored the experiences of general surgery trainees engaging in a near-peer coaching model (SPICE) that was designed and introduced to support intraoperative learning. The near-peer dynamic provided psychological safety within the learning environment, in which trainees could authentically focus on their learning needs, free from the pressures of impression management that dominate the traditional consultant–trainee educational dynamic. The authentic identification and articulation of learning needs, which are validated through the cognitive congruence of the near-peer dyad,⁸ is an integral aspect of the master adaptive learner process that underpins the development of adaptive expertise.³²

Trainees recognized the value of the exploratory discussions that they felt comfortable having with peers ("jamming backstage") in preparation for the "center-stage performance" with their consultants. Development of trainees' professional identity as "the surgeon" is closely tied to feelings of competence and may be hindered by the imposter phenomenon.³³ Use of the framework allowed trainees to enter the OT with a greater level of confidence in their knowledge, better prepared with an operative plan, and allowed them to identify as "the surgeon" rather than as an assistant or miscellaneous member of the surgical team.

The extent to which trainees are entrusted to perform operations during surgical training shapes the trajectory of their technical development and their surgical identity. In entrusting control of an operation to a trainee, consultants must accept a degree of vulnerability and tolerate a level of risk to the patient, for the benefit of the trainee's education.³⁴ Trainees appreciate the fragility of their position in this decision-making process and therefore are extremely hesitant to do anything that may jeopardize their consultant's perceptions of their competence

and will willingly sacrifice educational or operative opportunities for the sake of impression management.² They recognize that reputations can be established quickly and that negative reputations can be very difficult to salvage with detrimental effects on subsequent training opportunities.⁶ The inherent irreconcilable conflict between the need to satisfy important learning needs (through which they must acknowledge their limitations and insecurities) and the need to maintain the image of the "competent and confident trainee" creates a barrier to learning that is difficult to navigate. In this study, although the primary focus was the use of the SPICE model in a near-peer dyad, trainees found that the use of the model with consultants facilitated the development of the consultant–trainee relationship by providing a structure that legitimized and normalized the educational interactions. It afforded trainees the language to frame the learning discussion while protecting the trainee's image, through effective alignment of expectations. The perception that alignment of expectations helps to mitigate the risk of damage to the trainee's image suggests that much of the fear of reputational damage may be allayed through a more open dialogue about goals and needs. Similarly, the positive reinforcement trainees received through the consultants' enthusiasm in continuing the dialogue once it had been initiated served to highlight the value of the model in providing an accessible framework to "get things going" and enhance the level of consultant investment in the trainees' professional development.

This study highlights that practical education theory is highly beneficial for trainees in their approach to operative learning, and future research could explore ways to incorporate this into early surgical training. The study is limited by its inclusion of trainees from a single surgical specialty at a single institution, and hence the external validity requires further

study. The feasibility of incorporating the near-peer coaching framework in other contexts, across a variety of training sites, remains to be determined. We did not measure the impact of the near-peer coaching model on technical skills and therefore the self-reported improvements could not be validated. Also, the perceptions regarding improved interactions with consultant staff were from the trainee perspective only, and the impact of the introduction of the model from the perspective of faculty was not specifically assessed.

CONCLUSIONS

The implementation of the SPICE near-peer coaching model provided both junior and senior general surgery trainees with a practical and flexible approach to enhance their operative learning. The near-peer dynamic created a unique psychological safety that facilitated authentic reflection and goal setting and improved trainee confidence. Improved educational literacy was transformative for trainees in their ability to realize agency and intentionality in learning. The benefits of the SPICE model translated to other contexts, improving trainees' perception of their psychomotor performance and facilitating entrustment in conventional consultant–trainee relationships.

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