Faucett Erynne (Orcid ID: 0000-0003-1653-7753)
Wolter Nikolaus E. (Orcid ID: 0000-0002-5196-6150)
Balakrishnan Karthik (Orcid ID: 0000-0002-0244-249X)
Ishman Stacey (Orcid ID: 0000-0003-0997-9692)
Nguyen Lily (Orcid ID: 0000-0001-9566-4827)
Preciado Diego (Orcid ID: 0000-0003-0075-8279)
Prager Jeremy (Orcid ID: 0000-0002-8123-2529)
Husein Murad (Orcid ID: 0000-0002-0805-2644)
Johnson Romaine (Orcid ID: 0000-0002-2322-5347)
Gantwerker Eric (Orcid ID: 0000-0003-1309-9188)
Hart Catherine (Orcid ID: 0000-0003-0670-9937)
Sidell Douglas (Orcid ID: 0000-0002-2088-6502)
Choi Sukgi (Orcid ID: 0000-0002-5448-1546)
EL-HAKIM HAMDY (Orcid ID: 0000-0001-9349-8239)
Zur Karen (Orcid ID: 0000-0002-9045-6559)
Hartnick Christopher (Orcid ID: 0000-0002-6409-7863)
Rahbar Reza (Orcid ID: 0000-0002-6531-5922)
Daniel Sam (Orcid ID: 0000-0001-9698-9519)
de Alarcon Alessandro (Orcid ID: 0000-0003-4792-4676)
Propst Evan (Orcid ID: 0000-0002-8013-8530)

TITLE PAGE

Title:

Competency-Based Assessment Tool for Pediatric Esophagoscopy: International Modified Delphi Consensus

Authors:

Erynne A. Faucett MD[1]
Nikolaus E. Wolter MD[2]
Karthik Balakrishnan MD, MPH[3]
Stacey L. Ishman MD[4]
Deepak Mehta MD[5]
Sanjay Parikh MD[6]
Lily H. P. Nguyen MD[7]
Diego Preciado MD, PhD[8]
Michael J. Rutter MD[4]
Jeremy D. Prager MD[9]
Glenn E. Green MD[10]
Seth M. Pransky MD[11]
Ravi Elluru MD[12]
Murad Husein MD[13]
Soham Roy MD[14]
Kaalan E. Johnson MD[6]
Jacob Friedberg MD[2]

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1002/lary.29126

Romaine F. Johnson MD MPH[17]
Nancy M Bauman[8]
Charles M Myer IV MD[4]
Ellen S. Deutsch MD MS[16]
Eric A. Gantwerker MD MMSc[17]
J. Paul Willging MD[4]
Catherine K. Hart MD[4]
Robert H. Chun MD[18]
Derek J. Lam MD[19]
Jonathan B. Ida MD[20]
John J. Manoukian MD[7]
David R. White MD[21]
Douglas R. Sidell MD[3]
Christopher T. Wootten MD[22]
Andrew F. Inglis MD[6]
Craig S. Derkay MD[23]
George Zalzal MD[8]
David W. Molter MD[24]
Jeffrey P. Ludemann MD[25]
Sukgi Choi, MD[26]
Scott Schraff[27]
Charles M. Myer III MD[4]
Robin T. Cotton MD[4]
Shyan Vijayasekaran MBBS, FRACS[28]
Carlton J. Zdanski MD[29]
Hamdy El-Hakim MD[30]
Udayan K. Shah MD[31]
Marlene A. Soma MBBS[32]
Marshall E. Smith MD[33]
Dana M. Thompson MD[20]
Luv Ram Javia MD[34]
Karen B. Zur MD[34]
Steven E. Sobol MD MSc[34]
Christopher J. Hartnick MD[35]
Reza Rahbar DMD, MD[26]
Jean-Philippe Vaccani MD[36]
Benjamin Hartley MD[37]
Sam J. Daniel MD[7]
Ian N. Jacobs MD[34]
Gresham T. Richter MD[38]

Alessandro de Alarcon[4]
Matthew A. Bromwich MD[36]
Evan J. Propst MD MSc FRCSC[2]

Author Affiliations:

1. Division of Otolaryngology, Head and Neck Surgery, Phoenix Children's Hospital, Department of Child Health, University of Arizona- College of Medicine, Department of Otolaryngology, Mayo College of Medicine and Science, Phoenix, Arizona, USA
2. Department of Otolaryngology – Head and Neck Surgery, Hospital for Sick Children, University of Toronto, Canada
3. Department of Otolaryngology, Head and Neck Surgery, Stanford University, Lucile Salter Packard Children's Hospital, Palo Alto, California, USA
4. Department of Otolaryngology-Head and Neck Surgery, University of Cincinnati College of Medicine, Division of Pediatric Otolaryngology, Cincinnati Children's Hospital Medical Center Cincinnati, Ohio, USA
5. Department of Pediatric Otolaryngology, Texas Children's Hospital, Houston, Texas, USA
6. Division of Otolaryngology - Head & Neck Surgery, Seattle Children's Hospital, Seattle, Washington, USA
7. Department of Otolaryngology - Head and Neck Surgery, Montreal Children's Hospital, McGill University, Montreal, QC, Canada
8. Department of Otolaryngology, Children's National Health System, Division of Otolaryngology, George Washington University Washington, DC, USA
9. Department of Pediatric Otolaryngology, University of Colorado School of Medicine and Children's Hospital Colorado, Aurora, Colorado, USA
10. Department of Otolaryngology-Head and Neck Surgery, University of Michigan, Mott Children's Hospital, Ann Arbor, Michigan, USA
11. Division of Pediatric Otolaryngology, Rady Children's Hospital San Diego, San Diego, California, USA
12. Division of Otolaryngology, Dayton Children's Hospital, Dayton, Ohio, USA
13. Department of Otolaryngology- Head and Neck Surgery, Victoria Hospital, Schulich School of Medicine and Dentistry, Western University, London, ON, Canada.
14. Department of Otorhinolaryngology, University of Texas at Houston McGovern Medical School, Houston, Texas, USA
15. Department of Otolaryngology-Head and Neck Surgery, Division of Pediatric Otolaryngology University of Texas Southwestern Medical Center, Dallas, Texas, USA
16. Department of Anesthesiology and Critical Care Medicine, Children's Hospital of Philadelphia, Philadelphia, PA and Adjunct Associate Professor, Department of

Anesthesiology and Critical Care, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania, USA
17. Loyola University Medical Center, Department of Otolaryngology – Head and Neck Surgery, Maywood, Illinois, USA
18. Department of Otolaryngology, Children's Hospital of Wisconsin-Milwaukee Campus, Medical College of Wisconsin, Milwaukee, Wisconsin, USA
19. Department of Otolaryngology - Head and Neck Surgery, Oregon Health and Science University, Pediatric Otolaryngology, Doernbecher Children's Hospital, Portland, Oregon, USA
20. Division of Pediatric Otolaryngology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, Illinois, USA
21. Department of Otolaryngology-Head and Neck Surgery, Medical University of South Carolina, Charleston, South Carolina, USA
22. Division of Otolaryngology, Monroe Carell Jr Children's Hospital at Vanderbilt, Nashville, Tennessee, USA
23. Department of Otolaryngology-Head and Neck Surgery Children's Hospital of the King's Daughters, Eastern Virginia Medical School, Norfolk, Virginia, USA
24. Otolaryngology-Head and Neck Surgery, Washington University School of Medicine, St Louis, Missouri, USA
25. Pediatric Otolaryngology, British Columbia Children's Hospital, University of British Columbia, Vancouver, BC, Canada
26. Department of Otolaryngology and Communication Enhancement, Boston Children's Hospital, Boston, Massachusetts, USA
27. Arizona Otolaryngology Consultants, Phoenix, Arizona, USA
28. Department of Otolaryngology, Head and Neck Surgery, Perth Children's Hospital, University of Western Australia
29. Department of Otolaryngology/Head and Neck Surgery, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA
30. Division of Pediatric Surgery and Otolaryngology - Head and Neck Surgery, Departments of Surgery and Pediatrics, The Stollery Children's Hospital, University of Alberta Hospital, Edmonton, Alberta, Canada.
31. Division of Pediatric Otolaryngology, Nemours/Alfred I. duPont Hospital for Children, Wilmington, Delaware, USA
32. Department of Paediatric Otolaryngology, Sydney Children's Hospital, Randwick, NSW, Australia
33. Division of Otolaryngology-Head and Neck Surgery, University of Utah School of Medicine, Salt Lake City, Utah, USA
34. Division of Otolaryngology, The Children's Hospital of Philadelphia, Department of Otorhinolaryngology – Head and Neck Surgery, University of Pennsylvania, Perelman School of Medicine, Philadelphia, Pennsylvania, USA.

35. Department of Otolaryngology, Massachusetts Eye and Ear Infirmary, Harvard Medical School Boston, Massachusetts, USA
36. Division of Otolaryngology, Department of Surgery, CHEO, University of Ottawa, Ottawa, ON, Canada
37. Department of Otolaryngology, Great Ormond Street Hospital, London, England
38. Division of Pediatric Otolaryngology, Arkansas Children's Hospital, Little Rock, Arkansas, USA

Running Title:
Assessment tool for pediatric esophagoscopy

Word Count: 2087

Keywords
Esophagoscopy, Delphi, assessment, education, objective structured assessment of technical skills, OSAT

Correspondence

Send correspondence to: Dr. Evan J Propst, Department of Otolaryngology – Head & Neck Surgery, 6th Floor, Burton Wing, Hospital for Sick Children, 555 University Avenue, Toronto, Ontario, M5G 1X8. Tel: (416) 813-2192, fax: (416) 813-5036, email: evan.propst@utoronto.ca

Financial Disclosure
This study was funded by the Jordan and Lisa Gnat Family and Bastable-Potts Chair in Otolaryngology at SickKids and the Choi, Lo, Stronach and Paris families.

Conflict of Interest
None

Notes
This work was presented at the podium at the American Society of Pediatric Otolaryngology Annual Meeting, May 3-5, 2019, Austin, Texas.

ABSTRACT

Objective: Create a competency-based assessment tool for pediatric esophagoscopy with foreign body removal.

Study design: Blinded modified Delphi consensus process.

Setting: Tertiary care center.

Subjects & Methods: A list of 25 potential items was sent via the REDCap database to 66 expert surgeons who perform pediatric esophagoscopy. In the first round, items were rated as "keep" or "remove" and comments were incorporated. In the second round, experts rated the importance of each item on a seven-point Likert scale. Consensus was determined with a goal of 7 to 25 final items.

Results: The response rate was 38/64 (59.4%) in the first round and returned questionnaires were 100% complete. Experts wanted to "keep" all items and 172 comments were incorporated. 24 task-specific and 7 previously-validated global rating items were distributed in the second round, and the response rate was 53/64 (82.8%) with questionnaires returned 97.5% complete. Of the task-specific items, 9 reached consensus, 7 were near consensus, and 8 did not achieve consensus. For global rating items that were previously validated, 6 reached consensus and 1 was near consensus.

Conclusions: It is possible to reach consensus about the important steps involved in rigid esophagoscopy with foreign body removal using a modified Delphi consensus technique. These items can now be considered when evaluating trainees during this procedure. This tool may allow trainees to focus on important steps of the procedure and help training programs standardize how trainees are evaluated.

Level of Evidence: 5

INTRODUCTION

Surgical education has traditionally followed an apprenticeship model, with the staff surgeon evaluating the trainee subjectively at the end of their rotation. This method of evaluation can be prone to recall bias as it can occur several months following completion of a surgical procedure. Delayed evaluation also does not provide time for the trainee to reflect and improve.[1]

The Accreditation Council for Graduate Medical Education (ACGME) and the Royal College of Canadian Physicians and Surgeons have created specific outcome measures to assess surgical competency.[2,3] According to Reznick, valid and reliable assessments are needed to plan instruction and assess the efficacy of curricular interventions designed to enhance technical skills.[4] His group created the Objective Structured Assessment of Technical Skill (OSATS) to provide educators a standardized way to evaluate a learner's abilities.[5]

Objective and reproducible assessment tools can track the acquisition of skills and provide a framework for feedback. A competency-based approach toward medical education has been a goal of education for some time.[6] In Otorhinolaryngology – Head & Neck Surgery (ORL-HNS), OSATS have only been developed for 11 of the 114 core competency procedures for residency training.[6] Although an OSAT for rigid esophagoscopy has been described and obtained excellent construct validity, the tool was developed by a single faculty member, it does not differentiate between pediatric and adult rigid esophagoscopy and it does not evaluate foreign body removal.[7]

We sought to create a tool to evaluate pediatric rigid esophagoscopy with foreign body removal. OSATS have traditionally been created with input from a few experts. We recently created an OSAT for pediatric tracheotomy by seeking input from a large international group of experts using a modified Delphi consensus process to make the tool applicable across many training programs.[8] The Delphi process mathematically narrows down concepts through iterative rounds of anonymous questionnaires until consensus is achieved.[9] We sought to create a task-specific scale to evaluate discrete surgical steps involved in rigid esophagoscopy and foreign body removal, and a global-rating scale to evaluate overall performance, as each scale measures different aspects of training.

METHODS

Two authors (EJP, EAF) created a list of steps that they commonly perform during rigid esophagoscopy with foreign body removal. Three other authors (NEW, KB, SLI) edited and added to this list. All authors were fellowship-trained pediatric ORL-HNS surgeons who previously developed a competency-based assessment tool for pediatric tracheotomy[9].

Statements were collated into a questionnaire using Research Electronic Data Capture (REDCap).[10] We selected REDCap because replies are anonymous and respondents can easily complete and submit answers without downloading and uploading files. We tried to simplify questionnaire completion to increase response rates and decrease response times.

We reviewed the American Society of Pediatric Otolaryngology membership list and names of pediatric otolaryngologists at each academic institution in the United States and Canada to generate a list of potential experts. Those with a strong publication history in the field of rigid esophagoscopy and foreign body removal (Pubmed/book chapter editor or author) were included, many of whom had expertise in medical education. Experts with a publication history in this field from Europe and Australia were also included. Sixty-six prospective experts were invited

by email to anonymously complete the survey. Experts were promised authorship in the order in which they responded to acknowledge their work. Respondents were ranked in order of response time separately for each round and the average of all rounds created the final authorship order. This worked previously to acknowledge each expert's contributions, increase the response rate and decrease the time to respond[9]. We contacted each expert three times per round (invitation and two reminders), each one week apart.

Experts were asked to rate each item on the Task-Specific list as "keep" or "remove" in the first round, and to provide suggestions for change. Anonymous responses were exported to an Excel (Microsoft, Redmond, WA) file and two investigators (EAF, EJP) reviewed responses and incorporated suggestions. Efforts were made to be inclusive. For a task to be included, 50% of respondents needed to rate it as "keep". In the second round, we used a Global Rating Scale that had previously been validated for many different surgical procedures that was not included in the first round.[11]

During the second round, experts rated the importance of each item on the Task-Specific list using a 7-point Likert scale (1-Not at all important, 2-Low importance, 3-Slightly important, 4-Neutral, 5-Moderately important, 6-Very important, 7-Extremely important) and provided comments. Anonymous results were exported to an Excel file and a mean score was calculated for each item. Based on previous consensus statements in otolaryngology, consensus for the task-specific list and the global rating scale were calculated as: 1) Reaching consensus (individual responses fall within 2 Likert points of mean with only 1 outlier); 2) Near consensus (individual responses fall within 2 Likert points of mean with only 2 outliers); 3) No consensus (not meeting criteria 1 or 2).[12,13] Based on previous Task-Specific OSATS tools (mean+/-SD), we determined that an ideal Task-Specific list should have 7 to 25 items for inclusiveness and ease of use.[6]

The study end point was determined a priori, whereby 7 to 25 items reaching consensus in the second round would obviate the need for another iteration. However, >25 items reaching consensus would lead to keeping the most highly rated 25 items based on mean score. Conversely, <7 items reaching consensus would force another iteration whereby experts would be asked to rate only consensus and near consensus items again. If <7 items reached consensus, all items reaching consensus plus the most highly rated items reaching near-consensus based on mean score would be included up to a total of 7 items. This modification was created to decrease the burden placed on experts and shorten the study.

RESULTS

Sixty-six experts in rigid esophagoscopy and foreign body removal were contacted and two email addresses were erroneous. The first round achieved a response rate of 38/64 (59.4%). Every item evaluated in the first round attained >78% of respondents wanting to "keep" it in the list for the second round. There were no missing responses out of 912 possible items (38 experts, 24 items) for a completion rate of 100%. There were 172 comments incorporated into the second phase (Table 1). The time for completion of round 1 was 30 days.

In the second round, 24 task-specific (Table 2) and 7 previously validated global rating (Table 3) items were distributed and the response rate was 53/64 (82.8%). There were 40 missing responses out of 1,643 possible items (53 experts, 31 items) for a completion rate of 97.6%. For the 24 task-specific items, 9 reached consensus, 7 were near consensus, and 8 did not achieve consensus. The 9 task-specific items that reached consensus were all rated positively, with a mean (SD) Likert rating of 6.29 (0.37) (range 5.67 – 6.83). For the 7 previously-validated global rating items, 6 reached consensus and 1 was near consensus. The 6 global rating items that reached consensus were all rated positively, with a mean (SD) Likert rating of 5.91 (0.27) (range 5.54 – 6.33). Tables 2 and 3 show each item, mean score, and consensus level. The time for completion of round 2 was 20 days.

DISCUSSION

Decreased resident work hours, increased concerns for patient safety and a constant push from hospitals for greater efficiency have limited time for hands-on surgical training. These restrictions, along with variations in trainee learning curves, reinforce the need for objective and

reproducible methods of evaluation. We sought to develop a competency-based assessment tool for pediatric rigid esophagoscopy and foreign body removal because it is a commonly encountered complex procedure with potentially serious risks such as esophageal perforation and injury to the teeth and gums. This tool can be used to evaluate the trainee immediately following completion of the procedure in order to counteract recall bias often seen in end-of-rotation evaluations.

Our response rates were 59.4% and 82.8% for the first and second rounds, respectively. A response rate of 60% is accepted by many biomedical journals for survey research.[14] Also, >97% of items were completed for all submitted questionnaires for each round. This is much higher than the American Association for Public Opinion Research (AAOPR) suggestion that 80% equals a complete response.[15] We believe this response rate reflects clinicians who are experienced and interested in this area of medicine, ease of use of the REDCap system, assurance of anonymity, and offer of authorship. We did not see a drop in response rate in the second round as has been seen in other studies using the Delphi method. The time for completion of this study was 50 days. We believe the short interval between questionnaires maintained a high level of interest.

In the second round, 9 task-specific items reached consensus (Tables 2 and 3). We did not require another round because this fell within the range of 7 to 25 items determined a priori.[6] Final items focused on preparation and prevention of adverse events. A proposed scoring sheet is available in table 4.

Several items approached consensus. One of these was communication with operative team, including intubation and plan if foreign body is visualized at esophageal inlet as well as performing the surgical safety checklist. Communication with the operative team regarding the shared airway reached consensus in our previous OSAT for pediatric open tracheotomy. Though

communication regarding the airway is always important, these may not have reached consensus because rigid esophagoscopy is most often performed with the patient intubated, making the shared airway less of a concern, provided that the endotracheal tube does not get kinked by the esophagoscope or inadvertently dislodged during foreign body retrieval. Other items approaching consensus were: "minimizes fog or mucous from obscuring telescope" and specific details about how to grasp and withdraw the foreign body. These may have only reached near consensus because there was a similar but more important task of identifying the foreign body without accidentally pushing it distally. Lastly, the tasks of performing additional esophagoscopy to re-evaluate mucosa and rule out an additional foreign body and evaluation of teeth, mucosa, temporomandibular joint, and spine for injury reached near consensus. Though all are extremely important, a straightforward procedure with good visualization and minimal to no bleeding would be unlikely to cause an injury, and additional foreign bodies would be unlikely if only one radiopaque foreign body was seen on x-ray.

Six of the 7 items in the Global Rating Scale reached consensus and 1 was near consensus. The 6 global rating items reaching consensus were rated positively. Surprisingly, demonstrating familiarity with all steps of the operation/procedure only reached near consensus. This item received the highest mean Likert score, but only approached consensus because there were two outliers. We believe that a mean score of 6.38 out of 7 (91%) for this item justifies using the previously validated Global Rating Scale with pediatric rigid esophagoscopy and foreign body removal. Additionally, the Global Rating Scale has not been validated for use of a subset of items, supporting using it in its entirety. Finally, the Global Rating Scale is complementary to the task-specific scale, thus reinforcing its importance. A proposed scoring sheet is available in table 5.

A limitation of this study is that task-specific items for pediatric rigid esophagoscopy with foreign body removal were selected based on expert opinion and the scale has not achieved

construct validity using trainees of various levels. This could be done with live patients or potentially using a simulation laboratory. We need to determine if this tool will be helpful for trainees and faculty. Experts from developing and resource-limited regions were not included during development of this tool. Although our modifications to the Delphi technique have now appeared to work well for reaching consensus on the important steps involved in pediatric rigid esophagoscopy with foreign body removal in this study and open pediatric tracheotomy in a previous study, we cannot predict if they will work well when creating assessment tools for other procedures or with a different group of experts. Future studies investigating the construct validity of this pediatric rigid esophagoscopy with foreign body removal tool are required. Broad and structured use of this tool are required to permit independent evaluation.

CONCLUSION

Reaching consensus on the important steps of pediatric rigid esophagoscopy with foreign body removal is possible. The modified Delphi consensus process described herein allowed for this to happen. These items can be considered to create a competency-based assessment tool for pediatric rigid esophagoscopy with foreign body removal. This assessment tool may allow trainees to focus on important steps of this procedure and help training programs standardize how trainees are evaluated.

REFERENCES

1. Ishman SL, Brown DJ, Boss EF, Skinner ML, Tunkel DE, Stavinoha R, Lin SY. Development and pilot testing of an operative competency assessment tool for pediatric direct laryngoscopy and rigid bronchoscopy. Laryngoscope 2010;120(11):2294-300.
2. Andolsek K, Padmore J, Hauer KE, Edgar L, Holmboe E. Clinical competency committees: a guidebook for programs (2nd Edition). ACGME Accreditation Council for Graduate Medical Education (ACGME). https://acgme.org. Accessed June 14, 2019.
3. Hendry P, Silver I, Bursey F, Daniel S, Campbell C. Rationale for a change to competency-based continuing professional development. Competency-based CPD white paper series. www.royalcollege.ca. Accessed June 4, 2019.
4. Reznick RK. Teaching and testing technical skills. Am J Surg 1993;165;358-361.
5. Martin, JA, Regehr G, Reznick R, MacRae H, Murnaghan J, Hutchison C, Brown M. Objective structured assessment of technical skill (OSATS) for surgical residents. Br J Surg 1997;84(2):273–278.
6. Labbe M, Young M, Nguyen LHP. Toolbox of assessment tools of technical skills in otolaryngology-head and neck surgery: a systematic review. Laryngoscope 2017;128:1571-75
7. Allak A[1], Liu YE[2], Oliynyk MS[2], Weng KH[2], Jameson MJ[1], Shonka DC Jr[1]. Development and evaluation of a rigid esophagoscopy simulator for residency training. Laryngoscope. 2016 Mar;126(3):616-9. doi: 10.1002/lary.25439. Epub 2015 Nov 24.
8. Propst, Evan J, et al. “Competency-Based Assessment Tool for Pediatric Tracheotomy: International Modified Delphi Consensus.” The Laryngoscope, 2019, pp. The Laryngoscope, 10 December 2019.
9. Rescher N. Predicting the future: an introduction to the theory of forecasting. Albany, NY: State University of New York Press, 1998.
10. Paul A. Harris, Robert Taylor, Robert Thielke, Jonathon Payne, Nathaniel Gonzalez, Jose G. Conde, Research electronic data capture (REDCap) – A metadata-driven methodology

and workflow process for providing translational research informatics support, J Biomed Inform. 2009 Apr;42(2):377-81.
11. Reznick R, Regehr G, MacRae H, Martin J, McCulloch W. Testing technical skill via an innovative 'bench station' examination. Am J Surg 1996;172:226-230.
12. Rhee JS, Weaver EM, Park SS, Baker SR, Hilger PA, Kriet JD. Clinical consensus statement: diagnosis and management of nasal valve compromise. Otolaryngol Head Neck Surg 2010;143:48-59.
13. Balakrishnan K, Sidell DR, Bauman NM et al. Outcome measures for pediatric laryngotracheal reconstruction: international consensus statement. Laryngoscope 2018;129:244-55.
14. Livingston EH, Wislar JS. Minimum response rates for survey research. Arch Surg 2012;147(2):110.
15. American Association for Public Opinion Research. Standard definitions: Final dispositions of case codes and outcome rates for surveys. 2016. Pp.37. https://www.aapor.org/Standards-Ethics/Standard-Definitions-(1).aspx. Accessed June 4, 2019.

TABLES

Table I.
Pediatric Rigid Esophagoscopy And Foreign Body Removal Objective Structured Assessment of Technical Skill Tool Round 1.

Task-Specific Items	No. Completed	No. Rating Keep (%)	No. Comments
Prepares preoperative plan			
1. Reviews history and imaging to identify goal of procedure.	38	38 (100%)	16
2. Appreciates urgency of removal depending on type of foreign body, where applicable.	38	38 (100%)	17
Communicates with nursing		38 (100%)	
3. Selects appropriate esophagoscope (diameter and length).	38	38 (100%)	2
4. Selects appropriate telescope (diameter and length).	38	37 (97.4%)	1
5. Selects appropriate grasper, if required (type, length, optical telescope).	38	38 (100%)	5
Assembles instruments properly			
6. Tests scope(s) for adequate light, broken fibers, and cracks.	38	38 (100%)	8
7. Ensures grasper fits down esophagoscope.	38	38 (100%)	4
8. Ensures bridge and telescope fit into esophagoscope.	38	38 (100%)	8
Communicates with anesthesiologist			
9. Discusses intubation, where required.	38	38 (100%)	12
10. Requests endotracheal tube be secured to left side of mouth and that tape allows mouth to open.	38	38 (100%)	6

Positions patient properly			
11. Brings head of patient to top of bed.	38	38 (100%)	2
12. Uses shoulder roll, if necessary.	38	37 (97.4%)	5
Provides exposure for esophagoscopy			
13. Places tooth guard on teeth or gauze on gums.	38	38 (100%)	5
14. Selects appropriately sized laryngoscope.	38	38 (100%)	7
15. Inserts laryngoscope into esophageal inlet.	38	31 (81.6%)	16
16. Exposes esophageal inlet to provide easy esophagoscope entry.	38	36 (94.7%)	7
Performs rigid esophagoscopy			
17. Prevents esophagoscope from damaging lips and mucosa.	38	38 (100%)	11
18. Prevents fog or mucus from obscuring telescope.	38	38 (100%)	7
19. Identifies foreign body without pushing it distally, where applicable.	38	38 (100%)	7
Retrieves foreign body, where applicable			
20. Withdraws telescope while maintaining esophagoscope in correct position.	38	38 (100%)	4
21. Grasps foreign body without dislodging it distally.	38	37 (97.4%)	5
22. Withdraws foreign body into esophagoscope or to tip if too large to fit inside.	38	38 (100%)	9
Evaluates for injury			
23. Performs additional esophagoscopy to evaluate damage to mucosa or presence of additional foreign body.	38	38 (100%)	2
24. Removes tooth guard to evaluate for dental injury.	38	37 (97.4%)	8

No. = number

Table II.
Pediatric Rigid Esophagoscopy And Foreign Body Removal Objective Structured Assessment of Technical Skills Round 2.

Task-Specific Items	No. Completed	Mean (SD) Likert	Consensus
Surgical goals, preparation and potential challenges			
1. Reviews history, physical examination, imaging (rule out battery) and anatomical and patient factors to identify goal of procedure and whether flexible or rigid esophagoscopy +/- bronchoscopy are indicated.	53	6.83 (0.38)	Yes
2. Appreciates urgency of removal depending on type of foreign body, where applicable.	53	6.77 (0.55)	Yes
3. Consents caregiver(s) for procedure including risks, benefits, and potential complications.	53	6.17 (1.00)	No
Preparation of instruments			
4. Selects appropriately sized laryngoscope(s), when necessary.	53	6.08 (0.97)	No
5. Selects appropriate esophagoscope(s) (diameter and length).	52	6.20 (0.80)	Yes
6. Selects appropriate telescope(s) (diameter and length).	53	6.19 (0.79)	Yes
7. Selects appropriate suction (flexible or rigid).	53	5.67 (0.96)	Yes

8. Selects appropriate grasper(s) (type, length, optical telescope, works on duplicate foreign body) and ensures it passes through and beyond esophagoscope.	52	6.51 (0.73)	Yes
9. Tests scopes, cables and video monitor to ensure functionality (adequate light, broken fibers, cracks, white balance, focus).	53	6.29 (0.87)	No
10. Ensures telescope +/- bridge/rubber guide fit in/on esophagoscope.	53	5.98 (1.13)	Yes
Communication with operative team			
11. Discusses airway plan including intubation +/- rigid bronchoscopy and formulates plan if foreign body is visualized at esophageal inlet.	52	6.39 (0.98)	Near
12. Performs surgical safety checklist and discusses steps of procedure and potential complications.	53	5.98 (1.20)	Near
13. If intubated, requests endotracheal tube be secured to desired side of mouth and that tape allows mouth to open.	53	5.19 (1.37)	No
Patient position and exposure			
14. Brings head of patient to top of bed and uses shoulder roll, when necessary.	52	5.39 (1.22)	No
15. Evaluates and protects teeth and gums in age appropriate manner (tooth guard, gauze).	53	5.80 (1.22)	No
16. Exposes esophageal inlet to provide atraumatic entry of esophagoscope.	53	6.08 (1.06)	No
Rigid Esophagoscopy			
17. Protects lips, teeth, oral mucosa and esophagus from injury.	53	6.23 (0.81)	Yes
18. Minimizes fog or mucus from obscuring telescope (anti-fog, suction, retracts scope proximal to tip of esophagoscope).	53	5.65 (1.05)	Near
19. Identifies foreign body without accidentally pushing it distally.	53	6.23(0.81)	Yes
Foreign body retrieval, where applicable			
20. Withdraws telescope and bridge while maintaining esophagoscope at optimal distance from foreign body for retrieval.	53	6.17 (0.92)	No
21. Passes grasper distal to end of esophagoscope, ensures full opening of grasper and grasps foreign body while accounting for sharp edges, all without complications (mucosal injury, distal dislodgement).	52	6.41 (0.78)	Near
22. Withdraws foreign body into esophagoscope or to tip if too large to fit inside and removes esophagoscope uneventfully if possible or stops to consider alternatives in case of failure.	53	6.50 (0.90)	Near
Final Evaluation			
23. Performs additional esophagoscopy and examination of nasopharynx to reevaluate mucosa and rule out additional foreign body.	52	6.25 (1.06)	Near
24. Evaluates teeth, mucosa, temporomandibular joint and cervical spine for injury and is able to discuss management when injury is present.	52	5.84 (1.14)	Near

SD = standard deviation; No. = number

Table III.
Pediatric Rigid Esophagoscopy And Foreign Body Removal Obstructive Structured Assessment of Technical Skills Round 2.

Global Rating Scale	No. Completed	Mean (SD) Likert	Consensus
Respect of tissue			
1. Appropriate handling of tissue, minimizes tissue damage through appropriate use of instruments and appropriate force.	54	6.33 (0.83)	Yes
2. Efficient and economic movement.	54	5.69 (0.92)	Yes
Knowledge of instruments			
3. Familiar with names of instruments required for this procedure, does not ask for wrong instrument or use incorrect names when asking for instruments.	54	5.98 (0.90)	Yes
Instrument handling			
4. Competent use of instruments, fluid movement without stiffness or awkwardness.	54	5.92 (0.79)	Yes
Flow of operation			
5. Demonstrates forward planning; course of operation demonstrated through effortless flow from one movement to the next.	54	5.98 (0.91)	Yes
6. Strategically uses assistants to the best advantage at all times.	54	5.54 (1.06)	Yes
Knowledge of specific procedure			
7. Demonstrates familiarity of all steps of the operation/procedure.	54	6.38 (0.80)	Near

SD = standard deviation; No. = number

Table IV.
Pediatric Esophagoscopy And Foreign Body Removal Evaluation Sheet.

Date: (MM/DD/YY) _____ Trainee Name: (Last)_____(First)_____ Level of Training:_____ Evaluator Name: (Last)_____(First)_____			
Task-Specific Items	Not Done or Done Incorrectly	Done Correctly	Not Observed
Surgical goals, preparation and potential challenges			
1. Reviews history, physical examination, imaging (rule out battery) and anatomical and patient factors to identify goal of procedure and whether flexible or rigid esophagoscopy +/- bronchoscopy are indicated.	□	□	□
2. Appreciates urgency of removal depending on type of foreign body, where applicable.	□	□	□
Preparation of instruments			
3. Selects appropriate esophagoscope(s) (diameter and length).	□	□	□
4. Selects appropriate telescope(s) (diameter and length).	□	□	□
5. Selects appropriate suction (flexible or rigid).	□	□	□
6. Selects appropriate grasper(s) (type, length, optical telescope, works on duplicate foreign body) and ensures it passes through and beyond esophagoscope.	□	□	□
7. Ensures telescope +/- bridge/rubber guide fit in/on esophagoscope.	□	□	□
Rigid Esophagoscopy			
8. Protects lips, teeth, oral mucosa and esophagus from injury.	□	□	□
9. Identifies foreign body without accidentally pushing it distally.	□	□	□

Number of items performed correctly: ____
Was this a standard case? □ Yes □ No If not, Why? _____
Is this resident competent to perform this procedure? □ Yes □ No

Table V
Pediatric Rigid Esophagoscopy Global Rating Scale Evaluation Sheet.

Date: (MM/DD/YY) _____
Trainee Name: (Last)_____ (First) _____
Level of Training:_____
Evaluator Name: (Last)_____ (First) _____

Global Rating Scale					
1. Respect for tissue	1 Frequently used unnecessary force on tissue or caused damage by inappropriate use of instruments	2	3 Carefully handled tissue but occasionally caused inadvertent damage	4	5 Consistently handled tissues appropriately with minimal damage
2. Time and motion	1 Many unnecessary moves	2	3 Efficient but some unnecessary moves	4	5 Clear economy of movement and maximum efficiency
3. Instrument handling	1 Repeatedly made tentative or awkward moves by inappropriate use	2	3 Competent use of instruments but occasionally appeared stiff or awkward	4	5 Fluid moves and no awkwardness
4. Knowledge of instruments	1 Frequently asked for wrong instrument or used inappropriate instrument	2	3 Knew names of most instruments and used appropriate instruments	4	5 Obviously familiar with instruments and their names
5. Use of assistants	1 Consistently placed assistants poorly or failed to use assistants	2	3 Appropriate use of assistants most of the time	4	5 Strategically used assistants to the best advantage at all times

6. Flow of operation and forward planning	1 Frequently stopped operating or unsure of next move	2	3 Some forward planning with reasonable progression of procedure	4	5 Obviously planned course of operation with effortless flow from one move to the next
7. Knowledge of specific procedure	1 Deficient knowledge. Needed specific instruction at most steps	2	3 Knew all important steps of operation	4	5 Demonstrated familiarity with all aspects of operation

Total score (sum all numbers): ____
Was this a standard case? □ Yes □ No If not, why? _____
Is this resident competent to perform this procedure? □ Yes □ No