Benefits of a surgical safety checklist for otolaryngology patients

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Introduction

The volume and complexity of knowledge today has exceeded any single individual's ability to manage it consistently without error despite advances in technology, years of training, and specialization of functions and responsibilities. Checklists have been employed since the 1930s in aviation and high-risk industries to prevent accidents caused by human error. Only recently has their use been introduced to surgery after the World Health Organization (WHO) heightened awareness of the significant number of deaths, about a half million worldwide, that occur each year as a result of avoidable surgical error.[1] With over 275,000 surgical procedures performed daily, an emphasis on perioperative safety is a necessity.[2]

The WHO developed the first surgical safety checklist for use in the operating room in 2007. Since implementation, the checklist has reduced morbidity and mortality by over 30%.[3] Subsequently, many hospitals have adapted and implemented checklists to improve patient outcomes. Moreover, the Centers for Medicare & Medicaid Services (CMS) recommended the use of surgical safety checklists as a quality measure in 2016. Thomas Jefferson University Hospital (TJUH) implemented a formalized time out procedure based on the WHO checklist with assistance from the LifeWings project for patient safety in 2013.

The original objective of the WHO checklist was for use in all settings where surgery takes place. However, there is increasing consensus that checklists should be customized to meet the needs of different surgical specialties in order to ensure optimal safety.[4,5] The TJUH iteration of the WHO surgical safety checklist is centered on a time out procedure that occurs prior to incision, but after administration of anesthesia. Otolaryngology patients and operations can be complex, requiring advance communication and planning, **prior** to bringing each patient to the operating room, to safely secure the airway and obtain the necessary surgical equipment.

Our objectives were 1) to assess perceptions of operative safety and teamwork among nurses, otolaryngologists and anesthesiologists; and 2) to implement a preoperative surgical safety checklist to improve perioperative teamwork and communication.

Methods

The Department of Otolaryngology – Head & Neck Surgery at TJUH created and implemented a surgical safety checklist that is completed and reviewed with members of the surgical team, including nursing, anesthesia and the surgeon, prior to bringing each patient to the operating room. The checklist is completed in addition to the institution-wide mandatory surgical timeout and reviews items not included in the timeout, including airway concerns, bed positioning and special equipment needs. A full list of the elements reviewed is included in Figure 1. Before implementation, the Operating room (OR) staff received a lecture describing its use.

An 8-question survey using a Likehert scale was adapted from the Safety Attitudes and Safety Climate Questionnaire to assess perceptions of operative safety and teamwork. The survey was administered to nurses, otolaryngologists and anesthesiologists prior to and one month following pilot implementation of the preoperative checklist.

Statistical analysis was performed using R. The comparison of pre- and post-implementation total survey scores was analyzed by generalized linear regression with potential predictors of specialty, survey, gender and practice years. The survey scores for each question was analyzed using cumulative probability or adjacent-category-ratios for the ordinal responses, with potential predictors of specialty, survey, gender and practice year. A p value of <0.05 was considered significant.

Results

Seventy-five pre-implementation (22 otolaryngology, 42 anesthesiology, and 11 nursing) and 74 post-implementation (26 otolaryngology, 31 anesthesiology, and 17 nursing)surveys were completed. There was no significant demographic differences between the cohorts completing the pre-implementation and post-implementation surveys. Further respondent information can be viewed in table 1.

Pre- and post-implementation safety attitude scores are presented in Table 2. No significant improvement occurred in the overall post-implementation survey scores compared to pre-implementation scores. The mean score on the pre-implementation survey for nursing, anesthesia and otolaryngology were 3.86, 3.34, and 4.10, respectively; while the post-implementation scores were 3.79, 3.63, and 4.27, respectively. Analyzing each question individually, question 3 did show significantly improved post-implementation survey scores compared to pre-implementation scores in multivariate analysis (OR = 1.48, p = 0.037; see Figure 2). Question 1 also showed significantly improved post-implementation scores in univariate analysis, but not in multivariate analysis. No other questions showed improved post-implementation scores.

Some differences emerged between the professions. Overall, the otolaryngology and nursings' perception of perioperative safety and teamwork was significantly higher than the anesthesiologists' perception in both the pre-implementation and post-implementation surveys (mean difference 5.73 and 2.65, with p < 0.001 and p = 0.044, respectively; see Figure 3). There was a trend toward higher perceptions of safety and teamwork among male staff compared to female staff, regardless of specialty.

Pre-Operative Team Huddle

Nursing
Patient Name
Procedure/consent/laterality

Anesthesia
Airway concerns/plan
Tube type
Preoperative antibiotic/steroid
Medical concerns/Clearances
Hemoglobin, type & screen, other concerning labs

Surgeon
Trays/special equipment needs (ie sonopet, navigation)
Implants/medications
Bed Position
Nerve Monitoring
Clinical trials/anticipated specimen management
Other

Figure 1. The preoperative safety checklist.

Table 1. Respondent demographics

	Pre-Implement. Survey n(%)	Post-Implement. Survey n(%)	*p* value
Specialty			
Anes	42 (56.0%)	31 (41.9%)	p = .198
Oto	22 (29.3%)	26 (35.1%)	
Nurse	11 (14.7%)	17 (23.0%)	
Gender			
Female	20 (26.7%)	35 (47.3%)	p = .017
Male	52 (69.3%)	39 (52.7%)	
Years in Practice			
<5	37 (49.3%)	40 (54.1%)	p = .863
6-15	16 (21.3%)	13 (17.6%)	
15-30	13 (17.3%)	12 (16.2%	
>30	7 (9.3%)	9 (12.2%)	

Values are shown for number (n) and proportion (%) of respondents. Gender was missing in 3 pre-implementation surveys and years in practice was missing in 2 pre-implementation surveys. Fisher's exact test for count data was used for data analysis.

Table 2. Safety attitude survey scores

Question	Pre-Implementation Survey				Post-Implementation Survey			
	Anes (n=42) mean ± sd	Oto (n=22) mean ± sd	Nurse (n=11) mean ± sd	*p* value	Anes (n=31) mean ± sd	Oto (n=26) mean ± sd	Nurse (n=17) mean ± sd	*p* value
1. The surgeons, anesthesiologists, and nurses here work as a well-coordinated team.	2.95 ± 1.08	4.09 ± 0.81	4.27 ± 0.65	p < .001	3.29 ± 1.04	4.35 ± 0.75	4.00 ± 0.71	p < .001
2. I am satisfied with the quality of collaboration that I experience in this clinical area.	2.95 ± 1.10	4.14 ± 0.71	4.30 ± 0.95	p < .001	3.23 ± 1.12	4.15 ± 0.92	3.65 ± 1.00	p = .005
3. Disagreements in this clinical area are resolved appropriately (i.e. not who is right, but what is best for the patient).	3.12 ± 1.04	4.09 ± 0.92	4.09 ± 0.83	p < .001	3.58 ± 0.96	4.27 ± 0.83	4.29 ± 0.69	p = .004
4. Important issues are well communicated prior to the patient going to the operating room.	3.14 ± 0.93	3.91 ± 0.97	3.09 ± 1.22	p = .004	3.29 ± 0.94	4.04 ± 0.72	3.00 ± 1.12	p < .001
5. I feel comfortable with the anesthesia plan and surgical plan prior to the patient going to the operating room.	3.74 ± 0.73	3.95 ± 1.09	3.36 ± 1.29	p = .241	3.87 ± 0.99	4.42 ± 0.76	3.53 ± 1.07	p = .008
6. I would feel safe undergoing surgery here as a patient.	3.90 ± 0.82	4.36 ± 0.95	4.00 ± 0.89	p = .140	3.81 ± 1.01	4.60 ± 0.82	4.12 ± 0.86	p = .008
7. Areas for improvement in terms of systems, supplies, staffing and communication are adequately addressed.	3.05 ± 0.82	3.59 ± 0.80	3.20 ± 1.14	p = .063	3.19 ± 1.01	3.81 ± 1.06	3.35 ± 1.11	p = .090
8. I am encouraged by my colleagues to report any patient safety concerns that I may have.	3.93 ± 0.87	4.32 ± 0.78	4.55 ± 0.69	p = .044	4.00 ± 1.06	4.54 ± 0.65	4.41 ± 0.80	p = .061
Total Score	26.79 ± 5.48	32.45 ± 5.40	30.18 ± 6.29	p < .001	28.26 ± 6.50	34.00 ± 5.60	30.35 ± 6.09	p = .003

Responses were scored on a five-point Likert scale, anchored by 'strongly disagree' (1) and 'strongly agree' (5). Values are means of the responses with standard deviations (sd). ANOVA test was used for data analysis

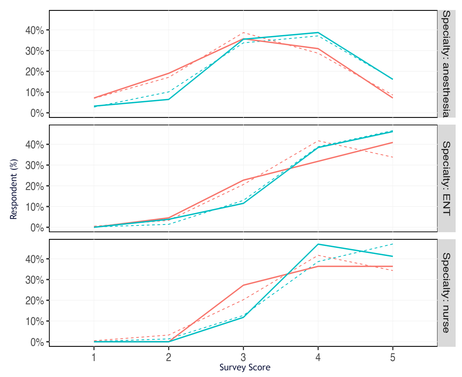

Figure 2. Line graphs showing the survey scores by specialty for question 3. The percentage of responders is plotted in solid lines, whereas the dotted lines represent the fitted percentages of the adjacent category model. In all three specialties, the post-implementation response has improved odds of scoring higher (OR = 1.48, p = 0.037) compared to the pre-implementation responses.

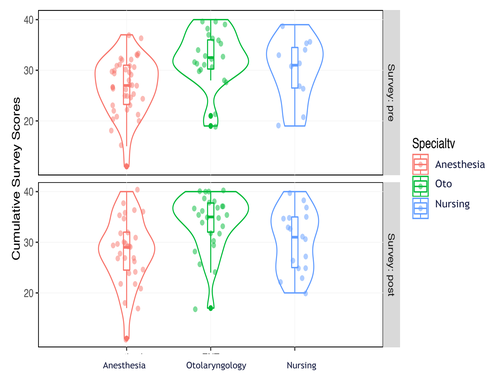

Figure 3. Violin plot showing the total survey scores for each specialty. Otolaryngology and nursing scored higher than anesthesiologists (mean difference 5.73 and 2.65, with p < 0.001 and p = 0.044, respectively), but there was no significant difference in pre vs. post scores.

Discussion

Checklists are increasingly becoming an integral component of practice in the operating room. Poor communication in the OR is the most commonly cited cause of surgical error.[2,6,7] Furthermore, breakdowns in multidisciplinary teamwork are also reported as a common contributory factor towards the occurrence of wrong site surgeries and other surgical adverse events.[1]

While our study does not include objective measures of safety, we know checklists lead to reductions in morbidity and mortality as a result of improved communication and teamwork.[1,2] In a review of 44 articles to assess the impact of surgical safety checklists on the quality of teamwork and communication in the OR, self-perceptions of teamwork and communication improved.[1] The review identified that checklists improved teamwork primarily by establishing an open dialogue at the start of the case. This promoted sharing of case information in advance, which helped identify knowledge gaps, encouraged interdisciplinary decision making, and enhanced a "team feeling".[1]

Our preoperative safety checklist occurs prior to bring the otolaryngology patient to the OR, which we believe is essential to promoting teamwork and cooperation and ideally averts issues that may occur before the patient is anesthetized. The WHO surgical checklist has three components, a sign in, a time out and a team debrief. The sign in occurs after the patient is in the room, the time out occurs after the patient is asleep and draped, and the team debrief occurs at the completion of the case.

The current sign in occurs too late and does not include essential information that must be reviewed in advance. First, our surgical safety checklist includes discussion of the airway, which is often complex. Intubation of the otolaryngology patient is managed by both otolaryngology and anesthesia; thus, a plan needs to be created together and prior to going back to OR. The intubation plan often requires equipment such as a glidescope or bronchoscope, as well as medications, such as lidocaine, that need to be obtained beforehand. Second, bed positioning and potential nerve monitoring are discussed, as they can affect the intubation plan, including anesthesia circuitry and surgical equipment, such as the NIMS machine, needed from nursing. Third, specimen management for biopsies and research studies also requires advance communication, as blood draws and consent may be required prior to beginning surgery. Finally, many otolaryngology cases involve multiple surgeons or specialties, with multiple surgical setups required, so the surgical plan and order of surgical operations is imperative to be known prior to going back to the operating room.

The implementation of the preoperative checklist for otolaryngology cases has already created many improvements in perioperative care. Since the implementation of the checklist, the otolaryngology department has started taking the lead in fostering a strong culture of safety. Through increased interdepartmental communication spearheaded by otolaryngology, additional new practices have been initiated. The otolaryngology department now includes discussion of difficult airways at our weekly preoperative conference, and this information is recorded and shared with all otolaryngology and anesthesiology house staff. Furthermore, important nursing concerns and questions have a new forum to be discussed and addressed. For example, specimen management for research protocols and additional trays required for certain procedures have been clarified. Finally, we have succeeded at enlisting all operating room staff into the checklist design and customization, which has been important in ensuring that the tool is used effectively. We will continue to meet periodically to discuss and modify the checklist until it is optimized.

Several areas of improvement remain for further success of the preoperative checklist. While education regarding the checklist has been performed, the surgical team has many tasks to complete when preparing the patient for the OR, and it has been challenging to find a time to get all surgical team members together to complete the checklist. We need to continue training and education on the checklist until it becomes embedded into the OR work routine, prioritized, and completed successfully for all patients. Research shows that the surgeons' commitment is particularly important for successful checklist implementation.[8] The commitment of our house staff to the project is essential for the success of the checklist and to ensure that it is used in "true fashion" rather than becoming another bureaucratic requirement. We plan to re-survey otolaryngologists, anesthesiologists and nurses at 6 months post-implementation to reassess for improvements in perceptions of safety and teamwork. Finally, we are beginning to look at objective measures of improvement such as operative time and surgical costs to demonstrate improved efficiency, as well as beginning analyzing the rate of unplanned difficult airways as a measure of operative safety.

Conclusion

The surgical safety checklist for otolaryngology patients customizes the WHO checklist to increase teamwork and communication among otolaryngologists, anesthesiologists and nurses.. It is completed prior to bringing the patient to operating room and reviews essential information that requires advance communication, including airway management. We believe this will lead to improved operative efficiency and safety. We will reassess the OR staffs' perception of safety and teamwork at 6 months, as well as begin to review objective measures, in order to demonstrate the success of the checklist.

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