ORIGINAL ARTICLE

Getting teams to talk: development and pilot implementation of a checklist to promote interprofessional communication in the OR

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Background: Pilot studies of complex interventions such as a team checklist are an essential precursor to evaluating how these interventions affect quality and safety of care. We conducted a pilot implementation of a preoperative team communication checklist. The objectives of the study were to assess the feasibility of the checklist (that is, team members' willingness and ability to incorporate it into their work processes); to describe how the checklist tool was used by operating room (OR) teams; and to describe perceived functions of the checklist discussions.

Methods: A checklist prototype was developed and OR team members were asked to implement it before 18 surgical procedures. A research assistant was present to prompt the participants, if necessary, to initiate each checklist discussion. Trained observers recorded ethnographic field notes and 11 brief feedback interviews were conducted. Observation and interview data were analyzed for trends.

Results: The checklist was implemented by the OR team in all 18 study cases. The rate of team participation was 100% (33 vascular surgery team members). The checklist discussions lasted 1–6 minutes (mean 3.5) and most commonly took place in the OR before the patient's arrival. Perceived functions of the checklist discussions included provision of detailed case related information, confirmation of details, articulation of concerns or ambiguities, team building, education, and decision making. Participants consistently valued the checklist discussions. The most significant barrier to undertaking the team checklist was variability in team members' preoperative workflow patterns, which sometimes presented a challenge to bringing the entire team together.

Conclusions: The preoperative team checklist shows promise as a feasible and efficient tool that promotes information exchange and team cohesion. Further research is needed to determine the sustainability and generalizability of the checklist intervention, to fully integrate the checklist routine into workflow patterns, and to measure its impact on patient safety.

When medical errors occur, they are regularly traced back to breakdowns in communication between members of the healthcare team.[1–6] In the surgical domain, where error rates are particularly high,[7 8] communication research has found that critical information is often transferred in a reactive ad hoc manner and communicative tension is frequent.[9] The JCAHO *2004 National Patient Safety Goals* focused on the problem of surgical errors and advocated ''active involvement and effective communication among all members of the surgical team'' as an essential component of patient safety in the operating room (OR).[10 11]

While communication failures become most evident in the investigation of sentinel events such as wrong site surgery, these events unfortunately represent the tip of the iceberg. We reported that communication failures were commonplace, occurring in 30% of procedurally relevant information exchanges among OR team members.[12] These failures exhibited a recurrent set of problems: communication was too late to be maximally effective, content was not consistently accurate and complete, issues were left unresolved until the point of urgency, and key individuals were excluded from discussions and decisions. Approximately one third of the failures had observable negative outcomes including delay, inefficiency, and team tension.[12]

A team checklist is a targeted intervention with the potential to address recurrent communication failures. Derived from comprehensive task analysis and widely employed in other safety conscious domains such as aviation, well designed checklists address human factors and safety principles including the reduction of reliance on memory, standardization of processes, improvement of information access, and provision of feedback.[13] Discipline-specific checklists such as the pre-anesthetic equipment checklist[14] are already part of established patient safety protocols in the OR. However, no integrated team checklist has been evaluated as a method of facilitating communication among surgery, anesthesia, and nursing teams before the initiation of a surgical procedure. Leonard *et al*[15] described the implementation of a perioperative team briefing instrument and made preliminary claims supporting its impact on several safety relevant outcomes including wrong site surgeries, but descriptions of the instrument's use have been sparse and impact claims have not been supported by research evidence.

Pilot studies are essential to the implementation and evaluation of complex interventions, such as a team checklist, which seek to change team members' behavior. Researchers have advocated an iterative, phased approach to such complex interventions to ensure their acceptability and feasibility before trial based testing.[16] The first objective of this study was to determine the feasibility of introducing a team checklist intervention in the OR, with feasibility defined as team members' willingness and ability to incorporate the checklist into their existing work processes. This is an important starting point because the OR is a busy, often time pressured environment in which each profession has different priorities and constraints. Additional objectives of this project were to describe how the checklist was used by participants from different professions and to describe the

functions of the checklist discussions, as observed by the researchers and perceived by the participants.

METHODS

Checklist development

The research team—including a communication researcher, a cognitive psychologist, surgeons, nurses, anesthesiologists, a surgery resident, and research staff—drafted and refined a checklist instrument based on prior research and their combined professional expertise. The instrument consisted of a list of items designed to prompt a preoperative discussion among surgeons, nurses, and anesthesiologists. The objectives were that the checklist should be comprehensive yet practical, pertinent for a broad surgical domain, and representative of all three professions. The research team first listed all types of patient and procedure related information pertinent to at least two professions in the OR. This list was then edited in an effort to balance the goals of comprehensiveness—that is, a detailed checklist that would elicit all critical information for any given case—with practicality—that is, a checklist that could be completed quickly and easily.

The checklist draft was presented to a sample of 14 surgeons, 14 nurses, and 8 anesthesiologists in a series of group and individual feedback interviews lasting 5–15 minutes. These individuals included both vascular and general surgery staff representing four different hospitals. The experience of participants ranged from 1 year to >20 years in the OR. Each participant was asked to comment on the content and arrangement of the checklist, and also to make predictions about its feasibility and usefulness. The researcher documented each participant's comments on a sample checklist and recorded reflective notes following each interview. Revisions were incorporated to reflect recurrent feedback. Figure 1 shows the checklist used in this pilot study. Before initiation of the checklist, participants' predictions about its feasibility and usefulness were similar across professions: most were positive about the idea but sceptical about actually getting team members to participate.

Checklist implementation

The checklist pilot was conducted in 2003 in the Division of Vascular Surgery at a Canadian quaternary care teaching centre. This division performs approximately 490 surgical procedures per year. Approval was obtained from the hospital's research ethics board and all participation was voluntary. Written consent was obtained from both OR team participants and patients.

Recruitment of operating team participants

OR team members were recruited for participation at profession-specific meetings and in the OR. Vascular surgeons and vascular surgery nurses were given a detailed explanation of the study rationale and were approached for informed consent before initiation of the study. Two of the four nurses had provided feedback on the content of the checklist. One of the staff surgeons is a co-author of this paper (BR) and suggested the Division of Vascular Surgery as the site for this pilot study.

Anesthesiologists participated in the vascular surgery ORs less regularly. A presentation was given to the group before the initiation of the study, but because the anesthesia schedule is finalized less than 24 hours in advance, recruitment sometimes took place the afternoon before the checklist or early on the morning of the checklist case. Surgical residents and nurses from outside the Division of Vascular Surgery were also approached by researchers early in the morning on the day of checklist cases if they had not yet taken part in the study.

Checklist cases

OR team members were asked to use the checklist for selected cases over a 7-week period. The selection of cases depended primarily on our ability to approach and obtain informed consent from patients, as required by the institution's research ethics board. All vascular surgery procedures were eligible for inclusion in the study. Patients were approached for recruitment by research assistants at least 24 hours before their scheduled procedure at their pre-admission or surgical clinic appointments.

Checklist procedure

The staff surgeons were notified of checklist cases the preceding day via e-mail. One or two trained researchers were present in the OR for each case. The researchers reminded the team that it was a checklist day and ensured that everyone had consented to participate in the study. The participants were told that they could use the checklist when and where it was most convenient. If necessary, the researchers prompted the checklist discussion by asking if it was a good time or by paging the surgeon to let him or her know that the others were ready. These interventions were discussed with team members before the implementation began to ensure their acceptability and appropriateness. The researchers provided simple instructions regarding the use of the checklist (such as reminders about how many participants were required), but did not provide direction regarding how individuals should contribute to the discussion.

Data collection and analysis

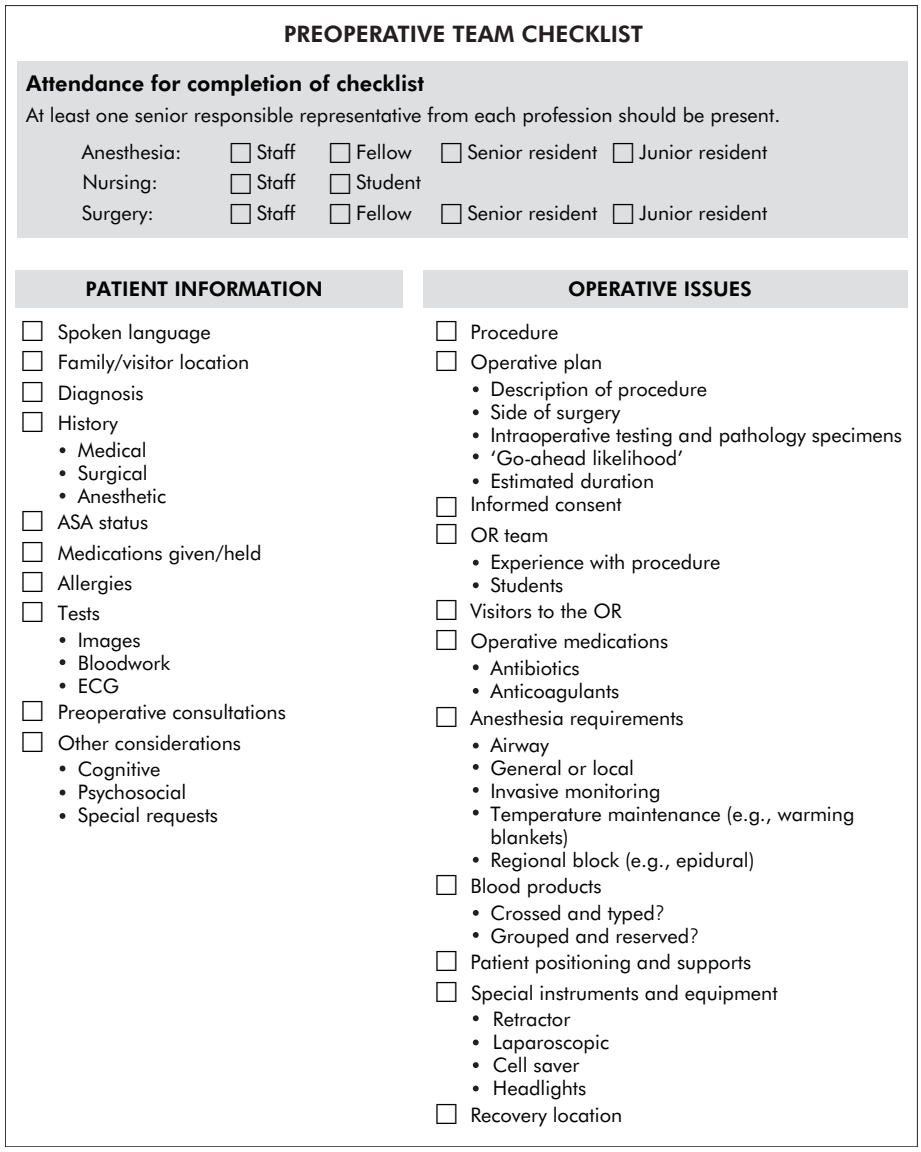
Using ethnographic field note methods,[17] the researchers documented the location, duration, and content of the checklist discussion including items discussed or skipped over, order of items discussed, the arising of questions or contradictions, and patterns of participation by team members. The context of the discussion—including the procedure type, participants' activities at the time the checklist took place, coordination required by the researcher, and procedurally relevant communication before and after the checklist discussion—was also documented. After each checklist discussion, researchers compared notes to assemble a comprehensive record of the communication for the procedure before, during and after the checklist.

Brief informal interviews were conducted with 11 of the study participants. Interview participants were a purposive sample of eight team members who had participated in multiple checklist discussions (three staff surgeons, one surgical fellow, three nurses, one anesthesia resident) and three individuals with only a single experience (three staff anesthesiologists). Interview participants were asked to describe the benefits and drawbacks of the checklist exercise.

Our data analysis employed a modified grounded theory approach that combined emergent theme analysis with attention to preselected issues identified in our previous work on teamwork and communication. Using a constant comparative analysis process, one researcher reviewed the observation and interview data and produced a summary analysis of three major themes: (1) how the checklist intervention fit into or conflicted with existing work processes; (2) how it was received by OR team members; and (3) what effects the discussions had. The analysis was elaborated and refined through an iterative review by the other two researchers who were involved in the implementation of the checklist. It was then presented to the larger research team for review.

Research observers

The research observers who took part in the checklist initiation included the principal investigator (LL) who was



PREOPERATIVE TEAM CHECKLIST

Attendance for completion of checklist

At least one senior responsible representative from each profession should be present.

Anesthesia:	☐ Staff	☐ Fellow	☐ Senior resident	☐ Junior resident
Nursing:	☐ Staff	☐ Student		
Surgery:	☐ Staff	☐ Fellow	☐ Senior resident	☐ Junior resident

PATIENT INFORMATION

- ☐ Spoken language
- ☐ Family/visitor location
- ☐ Diagnosis
- ☐ History
  - Medical
  - Surgical
  - Anesthetic
- ☐ ASA status
- ☐ Medications given/held
- ☐ Allergies
- ☐ Tests
  - Images
  - Bloodwork
  - ECG
- ☐ Preoperative consultations
- ☐ Other considerations
  - Cognitive
  - Psychosocial
  - Special requests

OPERATIVE ISSUES

- ☐ Procedure
- ☐ Operative plan
  - Description of procedure
  - Side of surgery
  - Intraoperative testing and pathology specimens
  - 'Go-ahead likelihood'
  - Estimated duration
- ☐ Informed consent
- ☐ OR team
  - Experience with procedure
  - Students
- ☐ Visitors to the OR
- ☐ Operative medications
  - Antibiotics
  - Anticoagulants
- ☐ Anesthesia requirements
  - Airway
  - General or local
  - Invasive monitoring
  - Temperature maintenance (e.g., warming blankets)
  - Regional block (e.g., epidural)
- ☐ Blood products
  - Crossed and typed?
  - Grouped and reserved?
- ☐ Patient positioning and supports
- ☐ Special instruments and equipment
  - Retractor
  - Laparoscopic
  - Cell saver
  - Headlights
- ☐ Recovery location

Figure 1 Pilot preoperative team checklist.

known to the nurses and one of the staff surgeons; one research fellow who was a former nurse educator and a former colleague to many of the participants; and one research assistant with no prior relationship to the participants. All three of these individuals were involved in facilitating and observing the checklist discussions. The research assistant conducted all of the informal feedback interviews.

RESULTS

Participants

All 33 OR team members agreed to participate in the study. Participants included eight consistent vascular surgery team members (four staff surgeons, one surgical fellow, and three nurses) and 25 less consistent members of the vascular surgery team (eight staff anesthesiologists, four anesthesiology residents, three surgery residents, and 10 nurses). Each person took part in 1–10 checklist discussions.

Surgical cases

Twenty six vascular surgery patients were approached to participate. Four declined participation and the remaining 22 patients constituted the sample. The checklist was implemented before 18 procedures. It was not used in the remaining four procedures because of changes in the surgical schedule. Ten procedures were the first case of the day and eight were the second case of the day. Procedures ranged in duration and complexity and included construction of arteriovenous fistulae, abdominal aortic aneurysm repair (open and endovascular), carotid endarterectomy, common femoral repair, aorto-biiliac repair, aorto-bifemoral bypass, and femoral popliteal bypass.

Feasibility of the preoperative team checklist

The checklist was implemented successfully in all 18 cases. The duration of the checklist discussion ranged from 1 to 6 minutes (mean 3.5). The timing and location of the checklist discussion varied as a result of daily workflow patterns (table 1). The most common time for checklist meetings was before the patient's arrival, and the most common location was in the OR.

In all cases, researchers reminded team members about the checklist on the morning of the surgery. In eight of the 18 cases, researchers assisted in gathering the team together,

Table 1 Location and timing of checklist discussion

	Before patient arrival	After patient arrival, before induction	After induction
OR	8*	2†	3
Hallway	0	3	1
Holding area/in transit	1	0	0

*One discussion took place during the preceding case.
†One discussion took place next to the patient, the other in a corner of the OR.

either by paging the surgical representative (n = 6) or going to look for the anesthesia representative (n = 2). In the majority of cases (n = 14), once all representatives were present, team members proactively initiated the checklist discussion without further prompting from the researchers.* In the remaining four cases the researchers took additional steps to instigate the discussion, such as approaching the participants and distributing checklists. These additional prompts were necessary primarily when the team members were preoccupied with other activities or concerns, and they were only necessary when the checklist occurred after patients' arrival in the OR.

The checklist involved some inconvenience for participants. Completion of the checklist often required the early arrival of staff surgeons to the OR. In cases when the checklist occurred after the patient's arrival, it introduced a brief interruption to anesthesiologists' and nurses' workflow. It was also more challenging in these cases to find an appropriate time for the discussion. These challenges were mitigated when one representative from each profession completed the checklist discussion while other representatives continued with their preoperative preparations. This was a feasible solution in the study hospital because the ORs are typically staffed by two anesthesiologists (one staff person and one resident or fellow) and two or three nurses.

All participants felt that the checklist discussions were efficient. While the surgeons were mindful of the need to minimize interruptions to preoperative preparation, they did not feel that the checklist discussion was time consuming or onerous. The surgeon who participated in the most checklist discussions (n = 8) commented that: ''*The more you do [the checklist], the more you get used to it. … It just becomes part of the routine*.'' (S2)

Two participants expressed concern about the interruption in workflow that was sometimes required to complete the checklist discussion. One nurse, for example, noted: ''*We had to take time away from the patient. It took people away from the room, or we were standing and waiting. … It didn't compromise care in any way. It just stepped you out of your role*.'' (N3)

Similarly, an anesthesia resident acknowledged that the timing of the checklist was ''tricky''. This resident noted that: ''*once the patient is in the room, we [the anesthesiologists] are busy*.'' (A1) Participants from all disciplines concurred that early completion of the checklist (that is, before set up) was optimal.

Despite these timing related challenges, there was a strong consensus that the benefits of the checklist were worth its relative inconveniences. This view was shared by 10 of 11 participants interviewed.

Patterns of checklist use

Checklist discussions involved 3–7 staff and resident participants. Surgery was represented by a staff surgeon in all but one checklist discussion in which the surgical fellow participated instead. Anesthesia was represented by a staff, fellow, or resident anesthesiologist.

The checklist discussions were typically led by one team member. Fifteen of the discussions were led by the staff surgeon, one by the surgical fellow, one by both the staff surgeon and anesthesia fellow, and one by the circulating nurse while the surgeons completed the preceding case. Almost exclusively, the leader progressed systematically through the items on the checklist. Occasionally, teams skipped selected checklist items or used them in a different order from which they appeared on the page. At each prompt the leader would state the relevant information or request details. The leader often paused briefly to await confirmation or invite interjections, and at other times provided all information unless interrupted by another team member. Two excerpts from checklist discussions are shown in box 1.

The roles assumed by disciplinary representatives were fairly stable across participants and checklist discussions. The surgical representative principally provided information to the team. In addition, the surgeon highlighted key issues, sought confirmation of details, and occasionally requested information. The anesthesia representatives primarily confirmed information and highlighted key issues pertinent to anesthesia. They also received information, provided information, and clarified ambiguities. The nursing representative primarily assumed a listening role throughout the checklist discussion. Nurses also provided information or confirmation (for example, regarding the availability of blood products), highlighted ambiguities and requested more specific details about the operative plan.

All participants indicated that they felt comfortable participating actively in the discussion. The discussion was most interactive when the checklist leader promoted contributions from the other participants—for example, by asking direct questions or pausing between prompts. All but one participant reported that the professions' respective contributions to the checklist discussion were appropriate; one anesthesia resident (A1) reported that some surgeons did not allow her an opportunity to present anesthesia related information.

Functions of the preoperative team checklist

Six functions of the checklist discussions were evident in this pilot study. The most common functions were provision of detailed case-related information, confirmation of details, articulation of concerns, and team building. Occasionally, the checklist discussion also provided an opportunity for education and decision making. OR team members emphasized information provision and team building as the most valuable functions of the checklist discussions. Each of the six functions is illustrated and described below.

Provision of detailed case-related information

- Example: The surgeon describes the extent of the patient's disease and details the kind of anastamosis that will be done.

*The researchers' presence in the operating room did serve as a visual prompt for the participants. However, in these 14 cases, the participants clearly expected and prioritized the checklist discussion.

Box 1 Excerpts from checklist discussions

Excerpt #1

SS (Staff surgeon): [*Initiating checklist discussion*] OK. The patient's spoken language is English. His son is awaiting a call at home. We're doing an endovascular aneurysm repair. His medical history is extensive, but most relevant to today are his neurological issues. Are there any special anesthetic considerations?

AS (Anesthesia staff): Just his dysarthria. Excessive sedation may be associated with airway obstruction and risk of regurgitation, so he's going to require light sedation.

SS: That's fine. One thing I'd say is it may be difficult to gauge his neurological function because we have these issues.

AS: Yeah, he has significant difficulty communicating. I've set up a system of hand signals with him.

SS: His arm will be accessible, then. Not tucked. (*AS nods*). OK.

AS: My other concern is the number of people in the room, because noise and movement may interfere with our ability to communicate with the patient.

SS: We can request silence. Alright, his ASA status is 4?

AS: 4.

Excerpt #2

SF (Surgical fellow): [*Mid-checklist discussion*] … It will be a standard triple A, and we'll be using a short bifurcated graft.

CN (Circulating nurse): OK.

SS: It might be a tube. But it will probably be a bifurcated graft. 20 or 22. (*CN nods*)

SF: Go-ahead likelihood is 100%. Operating time will be 2–2.5 hours including anesthetic time. He has signed his consent?

CN: Yes.

Minor details have been altered to maintain confidentiality.

The checklist provided a venue for detailed and timely information exchange among team members. This function of the checklist was best evidenced in the feedback interviews.† Two of three nurses interviewed said that the checklist increased their knowledge of the patient's history and the operative plan in a convenient ''snapshot'' that would otherwise have been impractical or impossible for them to acquire. One nurse commented: ''*It's nice because we learn more than we would otherwise. It's broader information than we usually get about the patient. … Today, for example, [the surgeon] whistled through it so quickly. We [the nurses] wouldn't have gotten half of that information from looking through the chart.*'' (N1)

The surgeons focused on their ability to provide information to other team members, particularly to nurses. Two of the three surgeons interviewed believed that procedures ran more smoothly when the checklist was used, especially in instances where the nursing staff or anesthesia resident was unfamiliar with vascular procedures. One surgeon commented: ''*I think as we have more and more unfamiliar faces in the OR, the use of [the checklist] will become increasingly important.*'' (S2)

Surgeons perceived that the checklist discussion improved OR efficiency and reduced equipment related delays by enabling more proactive planning by the team. One surgeon felt that the checklist heightened his vigilance in reviewing and communicating procedurally relevant details: ''*[The checklist] forces you to make sure that you're on your toes—that you're prepared with all of the case details before you arrive to the [OR].*'' (S1)

Similarly, two anesthesiologists described how the checklist increased the availability and timeliness of information: ''*It helped surgery to understand better what my issues were, and it helped me to understand better what surgery's issues were.*'' (A2) A resident described how the checklist alleviated her frustration that the surgeons often arrive too late to answer her questions about specific operative issues.

In contrast, three interview participants (one from each discipline) felt that the checklist had a limited impact on information exchange before a case. All three commented that, by the time the checklist discussion took place, the information covered was ''redundant'' because decisions about the case had already been made.

Confirmation of case-specific details

- Example: The surgeon notes that the patient has a history of prostate cancer. The nurse asks if the patient has had a radical prostatectomy. The surgeon isn't certain and consults the patient's chart to confirm.

In 10 of 18 discussions, participants sought explicit confirmation of one or more case related details. These exchanges related to various issues including the patient's medical history and allergies, blood product availability, and the status of antibiotic administration.

Articulation of concern or ambiguity

- Example: The nurse expresses concern about whether the anesthetic will be local or general, noting that mixed messages have come from the surgeon, anesthesia fellow, and patient.

In 10 of 18 discussions, participants highlighted a particular concern related to the case or described a problem or ambiguity. In the case of an ambiguity, such as the example presented above, the issue was often resolved during the checklist with all professions present.

Decision making

- Example: Cephazolin has arrived on the patient's chart for preoperative administration by the anesthesiologist. The anesthesiologist notes that the patient has had a relatively severe reaction to penicillin. The surgeon and anesthesiologist decide to administer an alternative antibiotic.

Decisions were occasionally made during the discussion. Three examples of decision making were observed, all involving the surgery and anesthesia representatives. Significant decisions are typically made ahead of time by the surgeons and anesthesiologists following patients' preadmission consultations.

Team building and camaraderie

- Example: The staff surgeon has an opportunity to meet the anesthesia resident for the first time; a discussion prompts laughter among the group; a nurse comments that ''it's time for our fireside chat''.

In addition to facilitating information exchange, the checklist offered an opportunity for the team to confer as a group, and to greet one another and converse about the case in a collegial, non-urgent situation. Observational evidence of this

† While information exchange is a defining feature of the checklist intervention, observers were not able to gauge independently whether the checklist discussions *increased* the amount of information available to the team unless this was revealed through an explicit exchange among team members.

team building function was recorded by researchers in seven of 18 checklist discussions.

The perception that the checklist discussions fostered a sense of team cohesion was strongly emphasized in the interviews following the study, particularly by the nurses and surgeons who participated in the majority of the discussions. One nurse (N3) described a sense of "camaraderie" that was evoked when the team had an opportunity to gather together. The promise of increased team cohesion was also cited by the surgeons as one of the most important outcomes of the preoperative checklist discussions. Following completion of the checklist implementation phase, participants from both surgery and nursing commented informally that they missed the checklist discussions.

Education

- Example: The anesthesia resident indicates that he has never before done a carotid endarterectomy with the surgeon. The surgeon describes his preferred positioning and draping procedures.

Education was observed in two checklist discussions. Both instances involved education across professions: from surgery to anesthesia and from nursing to surgery. Although cross-professional education was an observed function of the checklist, no participants described this type of education in the feedback interviews. One surgeon (S1) indicated that the checklist presented an educational opportunity for residents. He suggested that residents might be asked to lead selected checklist discussions, and that this might enhance their preparedness for procedures.

DISCUSSION

We believe that this work will be valuable to patient safety initiatives and research in two ways: (1) our experience provides detailed insight into the process of changing team communication routines, and (2) our descriptive findings suggest that the checklist intervention shows promise as a method for improving the quality and safety of patient care in the OR.

Most significant is the finding that team members working in a hectic and high pressure clinical environment can successfully implement a change in their communication practice. Several factors contributed to the success of checklist implementation in this study. The vascular surgery team included a small and consistent group of people who were supportive of research. The surgeons' commitment was particularly critical to successful checklist implementation. We engaged in an ongoing consultation process with the participants, receiving and providing continuous feedback, and this too was essential; the perceptions of participants both before and during an intervention provide critical insight into opportunities and obstacles that may not be available to an observer, yet are essential for tailoring the intervention to the context. The consultation process may also confer a sense of ownership to participants which may be essential to the success of interventions that seek to change behaviour.

Many of the OR team members who participated in the design of the checklist were sceptical that the pilot study would be successful. Indeed, changing team communication routines is not simple, and this study reveals specific challenges. Differing workflow patterns among the professions were identified early as a challenge to the assembly of team members for the checklist discussion. We learned that, in this environment, the team checklist is maximally useful when the discussion happens as early as is feasible, and before the patient's arrival in the OR. Checklists conducted in this context were more likely to include careful consideration of all items because team members were not distracted by a waiting patient and a sense of wasted time, and they had not yet committed to and enacted preparative decisions (such as positioning) that might require negotiation by other team members. However, this represents a short window of time and requires the early presence of all team members. Leonard *et al*[15] reported that surgical teams who implemented a perioperative team briefing process at a non-profit hospital in the United States elected to meet after induction of the patient. Our observations support this practice as an alternative that circumvents some timing related challenges. We believe, however, that earlier meetings—if they can be successfully implemented—have the greatest potential effect.

To overcome timing related challenges, future checklist initiatives will require some level of workflow intervention to ensure success without the orchestrating presence of a researcher. This study did not seek to determine whether the intervention could be used independently by the OR team. Because the checklist intervention is sensitive to variations in workflow over time and across professions, this promises to be a challenging issue which is worthy of independent investigation. Our findings suggest that the checklist became routine for some participants as the pilot study progressed. Participants began to ask independently about the checklist and to seek out the researchers.

The content of the discussions was efficient and worthwhile from the perspective of both the participants and the researchers. We elected to design a tool that was general enough to be relevant to a broad range of procedures. The discussions evoked by this tool seemed both detailed and thorough, suggesting that more specific checklist items may not be required. We expect that the checklist could be implemented for other procedures with only minor modifications such as the addition of procedure-specific equipment requirements.

We did not divide the checklist by profession and instead invited participants to contribute whenever they wished to add, query, or clarify information. Because the surgeons hold the majority of information about the patient and the procedure, they were typically the dominant contributors to the checklist discussions. Optimally, the professions would share equally the responsibility for initiating the checklist and participating actively in the discussion. However, within the existing social structures of the OR, the checklist did serve to encourage engagement, and participants reported that they were comfortable contributing to the discussion. The impact of the checklist on the team's communication throughout the procedure is a topic for further empirical investigation.

While our description of the checklist discussions is preliminary, it provides compelling evidence that this brief, team based communication intervention may impact safety relevant factors in the OR. For example, in more than half of the cases the checklist promoted the explicit confirmation of safety related details such as patients' allergies and the availability of blood products. This explicit confirmation function is akin to the work done by the widely used checklists regarded as fundamental to aviation safety.[18] The checklist also increased the amount of detailed, timely information exchange among team members and enabled the identification and resolution of concerns. This may, as some participants described, help to ensure the smooth progress of cases and prepare teams to respond effectively should critical situations arise. The checklist creates a circumstance in which team members can confer proactively, confirming preferences, questioning assumptions, and revealing ignorance in a safe, non-threatening, and non-urgent situation. Without this kind of licence and opportunity, team members are unlikely to reveal what they do not

Key messages

- Team communication can foster or compromise patient safety.
- Evidence-based tools are needed to promote and standardize communication among members of healthcare teams.
- Team communication tools require piloting to assess and optimize their feasibility in a particular context.
- A preoperative team checklist appears to be a feasible and efficient tool with the potential to increase information exchange and promote team cohesion.
- Variation in workflow patterns across professions is a primary barrier to the implementation of a preoperative team checklist.

know and confusion is apt to arise, leading to tension, reactive reasoning, and potential error.

Both observation and interview data in this study demonstrate that the preoperative team checklist is a promising intervention with the potential to improve information transfer and team cohesion. The next step in this line of inquiry will be to evaluate these impacts, along with other communication sensitive outcomes. To date, the evidence linking team communication with performance and safety relevant outcomes has largely come from retrospective analyses of errors and adverse events. Recent and ambitious prospective research programmes have begun to establish links between team behaviors and measures of surgical excellence,[19] and between team coordination and health outcomes such as length of hospital stay for orthopedic surgery patients.[20] We believe that it is crucial to extend these efforts through the implementation and evaluation of communication-specific interventions such as the preoperative team checklist. Not only are communication practices amenable to change, but the impact of such changes may be substantial given the central role of communication in fostering—or compromising—safe and effective practice.

This type of research presents interesting methodological challenges that will become increasingly important as we move from descriptive to evaluative research. For example, the researchers both observed and participated in the checklist intervention. This is an amplified example of a regular consideration in qualitative research: the importance of reflection on the dual role of researcher and participant. This dual role is a limitation—but also a strength—in the exploration and evaluation of complex behavioral interventions such as the team checklist. While it may be ideal to separate the tasks of implementing and observing the checklist, this approach may neither be pragmatic nor produce the richest understanding of how the intervention functions. In this study the research team discussed all observations iteratively and reflexively, and presented the findings to participants for input and verification according to accepted procedures for qualitative research. While the participants may have reported favorably about their experiences because of their familiarity with the researcher, we received no signals that this was a concern; participants were candid and, in fact, offered unsolicited input—both critical and positive—after the conclusion of the study.

CONCLUSION

This pilot study has taken the first step in promoting evidence-based behavior change in OR team communication. We have shown that the team checklist is a feasible method of getting OR teams to talk systematically about key procedural issues before a surgical case. It is efficient and can have a positive impact on information exchange, problem solving, and a sense of team cohesion. Workflow patterns need to be considered before wide scale implementation of this intervention. Further research is required to determine the generalizability and sustainability of the checklist and to measure its impact on outcomes relevant to patient safety.

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