Exploring anesthesiologists' understanding of situational awareness: a qualitative study

La conscience situationnelle telle que la comprennent les anesthésiologistes : une étude qualitative

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Received: 2 February 2017 / Revised: 21 March 2017 / Accepted: 19 May 2017 / Published online: 1 June 2017
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Abstract

Purpose This study explored how anesthesiologists understand situational awareness (SA) and how they think SA is learned, taught, and assessed.

Methods Semi-structured interviews were performed with practicing anesthesiologists involved in teaching. This qualitative study was conducted using constructivist grounded theory techniques (i.e., line-by-line coding, memoing, and constant comparison) in a thematic analysis of interview transcripts. Group meetings were held to develop and review themes emerging from the data.

Results Eighteen anesthesiologists were interviewed. Respondents displayed an understanding of SA using a mixture of examples from clinical experience and everyday life. Despite agreeing on the importance of SA, formal definitions of SA were lacking, and the participants did not explicate the topic of SA in either their practice or their teaching activities. Situational awareness had been learned informally through increasing independence in the clinical context, role modelling, reflection on errors, and formally

through simulation. Respondents taught SA through modelling and discussing scanning behaviour, checklists, verbalization of thought processes, and debriefings. Although trainees' understanding of SA was assessed as part of the decision-making process for granting clinical independence, respondents found it difficult to give meaningful feedback on SA to their trainees.

Conclusion Although SA is an essential concept in anesthesiology, its use remains rather tacit, primarily due to the lack of a common operational definition of the term. Faculty development is required to help anesthesiologists teach and assess SA more explicitly in the clinical environment.

Résumé

Objectif Cette étude a exploré la façon dont les anesthésiologistes comprennent la conscience situationnelle (CS) et la façon dont elle est apprise, enseignée et évaluée.

Méthode Des entretiens semi-structurés ont été réalisés auprès d'anesthésiologistes en pratique et impliqués dans l'enseignement. Cette étude qualitative a été réalisée en utilisant des techniques de théorisations constructivistes ancrées (c.-à-d. codage par intégration proportionnelle, la rédaction de mémos et la comparaison en continu) dans une analyse thématique des transcriptions d'entretien. Des réunions de groupe ont été organisées afin de mettre au point et de passer en revue les thèmes émergeant des données.

Résultats Dix-huit anesthésiologistes ont été interviewés. Les répondants ont montré une compréhension de la CS utilisant un mélange d'exemples tirés de l'expérience clinique et de la vie quotidienne. Malgré le consensus quant à l'importance de la CS, aucune définition formelle de la CS n'existait, et les participants n'ont pas expliqué le thème de la CS dans leur pratique ou leurs activités

This article is accompanied by an editorial. Please see Can J Anesth 2017; 64: this issue.

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d'enseignement. La conscience situationnelle avait été acquise, de façon informelle d'une part, par une indépendance grandissante dans le contexte clinique, l'émulation de modèles, la réflexion sur les erreurs, et de manière formelle d'autre part, par la simulation. Les répondants enseignaient actuellement la CS en montrant l'exemple et en discutant des comportements de prise de conscience de l'environnement, par le biais de listes de contrôle, par la verbalisation des processus de pensée et en réalisant des débriefings. Bien que la compréhension de la CS des stagiaires soit évaluée dans le cadre du processus de décision à autoriser l'indépendance clinique, les répondants ont trouvé qu'il était difficile de donner des rétroactions significatives sur leur CS à leurs stagiaires.

Conclusion *Bien que la conscience situationnelle soit un concept essentiel en anesthésiologie, son utilisation demeure plutôt tacite en raison de l'absence d'une définition commune du terme. Il est nécessaire de mettre au point un programme d'enseignement afin d'aider les anesthésiologistes à enseigner et évaluer la conscience situationnelle de façon plus explicite dans l'environnement clinique.*

Situational (or situation) awareness (SA) has been defined as “the perception of elements of the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future.”¹ Situational awareness has been recognized as an essential non-technical skill and a principle of crisis resource management (CRM) in anesthesiology.²⁻⁵ The concept of SA has been incorporated into the “Anaesthetists’ Non-Technical Skills” (ANTS) framework,⁶ the CRM objectives of the “National Curriculum for Canadian Anesthesiology Residency”,⁷ and the Canadian Anesthesiologists’ Society “Guidelines to the Practice of Anesthesia”.⁸ In addition, SA is specifically identified as part of the CanMEDS 2015 medical expert competencies and milestones.⁹

Although there have been different definitions and examples of SA within anesthesiology, there is little known about clinical anesthesiologists’ understanding of the concept of SA.^{2,4,10} In a needs assessment by the Royal College of Physicians and Surgeons of Canada, SA was identified as the “most important and least understood human factor in healthcare”.¹¹ Discussions about individual SA, team SA, and distributed SA can help create a framework for understanding the concept. Nevertheless, apart from “expert” descriptions of these terms, it is unclear how practicing clinical anesthesiologists relate the term “situation(al) awareness” to their day-to-day practice.^{4,10,12}

Certain cognitive abilities (e.g., working memory capacity, general intelligence, time-sharing ability, perceptual-motor ability, and visual-recognition ability) have been identified as predictors of SA ability.^{13,14} Situational awareness skills vary greatly between individuals based on their “innate abilities, experience, and training”.¹⁵ Situational awareness training, including training in attention management strategies and part-task training, may improve skills in task management, comprehension development, projection and contingency planning, information seeking, and self-checking.^{13,16}

While potentially applicable to anesthesiology, much of the research into learning SA has been borrowed from the aviation industry. The relatively modest literature on SA in medicine has tended to focus on teaching and assessing SA. Approaches to teaching SA skills in anesthesiology include practicing scanning behaviour; training in attention allocation and multitasking through the use of games and simulation; and exercises in pattern matching, classroom-based teaching, computer-based training, simulation, and the use of virtual environments.^{2,4,17} Approaches to teaching SA in other medical specialties, including surgery and critical care, have included the use of classroom-based techniques, small group sessions, simulation, and coaching, as well as a focus on “slowing down” moments in surgery.¹⁸⁻²³

Ratings of individual anesthesiologist’s SA form part of the ANTS behavioural marker system, which has been used in both simulated and real clinical environments.²⁴ Similar behavioural marker systems (based on ANTS) have been developed for other healthcare providers, since non-technical skills (including SA) are also considered essential in these disciplines. Examples include the Anaesthetic Non-Technical Skills for Anaesthetic Practitioners (for anesthesia assistants),²⁵ Non-Technical Skills for Surgeons,²⁶ and Scrub Practitioners’ List of Intraoperative Non-Technical Skills (for scrub nurses).²⁷ The ANTS system evaluates SA at three different levels: Gathering information (Level 1: Perception), Recognizing and Understanding (Level 2: Comprehension), and Anticipating (Level 3: Projection).¹ Other strategies for assessing SA include variations of the Situation Awareness Global Assessment Technique (SAGAT), Situation Awareness Rating Technique, and the Situation Present Assessment Method, mostly within the context of simulation.^{17,28-32} The SAGAT technique, developed by Endsley *et al.*, uses pauses to assess participants’ SA about a scenario in real time (e.g., Level 1: What is the last recorded blood pressure (BP)? Level 2: What is the likely cause of that BP? Level 3: What will happen to the BP if the patient receives no treatment?).³³ The SAGAT has also been modified to assess SA within a team environment (TSAGAT).³⁰

Many questions remain despite the acknowledged importance of SA as documented in reviews and research. Our study was designed to address the following research questions:

1. How do anesthesiologists understand the concept of SA?
2. How do anesthesiologists learn SA?
3. What do anesthesiologists think about how SA is currently taught and assessed?

Methods

This qualitative study, approved by the University of Calgary Conjoint Health Research Ethics Board (REB15-1959, December 2015), used constructivist grounded theory techniques with a focus on participant experiences and their understanding of SA.³⁴ A constructivist approach enables researchers to examine “the ways in which events, realities, meanings, experiences and so on are the effects of a range of discourses operating within society.”³⁵ Constructivist grounded theory techniques, such as line-by-line coding, memoing, and constant comparison, were used in a thematic analysis of transcripts to afford a broader inductive exploration of the SA perspectives and practices of Calgary anesthesiologists.³⁶

Data collection

One of the authors (J.H.) initially developed an interview guide ([Appendix](#)) based on the study research questions. The rest of the study team then reviewed and revised the guide, including the addition of probes for each question to stimulate discussion. Semi-structured interviews were conducted in person by J.H., who was joined for the first two interviews by J.L., a qualitative researcher with extensive interviewing experience. Interviews were conducted over ten months from January–October 2016. A third-party professional transcriptionist transcribed the audio recordings of the interviews verbatim, and all data were anonymized before analysis. Simultaneous data collection and coding were performed (see data analysis section below). Although our study design was based on an estimated 15–20 interviews, the final number depended on reaching thematic saturation in our analyses (i.e., no new themes emerging from the data).^{35,37–39}

Participants

We sought to interview anesthesiologists who worked at any of the five hospitals in Calgary and were involved in teaching anesthesiology to medical students and residents.

All anesthesiologists who met these criteria were invited by email (by J.H.) to participate in semi-structured interviews. Interested anesthesiologists contacted J.H. directly to arrange a time for their interview. During the study period, there were approximately 165 staff anesthesiologists working in Calgary and approximately 32 trainees in the anesthesia residency program. Although this was in effect a convenience sample, an attempt was made to balance the demographic characteristics among the interviewees (e.g., sex, teaching site, years in practice) selected from the volunteer pool.

Analysis

For interviews 1–7, J.H. carried out an initial line-by-line coding of the transcripts for calibration purposes using qualitative data analysis software (NVivo 11 for Mac; QSR International, Melbourne, Australia) for the coding as well as for memoing. Once the initial seven interviews had been coded, the study team reviewed the codebook and all transcripts as a group and made any necessary changes to the codebook. The remaining interviews (8–18) were coded and interviews 1–7 were re-coded. Coding was performed using an iterative process—i.e., previously coded transcripts were reviewed and then further coded once more interviews had been performed and new data had been acquired and analyzed. The study team met frequently to discuss emerging ideas and themes related to the data.

Two of the four members of the study team (J.H. and R.C.) are anesthesiologists with an interest in medical education. The other two (R.E. and J.L.) are PhD medical education researchers with an extensive qualitative research background. The different perspectives within the group allowed for broader examination and interpretation of the data. The invited participants were all known to J.H. in a professional capacity.

Qualitative rigour

Rigour in qualitative research relates to the trustworthiness of the work.⁴⁰ While the notions of reliability and validity can apply to qualitative work, these concepts are considered differently when used to evaluate quantitative research.⁴¹ The credibility (truth value) and transferability (applicability) of qualitative research may reflect its validity, whereas the dependability (consistency) reflects its reliability.⁴¹ The strategies our study team used to increase the validity of our research included peer-reviewing/debriefing during the data analysis process, clarifying and unpacking potential researcher biases, refinement of the coding system as interviews progressed, and iterative deliberative development of emerging

theories and interpretations of the data.⁴⁰ To increase reliability, the study team reviewed the codebook/coding system used in this project, more than one member coded the transcripts, and agreement regarding coding was established through regular meetings. We used longitudinal member checking during subsequent interviews as another strategy to increase reliability—i.e., to confirm experience or meaning, we asked subsequent interview participants questions that related to findings from earlier interviews.^{40,42}

Results

Eighteen anesthesiologists were interviewed for this study over a period of ten months. Sixteen participants were initially interviewed, and the sample was then expanded to 18 participants to seek greater diversity of opinion. Participant characteristics are described in the Table. The thematic analysis identified many concepts which we grouped within four themes: understanding SA, learning SA, teaching SA, and assessing SA.

Understanding SA

Respondents considered good SA to be a fundamental skill in anesthesiology practice, although many admitted that they had not spent much time thinking about the concept prior to the interview.

“I think it’s highly valued and ... one of those implicit parts of our culture.”

Interview 12

Many respondents were able to describe the concept of SA in the context of the operating room.

“if we’re doing a trauma...patient who’s bleeding rapidly, if you’ve got suddenly a change in your rhythm when you’re listening to the pulse oximeter...quickly assimilating all of that information and then making a decision.”

Interview 4

Other respondents described SA based on examples from everyday life, such as parenting, team sports, driving, and aviation.

“Driving, for example... You need to be aware of not just keeping your car on the road but ... what kind of weather is out there, what are the road conditions ... what’s happening behind you, what’s happening to the side of you and ... in your car.”

Interview 7

Respondents offered various definitions of the term SA, many of which centred on gathering information from various sources within their environment. Many respondents also discussed the interpretation of this information and the anticipation of future events. Nevertheless, respondents generally expressed a lack of confidence with working definitions of SA as they exist in the literature, and they admitted that SA was not routinely discussed in their work setting.

“I think it’s an easy catchphrase to use. But I don’t know ...if it’s ever been defined to me. And I don’t know if anyone’s ever defined it in terms of how we teach it or who has it.”

Interview 6

Respondents identified different aspects of SA, including the need for vigilance, filtering of non-relevant data (information gathering), the importance of clinical context and experience (data interpretation), and the need to prepare for and anticipate events (anticipation). There was some discussion of team SA, but most respondents focused on individual SA.

Respondents remarked on various barriers to their day-to-day SA, including excessive noise (e.g., music, non-medical conversations), monitor alarms, personal stressors (e.g., fatigue, hunger, mental distraction), high patient complexity, electronic distractions (e.g., cell phone or computer/internet), and the presence of learners. They described strategies to maintain or enhance SA, including scanning behaviour (e.g., monitor scan, room scan), the use of checklists/briefings, and frequent self-reflection on performance.

Situational awareness was also discussed in terms of emotional intelligence—a type of social intelligence that involves monitoring, discriminating between and using emotions to guide thinking and actions.⁴³

Table Participant characteristics

Participant characteristic	Result
Sex M:F, <i>n</i>	12:6
Number of years in practice, range	2-27
Number in practice <10 yr	8
Number in practice >10 yr	10
Practice Site, <i>n</i>	
Foothills Medical Centre	9
Peter Lougheed Centre	4
Rockyview General Hospital	2
Alberta Children’s Hospital	2
South Health Campus	1
Canadian Graduate: International Medical Graduate, <i>n</i>	15:3
Length of interviews min, mean (range)	54 (34 - 88)

“ residents that I have come across who lack situational awareness... either they’re not vigilant ... [or] they don’t know how to read non-verbal cues.”

Interview 4

A number of respondents thought that “good SA” was a critical way to differentiate between novice and expert anesthesiologists.

“maturing from a medical student... to an anesthesia resident, to an anesthesia staff person ... a lot of what you’re doing is developing situational awareness.”

Interview 11

Learning SA

Although several anesthesiologists indicated that they had learned about SA through simulation, most participants described having to build SA skills with little educational support and largely through self-reflection around medical errors and near misses. The power of role modelling SA was also highlighted.

“this is the same as all the other non-technical skills, like how do you teach professionalism, how do you teach scholarship? ... a lot of it is through role modelling.”

Interview 8

Respondents mentioned that some learners have inherently better SA skills than others.

“I think some people are just good at it... they’re street smart...they just know what’s going on.”

Interview 3

Nevertheless, most respondents agreed that SA was a skill that could be learned.

“I imagine that nature sort of pegs your range. And nurture puts you where you end up finishing up on that range.”

Interview 6

Respondents thought that, while SA learning in anesthesia begins at the earliest stages of training, it mainly occurs in senior years (usually postgraduate year three and above).

“my conversation with an R5 is very different because ... I know that they’ve acquired those skills and that baseline level of functioning ... the majority of teaching that I do for an R5 is all about situational awareness actually.”

Interview 7

Teaching SA

Respondents thought that SA should be taught. They described using different teaching methods, including behavioural teaching around checklists and scanning behaviour, debriefing after errors and near misses, talking aloud, and giving graduated independence to learners.

“you have to verbalize your thoughts... if you hear silence in the room and suction going and ... situational things that tell you that the surgeons are in trouble and you just order four units of blood and you don’t verbalize why you’ve done that then...the opportunity to teach that awareness is lost.”

Interview 7

While few respondents used the term “situational awareness” in their teaching, those who had a background in simulation were more likely to use the specific terminology of SA and other CRM principles. While respondents frequently mentioned simulation as a tool to teach SA, they remarked that the artificial environment of simulation could not substitute for true clinical experience.

“The problem with simulation ...is that it’s an artificial situation - as much as we try to make it into a realistic situation, it’s not... And you lose a lot of those non-verbal cues ... with regard to what ... we interpret as important and not.”

Interview 4

Several respondents described barriers to teaching, including a limited understanding of how to teach SA and the time pressure in the operating room. Respondents thought that faculty development to improve familiarity with SA concepts and teaching methods would be beneficial.

“I think one of the challenges is that we don’t think about it, so we don’t... deliberately focus on it.”

Interview 10

Additionally, respondents described the need to prioritize patient safety rather than to allow residents to learn from errors in SA.

“I don’t let [residents] drift too far ... versus waiting for them to miss it and then [patients] come to harm and then to teach that point.”

Interview 2

Assessment of SA

Our respondents described assessing their trainees’ SA using various discrete methods, including direct

assessments of information gathering and understanding, discussions of anesthetic plans and anticipated events, and SAGAT-like questioning activities.

“periodically testing them...like what was the last peak airway pressure... what was your respiratory rate? What was your positive end-expiratory pressure?”

Interview 4

Nevertheless, many respondents described using a gestalt evaluation of SA rather than specific techniques, which reflected a focus on their trust in the trainee and affected decisions about giving the trainee certain levels of responsibility and independence.

“when you’re working with a resident...one of the things you...unconsciously determine is... does this individual have good situational awareness for their stage of training? And therefore, am I comfortable with them doing what they’re doing? Can I leave the room for this amount of time?”

Interview 11

Respondents highlighted the difficulty of truly assessing SA due to the internal nature of the trainees’ thoughts and understanding of events. Some also highlighted that the very act of assessment changed the trainee’s SA *in situ*.

“by the simple fact of asking them about it ‘Were you aware of that?’ ... it changes their... awareness of it or ...the way that they would think about it. Simply because you’ve asked about it.”

Interview 7

Respondents stated that they tended to avoid giving feedback about SA as they thought it would be received as personal criticism.

“you’re criticizing their cognitive process in some ways, and that cognitive process is not ... something that they’ve learned in residency. It’s something that’s part of their whole... development.”

Interview 15

Discussion

This is a novel study exploring how clinical anesthesiologists understand the concept of SA, how they presume it is learned, and how they approach the teaching and assessment of SA.

There was general agreement as to the importance of SA and the fact that deficiencies in SA were well known to relate to critical incidents in anesthesiology practice.^{44,45} Nevertheless, we found that SA was not explicitly

discussed in the workplace in this community of practice. The expert reviews of SA in anesthesiology within the literature have focused on explicit codified knowledge of SA—knowledge that is “subject to quality control by editors, peer review and debate and ... given status by incorporation into educational programmes”.⁴⁶ This differs from a more individual and personal knowledge of SA, which Eraut defined as “the cognitive resource which a person brings to a situation that enables them to think and perform”.⁴⁶ Personal knowledge can be either tacit or explicit and is context-dependent.⁴⁶ Situational awareness was likely still a tacit concept in the particular community of practice we engaged, a type of “intuitive expert knowing”.⁴⁷

The anesthesiologists within our community of practice considered SA relevant to both their clinical and non-clinical lives and particularly important to their specialty. Nevertheless, as with human factors in aviation communities,⁴⁸ there was no definitive easily quoted description of SA, and many respondents initially struggled with verbalizing how they understood SA. Nevertheless, participants were able to articulate, to varying degrees, the importance of gathering, interpreting, and anticipating information from the patient and the environment. Consequently, Endsley’s three-level SA model proved to be a useful relevant framework that could provide a shared language for these anesthesiologists.¹

Anesthesiologists described the way they learned SA as having been heavily influenced by experiential learning during and beyond their training. Progressive clinical independence, role-modelling, self-reflection, and analysis after errors were identified as critical for developing SA in the absence of formalized instruction, although some anesthesiologists had encountered the concept of SA during simulation training. Our findings in this regard align with both experiential and social learning theories, highlighting the importance of practical and collaborative approaches to developing SA.⁴⁹

Respondents discussed different approaches to teaching SA, including the use of checklists, scanning behaviour, debriefing after errors, and talking aloud in order to share otherwise tacit knowledge. These approaches to teaching SA have also been suggested in the literature.^{4,16} Although simulation has been identified by others as a method of teaching SA,⁵⁰ our respondents expressed concern regarding the inauthenticity of the simulated environment with respect to the development of SA skills. It was unclear whether individuals who were familiar with simulation were better or more explicit teachers of SA in the clinical environment, only that those with simulation experience seemed more familiar with the concept of SA.

Respondents assessed trainees’ performance on information gathering, data interpretation, and ability to

anticipate future events, an approach that is consistent with Endsley's three-level SA model and the ANTS behavioural marker system evaluation of SA.^{6,15} Assessment of a trainee's SA was seen as a gestalt process, similar to that used in a global rating type of assessment, and the anesthesiologists used their impressions to inform decisions about granting clinical independence to trainees.

One implication of this study is the apparent need for a common operational definition of SA for anesthesiology teaching and assessment in the clinical context. Also, despite the numerous extant resources related to SA in anesthesiology,^{4,6,10} there is a clear need for continuing professional development and faculty development to address SA issues. Perhaps most importantly, there is an apparent need for more explicit discussion and acknowledgement of SA as a vital skill in anesthesiology practice and education. These discussions should also consider the advantages and disadvantages of using different instructional modalities, e.g., simulation, to teach and assess trainees in SA techniques.

We acknowledge several limitations to this research. First, these findings are within a single community of practice at a specific time and, as such, may not be generalizable to all contexts of anesthesiology practice. Second, our focus was primarily on individual SA rather than on team or distributed SA.¹⁰ Third, the first author undertook the bulk of the coding for this study, with the inherent risk of bias related to pre-existing views about SA, knowledge of the literature, and personal clinical and simulation experiences in anesthesiology. Nevertheless, all research team members reviewed the interview transcripts and performed their own coding of the interviews. Emerging themes and questions were discussed regularly in group meetings. Finally, we acknowledge that the views of learners were not part of this study as only staff anesthesiologists were recruited.

In conclusion, anesthesiologists appeared to understand SA, although a commonly used operational definition and any formal or regular consideration of SA issues were both lacking. Although SA is clearly relevant and important to our specialty, it remains a somewhat tacit and nebulous concept, and as such, it should be discussed, taught, and assessed more explicitly, with particular attention to the practical and collaborative aspects identified in this study. Our findings reflect Glavin and Flin's discussion of SA as a competency in anesthesiology—i.e., SA is undoubtedly important but incompletely acknowledged; however, it deserves as much attention as the basic science knowledge required for the role of medical expert in anesthesiology.⁵

Conflicts of interest None declared.

Editorial responsibility This submission was handled by Dr. Hilary P. Grocott, Editor-in-Chief, *Canadian Journal of Anesthesia*.

Author contributions Julia A. Haber, Jocelyn M. Lockyer, Rachel H. Ellaway, and Rosaleen Chun contributed substantially to the conception and design of the study, the analysis and interpretation of data, and drafting the article. Julia A. Haber and Jocelyn M. Lockyer contributed substantially to the acquisition of data.

Funding sources Foothills Medical Centre Anesthesia Staff Research Fund – 2016 Recipient.

Appendix: Interview Guide

Interview questions:

Your experiences with the concept of situation awareness (SA)

1. What is your understanding of the concept of situation awareness?

Probes:

- What does the term situation awareness mean to you?
- If you haven't heard much about situation awareness, what do you believe it refers to in anesthesia practice?

2. How have you encountered the concept of situation awareness?

Probes:

- When do you remember first encountering the concept of SA?
- In what context(s) have you encountered the concept of SA?
- Are there examples of where you have encountered the concept of SA outside of anesthesiology or the field of medicine?

3. How is the idea of SA relevant to your practice?

Probes:

- Can you think of an example in your practice where situation awareness was important or affected a patient outcome?
- How has the term come up during discussions with colleagues?
- Are there any examples where you may have read about the term "situation awareness"?

4. Is SA a concept that is recognized or acknowledged within your workplace culture?

Probes:

- Are there contexts in which your group might discuss SA, for example, morbidity + mortality rounds? Resident teaching sessions? Discussions about residents in difficulty?
 - Can you think of an example where situation awareness was highlighted within your group, either in practice or in discussion?
 - (If interviewee answers “not valued”): Why do you think SA is not valued in your practice group/workplace?
5. What are some of the barriers or challenges to maintaining SA in the clinical environment?

Probes:

- The use of technology might compromise SA. How have you encountered this?
6. How do you know if someone has good SA?

Probes:

- What are the ways in which you personally assess someone’s SA?
- How should SA be evaluated?

Your understanding of learning SA

7. How do you think situation awareness is learned?

Probes:

- What experiences help with the learning of situation awareness?
- At what point(s) in training does situation awareness learning occur?
- How do you think context factors into learning SA? Clinical vs classroom vs simulation scenario? Explicit or implicit instruction?

8. How have you personally learned about situation awareness?

Probes:

- Tell me about a time when situation awareness was important during your training.
- What role did your residency training play in your learning about situation awareness?

9. What are your thoughts about whether SA is something that everyone can learn?

Probes:

- Discuss whether SA is an innate skill or a skill that can be developed.

- Why might someone argue that you cannot learn situation awareness?

Your thoughts on the teaching of SA

10. How do you personally approach the teaching of situation awareness to learners?

Probes:

- How do you discuss situation awareness with learners?
- Can you tell me about any resources you have used in the teaching of situation awareness to learners?
- Where does the teaching of situation awareness take place during medical training?
- What techniques do you use to teach situation awareness?

11. What do you find to be challenging about teaching situation awareness to learners?

Probes:

- Which learners are more challenging to teach situation awareness (e.g., International Medical Graduates)?
- What are the challenges or barriers to teaching situation awareness?
- When is it most challenging to teach situation awareness?
- How do you approach the learner who is struggling with situation awareness?
- Why might you choose NOT to teach about situation awareness if you have a learner?

12. How do you know if learners are able to incorporate your teaching of situation awareness into their practice?

Probes:

- Can you think of an example of when you have observed a learner incorporate your teaching into clinical practice?

Your ideas about the teaching environment and its relationship to SA teaching

13. How might we improve the teaching of situation awareness to our learners?

Probes:

- What would you have done differently in your teaching of situation awareness now that you have had time to reflect on this issue?

- At what stages of training is teaching of situation awareness most beneficial? Practical?

14. What faculty development would be of benefit to staff anesthesiologists regarding teaching situation awareness?

Probes:

- Do you have any thoughts on how to improve the teaching skills of staff anesthesiologists regarding situation awareness?
 - How can faculty improve on providing feedback to learners regarding their situation awareness?
15. Do you have any other thoughts about teaching situation awareness to learners?
16. Is there anything else you would like to discuss?

Demographic data

- Time since completion of anesthesiology training
- University/Location of participant's anesthesiology residency
- Participant's main practice site in Calgary
- Participant's involvement in departmental leadership/residency training committee/programmed resident teaching activities

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