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Using Surgical Video to Improve Technique and Skill

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While recent quality improvement efforts have made considerable gains in improving perioperative care, these approaches largely ignore the details of what occurs during the operation itself. It is generally accepted that what occurs at the hands of the surgeon during a procedure has significant influence on patient outcomes. However, objectively assessing surgeon performance in the operating room has been difficult. As a result, surrogate measures, such as procedural volume, have served as proxies for operative proficiency.¹ Recently, enthusiasm has been growing to tackle the challenges of directly evaluating and improving surgeon performance using intraoperative video. This work with practicing surgeons builds on the previous experience of using video to assess laparoscopic skills among residents^{2,3}

Illustrating this strategy, one recent high-profile study in bariatric surgery demonstrated that higher peer ratings of surgical skill—assessed by video analysis of performance during laparoscopic gastric bypass—were associated with lower rates of postoperative adverse events.⁴ While it may seem obvious that greater skill would be associated with improved outcomes, this was the first study to demonstrate that variations in technical skill could be reliably measured by peer evaluation of practicing surgeons. Perhaps most importantly, this study was the first to definitively link peer ratings of skill directly with patient outcomes.

This study has only scratched the surface of using video analysis to improve intraoperative performance. Video analysis affords the opportunity to study both surgical technique (i.e. the details of how an operation is conducted) and surgical skill (i.e. how well a surgeon performs a procedure). This strategy may be particularly applicable for technically complex procedures that already have the capability to capture video (e.g. advanced laparoscopy, robotic surgery, video-assisted thoracoscopic surgery). Furthermore, this work could also be extended to open procedures using other video-recording modalities.

Video Analysis to Study Surgical Technique

Although surgical technique has traditionally been studied using operative reports and surveys, evidence suggests that these may not be reliable.⁵ Relying on surgeons' perception of operative events presents a major barrier to studying technique. Perceptual gaps may arise when there is a disconnect between what the surgeon thinks they are doing and what they are

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actually doing during an operation. For example, a surgeon may state in their operative note that they performed the Critical View of Safety during a laparoscopic cholecystectomy. However, in some cases they may not actually achieve this, creating a gap between the surgeon's perception of events and the safest technique. Addressing these subjective sources of error using surgical video—which demonstrates exactly what the surgeon did during the procedure—may be an important, but previously overlooked, opportunity for improving surgeon performance.

Video analysis would also offer a novel scientific approach to understanding how the details of the operation link to both short- and long-term outcomes. For example, with a common bariatric surgery procedure, laparoscopic sleeve gastrectomy, there is lack of consensus about which techniques result in the lowest complication rates and best long-term outcomes. The Michigan Bariatric Surgical Collaborative (MBSC) has launched a statewide initiative to use video to study the details of surgical technique with this procedure. Surgeons will upload videos to a web-based review program and peer surgeons will provide evaluations using a standardized instrument. These assessments will then be linked to patient outcomes to identify the best “macro” (i.e. global steps of the operation) and “micro” techniques (i.e. detailed technical steps of the operation) for performing the procedure. In addition to perioperative outcomes, it may also be possible to link differences in intraoperative techniques to long-term outcomes (e.g. weight loss and resolution of comorbid diseases for bariatric procedures).

Video Analysis to Study Surgical Skill

While optimizing technique will be important, addressing surgical skill for individual surgeons will be essential to improving surgical quality. Building on the research that linked surgical skill and patient outcomes with bariatric surgery, video-based assessment could be used to objectively measure skill in a broader array of operations in order to identify lower-skilled surgeons for improvement. Similar to the MBSC study on laparoscopic gastric bypass, peer surgeons could be assembled to rate operative videos using a validated instrument, such as the Objective Structured Assessment of Operative Skills or the Global Operative Assessment of Laparoscopic Skills.^{6,7} As with studying technique, surgeons' assessments could then be utilized to examine associations between skill ratings and patient outcomes.

Improving Technique and Skill

Although evaluating technique and skill is important, leveraging these assessments to improve surgeons' operative performance is the next step. Strategies for improving procedural technique and skill among practicing surgeons are rare. Traditional methods, such as weekend courses, simulators, and cadaver labs, are not likely up to the task. On the other hand, surgical coaching—popularized by Atul Gawande in his widely-read *New Yorker* essay—has been gaining momentum as a strategy to improve practicing surgeons' operative proficiency.⁸ The Wisconsin Surgical Coaching Program, pioneered by Caprice Greenberg, has demonstrated that video-based peer coaching could potentially be effective

in surgery. This strategy targets continuous development among practicing surgeons on a variety of dimensions, including improvements in surgical skill.⁹

Using the aforementioned strategies, the MBSC has developed a practical example by creating a structured coaching intervention to target the refinement of technical skill for bariatric surgeons. This initiative involves a structured program to link lower-skilled surgeons with coaches, with the specific goal of improving technical proficiency. Coaches would be formally trained to provide effective mentoring to their peers, focusing on constructive feedback for identifying specific skill deficiencies and making structured plans for improvement.

In addition to skill enhancement, peer coaching could also be used to implement best techniques identified from video-based assessments. This strategy will be tested in our ongoing MBSC project studying techniques for laparoscopic sleeve gastrectomy. This approach could also apply more broadly to all surgeons who are learning new procedures to ensure their safe adoption.

Challenges to Improving Technique and Skill

While the use of video analysis to improve skill and technique is promising, one particularly important challenge must be recognized: building surgeon trust and social capital. In the bariatric surgery examples described above, this was accomplished over time through a spirit of collaboration that fostered relationships and a shared goal of quality improvement among surgeons in Michigan. For this process to succeed, these initiatives would first need to be piloted on a smaller scale through individual institutions or regional collaboratives to build social capital and ensure surgeon “buy-in”. Once established locally, a professional society (e.g. the American College of Surgeons, Society of Thoracic Surgeons, depending on the specialty or interest) could serve as a potential framework through which a program could be implemented more broadly. It will be necessary to clearly establish that skill assessment would be strictly for quality improvement purposes, ensuring complete confidentiality for participating surgeons. Through these steps, a collaborative infrastructure can be built to implement video-based analysis in a real-world practice setting.

Ultimately, intraoperative video analysis may be a versatile tool for improving surgical performance, with applications for optimizing surgical technique and skill. This strategy depends on social capital and relationships that are maintained through trust and confidentiality, which may be best built within a regional quality collaborative or specialty society. By addressing these challenges, surgeons may unlock the potential benefits of video-based analysis and open up a new frontier of surgical quality improvement.

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