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# Mixed methods evaluation of a specialty-specific system to promote physician engagement in safety and quality reporting in a large academic health system

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## ABSTRACT

**Background** Incident reporting systems (IRS) can improve care quality and patient safety, yet their impact is limited by clinician engagement. Our objective was to assess barriers to reporting in a hospital-wide IRS and use data to inform ongoing improvement of a specialty-specific IRS embedded in the electronic health record targeting anaesthesiologists.

**Methods** This quality improvement (QI) evaluation used mixed methods, including qualitative interviews, faculty surveys and user data from the specialty-specific IRS. We conducted 24 semi-structured interviews from January to May 2023 in a large academic health system in Northern California. Participants included adult and paediatric anaesthesiologists, operating room nurses, surgeons and QI operators, recruited through convenience and snowball sampling. We identified key themes and factors influencing engagement, which were classified using the Systems Engineering Initiative for Patient Safety framework. We surveyed hospital anaesthesiologists in January and May 2023, and characterised the quantity and type of reports submitted to the new system.

**Results** Participants shared organisation and technology-related barriers to engagement in traditional system-wide IRSs, many of which the specialty-specific IRS addressed-specifically those related to technological access to the system. Barriers related to building psychological safety for those who report remain. Survey results showed that most barriers to reporting improved following the specialty-specific IRS launch, but limited time remained an ongoing barrier (25 respondents out of 44, 56.8%). A total of 964 reports with quality/safety concerns were submitted over the first 8 months of implementation; 47–76 unique anaesthesiologists engaged per month. The top safety quality categories of concern were equipment and technology (25.9%), clinical complications (25.3%) and communication and scheduling (19.9%).

**Conclusions** These findings suggest that a specialty-specific IRS can facilitate increased physician engagement in quality and safety reporting and complement existing system-wide IRSs.

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Traditional system-wide incident reporting systems (IRS) could improve care quality and patient safety, yet their impact is determined by the degree of clinician engagement.

### WHAT THIS STUDY ADDS

⇒ We used a combination of interviews, surveys, and user data to determine whether a specialty-specific IRS increased clinician engagement in reporting and identified key themes and factors affecting engagement.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our findings regarding the need for psychological safety and other considerations of factors affecting an institution's culture of safety should be considered when relying on an IRS to capture quality or safety related concerns.

## INTRODUCTION

Adverse events in healthcare settings are a preventable cause of morbidity and mortality,[1] particularly in the inpatient setting.[2] Incident reporting systems (IRSs) are one-way to identify risks in order to implement interventions.[3] Hospitals are required by the Joint Commission to maintain a confidential IRS.[4 5] The scope of IRSs has expanded beyond harm prevention into quality, including appropriate and efficient resource utilisation to achieve the best possible patient outcomes.[1 6]

However, there are mixed findings as to the success of IRSs in making healthcare safer and higher quality.[3 7 8] The success of an IRS is dependent on the quality and number of reports submitted. Reporting rates are dependent on evidence that reports are being used appropriately, feedback

given to reporters and an existing overall 'culture of safety'.[2 7 9 10] A recent meta-analysis indicated that higher healthcare staff engagement was correlated with patient safety outcomes.[11] Yet, engaging physicians in reporting is challenging due to concerns about adverse professional consequences, time limitations and the nature of the incident itself, particularly if the incident did not result in patient harm.[12 13] Physicians can view IRSs as an infringement on their autonomy and professional judgement.[14–16] Further, IRSs may also reflect bias with one study finding fewer reports on men and white clinicians as compared with their colleagues.[17]

Evidence-based IRS best practices include having clear roles and responsibilities for events, greater engagement from clinicians of diverse professions and fostering of shared experiences from reports with visible action.[18] Publicly rewarding high-impact reports,[19] fostering physician-specific spaces for discussion of safety concerns[20] and involving managerial non-clinician staff[21] can increase engagement. Most research to date focuses on hospital-wide IRSs, but a greater understanding of the complementary role of physician-specific and specialty-specific IRS is needed.

In this mixed methods evaluation, we sought to identify barriers to quality and safety reporting among healthcare professionals working in surgical settings in a large academic health system to inform the ongoing improvement of a specialty-specific IRS embedded in the electronic health record (EHR) targeting anaesthesiologists. The Systems Engineering Initiative for Patient Safety (SEIPS) V.2.0 framework was selected for analysis to highlight the complexity of interactions between people and systems involved in submitting an IRS report and the work factors that may drive engagement or create additional barriers.[22]

## METHODS

### Setting

This evaluation took place in the Department of Anesthesiology, Perioperative and Pain Medicine at Stanford Health Care (Palo Alto, California, USA), a quaternary academic medical centre that performs approximately 120 000 surgeries on predominantly adult patients, requiring approximately 72 000 anaesthetics annually.

### Existing hospital-wide incident reporting system

The hospital-wide IRS allows any employee to report on potential and realised patient safety events, with the option to submit reports anonymously (figure 1, Pathway 1A). Reports are reviewed by a hospital-level safety team consisting of nursing and operational quality experts. Depending on incident severity, this team can carry out its own critical event review or forward the report to another relevant leadership team or nursing or physician leader for a response.

A second reporting system, also hosted on the hospital intranet, allows reporting of professionalism-related events (figure 1, Pathway 1B). We will refer to this system as the IRS for professionalism. Until 2022 both professionalism and safety events were reported to the same IRS. In figure 1, we describe these two systems.

### Specialty-specific incident reporting system

Anaesthesiologists informally recognised the limitations of the hospital-wide IRS, including the cumbersome form, reporting language using terminology nurses are more likely to find familiar and opaque follow-up process and impact. Anaesthesiology quality improvement (QI) leaders developed a complementary IRS, specific to their specialty (figure 1, Pathway 2). The new IRS was adapted from the anaesthesia-specific IRS at Massachusetts General Hospital[23] and the EHR-integrated IRS at Lucile Packard Children's Hospital.[24] The IRS was developed as part of a hospital-wide QI programme.[25]

The point-of-care, anaesthesiology-specific IRS was embedded in the EHR with mandatory (as of October 2022) comment on closure of the patient's intraoperative record. Using language reflective of the perioperative environment, anaesthesiologists characterised reports as a 'Quality concern/Notable event' or 'Kudos' which recognised a positive event within the operative encounter. Per incident, a checklist of 50 quality or safety event categories is provided for reporters to review and check off (online supplemental appendix A). At the time of this work, the specialty-specific IRS was available to anaesthesiologists, with the goal of expanding to certified registered nurse anaesthetists (CRNAs) and trainees.

To ensure integration between the two IRSs, anaesthesiologists are directed to submit reports to the hospital-wide IRS for a subset of events including Equipment/Technology, Clinical Complication or Communication and Scheduling; efforts to automate this step are ongoing. Physician QI leadership also forward reports to hospital-wide IRS as appropriate.

Reports are extracted from the EHR into a secure spreadsheet monthly. One of two departmental physician QI leads and faculty volunteers review reports, sorting them into eight categories (discuss with committee; follow-up; follow-up and forward; forward; not to discuss; project; project and forward; track) (online supplemental appendix A). A subset of reports with high acuity are selected by reviewers and brought before the Quality Reporting Subcommittee of the Departmental Quality Council for discussion. This subcommittee is composed of departmental QI leadership and a rotating group of 20 faculty volunteers. The next steps are determined for each report and are recorded in the spreadsheet.

Reporting trends and the downstream impact of reports are presented at monthly faculty meetings and emailed to the department every month. Efforts to provide individual report/reporter feedback are ongoing.

### Data collection and analysis

Qualitative interviews, faculty surveys and user data from the specialty-specific IRS were collected in a convergent

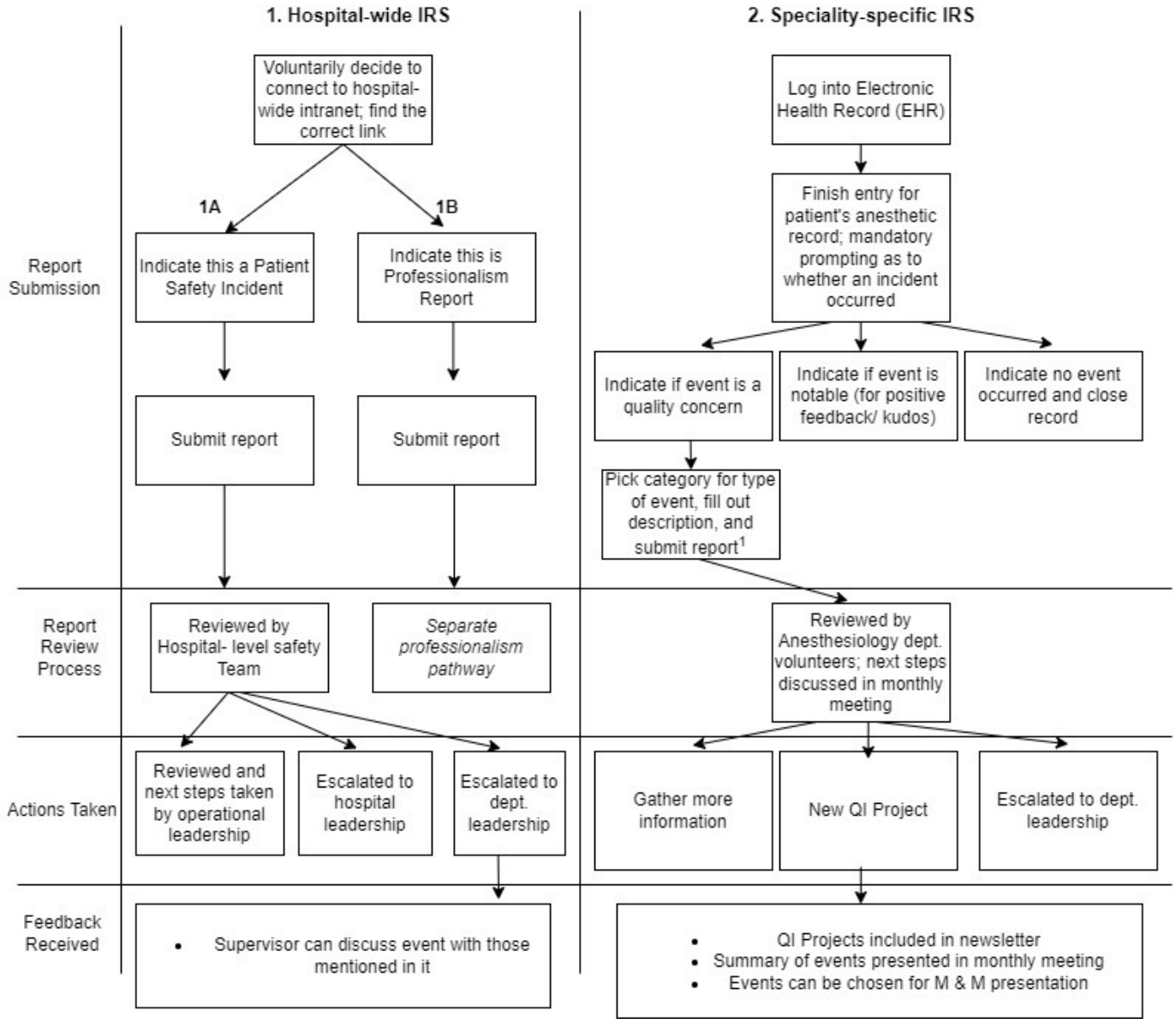


**Figure 1** Workflow for all IRSs. Depending on the category selected the reporter could be prompted to submit a report to the hospital-wide IRS instead. EHR, electronic health record; IRS, incident reporting systems; QI, quality improvement.

mixed methods design,[26] and results were interpreted and presented through the SEIPS V.2.0 framework to highlight work factors addressed by the specialty-specific IRS and limitations.[22] This project was deemed not human subjects research by the Stanford Institutional Review Board as quality improvement (Protocol ID #68776). Individual interview participants gave oral consent prior to interviews and meeting participants were informed that notes would be systematically collected by the evaluation team.

### Survey of faculty anaesthesiologists

Attending anaesthesiologists were asked to complete an anonymous online survey (Google Forms, Mountain View, California, USA) during monthly department meetings in January and May 2023, and the survey link was emailed to allow absent individuals to participate. Frequencies and percentages were calculated for each question. The denominators for reported percentages are the number of surveys completed in January and May 2023, respectively. Further details can be found in online supplemental appendix B. Major survey concepts included: a number of reports filed in the hospital-wide and specialty-specific systems, reasons for being less likely to file a report and confidence that the issue prompting the report will be addressed.

### Engagement with specialty-specific IRS

Engagement in the specialty-specific IRS was assessed using the Department's Quality Council spreadsheet which captured all IRS reports from 1 October 2022 to 31 May 2023. Four outcomes were used to describe engagement: (1) the number of 'kudos'' reports (total and per month); (2) the number of quality and safety concern

reports (total and per month); (3) the number of unique reporting clinicians relative to the faculty exposed to the intervention (total and per month); and (4) the number of unique patient encounters with a report (total). Percentages of the type of concern (total and per month) and assessment (total) were also calculated. Additional details can be found in online supplemental appendix A. All survey and engagement analyses were performed using SAS (V.9.4; SAS Institute, Cary, North Carolina, USA).

### Qualitative interviews

Adult and paediatric anaesthesiologists, surgeons, operating room registered nurses, CRNAs and anaesthesiologist physician trainees were recruited using convenience and snowball sampling and invited to participate in 30 min semi-structured interviews via teleconferencing. All outreach ceased on reaching thematic saturation.

The interview guide (ASL, CBJ, SV), was meant to capture experiences with the hospital-wide IRS and the specialty-specific IRS, types of safety events reported, psychological safety to report and feedback on reports (online supplemental appendix C). Interview recordings were transcribed verbatim (REV; San Francisco, California, USA), de-identified and imported into qualitative software for analysis (QSR International's NVivo 2020). Interviews were analysed thematically using a deductive and inductive approach in which a priori codes were drawn from the interview protocol and emergent themes were identified during analysis. A subset of interviews were coded by three authors (ASL, SV and AP) to inform consensus discussions,[27] and the remaining interviews were coded by a single author (ASL) (online supplemental appendix E). Data were analysed by individual themes and by the interviewee's profession to identify patterns. Observational notes from monthly Anaesthesia QI Reporting Review Committee Meetings provided additional context.

### Ethics statement

The Stanford University Institutional Review approved this project (Protocol # 68776) as a quality improvement project for the purpose of improving clinical care.

### Patient and public involvement

Patients were not involved in this evaluation.

## RESULTS

Our mixed-methods results pertained to: (1) engagement and reporting in hospital-wide and specialty-specific IRSs, (2) barriers to IRS reporting, including improvement recommendations for specialty-specific IRS.

### Engagement and reporting in hospital-wide and specialty-specific IRSs

The first faculty survey in January 2023 was completed by 65 anaesthesiology faculty who reported limited engagement with hospital-wide IRS: only 53.8% (35/65) of anaesthesiologists self-reported that they completed at least one report in the last year; 46.2% (30/65) completed no reports.

Anaesthesiologist engagement with the specialty-specific IRS was more substantial; a total of 178 clinicians submitted 1059 reports to the specialty-specific IRS for 1057 encounters from 1 October 2022 to 31 May 2023. On average, 61±9 clinicians submitted a report per month with a range of 47–76 each month. Of the 1059 submitted reports, 95 were positive 'kudos' reports from 47 clinicians, averaging 11.9±9.5 'kudos' per month. Most reports (n=964) were for quality and safety concerns. The total number of quality and safety reports was highest in the first month of implementation for the specialty-specific IRS (n=168), decreasing to a relatively stable average of 114±14 reports per month in subsequent months (figure 2A). More faculty anaesthesiologists reported experiencing the measured barriers when referring to the hospital-wide IRS than the specialty-specific IRS; the number of faculty reporting each barrier in January and May surveys is shown in table 1.

Physicians categorised concerns in the specialty-specific reporting system; figure 2B shows the percentage of reports within the six categories of concerns. Across all periods, the most common concerns were equipment and technology issues (25.9%), clinical complications (25.3%) and communication and scheduling concerns (19.9%).

The departmental quality and safety leadership reviewed all reports and summarised the results of committee meetings at monthly faculty meetings in part to increase physicians' confidence that concerns will be addressed (January survey 61.5% (40/65) reported being somewhat to completely confident). Indeed, by May 2023, this percentage had risen to 70.5% (31/65).

### Barriers for IRS reporting

For the specialty-specific IRS, 44 anaesthesiology faculty completing the May 2023 survey reported that barriers to engagement in specialty-specific IRS decreased relative to the hospital-wide IRS (table 1). However, limited time (25/44, 56.8%) and not knowing what to report (8/44, 18%) remained ongoing barriers.

Qualitative interviews took place with 24 clinicians and QI team members (of 46 invited), lasting 24 min on average between January and April 2023. For the participant's clinical role, please refer to online supplemental appendix D. Barriers are organised according to the work system factors of the SEIPS V.2.0 framework in table 2A,B, with the rightmost column elaborating on how the specialty-specific IRS addresses these barriers.

Interviewees identified barriers at each SIEPS V.2.0 level. Most factors related to engagement were categorised as organisational challenges with emphasis on fear of negative professional consequences, desire to receive feedback and processes to capture trends and act on them in a timely fashion.

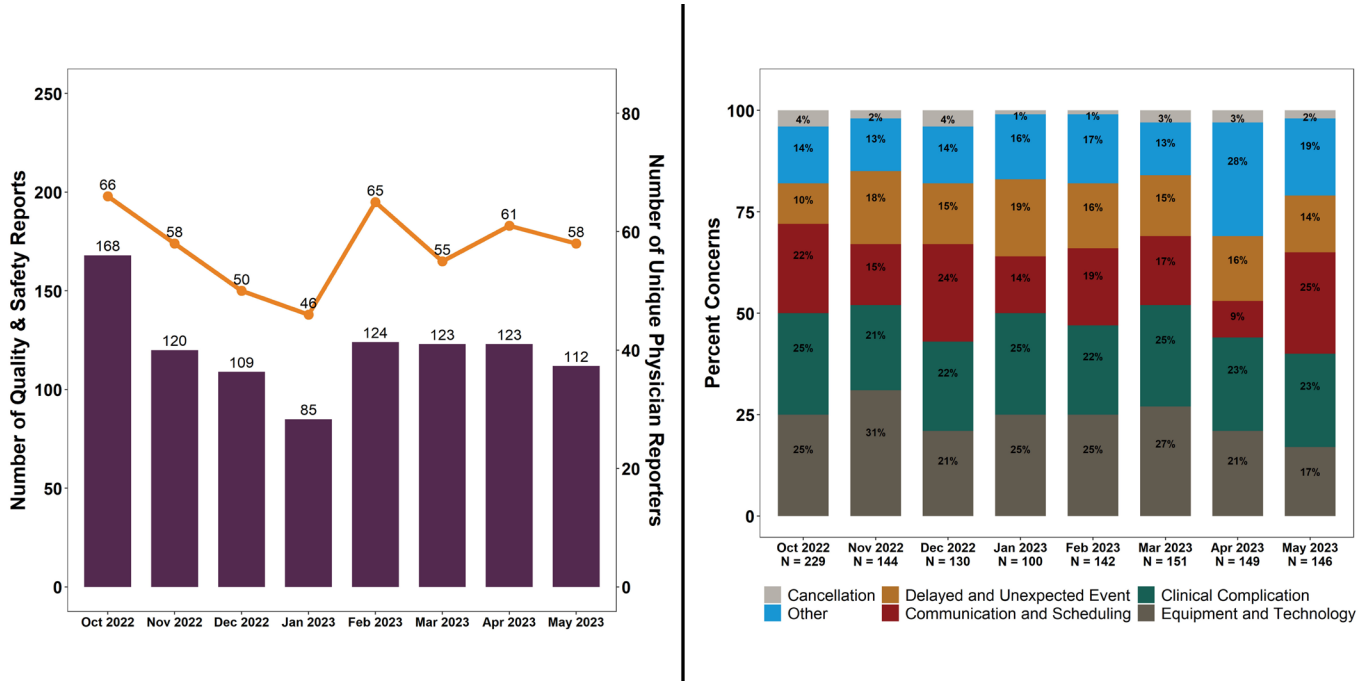


**Figure 2** Engagement with the specialty-specific incident reporting system from October 2022 through May 2023. (A) Shows the number of quality and safety reports and number of unique physician reporters per month. (B) Shows the percentage (%) of quality and safety concern types out of the total number of quality and safety concerns for each month.

### Person level

Interviewees reported limited engagement in the hospital-wide IRS based on not knowing how to file reports and perceiving events as not being reportable. These events tended to not result in negative outcomes, such as lack of equipment or near-misses, being a QI opportunity.

The specialty-specific IRS addresses these barriers by being embedded in the EHR, and therefore being easy to locate, as well as lowering the threshold for reporting events given that the convenience of quickly noting opportunities for improvement.

### Task, tools and technology factors

Task factors were largely related to the time to report events, as well as when reporting occurs. Interviewees noted that filling out the report does make closing a patient's record a longer process and that if the event being reported was an emotionally-draining one, adding

**Table 1** Responses of faculty anaesthesiologists to survey questions capturing barriers to submitting reports through hospital-wide system (January 2023 survey) and specialty-specific (January 2023 and May 2023 surveys) incident reporting systems (IRS)

| | Hospital-wide IRS (January 2023)* | Specialty-specific IRS (January 2023)† | Specialty-specific IRS (May 2023)‡ |
|---|---|---|---|
| Surveys completed (N) | 65 | 65 | 44 |
| Difficult to access | 33 (51%) | 7 (11%) | 2 (5%) |
| Limited time | 32 (49%) | 30 (46%) | 25 (57%) |
| Pessimism about change | 28 (43%) | 14 (22%) | 9 (20%) |
| Not designed for physicians or CRNAs | 27 (42%) | 4 (6%) | 0 (0%) |
| Punitive action | 20 (31%) | 11 (17%) | 6 (14%) |
| Do not know what to report | 8 (12%) | 6 (9%) | 8 (18%) |

*January 2023 survey question 3—'If you observed a possible patient safety incident and did not fill out a [hospital-wide system] report, what were the reasons you did not fill out the report? [Check all that apply]'.
†January 2023 survey question 5—'What are the reasons you are less likely to fill out a [Specialty-specific system] report? [Check all that apply]'.
‡May 2023 survey question 3—'What are the reasons you are less likely to fill out a [Specialty-specific system] report? [Check all that apply]'.
CRNAs, certified registered nurse anaesthetists.

**Table 2** (A) SEIPS V.2.0 person, task and tools and technology factors influencing clinician engagement in hospital-wide IRS and whether the specialty-specific IRS addresses these factors. (B) SEIPS V.2.0 organisation and environmental factors influencing clinician engagement in hospital-wide IRS and whether the specialty-specific IRS addresses these factors

| | Barriers | Ways the specialty-specific IRS addresses these factors |
|---|---|---|
| **(A)** | | |
| Person factors | | |
| P1: clinician knowing how to access the hospital-wide system<br>P2: the clinician perceiving this is a matter worth reporting versus one resolved in an alternate manner | 'It may be because they just have no idea where the(hospital-wide IRS)report links are.' interview 5, anaesthesiologist<br>'…if something's missing during the case and it was a close call, we don't do anything except grumble…'Come on, I do this case every week. Can we please just have the equipment I need?'…but probably we should say at the end, 'You know, I needed that Johnson retractor, and let's make sure it's available every time we have this case.' That doesn't happen. It ends up being a polite, snide comment about something, rather than a formal safe report.' interview 9, surgeon | P1 and P2: having the specialty-specific reporting system embedded in the EHR facilitates access and encourages reporting events occurring recently.<br>'…having it [in the EHR] when you close the record is probably going to be your best [bet] because that's when it's still fresh. And I think a lot of times there's also a recency bias in terms of, 'Oh yeah, it just happened. I remember this, I did this,' and it's easy to do when it's in the moment.' interview 16, anaesthesiologist |
| Task factors | | |
| Ta1: no protected time to report incidents<br>Ta2: if the event that occurred was a stressful one; having to report on it immediately does not allow time for reflection<br>Ta3: create opportunity to describe positive events | 'I know they try to make it easier and have a link on the main page before, but it still takes some time to fill out.' interview 16, anaesthesiologist<br>'that system you're describing where you're forcing a clinical person to address a situation like that when they're in the midst of acute clinical care, …that is something that's adding, not really giving them the appropriate time to deal with what should be an important thing to think about. And for most people, especially if there was a bad event or a stressful event… the time where just at the final part of the clinical experience with that, that is probably the worst time to ask them to try to sort through it and intelligently report it.' interview 14, surgeon | Ta1: not addressed by specialty-specific IRS.<br>Ta2: not addressed by specialty-specific IRS.<br>Ta3: the specialty-specific IRS allows for submitting 'kudos' reports or positive reports on others.<br>'….the positive side of all of it, why can't we be doing clinical shout outs too?…If you have an exceptional encounter with a provider or a nurse, why can't we prop them up?…And then make sure that those things are sent to our bosses.' interview 7, anaesthesiologist |
| Tools and technology factors | | |
| T1: poor accessibility requiring separate log-in on computer<br>T2: burdensome reporting experience | '…before [having a direct EHR link in new system), it seemed like too many steps to put these things in. Maybe I would shoot off an email to someone in the department if it was something particularly concerning.' interview 4, anaesthesiologist<br>'The(hospital-wide system)is not intuitive for a clinician who is a physician to use. It's not structured in a way that it will take the types of reports that we would submit frequently, easily.' interview 3, QI project team<br>'Sometimes…when you go to put in a location, it won't accept the location…The software isn't functioning properly…' interview 22, anaesthesiologist | T1: the user accesses the specialty-specific system through the EHR.<br>T2: there are limited fields for the reported to fill out.<br>'That piece about being required to complete before you close out the record, that it's super easy, that you don't have to enter usernames and passwords and remember to do it or access a separate system. It's right there for you at the end of the case. You're easily able to see, to record any issues that occurred. I think ease of use or ease of reporting, mandatory reporting, those would probably be the two key elements.' interview 19, anaesthesiologist |

Continued

**Table 2** Continued

| | Barriers | Ways the specialty-specific IRS addresses these factors |
|---|---|---|
| | 'Almost everybody has to type in their username and password three or four times before they're able to actually get into(Hospital-wide IRS)if they're logging in from even a hospital computer, unless the previous user of the desktop happened to already have(Hospital-wide IRS)open and they just immediately logged out. It's these kinds of mental hassles and just finger typing hassles that I think add to the collective burden of just digital burnout and having to just navigate through these various circumferential routes in order to ultimately circumvent one's way towards whatever one's trying to find in(Hospital-wide IRS)or on anything else on the hospital instrument. That's been my frustration.' interview 5, anaesthesiologist | |
| **(B)** | | |
| Organisation factors | | |
| O1: prior experience with professional retaliation discourages future reporting<br>O2: rare feedback on impact of reports<br>O3: suboptimal processes to detect and address recurrent trends in reports<br>O4: no systematic way to address safety issues at the department (rather than institution) level<br>O5: lack of training during onboarding<br>O6: used as to highlight resource needs for leadership<br>O7: necessary to have all staff act on reports in a manner consistent with maintaining psychological safety<br>O8: norms regarding roles encourages completion of hospital-wide reports to nursing staff | 'If I thought that submitting the report could improve any aspect of care…then I would gladly take part in it. But it seems like if you submit a (Hospital-wide IRS) report, the person who is on the receiving end of it gets punished. And that's not what I want, but that's unfortunately what happens.' interview 9, surgeon<br>'It just goes into the void and we're like, 'Why are we doing this' Because nothing is going to change. It's a big system. Nobody cares about this little problem, although this little problem happens a lot.' interview 7, anaesthesiologist<br>'Most of these [reports), I think, result from human error. So I think there should be a way for us to more easily detect patterns instead of just looking at it and be like, 'Okay,' and then forget about it… You have to be able to group the complaints into different bins otherwise I think it's just kind of useless.' interview 11, anaesthesiologist<br>'Yeah, at its core, the department has no visibility of the safety and quality issues that we have, at least in a systematic way. So you might hear about a safety issue, you might experience it yourself, you might hear a rumor that one happened, you might talk to another provider and they'll tell you that something happened…but there's no systematic way the department has historically captured this information, collated it, prioritized it, and acted upon it. So it might have been that the same safety events happened a hundred times over the last several years, and every time people talked about it in the back rooms or kept it secret or mentioned it to someone, and nothing ever changed because we never actually had a method for addressing the issues.' interview 2, QI project team | O1: the specialty-specific system is only for quality/safety reports and not for professionalism reports.<br>O2: feedback on types of reports and QI projects created based on the reports is included in the anaesthesiology monthly meetings and is sent out in a newsletter.<br>'And so I brought up the concern…as a resident…the person followed up with me that they were instituting now a red flag that would come up with certain drugs that are tagged the same way that there's a cross allergic reaction with other medications in the EHR system so that it would trigger the nurse to be like, 'Hey, there's an epidural in place, don't give this drug.' So that was rewarding to see.' interview 10, anaesthesiologist<br>O3 and O4: the reports from the new system are reviewed every month and allow for quick turnaround in reacting to problem—that is, the workflow for peripheral intravenous bag and tubing set-up was adjusted and the reporting system was able to document an increase in the rate of intravenous bag and tubing failure associated with this new workflow.<br>'And the clinical director told us, 'Whenever that happens, file a [report).' Because if you don't, then the leadership doesn't know, there isn't a way to bubble up this piece of information in a meaningful way because other than the director saying, 'Hey, here are a bunch of days that we didn't have an anesthesia tech,' that can be more easily dismissed [by leadership). Whereas if you have 20 [reports] that say, 'Oh, we didn't have an anesthesia tech,'…It did get the message across that we need an anesthesia tech all the time.' interview 15, anaesthesiologist<br>'There was collective buy-in to those reporting systems that led to everybody wanting to contribute to the reporting process. And there I guess is a collective hunger and I suppose divisional humility to want to share errors and mistakes and improve from each other's events. I'm not sure that that same culture still has been fully embraced enough within the [name of division] for everybody to actually appreciate what the QI reporting system does aside from just another thing that needs to be checked off in order to close the record.' interview 5, anaesthesiologist<br>O5 and O8: physicians are required to note whether or not a QI incident occurred for any anaesthetic record in the EHR. |

Continued

**Table 2** Continued

| | Barriers | Ways the specialty-specific IRS addresses these factors |
|---|---|---|
| | 'During my fellowship orientation when people are teaching us how to use the system, this wasn't brought up at all. So I just assumed it's not important for part of the learning logistics that a fellow should be aware of…it's not a built-in system. I don't even know how to log in…' interview 11, anaesthesiologist<br>'…it's also a very fragile situation because at the [outside institution] that I'm referring to, there was an event that occurred where a physician filed a report and then one of their clinical supervisors became upset about the report being filed. And so that completely destroyed the psychological safety that people had in the system. And from that point forward for several years actually, the number of physician filed safety reports dramatically dipped.' interview 15, anaesthesiologist<br>'…usually it's nursing that on the behalf of the event. So I haven't felt the need to do one on top of that, nor do I have enough time usually.' interview 8, surgeon | 'There was collective buy-in to those reporting systems that led to everybody wanting to contribute to the reporting process. And there I guess is a collective hunger and I suppose divisional humility to want to share errors and mistakes and improve from each other's events. I'm not sure that that same culture still has been fully embraced enough within the[name of division] for everybody to actually appreciate what the QI reporting system does aside from just another thing that needs to be checked off in order to close the record.'interview 5, anaesthesiologist<br>'…now [with the new system), I have a lower threshold [to report something). When there's equipment issues, when there's logistical issues that might harm patients, I'm more comfortable putting those in.' interview 4, anaesthesiologist<br>O6 and O7: not addressed by specialty-specific IRS. |
| Environment factors (internal and external) | | |
| E1: work activities vary by profession; lack of streamlined computer access is particularly burdensome to surgeons<br>E2: fear of litigation may be the only driver for reporting; as oppose to reporting for the purpose of preventing future incidents<br>E3: in settings with limited staff, such as ORs, reports can lead to identification of the reporter and possible retaliation | 'Yeah, I think there's a default for it to probably be submitted more by people who are around a computer in the hospital all the time. I think as a surgeon, it's hard to submit a(hospital-wide report)because you have to log in through the intranet, which may not be readily available on your phone. It's rare that I'm sitting down in front of a computer for a prolonged period of time.' interview 18, surgeon<br>'But also I think from the reporting aspect, it's not something that you report because you want feedback on, it's something that you report because you're afraid you're going to get sued and if you get caught not reporting it or asking for help or trying to hide something that it'll be worse.' interview 10, anaesthesiologist | E1: not addressed by specialty-specific IRS.<br>E2: not addressed by specialty-specific IRS.<br>E3: not addressed by specialty-specific IRS. |

EHR, electronic health record; IRS, incident reporting systems ; QI, quality improvement; SEIPS, Systems Engineering Initiative for Patient Safety.

more requirements is not ideal. Other barriers related to timing include that events can happen even after the record is closed.

Barriers related to tools and technology were poor accessibility and too many required fields in the hospital-wide IRS report. The specialty-specific IRS largely addressed barriers related to tools and technology by having few fields to fill out and streamlining the reporting experience but did not address task-related barriers—especially those related to clinicians having protected time to report events—although it did allow reporters to include positive events.

### Organisational factors

Most factors noted were organisational, largely related to negative experiences with hospital-wide IRS reports, not seeing reports being acted on, not perceiving department-specific improvements efforts resulting from the hospital-wide IRS, lack of psychological safety and certain roles being more likely to submit reports. Interviewees tended not to differentiate between the hospital-wide IRS for professionalism and the one for safety, suggesting that professionalism reports are often submitted to the hospital-wide IRS system and that reporters assume both are treated equally. Some participants noted negative experiences from professionalism reports, such as being asked to justify clinical decision-making or reports about unprofessional behaviour submitted when acting appropriately.

Individuals noted that getting feedback from a supervisor regarding inappropriate professionalism reports hampered willingness to submit future reports. They also commented that actions taken on safety reports seemed to be of little benefit to patient safety. While one individual acknowledged that professionalism issues could impact patient safety, the majority indicated that safety and professional concerns should be handled separately. Physicians wanted more direct oral feedback at the time of the incident regarding behaviour interpreted by their colleagues as unprofessional. However, some interviewees noted other concerns regarding professionalism reports, such as bias in who is reported being unprofessional, with more non-white and female individuals being reported on.

Some organisational factors were partially addressed by the specialty-specific IRS, such as having department-specific oversight over reports and efforts, with more feedback than the hospital-wide IRS, but more challenging organisation-wide barriers were not addressed.

### Environmental factors (internal and external)

Environmental barriers noted by interviewees included limited access to a computer for filing reports, being motivated to report due to fear of litigation and in settings with limited personnel-being identified when filing a report with the risk of retaliation. A surgeon noted not spending much time in front of a computer. Another clinician commented on their motivation for filing reports to avoid possible litigation, which does not align with the IRS's purpose to improve patient safety. Others shared in settings such as in an operating room- if someone files a report it is easy to identify who could have done so which allows for professional retaliation. The specialty-specific IRS does not address these barriers.

## DISCUSSION

This mixed methods evaluation found numerous barriers to physician engagement in quality and safety IRSs, many which were addressed by a specialty-specific IRS embedded into the EHR. Physician engagement in reporting was specifically supported by organisational-level facilitators: point-of-care accessibility via the EHR, clear separation between safety/quality concerns and professionalism issues and regular feedback on actions due to IRS reports. Our findings validated previous research on the role of feedback, bias and a culture of safety in quality reporting. We demonstrated the importance of feedback to reporters for motivating further engagement,[28 29] and showed that the lack of a culture of safety can be a barrier to engagement.[30 31] We also observed that the manner in which professionalism issues are addressed by leadership can affect confidence in the system as a whole and preferences in feedback to the reporter (eg, not feedback on one's clinical judgement, but whether a submitted report is appropriate or if there are any improvement efforts stemming from it).

Integrating the IRS into the EHR and making interaction mandatory facilitated access and use of the specialty-specific system. Notably, reducing this access barrier through technology (integration with EHR) and organisation (making it a forced choice) resulted in 408/964 (42.3%) reports issues delegated to other units and 46/964 (4.8%) new QI projects. This volume of new projects is almost twice what is reported for other specialties as ongoing projects (n=25), suggesting increased access has identified more areas for improvement than other methods.[32]

Despite attempts of the IRSs to separate professionalism concerns from quality/safety concerns, these were at the forefront of many conversations and related to the role of anonymity. With a separate track for professionalism concerns, our findings suggest anonymity of reports may not be desirable or feasible for quality and safety reporting. Previous work in the context of a learning health system has identified facilitative factors: confidentiality, not being required and easily accessible. Here, the hospital-wide IRS relied on predominantly anonymous reports, while the specialty-specific IRS required identification. Physicians believed the latter system led to improving the number of high-impact issues reported (vs low-impact, interpersonal issues).[31 33 34] To protect a confidential, but not anonymous, reporting system from reluctance to report, previous reviews suggest providing legal immunity to reporters, highlighting positive quality

changes resulting from reporting and attending to any fear of embarrassment that might result from reporting.[35]

Our findings highlight the importance of having a convenient reporting system, but also the need to build psychological safety across all roles. Interviewees stressed that feedback on improvement efforts is important to motivate continued reporting and support a culture of safety. Feedback could address power differentials that negatively impact perceptions of safety culture. One study demonstrated that more hierarchical settings impeded safety culture[36]; it is an open question as to whether transparency could serve to create more level power structures, thereby encouraging safety culture and reporting.

Given the reporting volume and limited resources devoted to the specialty-specific IRS, it is challenging to provide personalised feedback even though it could translate to higher engagement. While ideally, everyone would receive feedback on the appropriateness of reports, that is not feasible due to initial volumes.

Limitations for this evaluation included the anonymity of the faculty providing survey data, which could not be linked to engagement data. Also, although the faculty meeting was an opportunity to reach a large number of anaesthesiologists, it is highly likely not all anaesthesiologists attended due to timing conflicts. Hospital-wide IRS engagement data were also largely anonymous, not linked to the profession and were therefore not used; however, accessing such data may be an area for future work. Finally, data collection took place at the beginning of the intervention because of resource limitations; only the latter portion reflects a 'steady-state' behaviour.

## CONCLUSION

These findings suggest that a specialty-specific IRS can facilitate increased physician engagement in quality and safety reporting and complement existing system-wide IRSs. Future improvements include organisational efforts to build greater psychological safety when reporting incidents, perhaps through greater information sharing on safety issues and initiatives.

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