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Interdisciplinary Development and Implementation of Communication Checklist for Postoperative Management of Pediatric Airway Patients

Sang W. Kim, MD[1], Stephen Maturo, MD[1], Danielle Dwyer, MD[2], Bradley Monash, MD[2], Phoebe H. Yager, MD[2], Kerstin Zanger, MD, PhD[2], and Christopher J. Hartnick, MD[1]

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Abstract

Objective. The authors describe their multidisciplinary experience in applying the Institute of Health Improvement methodology to develop a protocol and checklist to reduce communication error during transfer of care for postoperative pediatric surgical airway patients. Preliminary outcome data following implementation of the protocol and checklist are also presented.

Study Design. Prospective study from July 1, 2009, to February 1, 2011.

Setting. Tertiary care center.

Subjects. One hundred twenty-six pediatric airway patients who required coordinated care between Massachusetts Eye and Ear Infirmary and Massachusetts General Hospital.

Methods. Two sentinel events involving airway emergencies demonstrated a critical need for a standardized, comprehensive instrument that would ensure safe transfer of care. After development and implementation of the protocol and checklist, an initial pilot period on the first set of 9 pediatric airway patients was reassessed. Subsequent prospective 11-month follow-up data of 93 pediatric airway patients were collected and analyzed.

Results. A multidisciplinary pediatric team developed and implemented a formalized, postoperative checklist and transfer protocol. After implementation of the checklist and transfer protocol, prospective analysis showed no adverse events from miscommunication during transfer of care over the subsequent 11-month period involving 93 pediatric airway patients.

Conclusion. There has been very little written in the quality and safety patient literature about coordinating effective transfer of care between the pediatric surgical and medical subspecialty realms. After design and implementation of a simple, electronically based transfer-of-care checklist and protocol, the number of postsurgical pediatric airway information transfer and communication errors decreased significantly.

Keywords

safety, quality, checklist, pediatric airway, pediatric surgery

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In 1999, the Institute of Medicine reported a staggering figure that approximately 98,000 Americans died each year from medical error. An estimated 80% of these medical errors were system derived.[1] Since then, there have been extensive efforts to maximize effective, efficient care while minimizing system-derived medical errors. In a more recent systemic review of the literature, DeVries et al[2] observed 43.5% preventable adverse events, 7.4% of which resulted in death. Within the specialty of otolaryngology, Shah et al[3] extrapolated that there are at least 2600 error-related major morbidities and 165 error-related mortalities in the United States annually.

Protocols, checklists, and best-practice guidelines have been established in the hope of improving information transfer and communication (ITC). Adult intensive care unit checklists have been successful in ensuring that best-practice guidelines are enforced to decrease complications such as deep venous thrombosis and central line infections.[4] More specifically to the pediatric realm, daily goal checklists have

[1]Massachusetts Eye and Ear Infirmary, Department of Otolaryngology, Boston, Massachusetts, USA
[2]Massachusetts General Hospital, Department of Pediatrics, Boston, Massachusetts, USA

Corresponding Author:
Christopher J. Hartnick, MD, Massachusetts Eye and Ear Infirmary, Department of Otolaryngology, 243 Charles St, Boston, MA 02104-3914
Email: christopher_hartnick@meei.harvard.edu

Table 1. Prior to the Development of the Protocol/Checklist (July 2009–September 2009)

	n
Patients with airway problems	33
Nonsurgical airway patients	11
Surgical airway patients	22
Tracheotomy	7
Laryngotracheal reconstruction	9
Tracheoplasty	2
Excision of lymphatic malformation of oral cavity	1
Bilateral choanal atresia repair	1
Deep neck infection	1
Tonsillectomy/adenoidectomy for severe obstructive apnea	1

been shown to improve understanding and communication among nurses and physicians, yet whether this translates into better health care outcomes has not been demonstrated.[5,6]

Much has been written in the surgical literature on ITC in the operating room, but little attention has been directed at the extended postoperative period despite the fact that communication errors are distributed equally in all phases of surgical care.[5-7] The recent emphasis on quality and safety has stressed the importance of ITC, but few studies have investigated practical tools that can assist postoperative ITC between various multidisciplinary teams involved in the care of a complex surgical patient. Although limited in its scope, most postoperative ITC research discusses the perioperative time period in which transfer from the anesthetist to the critical care team has been compared with such highly reliable industries as aviation, racecar driving, and nuclear power.[8,9] In the pediatric surgical realm, there have been few reports on practical tools to enhance ITC efficacy among the surgical, intensivist, hospitalist, and allied health teams.

The Pediatric Airway, Swallowing and Voice Center, a collaboration between the Massachusetts Eye and Ear Infirmary (MEEI) and the Massachusetts General Hospital (MGH), specializes in the treatment of children with voice disorders and airway symptoms that affect the ability to eat, breathe, or speak. The pediatric otolaryngology service at MEEI also provides inpatient otolaryngologic consultation to the MGH, which has a comprehensive range of pediatric services to include pediatric (PICU) and neonatal intensive care units along with general pediatric wards. Pediatric otolaryngology surgery is exclusively carried out at the MEEI; those patients who require intensive care are transferred from the MEEI operating room to the MGH PICU. Pediatric airway surgical patients constitute most of these transfers, averaging about 10 transfers per month.

From July 1, 2009, until September 30, 2009, 33 pediatric airway patients required coordinated care between MEEI and MGH. Twenty-two of these patients required airway procedures (**Table 1**). There were 2 critical respiratory emergencies during this time period. Based on an internal investigation by a multidisciplinary focus group, we recognized that these adverse events were caused by a breakdown in effective communication during multiple transfers of care. Here we describe the process of developing and implementing a protocol for transfer of care of postsurgical pediatric airway patients using the well-described Institute of Health Improvement (IHI) methodology. Subsequent implementation of the protocol and checklist shows promising early outcome on minimizing the communication errors during postoperative transfer of care.

Methods

Two sentinel events involving airway emergencies demonstrated critical need for a standardized, comprehensive instrument that would ensure safe transfer of care. Both events involved airway complications in which pediatric teams providing the postoperative care were unable to provide appropriate timely intervention because of unfamiliarity with the airway surgery that each of the 2 patients underwent. Delay of appropriate care was further highlighted by the fact that the pediatric otolaryngology team and postoperative care teams belonged to 2 distinct institutions.

Analysis of these 2 events revealed that ineffective communication during patient transfer was the likely underlying cause. This prompted an internal discussion among the various pediatric services regarding how to prevent another similar adverse event in the future. An interinstitutional focus group was formed that consisted of an attending physician, fellow, and resident from MEEI and a pediatric resident, hospitalist, PICU fellow, and attending from MGH. A formal internal review of the 2 sentinel events was conducted. Root cause analysis (RCA) was carried out in a group meeting with the otolaryngology attending (C.J.H.) as the moderator. Based on the literature study, the focus group developed a communication checklist: a succinct 1-page electronic document accessible from both institutions' electronic medical record. An ongoing prospective database of pediatric airway patients involving interinstitutional care was created with approval of the Institutional Review Board committee and maintained by the pediatric otolaryngology service.

Building a Team

Building an interdisciplinary team is a challenging task, especially if it involves multiple physicians. Physicians by nature are highly trained individuals traditionally trained to think independently and to treat each patient as a unique case that warrants distinctly tailored clinical decision making. One of the strategies to get physicians engaged in safety efforts is to focus on improvement projects that are important to the medical staff. Our focus group's leader and discussion moderator was the senior otolaryngology attending (C.J.H.). In IHI terms, this person was the "physician champion" with the medical and surgical knowledge and experience of pediatric surgical airway care. Building from this, representative attendings, fellows, and residents from both the PICU and pediatric service of MGH expressed their interest in the project and volunteered to participate.

Identifying the Opportunity for Improvement

The sentinel events prompted critical assessment of the current postoperative transfer process. RCA should be aimed at

identifying the various factors that may have contributed to the adverse outcome. These factors may be latent technical or organizational factors or an active failure by individuals such as neglect or inadequate knowledge. Therefore, an RCA of adverse events needs to focus on 3 questions: (1) What is the primary cause of the event? (2) Why did the sentinel event happen? (3) What changes need to be implemented to prevent sentinel events in the future?[10]

Based on the RCA, 2 areas of concern were identified: (1) geographical provider separation leading to a lack of immediate availability in case of emergency and (2) multiple providers at various training levels working in shifts. Geographical provider separation was due not only to the time it took to walk between hospitals but also to the fact that separate paging and communication systems were in use. The second area of concern involving multiple providers stemmed from the fact that the care of complex pediatric airway patients required multiple subspecialists at various levels of training and experience. This was further complicated by the multiple physical transfers of patients that occurred from the operating room to the PICU to the pediatric ward to home. A literature search was performed with key words *safety improvement*, *methodology*, *communication error*, and *handoff*. Critical comparison of various proven methodologies and case reviews were studied. After an in-depth literature review, the team focused on the IHI methodology to carry out system changes to address these areas of concern.[10,11]

Checklist Development

The physically and structurally unique MEEI-MGH relationship exposes our patients to greater risk for communication breakdown between the providers affiliated with each institution. We set our goal to minimize any ITC that would lead to compromise in the postoperative outcome.

The group recognized that existing forms such as brief operative reports are often difficult to identify in the medical record chart and often do not contain relevant information for nonsurgical caregivers. While some surgical findings may have significant meaning for a surgeon, providers without a surgical background may not recognize that certain anatomic alterations dictate alternative interventions during a respiratory emergency. With these goals in mind, we created a clear and concise checklist that contains all essential information to all team members in a comprehensible way without redundancy (**Table 2**).

Implementation and Improvement Measurement

After the first month of implementation, the focus group reassessed the protocol and checklist. During this time period, there were 9 pediatric airway cases involving MGH/MEEI collaborative care, of which 2 patients underwent tracheotomy. The goal of the feedback session was to encourage every member of the focus group to share their perspectives on how the protocol can be better streamlined and improved.

The focus group recognized that the mere existence of a checklist would not prevent communication errors. To ensure that the checklist would not become a static document, akin to an in-depth operative note, the team stressed the importance of a dynamic transfer process centered on the checklist. The checklist would serve as a framework that would be the starting point for face-to-face, proactive ITC. During the transfer process, this document would be electronically retrieved and reviewed by both the surgical and medical teams. Furthermore, where previously the pediatric ENT fellow would discuss transfer with only the corresponding medical fellow, the process would now include an entire team huddle with all providers (ie, residents, nurses) meeting simultaneously around the electronic checklist. The checklist would serve to highlight key concerns that needed to be understood by the receiving providers so as to avoid any type of airway emergency. The team huddle would provide the receiving team an opportunity to summarize their understanding of the patient, clarify confusing issues, and plan for handling of possible complications.

The centralized placement of the checklist in the electronic medical record would allow for further transfers of care, for example, from the daytime resident to the night float resident, to occur seamlessly and with the assurance that key information was relayed and, more importantly, understood.

Results

Upon implementation of the checklist in the electronic medical record, pediatric airway cases were followed from March 1, 2010, to February 1, 2011. Operative reports, hospital charts, discharge summaries, and outpatient charts were tracked on all patients (**Table 3**). During our observation period, we had no adverse events related to key information omission during pediatric airway patient transfer. Our multidisciplinary team continues to keep track of all the pediatric airway patients who require interinstitution care with plans to follow up and evaluate future areas to improve.

Informal surveys among the various providers revealed that the checklist did not prolong the transfer process. In fact, most involved felt that the checklist made the transfer more efficient as the pertinent questions were answered at the time of transfer, rather than previously when multiple pages and phone calls were required to provide key information after the transfer process had occurred. The centralized location in the electronic medical record was found to be extremely helpful, especially during shift changes and transfer from the intensive care unit to the general pediatric ward. An unforeseen benefit of the checklist being available electronically was its accessibility by emergency department staff when discharged patients presented unexpectedly.

Discussion

In our clinical setting, a complex arrangement of 2 institutions with multiple services involved exposes the patients to communication errors during transfer that can lead to adverse events. The goal of our checklist and transfer protocol was to improve ITC among pediatric otolaryngology, pediatric intensivists, and pediatricians with the ultimate result being to improve patient safety. Based on 2 sentinel events, we developed a multidisciplinary focus group to assess the root cause

Table 2. Massachusetts General Hospital/Massachusetts Eye and Ear Infirmary Airway Checklist

1. Diagnosis:
2. Status post: RIB/ANTERIOR/POSTERIOR/LARYNGEAL CLEFT REPAIR/TRACHEOTOMY
3. Meds to be continued after transfer to the floor:
   - Antibiotics (Unasyn, augmentin, clindamycin, _____) for a total of 2 weeks, or until _____.
   - PPI for a total of 3 months, or until _____.
   - Analgesia: Continue to wean _____ per protocol.
   - Sedation: Continue to wean _____ per protocol.
4. Diet after transfer to floor:
   - NPO
   - Pt MAY/MAY NOT have an NG tube.
   - If G-tube, can begin/continue feeds if bowel sounds present.
   - Advance to _____ diet as tolerated.
5. If child has tracheotomy:
   - Tracheotomy type: Shyley Bivona Other
   - Tracheotomy size
   - If fresh tracheotomy:
     1. Contact social services ASAP for discharge planning
     2. Family needs to watch pediatric CPR video
     3. Each caregiver needs to change trach three times, and know how to suction trach before discharge
6. In case of airway emergency:
   - Pt MAY BE REINTUBATED prior to ENT arrival.
   - Pt IS/IS NOT baggable from above.
   - If necessary, intubate with _____ size ETT. Always have this ETT and ½ size smaller ETT taped at the patient's bedside as well.
   - If necessary, use _____ size oral airway or _____ LMA.
7. Other considerations:
   - Continue standard postoperative wound care.
   - If not already done, have speech therapy involved for swallowing and/or speech especially with trachs.
   - Consult physical therapy as soon as patient arrives on floor.
   - If patient has tracheotomy, begin trach teaching with family and contact social work for home supplies.
8. Contact Information
   - Attending Pager
   - Fellow Pager
   - Resident Pager
9. For transfers to MEEI, there must be a resident transfer note from PICU before patient transferred and there must be resident-to-resident sign-out.
10. For transfers to MEEI, there must be written orders including formal weaning protocol from sedation medications.

Table 3. Following the Implementation of the Protocol/Checklist (March 2010–February 2011)

	n
Patients with airway problems	93
Nonsurgical airway patients	36
Surgical airway patients	57
Tracheotomy	17
Laryngotracheal reconstruction	14
Tracheoplasty	5
Tonsillectomy/adenoidectomy for severe obstructive sleep apnea	10
Juvenile nasopharyngeal angiofibroma resection	1
Balloon dilatation for subglottic stenosis	3
Choanal atresia repair	3
Tracheal resection	1
Laryngeal cleft repair	2
Tracheoesophageal fistula repair	1

of these adverse events and recognized a need to improve ITC process. We used a well-described IHI methodology as it included key emphasis on collaborative, 2-way development of process improvement. Based on this effort, we have developed a transfer protocol and a postoperative airway checklist.

Over an 11-month time period, we observed no adverse events attributed to deficiencies in ITC. The checklist and protocol were well accepted by all teams involved. Most providers felt that the new process was more efficient and focused. We conclude that such a positive compliance process was related to the fact that the protocol was driven and developed in a multidisciplinary way as advocated in IHI methodology. Face-to-face transfer, centered on the electronic checklist, provided an opportunity for insightful questions and clarification on the key issues pertinent to the child's postoperative care. The constancy of having the checklist in the patient's electronic record made the process easier with retrieval and review during shift change/transfer.

We understand that our 11-month observation may be related to increased awareness (Hawthorne effect) and emphasis on ITC within the multidisciplinary teams involved at both institutions. Yet this increased awareness of a better transfer-of-care process highlighted by effective communication was the goal of our focus group. Given the relatively small number of pediatric airway patients whose care is shared between MEEI and MGH each month, we believe we will be able to continually monitor whether the observed gains weaken and then reassess the checklist and team huddle to identify areas for improvement. It would be naive to suggest that a simple electronic checklist and transfer protocol can result in decreased postoperative ITC errors. The likely factors that decrease postoperative ITC error have more to do with the change in attitudes and behaviors regarding communication spurred by the checklist and protocol. This is no small task as it takes a concentrated effort by individuals, departments, and institutions to adopt a process and change in culture that stresses teamwork and cooperation among all persons involved in the care of a child. Maintaining this attitude change is also imperative in the current era of health care with diminishing budgets, reduced staff, and frequent provider turnover highlighted by shift work, especially among providers in training. Establishing a process, stressing the importance of the process to all individuals involved, and occasionally reviewing the process for improvements will help ensure maintenance despite individual provider turnover.

More study will be needed to determine that implementation of the protocol and checklist actually changes patient outcomes over the long term. More importantly, however, we would hope that the implementation of this process may spur thought and development among other subspecialty pediatric providers, in both the surgical and medical realms, to evaluate their ITC between disciplines. As more research is done on patient quality and safety, it will be imperative for all who care for children to identify areas for improvement, devise solutions, and review processes specific for children and not merely transfer adult practices to the pediatric arena.

Conclusion

Pediatric airway surgery involves multidisciplinary care. In our clinical setting, a complex arrangement of 2 institutions with multiple services involved exposes the patients to communication errors during transfer that can lead to adverse events. Based on 2 sentinel events, we developed a multidisciplinary focus group to assess the root cause of these adverse events and concluded that the current verbal transfer process between services needed improvement. We used a well-described IHI methodology as it included key emphasis on collaborative, 2-way development of process improvement. Our development and implementation of a postoperative checklist and formalized transfer-of-care process led to a decrease in airway emergencies due to ITC errors. The checklist was inexpensive to produce and easily adaptable to current transfer processes in place. Pediatric airway surgery is a relatively small sample of pediatric intensive care, but we feel that our checklist and transfer protocol can be modified for other instances in pediatrics in which multiple subspecialties working together can improve their communication.

The Institutional Review Board has reviewed and approved this study.

Resources for Clinicians[11]

Engaging Physicians in Quality and Safety

http://www.ihi.org/knowledge/Pages/Presentations/PhysicianEngagementinQualityandSafety.aspx

A Safety Briefing Tool

http://www.ihi.org/knowledge/Pages/Tools/SafetyBriefings.aspx

Root Cause Analysis

Systems analysis of clinical incidents: The London Protocol: http://www.ihi.org/knowledge/Pages/Tools/SystemsAnalysisofClinicalIncidentsTheLondonProtocol.aspx

A framework for conducting a root cause analysis: http://www.jointcommission.org/Framework_for_Conducting_a_Root_Cause_Analysis_and_Action_Plan/

Application of Toyota production system principles to a health care setting: http://www.ihi.org/knowledge/Pages/Publications/LearningtoLeadatToyota.aspx

Author Contributions

Sang W. Kim, study conception, design, analysis, acquisition of data, interpretation of data, drafting of manuscript, critical revision; **Stephen Maturo**, study conception, design, analysis, acquisition of data, interpretation of data, drafting of manuscript, critical revision; **Danielle Dwyer**, study conception, design, analysis, critical revision; **Bradley Monash**, study conception, design, analysis; **Phoebe H. Yager**, study conception, design, analysis, critical revision; **Kerstin Zanger**, study conception, design, analysis, critical revision; **Christopher J. Hartnick**, corresponding author, study conception, design, analysis, interpretation of data, drafting of manuscript, critical revision.

Disclosures

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