Surgical and medical errors are all too common. The landmark Institute of Medicine book *To Err Is Human* estimates that 98,000 patients die of complications directly attributable to medical errors every year. In addition, a recent systematic review revealed that 1 in every 150 patients admitted to a hospital dies as a result of an adverse event, and almost two-thirds of in-hospital events are related to surgical care. Other recent studies have elucidated causes of surgical and medical errors, including failures in effective team communication and handoffs as well as lack of standardization in clinical protocols. Despite these factors, promising work has been done in the surgical field to increase patient safety through the use of checklists, simulation training, and teamwork training to increase the quality of teamwork in the operating room. Perhaps one of the strongest endorsements for the use of surgical checklists was demonstrated by the WHO Safe Surgery Saves Lives campaign. The implementation of this standardized, easy-to-use checklist not only has improved perioperative outcomes for morbidity and mortality, but such improvements were also associated with an enhanced perception of teamwork and safety culture among multidisciplinary surgical team members.

Far less in the neurological surgery literature to date has been published that focuses on increasing the neurosurgical safety climate via improved teamwork and communication training as well as standardized clinical care in the form of checklists. The Department of Neurological Surgery at the Mayo Clinic in Arizona recently shared their experience in creating a culture of safety within operative neurosurgery: the design and implementation of a perioperative safety video.
their experience in using an operative checklist to confirm the identity of the patient and the correct procedure, site, and side; verify antibiotic administration; and confirm radiological imaging for the patient. All of these elements are commonly found in the Joint Commission Universal Protocol guidelines. Over a period of 8 years, there was a 99.5% overall compliance in using the operative checklist; however, these investigators were unable to demonstrate a reduction in wrong-patient, wrong-procedure, wrong-site, and wrong-side cases, as none of these events occurred before or after implementation of the checklist. Although no wrong-site or wrong-side surgeries were reported in their study, a recent national survey of neurosurgeons reveals an otherwise troubling trend. Twenty-five percent of surveyed neurosurgeons reported making an incision on the wrong side of the head, and 35% reported wrong-level lumbar surgical procedures during their career. In addition, the operative checklist that was implemented in the Mayo Clinic study did not address any concerns specific to neurological surgery and did not explicitly encourage open communication practices among the multidisciplinary team. Lastly, the implementation of surgical checklists may be met with provider resistance and the perception of less satisfactory levels of team efficiency and comfort.

With these knowledge gaps in mind, we designed a neurosurgical perioperative safety video with the goal of outlining standard critical safety checks and multidisciplinary team communication practices that must occur with every neurosurgical patient in the perioperative setting. The target audience for the video includes neurosurgery and anesthesiology attending physicians and trainees, perioperative and operating room nursing staff, and neuromonitoring specialists. The video is part of a broader organizational initiative to increase the quality and safety of neurosurgical patient care at our institution. We believe it is imperative for neurosurgeons, anesthesiologists, and operating room staff to prioritize patient safety and build a robust culture of safety by elevating safety climate and awareness, especially given the emergence of accountable care organizations, value-based purchasing, pay-for-performance reimbursement schemes, and an overall increasing regulatory focus on reducing adverse events and medical errors.

**Methods**

The overall goal of the video was to create an educational tool that supports and guides the clinical practice of providers caring for neurosurgical patients in the perioperative period. The video development process consisted of 4 steps: determining overall objectives, deciding on content and format, modifying based on stakeholder feedback, and producing and postproduction revising. Throughout this process, a research team formulated a plan to study the effects of the video on providers’ knowledge of perioperative safety practices in addition to the changes in providers’ safety attitudes, safety culture, and behavior in the operating room.

**Determining Overall Objectives**

A multidisciplinary group consisting of neurosurgery attending physicians and residents, operating room nurses and managers, anesthesiologists, neuromonitoring specialists, hospital medicine attending physicians, a quality manager, and representatives from a professional video production company met over a period of several months to design, write the script for, and eventually produce the video (Fig. 1). The multidisciplinary task force initially convened to determine the objectives and purpose of the video, which were as follows: 1) to minimize errors and improve patient outcomes by simplifying and standardizing neurological perioperative patient safety practices and team communication processes; 2) to highlight critical patient safety checks, precautions, and team communication practices (for example, timeouts and debriefs); and 3) to foster a culture of patient safety and promote improved communication within the perioperative settings.

**Determining Content and Format**

Over the subsequent few months, an iterative process
Design of neurosurgery perioperative safety video was undertaken to determine the content and format of the video. The team began by performing a literature search in neurosurgical and general surgical journals to compile clinically proven patient safety practices. In addition, team members added additional safety procedures that should be routinely practiced in the perioperative neurosurgical period. A concrete example is having the neuromonitoring specialist inform the entire team during the postoperative debrief of neuromonitoring results, any major changes in monitoring, and the need for follow-up. Certain practices in the video, such as an anesthesiologist performing a full preoperative patient evaluation, is ultimately up to each institution to determine how this should be best addressed. For instance, it is reasonable to have comanaging hospitalists perform the preoperative medical evaluation while an anesthesiologist or nurse anesthetist performs the airway evaluation and basic preoperative evaluation.

The team also agreed that the focus of the video should be on major “stopping points” in the process that any patient undergoes during the neurosurgical perioperative period, that is, the preoperative medical and anesthesia evaluation, preoperative room evaluation, preoperative timeout before skin incision, postoperative debrief prior to leaving the operating room, and patient handoff upon transfer to the postoperative receiving unit. Although the timeout in our video is depicted prior to skin incision, it is not done immediately before skin incision as outlined in the Joint Commission Universal Protocol guidelines. This practice is in keeping with our institution’s timeout regulations and departmental practices. In addition, the team agreed to include all neurological surgery procedures, including spine, craniotomy, and transsphenoidal procedures.

Because of its proven record in reducing surgical morbidity and mortality, relative ease of use, and focus on improving interdisciplinary team communication practices, the WHO Surgical Safety Checklist was used as a major point of reference in the design of the perioperative safety video. The taskforce inserted neurosurgery-specific language and concerns to make the WHO Surgical Safety Checklist and its communication practices more applicable to neurosurgical procedures. In addition, the taskforce consolidated the timeouts before induction of anesthesia and before skin incision on the WHO checklist for 2 reasons. One of the main themes emphasized in the perioperative safety video is the importance of multidisciplinary teamwork and communication. It is often challenging to have all multidisciplinary operating room team members congregate on 2 separate occasions to conduct 2 timeout checks. Moreover, the WHO checklist before the induction of anesthesia places heavy emphasis on addressing airway concerns and verifying the functionality of equipment. Anesthesiologists at our institution already routinely perform their own separate equipment checks and assess the patient’s airway prior to anesthesia induction.

Modification of Content Based on Stakeholder Feedback

Once the major elements of the video were determined, the taskforce then closely partnered with a professional video production company to lay out the scenes and draft a script of the video. This process involved several stages in which the script was continuously revised. Careful attention was placed on the emphasis of key safety practices and behaviors in the video by pairing the planned action on screen with the narrative recording and text on screen. In addition, the video taskforce and producers were keen not to make the video so short that it did not appropriately address all of the key points in providing safe neurosurgical patient care, but they wanted to ensure that the video was not so long that the attention and interest of the intended audience was lost.

Video Production and Postproduction Revision

The video was shot on a single Sunday in actual patient care areas at our institution that were staged to simulate realistic patient care. Postproduction of the video took approximately 1 month in which representatives from the multidisciplinary taskforce met with the video production company on several occasions during film editing to ensure the final video was true to the original design and intent of the entire team. Once complete, the video was screened and approved by all members of the original multidisciplinary taskforce as well as key stakeholders in our institution’s medical center leadership.

Results

In July 2012 the video was introduced to attending physicians and trainees in the Department of Neurological Surgery and the Department of Anesthesia and Perioperative Care; neuromonitoring specialists; and nurses caring for neurological surgery patients in the preoperative unit, operating room, postanesthesia care unit, and neurological intensive care unit. Continuing medical education and continuing nursing education credits are given to providers who watch the video and complete the accompanying research survey at 3 predetermined time intervals over a period of a year. In addition, a new University of California, San Francisco, Department of Neurological Surgery policy mandates that each departmental employee and visitor must view the video to participate in the operating room. Elements of the timeout depicted in the video are posted on large poster boards in each neurosurgical operating room (Video 1).

**Video 1.** “Creating a Culture of Safety within Operative Neurosurgery.” A 10-minute video targeted at the multidisciplinary neurosurgical care team that standardizes and highlights critical safety checks, precautions, and team communication practices that must occur with every neurosurgical patient. Click here to view with Media Player. Click here to view with Quicktime.

Discussion

The experience of designing the neurosurgical perioperative safety video has yielded several key lessons. First, it is important to get buy-in from multiple individuals across different specialties and practices prior to initiating the process of video design, scripting, and shooting. It is very difficult to be successful in clinical and educational projects designed to improve the safety and quality of patient care without the support of this key group of
stakeholders. In particular, quality and safety champions ought to obtain the early engagement and endorsement of medical center or hospital leadership, departmental leadership, nursing supervisors and managers, and neurological surgery trainees prior to starting any major quality and safety project. By getting the early engagement and support of these stakeholders, we were able to convene a committed group of multidisciplinary team members on the video taskforce consisting of neurosurgery attending physicians and residents, anesthesiologists, neurormonitoring specialists, and nursing staff to help design and implement the video. The multidisciplinary taskforce allowed us to think broadly about safe perioperative neurological patient care from several different perspectives and allowed us to have the early buy-in of other departments to widely distribute the completed video.

Second, it is important to determine the key aims and objectives of the video prior to engaging in any other project activity. Keeping the multidisciplinary taskforce focused on the predetermined key aims and objectives allowed the group to concentrate on the initial goals of the project and helped to minimize any diversions from the goals. Setting these key aims and objectives also allowed the taskforce to focus the video content on key “can’t-miss” neurological surgery safety checks.

Third, to maximize the impact of safety checks, the group agreed that the checks should be an active process consisting of open communication and clear behaviors assigned to members of the multidisciplinary surgical team. The video’s focus on promoting open communication is best summed up by the preoperative timeout, postoperative debrief, and patient handoff in the postoperative unit scenes. In addition, at the end of both the craniotomy and spine timeouts, both attending surgeons state, “If anyone has any concerns, please speak up and let me know.”

Fourth, although it was important for the taskforce to stay focused on the agreed upon aims and objectives for the video, it was just as critical for project leaders to actively listen to all taskforce members’ input. The practice of active listening allowed taskforce members to feel that input from each of them was valuable and given heavy consideration. This practice also prevented project leaders from adopting tunnel vision and losing touch with the pulse of the project team.

Using a pre- and posttest survey tool, we ultimately aim to study the effect of the safety video on providers’ knowledge of standard neurosurgical perioperative safety practices and on provider safety attitudes and safety culture. Study investigators have written knowledge-based questions based on video content and key concepts. Evidence in the aviation and general surgery literature demonstrates the correlation between improved organizational safety culture and improved outcomes. The link between changes in the organizational safety culture and outcomes has not yet been reported in neurological surgery. The video’s effect on changes in safety culture and provider safety attitudes will be assessed through questions from the Safety Attitudes Questionnaire for the operating room, a previously validated survey tool to assess safety culture awareness in the operating room. We also aim to study the effect of the video on the completion and quality of completion of predetermined elements of the preoperative timeout and postoperative debrief that are described in detail within the video. Data are currently being collected and will be reported in aggregate.

Conclusions

It is important that the field of neurological surgery focuses as much attention and resources to improving the safety and quality of patient care as it does on research and clinical advancements. The human, ethical, and financial cost of not doing so is too high. To that end, the overall goal of our neurosurgery perioperative safety video is to increase the safety and quality of care provided to neurological surgery patients within a larger institutional and departmental quality and safety program. The video aims to accomplish this by concretely describing and showcasing, to an audience of a multidisciplinary group of neurological providers, safety practices that must occur with every patient undergoing operative neurosurgery.

The neurosurgery perioperative safety video can be a national model for how other institutions can educate their multidisciplinary perioperative patient care teams to ensure that critical safety steps are taken for every neurological patient. Changes in provider behavior and safety attitudes will be a driving force to improve the quality and safety of care for our patients.

Disclosure

Dr. Mummaneni is a consultant for DePuy and receives royalties from DePuy, Quality Medical Publishers, and Thieme Publishers.

Author contributions to the study and manuscript preparation include the following. Conception and design: Lau, Mistry, Han, Mummaneni, Berger. Acquisition of data: Lau, Mistry. Analysis and interpretation of data: Lau, Mistry. Drafting the article: Lau. Critically revising the article: all authors. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Lau.

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