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Surgery and Anesthesia Preoperative "Virtual Huddle": A Pilot Trial to Enhance Communication across the Drape

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Abstract

Objectives   Effective communication between surgeons and anesthesiologists is critical for high-quality, safe, and efficient perioperative patient care. Despite widespread implementation of surgical safety checklists and time-outs, ineffective team communication remains a leading cause of patient safety events in the operating room. To promote effective communication, we conducted a pilot trial of a "virtual huddle" between anesthesiologists and surgeons.

Methods   Attending anesthesiologists and surgeons at an academic medical center were recruited by email to participate in this feasibility trial. An electronic health record-based smartphone application was utilized to create secure group chats among trial participants the day before a surgery. Text notifications connected a surgeon/anesthesiologist pair in order to introduce colleagues, facilitate a preoperative virtual huddle, and enable open-ended, text message-based communication. A 5-point Likert scale-based survey with a free-text component was used to evaluate the utility of the virtual huddle and usability of the electronic platform.

Results   A total of 51 unique virtual huddles occurred between 16 surgeons and 12 anesthesiologists over 99 operations. All postintervention survey questions received a positive rating (range: 3.50/5.00–4.53/5.00) and the virtual huddle was considered to be easy to use (4.47/5.00), improve attending-to-attending communication (4.29/5.00), and improve patient care (4.22/5.00). There were no statistically significant differences in the ratings between surgery and anesthesia. In thematic analysis of qualitative survey results, Participants indicated the intervention was particularly useful in interdisciplinary relationship-building and reducing room turnover. The huddle was less useful for simple, routine cases or when participation was one sided.

Conclusion   A preoperative virtual huddle may be a simple and effective intervention to improve communication and teamwork in the operating room. Further study and consideration of broader implementation is warranted.

Keywords
► provider–provider communication
► mobile computing and communication
► perioperative services
► interdisciplinary care teams
► process improvement

Background and Significance

Teamwork and interdisciplinary communication in the operating room (OR) can facilitate efficiency, promote patient safety, and improve provider wellness.[1] Surgeons and anesthesiologists are leaders in the OR and their effective communication and coordination is central to optimal patient care.[2] Communication failures are associated with an increased rate of serious adverse events and were identified as a root cause in up to 54% of perioperative sentinel events resulting in patient death or permanent loss of function.[3–7] In a review of 444 surgical malpractice claims, 72% involved communication-based errors, and the attending surgeon was reported to be the most common team member involved.[8] An analysis of communication across the different phases of surgical care delivery (i.e., preoperative, intraoperative, postoperative) found that most failures occur during the preoperative assessment.[9]

Over the last two decades, the Joint Commission released "The Universal Protocol"[10]—safety guidelines for perioperative health care providers, including the surgical safety checklist and safety time-out—which has been widely adopted as a mechanism to reduce or eliminate preventable medical errors. In addition, a multitude of interventions including read-backs, situation-background-assessment-recommendations, critical assertions, and team trainings have been introduced with variable success in an attempt to reduce communication failures.[11,12] Despite these innovations, barriers to effective communication remain.[13]

More recently, information technology (IT) based strategies have been applied in perioperative departments to help break down these barriers. Specifically, electronic health record (EHR) based chat functions have been utilized by anesthesia providers to improve OR management, specifically room turnover time.[14] Given the increasing prevalence of and familiarity with technology in the OR, promoting an electronic mode of interdisciplinary communication is worthy of investigation and implementation.

In this study, we conducted a feasibility pilot trial of a simple, "virtual huddle," based upon an electronic communication platform between anesthesiologists and surgeons on the evening prior to the day of surgery. The aim of this trial was to evaluate the practicality of and ability to leverage integrated IT-based tools as a mechanism to further enhance team communication, improve handoffs, and foster collegiality in the perioperative arena.

Methods

The pilot trial occurred over a 3-week time period at a tertiary care, academic medical center. We utilized a commercially available EHR (Epic Systems, Verona, Wisconsin, United States) with a smartphone application and functionality for secure chat messages between health care providers. Attending surgeons from all surgical subspecialties and anesthesiologists were recruited by email to participate in the trial. On the day prior to surgery, participants (one
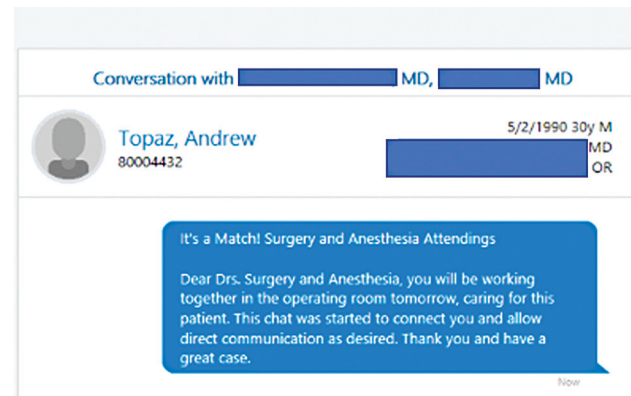

Fig. 1 Screenshot of the initial secure text message that creates a group chat between the attending anesthesiologist and surgeon on the day prior to surgery (data presented in ►**Fig. 1** are imaginary).

attending anesthesiologist and one attending surgeon) were connected via an EHR-based secure chat message that was manually initiated by a member of the project team. A text notification was sent to surgeons and anesthesiologists who would be working together the next day, as seen in (►**Fig. 1**). Available on both smartphone and desktop applications, the EHR-based secure chat functions worked as a direct messaging tool. Participants were able to use the platform to communicate directly about their case(s) in an open-ended, unstructured fashion similar to text messaging. Chats were started for all surgeries between trial participants, regardless of level of complexity, and were connected to a patient's electronic chart such that a case summary and clinical details could be readily reviewed upon receipt of the chat notification. A trial protocol was sent to participants with instructions in which they were encouraged to discuss the next day's cases to preemptively address potential causes of communication failure, including anticipated case difficulty or duration, relevant concerns from the patient's medical history, case-specific alternations to usual practice, special equipment that should be made available, among other topics. Of note, the virtual huddle conversation content was not analyzed for this pilot project due to privacy concerns and vendor functionality limitations.

At the study institution, a preoperative briefing occurs after the patient enters the OR and before induction of anesthesia. Subsequently, a final time-out, in accordance with the World Health Organization surgical safety checklist,[15] is conducted immediately prior to incision for all surgeries. Participation in these two safety checkpoints, which occur physically in the OR, includes a member of the surgery team for the briefing and the attending surgeon for the time-out, a member of the anesthesia team, the circulating nurse, and the surgical tech. The currently described "virtual huddle" was performed in addition to these standardized perioperative protocols on the eve prior to surgery.

Following the study period, an electronic 5-point Likert scale-based survey with a free-text option for additional comments was sent to participants to evaluate the usability

of the electronic platform and its potential to improve communication between surgeons and anesthesiologists. Quantitative scores were analyzed utilizing descriptive statistics, including mean, standard deviation (SD), and 95% confidence intervals (CI). Of note, the upper limit of the 95% CIs is 5, the maximum score on the Likert scale utilized. Additionally, two-tailed two-sample Student's t-test was used to compare results between surgeons and anesthesiologists. A p-value < 0.05 was considered statistically significant. Statistics were performed with Microsoft Excel.

To further analyze surgeon and anesthesiologist participant survey responses on their evaluation of the platform, a 6-phase process for conducting reflexive thematic analysis (RTA) was used.[16] RTA within a paradigmatic framework of interpretivism and constructivism allows for analysis in a manner designed to respect and express the subjectivity of participants' accounts of their attitudes, while also acknowledging the reflexive influence of the researcher's interpretations. Open-text feedback was collected from our participants in the postintervention survey regarding their experience with pilot and analyzed accordingly. These comments were then stratified by origin from surgeons and anesthesiologists and connected into a thematic map. The institutional review board reviewed the study protocol and waived the requirement for informed consent.

Results

A total of 20 surgeons and 15 anesthesiologists were initially recruited for the trial, and 16 surgeons and 12 anesthesiologists participated. From this cohort, a total of 51 unique EHR-based secure chat connections were created to cover 99 operations. Participation came from a diverse range of surgical specialties: neurosurgery ($n = 1$), transplant surgery ($n = 1$), cardiothoracic surgery ($n = 4$), colorectal surgery ($n = 4$), head and neck surgery ($n = 1$), plastic surgery ($n = 1$), surgical oncology ($n = 3$), and urology ($n = 1$).

The postpilot survey response rate was 79% (11 surgeons, 8 anesthesiologists). The Likert scale survey results are shown in ►Table 1, and subjective comments are listed in ►Table 2. All questions received a positive rating (range: 3.50/5.00–4.53/5.00), and the virtual huddle was considered to be easy to use (mean = 4.47/5.00, SD = 1.74, 95% CI = 3.69–5.00), improve attending-to-attending communication (mean = 4.29/5.00, SD = 1.66, 95% CI = 3.55–5.00), and improve patient care (mean = 4.22/5.00, SD = 1.44, 95% CI = 3.58–4.87). There were no statistically significant differences in the ratings between surgery and anesthesia providers.

On thematic analysis of participant responses, three major themes arose: communication between surgery and anesthesia, case complexity, and usability of the chat

**Table 1** Postintervention Likert scale survey responses

Please rate your level of agreement with the following statements								
Question	Mean	Min	Max	SD	95% CI	Anesthesia average ($n = 8$)	Surgery average ($n = 11$)	p-Value (Surgery vs. anesthesia)
Using a virtual huddle would improve attending to attending communication	4.29	3.00	5.00	1.66	(3.55, 5.00)	4.14	4.40	0.39
Learning to use epic secure chat virtual huddle was easy	4.53	3.00	5.00	1.76	(3.74, 5.00)	4.71	4.40	0.32
Using a virtual huddle would improve patient care	4.22	3.00	5.00	1.44	(3.58, 4.87)	4.14	4.27	0.69
The design of the epic secure chat virtual huddle was simple and intuitive	4.18	3.00	5.00	1.61	(3.45, 4.90)	4.29	4.10	0.49
Using a virtual huddle would make patients safer	3.94	3.00	5.00	1.39	(3.32, 4.57)	3.71	4.09	0.30
Using a virtual huddle would improve attending to attending interactions	4.38	3.00	5.00	1.88	(3.53, 5.00)	4.43	4.33	0.77
If available, I would continue to use a virtual huddle	4.35	3.00	5.00	1.69	(3.59, 5.00)	4.43	4.30	0.68
I would recommend a virtual huddle to colleagues	4.35	3.00	5.00	1.69	(3.59, 5.00)	4.43	4.30	0.68
Epic secure chat virtual huddle was easy to use	4.47	3.00	5.00	1.74	(3.69, 5.00)	4.57	4.40	0.59
Use of the virtual huddle will help improve the working environment	4.00	3.00	5.00	1.77	(3.21, 4.79)	4.29	3.78	0.18
Use of the virtual huddle would positively impact my personal level of well-being	3.50	2.00	5.00	1.64	(2.76, 4.24)	3.43	3.56	0.79
1—very untrue; 2—untrue; 3—neutral; 4—true; 5—very true								

Table 2 Subjective free-text survey responses

Comments or feedback? (12/19 participants)	Surgery/anesthesia
"Was very helpful when working with surgeons that I haven't worked with previously."	Anesthesia
"Was great but not sure about compliance from all the surgeons."	Anesthesia
"I hate EHR secure chat (it's annoying) and it's hard to remember to get the messages especially when they come late at night. That said, it was very helpful to know who I would be working with and to have a way to communicate with them."	Anesthesia
"During this process I've become a fan of the secure chat function to improve room turnover as I can reply back to the circulator nurse when they message me to roll back patients. It has also helped to confirm positioning and anesthesia type for first case starts which can be very helpful when setting up in the morning."	Anesthesia
"It would be helpful if I can reach out to the surgeon myself; when I had to wait to be connected, it wasn't as easy to reach my surgeon in a timely fashion. Otherwise, the system is great!"	Anesthesia
"Unable to assess this pilot with only two interactions"	Anesthesia
"Generally not a fan of the EHR, but this was easy to use, basically secure text messaging, could be helpful to talk to anesthesia, but not applicable to straight-forward cases."	Surgery
"I only had two experiences during the period, both were fine. Only one case warranted a precontact communication. Conceptually this is a nice tool."	Surgery
"Unfortunately I had very limited use during the allotted time."	Surgery
"I was assigned several times. We communicated the first time but there wasn't much to say, but after that there wasn't much utilization, and I don't think there would have been much to add for that particular group of patients I was operating on. Most of the anesthesiologists I work with know my routine by now and it's pretty consistent."	Surgery
"I'd rather talk with the anesthesia attending than text. Too complex for just messaging."	Surgery
"I did it twice. One time, the anesthesia attending never responded. The other time, it was clear that the anesthesiologist had not thought about the case or reviewed the patients."	Surgery

(►**Fig. 2**). Both surgeons and anesthesiologists believed that the platform promoted relationship building between the two specialties and increased comfort levels working with attendings that they had not worked with previously. Case complexity was another factor that participants found important. Participants reported that the chat function was more useful for complex procedures, procedures that were greater than 2 hours in length, or when there were multiple similar procedures across the course of the day. In these instances, the physician users felt the tool additionally improved OR turnover. In contrast, the virtual huddle was felt to be less useful for simple and routine cases.
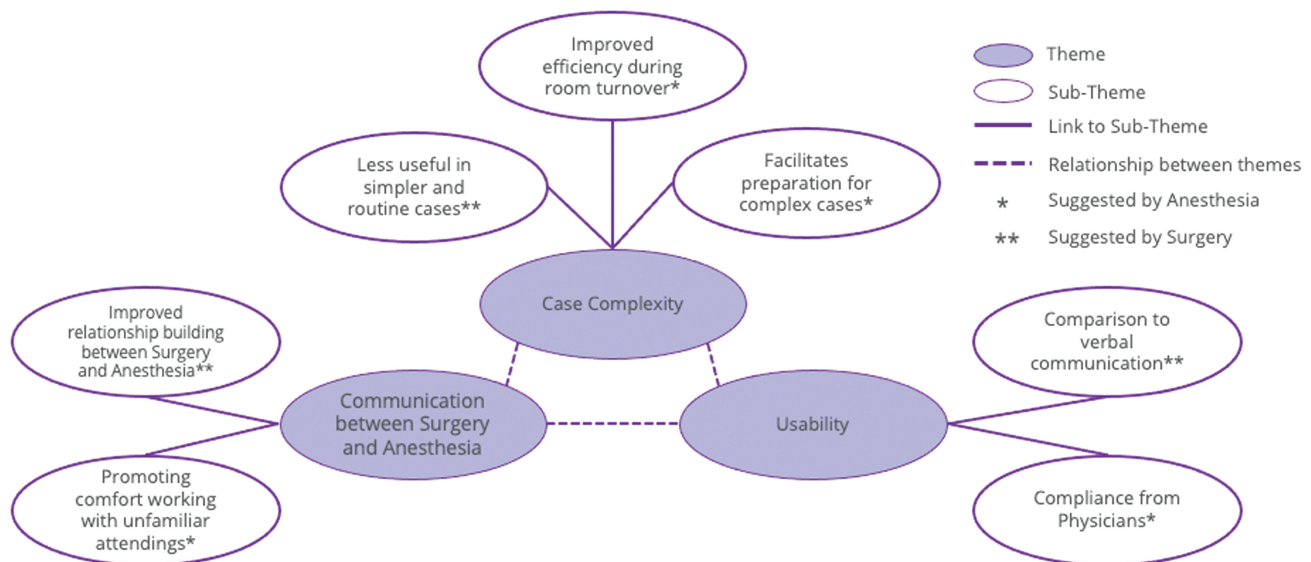
Fig. 2 Thematic map analysis of feedback from participating surgeons and anesthesiologists.

Discussion

This study demonstrates the utility and feasibility of a mobile phone, IT-based "virtual huddle" between surgeons and anesthesiologists. EHR-based, secure chat messaging technology offers an intuitive, readily available, and accessible mechanism for connecting different disciplines prior to a procedure with essentially no added burdens on providers.[14,17] Pilot trial participants rated the experience as overwhelmingly positive. Comments depicted the process as a simple, favorable concept, although perhaps not always necessary. The chats were set up for a wide range of cases; however, thematic analysis suggests this type of interdisciplinary communication is most useful for a subset of more complex procedures. The direct line of communication provided by a secure, patient-specific text messaging system can act as an adjunct to traditional perioperative handoffs to aid in preparation for the case, enhance OR efficiency, and ultimately promote patient safety.[8,18,19] Additionally, providers benefit from knowing who to expect on the other side of the drape, and the conversation provides an opportunity to foster collegiality as both attending physicians have connected before entering an OR.

Although the results of this pilot trial are promising, remaining questions include the following: (1) does a virtual huddle add clinical benefit to common preexisting checkpoints to warrant broader implementation locally and elsewhere? (2) is it technically feasible to implement across a large health system? (3) if implemented, what aspects of the virtual huddle should be changed based upon this initial experience?

At the study institution, standard practice, as described above, is to conduct a briefing prior to induction of anesthesia to review case and patient details with all members of the interdisciplinary OR team, including surgery and anesthesia. Although this system is robust, it does not occur until the day of surgery itself when the patient and team are physically in the OR, it is not surgery and anesthesia specific, and it is checklist based rather than conversation based. A virtual huddle can occur the day prior to or morning of an operation, allowing for case preparation prior to entering the OR. The virtual huddle can occur, regardless of physical location, offering maximum flexibility for providers, an aspect of telehealth that has proven useful in numerous medical fields.[20,21] Additionally, a directed conversation between the two attending physicians fosters collegiality and adds an element of humanity that is not generally captured by standardized checklists.[22,23] We acknowledge that for some institutions, the virtual huddle may not easily integrate into the standard workflow, although we believe it offers, at a minimum, an additional opportunity to communicate with minimal burden to end users.

Broader implementation at the study institution is ultimately planned but is limited by gaps in technological system interoperability. The virtual huddle currently requires a third party (in this case, a member of the pilot trial team) to review a complex schedule on the evening prior to the day of surgery and manually create the group chats for several reasons. First, our anesthesiologists' schedules are manually generated unlinked from case information in the

EHR system. Second, there is no functionality within the EHR to automatically create this type of chat based upon case information, for example, members of the scheduled OR team. Although it is possible for either the surgeon or anesthesiologist to initiate a chat, we found the requirement to initiate the group thread was a barrier for end users. Thus, full implementation in the current state would require administrative support staff to initiate virtual huddles. In the future, as interoperability between scheduling systems and the EHR improve, virtual huddles have the potential to be constructed in a more automated fashion alleviating the requirement for an administrative support staff.[24]

There were several other lessons learned to optimize the clinical application of this useful technology. For simpler or subsequent cases, the notification received by the provider regarding the generation of the huddle might prove to be bothersome in itself, as the huddle may not seem to be necessary when the patient and operative details are straightforward. As such, when multiple cases are shared between the same providers on the same day, only one virtual huddle may need be created. The development of algorithms for chat generation depending on the level of case complexity or additional patient factors would be worth exploring. Additionally, this pilot virtual huddle occurred only between surgery and anesthesia attendings. Future editions of the virtual huddle could include residents or fellows, circulating nurses, and surgical techs such that the entire OR team can participate in the conversation. One downside of this approach would include risking further alert fatigue as too many messages could prevent users from participating.[25] Other study limitations include small sample size, lack of objective measures for improved communication, inability to examine the volume or content of chats once created, and undefined indications for usage. Given the small sample size and nature of this pilot project, we were underpowered to evaluate the impact of the intervention on patient safety. Further research is warranted. It may be possible to use visual analytics techniques for workflow analysis and comparison between different roles.[26]

Leveraging EHR-based secure chat messaging to facilitate interdisciplinary communication has shown benefit in clinical settings outside of the perioperative sphere.[27] Improving the exchange of information between surgery and anesthesia carries numerous benefits for patient safety, surgical outcomes, and provider wellness. Given the results of this pilot study, there is evidence that implementation of EHR-based secure chat messaging or "virtual huddles" among perioperative team members is feasible and offers a simple adjunct to enhance a vital aspect of perioperative care. Further study and consideration of broader implementation is warranted.

Clinical Relevance Statement

Improving the exchange of information between surgery and anesthesia carries numerous benefits for patient safety, surgical outcomes, and provider wellness. A preoperative virtual huddle, utilizing EHR-integrated secure chat messaging, may be a simple and effective intervention to improve communication and teamwork in the OR.

Multiple-Choice Questions

1. A "virtual huddle" between surgeons and anesthesiologists using EHR-integrated secure chat messaging may be most effective at what perioperative time period?
   a. Initial evaluation
   b. Preoperative period
   c. Intraoperative period
   d. Postoperative period

   Correct Answer: The correct answer is option b. A "virtual huddle" between surgeons and anesthesiologists using EHR-integrated secure chat messaging, may be most effective during the preoperative period. This study describes the creation of conversations between providers on the night prior to the scheduled surgery in order to optimize preparation for the specific surgery for the specific patient.

2. What is a current disadvantage of EHR-integrated secure chat messaging utilization for a virtual huddle between surgeons and anesthesiologists?
   a. Chats are not specific to a particular patient or case
   b. Each chat must be generated manually
   c. Users without smartphones are not able to utilize the tool
   d. The virtual huddle can occur, regardless of physical location

   Correct Answer: The correct answer is option b. A current disadvantage of EHR-integrated secure chat messaging utilization for a virtual huddle between surgeons and anesthesiologists is that each chat must be generated manually (b) by reviewing each specialty's schedule for the next day and pairing providers from the separate schedules on separate software systems. Chats are generated to be specific to a particular case and patient (a), users without smartphones are able to utilize the tool on the desktop EHR application (c), and the fact that the virtual huddle can occur regardless of physical location (d) is a great advantage to the tool.

Protection of Human and Animal Subjects
The study was performed in compliance with the World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects and was reviewed by the University of California, San Diego Institutional Review Board.

Conflict of Interest
None declared.

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