Clinical Practice Guidelines in the Management of Pediatric Foreign Body Aspiration and Ingestion: A Systematic Evaluation Using the AGREE II Instrument

Anza Rizvi
Thomas Jefferson University
Fatima Rizvi
Thomas Jefferson University
Kevin Chorath
University of Pennsylvania
Neeraj Suresh
University of Pennsylvania
Emma De Ravin
Thomas Jefferson University
Dominic Romeo
University of Pennsylvania
Deepak Lakshmipathy
University of Pennsylvania
Louis-Xavier Barrette
University of Pennsylvania
Karthik Rajasekaran
Karthik.Rajasekaran@pennmedicine.upenn.edu
University of Pennsylvania

Research Article

Keywords: Pediatric foreign body, Clinical practice guideline, Quality, Appraisal, AGREE II

Posted Date: November 16th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-3599960/v1

Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at Pediatric Surgery International on February 27th, 2024. See the published version at https://doi.org/10.1007/s00383-024-05637-9.

Abstract

Purpose

Several clinical practice guidelines (CPGs) have been produced to optimize diagnosis and management of pediatric foreign body aspiration and ingestion. However, to date there have been no critical evaluations of their methodological rigor or quality. Herein we address this need via the Appraisal of Guidelines for Research and Evaluation (AGREE II) instrument.

Methods

A literature search of Embase, MEDLINE via PubMed, and Scopus was performed up until February 25, 2021. Identified CPGs were then assessed by four independent reviewers trained in AGREE II. A scaled domain score of > 60% was indicated as satisfactory quality. Intraclass correlation coefficients (ICC) were calculated to assess inter-reviewer agreement.

Results

11 guidelines were assessed with only one being classified as high quality and others being either average (two) or low quality (eight). Domain 4 (clarity of presentation) achieved the highest mean score (66.41% ± 13.33%), while domain 5 (applicability) achieved the lowest score (10.80% ± 10.37%). ICC analysis revealed generally strong agreement between reviewers with a range of 0.60–0.98.

Conclusion

Quality appraisal using the AGREE II instrument suggests that the methodologic rigor and quality of current guidelines for the diagnosis and management of pediatric foreign body aspiration and ingestion need significant improvement.

Introduction

Foreign body aspiration and ingestion is an important concern in the pediatric population and a significant cause of morbidity and mortality in children [1]. Aspiration or ingestion of foreign bodies are responsible for a significant number of emergency cases, with foreign body ingestions in children ≤ 5 years old being the fourth most common reason for calls to American poison-control centers in 2016 [2]. Approximately 80–90% of foreign bodies in the gastrointestinal (GI) tract pass spontaneously without complications; however, some may require removal of the foreign body either endoscopically or surgically [3]. Esophageal obstruction is the most common complication associated with foreign body ingestion but more severe variants involving erosion through the GI tract and subsequent fistula formation, hemorrhage, and peritonitis are also possible [4–6]. Foreign body aspiration is less common than ingestion yet often more morbid, serving as the leading cause of unintentional death among children (accounting for approximately 500 US child deaths per year) [7, 8]. Delayed diagnosis and treatment of aspirated foreign bodies is also associated with complications such as pneumonia, atelectasis, bronchiectasis, and bronchial fistulas [9, 10].

Endoscopic removal and management of ingested foreign bodies is also often more difficult in children compared to adults. Much of this stems from the added diversity of clinical parameters in this patient population. Whether it be due to age-dependent anatomy, highly variable body habitus, or difficulty in ascertaining history about time since last ingestion and size, shape, and location of the foreign body, it can be difficult to quickly ascertain where the foreign body lies in the GI tract and plan an endoscopic approach accordingly [11]. Additionally, children are more susceptible to ingesting different types of foreign bodies (via toys, non-edible objects, etc.), so there may be an increased likelihood of complications. Organizations have subsequently struggled to establish uniform standards in management [12].

Multi-disciplinary subcommittees have attempted to resolve this discordance in recent years by developing clinical practice guidelines (CPGs). CPGs theoretically involve numerous experts systematically synthesizing existing literature to construct evidence-based recommendations in diagnosis, treatment, and management of clinical conditions [13–15]. Clinicians therefore often rely on these CPGS to standardize their care for patients across different medical settings. Unfortunately, outside of author credentials, organizational reputability, and review processes of associated journals, these CPGs are rarely audited on their developmental rigor [13–15]. And given the complexity and danger of conditions like pediatric foreign body aspiration and ingestion, it is critical that CPGs be evaluated on this front prior to implementation.

The Appraisal of Guidelines for Research and Evaluation (AGREE II) instrument is a tool used to methodically assess the rigor and quality of CPGs and consensus statements [16]. To date, among 24 different appraisal tools of CPGs, AGREE II was shown to be the most effective and reliable [17]. The AGREE II instrument has been widely used in published scientific research as well as endorsed by several health care organizations. Previously, the tool has been extensively used to assess several different areas of pediatrics, including but not limited to surgery, Hirschsprung's disease, and gastroesophageal reflux disease [18–20]. To our knowledge, a comprehensive evaluation of CPGs for the diagnosis, treatment, and management of pediatric foreign body aspiration and ingestion has not been previously conducted. Therefore, our goal is to leverage the AGREE II instrument to assess whether the methodologic quality and rigor of existing CPGs are sufficient.

Methods

Literature Search and Selection Criteria

A literature search was performed of the following databases: Embase, MEDLINE via PubMed, and Scopus from inception to February 2, 2021. Additionally, a manual internet search was performed to identify guidelines not included in these major medical databases. The following search terms were used: (“pediatric foreign body removal” OR “foreign body removal in children” OR “ingested foreign body” OR “foreign body aspiration” OR “foreign body ingestion in children” OR "airway foreign body") AND (“guideline” OR “consensus” OR “recommendation”).

National and international guidelines that addressed the diagnosis, treatment, and management of pediatric foreign body aspiration or ingestion were included. If a society or development group published multiple guidelines, the most recent version was referenced. Systematic reviews, editorials, short summaries, retrospective reviews, textbook chapters, non-English language publications, and other literature reviews evaluating or explaining guidelines were excluded. The selected articles were discussed by the authors (AR, FR, KC, and KR) and any discrepancies in inclusion criteria were resolved prior to continuing in the evaluation process.

Data Extraction and Management

The following data was extracted from each CPG: development body, year of publication, development method, development committee members, target users, number of references, and relevant funding. Data was collected using a standardized form based on the six quality domains (scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence) and 23 total specific line items in the AGREE II instrument (Table 1).

Table 1
Individual Components of the AGREE II Evaluation Tool

Scope and Purpose	
1	The overall objective(s) of the guideline is (are) specifically described.
2	The health question(s) covered by the guideline is (are) specifically described.
3	The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.
Stakeholder Involvement	
4	The guideline development group includes individuals from all relevant professional groups.
5	The views and preferences of the target population (patients, public, etc.) have been sought.
6	The target users of the guideline are clearly defined.
Rigor of Development	
7	Systematic methods were used to search for evidence.
8	The criteria for selecting the evidence are clearly described.
9	The strengths and limitations of the body of evidence are clearly described.
10	The methods for formulating the recommendations are clearly described.
11	The health benefits, side effects, and risks have been considered in formulating the recommendations.
12	There is an explicit link between the recommendations and the supporting evidence.
13	The guideline has been externally reviewed by experts prior to its publication.
14	A procedure for updating the guideline is provided.
Clarity of Presentation	
15	The recommendations are specific and unambiguous.
16	The different options for management of the condition or health issue are clearly presented.
17	Key recommendations are easily identifiable.
Applicability	
18	The guideline describes facilitators and barriers to its application.
19	The guideline provides advice and/or tools on how the recommendations can be put into practice.
20	The potential resource implications of applying the recommendations have been considered.
21	The guideline presents monitoring and/ or auditing criteria.
Editorial Independence	
22	The views of the funding body have not influenced the content of the guideline.
23	Competing interests of guideline development group members have been recorded and addressed.
AGREE II = Appraisal of Guidelines for Research and Evaluation	

Quality Appraisal

Four authors (AR, FR, DR, ER) performed independent assessments of the selected CPGs using the AGREE II instrument. Prior to critically evaluating the CPGs, all investigators were required to complete the free, online training modules available on the AGREE website (www.agreetrust.org). For each line item in the quality domains, a score between 1 to 7 was assigned. A score of 1 (strongly disagree) was given when no relevant information regarding the line item was reported or provided, while a score of 7 (strongly agree) was given if the quality of reporting is comprehensive, intelligible, and salient. A scaled domain percentage score was calculated using the AGREE II instrument methodology, whereby the following formula was used [21]:

$$scaleddomainscore = \frac{(obtainedscore - minimumpossiblescore)}{(maximumpossiblescore - minimumpossiblescore)} \times 100\%$$

A scaled domain score of > 60% was indicated as the threshold to gauge the quality of CPGs. The AGREE II instrument also defines CPGs as high (≥ 5 domains scoring > 60%), average (3 or 4 domains scoring > 60%), and low (≤ 2 domains > 60%) quality [21]. The overall score for each guideline was also calculated and reported as a mean average of the six quality domains.

Statistical Analysis

To assess the agreement and define the reliability of the AGREE II instrument among the four appraisers, the authors performed an intraclass correlation coefficient (ICC) analysis using Python 3.8.2 and the 'pingouin' API. The ICC assesses the consistency of measurements made by the different appraisers measuring the same quantity. ICC was classified as poor (< 0.20), fair (0.21–0.41), moderate (0.41–0.60), good (0.61–0.80), and very good (0.81–1.00) per prior literature [22].

Results

Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocols, the initial literature search yielded 610 articles. Articles were reviewed by title and abstract for inclusion and exclusion criteria. From the original literature search, 31 articles were chosen for full review. After thorough review, 11 guidelines met inclusion criteria and were selected for further evaluation (Fig. 1).

Guideline Characteristics

Table 2 provides a summary of the general characteristics for each CPG. Specific details include the name of the developing body, country of origin, year developed, relevant funding source, target users, guideline writers, and evidence base. Three of the 11 CPGs were developed in the United States and included North American Society for Pediatric Gastroenterology, Hepatology & Nutrition (NASPGHAN) 2015, Arkansas Children's Hospital 2016, and American Society for Gastrointestinal Endoscopy (ASGE) 2011. The remaining guidelines were developed across the world including Italy, Australia, Europe, and Canada. The guidelines were written by development committees representing a diverse panel of experts including but not limited to pediatricians, endoscopists, pediatric surgeons, toxicologists, and otolaryngologists. The evidence base for the guidelines were drawn from systematic literature review and expert opinion consensus. Funding sources were not explicitly reported in any guideline.

Table 2
General Characteristics of Included Clinical Practice Guidelines

Title	Society/ Institution	Year	County/ Region	Development Method	Developers	Target User	Number of References	Funding
The Trust Clinical Guideline for Swallowed Foreign Bodies in Children Under 16 years Old	Norfolk and Norwich University Hospitals (NHS Foundation Trust)	2020	Europe	Not specified	Richard England and Oliver Burdall, Pediatric Surgery Department	Pediatric admissions unit, pediatric surgery, radiology, and otolaryngology	10	Not specified
The Royal Children's Hospital Melbourne	The Royal Children's Hospital Melbourne	2020	Australia	Not specified	Not specified	Not specified	9	Not specified
Foreign Body and Caustic Ingestions in Children: A Clinical Practice Guideline	Italian Society of Pediatric Gastroenterology, Hepatology and Nutrition (SIGENP)	2020	Italy	Systematic review; expert panel consensus	Expert panel of Italian endoscopists	General pediatricians and endoscopists	99	Not specified
Foreign Body Aspiration and Foreign Body Ingestion in Children	Whittington Health (NHS)	2019	Europe	Not specified	Not specified	Accident and emergency doctors and nurses, pediatric doctors, and nurses	12	Not specified
Ingested Foreign Body - Emergency Management in Children	Children's Health Queensland Hospital and Health Service	2019	Australia	Not specified	Senior ED clinicians and pediatricians across Queensland	Queensland Health Medical and nursing staff	6	Not specified
Ingestion of Foreign Bodies	Brighton and Sussex University Hospitals (NHS Trust)	2018	Europe	Not specified	Miki Lazner, Jason Gray	Not specified	0	Not specified
Pediatric Foreign Body Ingestion/Aspiration/Removal	Arkansas Children's Hospital	2016	United States	Not specified	Jonathan W. Orsborn, ANGELS team	Not specified	14	Not specified
Management of Ingested Foreign Bodies in Children: A Clinical Report of the NASPGHAN Endoscopy Committee	North American Society for Pediatric Gastroenterology, Hepatology & Nutrition (NASPGHAN) Endoscopy Committee	2015	United States	Consensus among a panel of expert endoscopists	Expert panel of pediatric endoscopists	Pediatric endoscopists	89	Not specified
Management of Ingested Foreign Bodies and Food Impactions	American Society for Gastrointestinal Endoscopy (ASGE)	2011	United States	Systematic review; expert consensus	The Standards of Practice Committee of the ASGE	Endoscopists	74	Not specified
Update on Management of Caustic and Foreign Body Ingestion in Children	SIGENP	2009	Italy	Evidence from clinical experience, recent studies, and expert reports discussed during a consensus conference	Working group of pediatricians, endoscopists, pediatric surgeons, toxicologists, and otolaryngologists	Medical professionals involved in casualty	67	Not specified
BC Children's Hospital Emergency Room Clinical Practice Guidelines	British Columbia's Children's Hospital	2007	Canada	Not specified	Navid Dehghani, Jeffrey P. Ludemann, Erik Skarsgard, Eddy Ng	Not specified	9	Not specified

NHS = National Health Service, ED = Emergency Department, ANGELS = Antenatal and Neonatal Guidelines, Education and Learning System, BC = British Columbia

Guideline Appraisal

The domain scores of guidelines according to the AGREE II instrument are highlighted in Table 3. The scores vary widely from a low of 0.00% to a high of 100.00%. Domain 1 (scope and purpose) and domain 4 (clarity and presentation) achieved the highest overall scores with scores of 49.87 ± 29.76 and 66.41 ± 13.33, respectively. Domain 5 (applicability) and domain 6 (editorial independence) achieved the lowest overall scores with scores of 10.80 ± 10.37 and 21.02 ± 36.73, respectively. Domain 6 (editorial Independence) had the highest variability among guidelines with a standard deviation of 36.73. Of the selected guidelines, only that of the Italian Societv of Pediatric Gastroenterology, Hepatology, and Nutrition (SIGENP) 2020 achieved an overall rating of high per previously described criteria. Two guidelines achieved an overall rating of average, while the remaining eight achieved an overall rating of low.

Table 3
Quality Appraisal of Included Clinical Practice Guidelines Using Scaled Domain Scores

Guideline	Domain 1 Scope and Purpose (%)	Domain 2 Stakeholder Involvement (%)	Domain 3 Rigor of Development (%)	Domain 4 Clarity of Presentation (%)	Domain 5 Applicability (%)	Domain 6 Editorial Independence (%)	Mean Overall Score	Overall Quality
The Trust Clinical Guideline for Swallowed Foreign Bodies in Children Under 16 Years Old	70.83	43.06	28.65	80.56	28.13	0.00	41.87	Low
The Royal Children's Hospital Melbourne	16.67	0.00	8.85	68.06	0.00	0.00	15.60	Low
Foreign Body and Caustic Ingestions in Children: A Clinical Practice Guideline	86.11	72.22	68.75	75.00	5.21	100.00	67.88	High
Foreign Body Aspiration and Foreign Body Ingestion in Children	65.28	37.50	17.71	51.39	31.25	0.00	33.86	Low
Ingested Foreign Body - Emergency Management in Children	68.06	54.17	13.54	47.22	9.38	0.00	32.06	Low
Ingestion of Foreign Bodies	1.39	0.00	5.21	45.83	0.00	0.00	8.74	Low
Pediatric Foreign Body Ingestion/Aspiration/Removal	18.06	5.56	9.90	65.28	6.25	2.08	17.86	Low
Management of Ingested Foreign Bodies in Children: A Clinical Report of the NASPGHAN Endoscopy Committee	79.17	54.17	43.23	87.50	12.50	62.50	56.51	Average
Management of Ingested Foreign Bodies and Food Impactions	44.44	44.44	60.42	69.44	5.21	66.67	48.44	Average
Update on Management of Caustic and Foreign Body Ingestion in Children	25.00	36.11	28.13	69.44	14.58	0.00	28.88	Low
BC Children's Hospital Emergency Room Clinical Practice Guidelines	73.61	30.56	13.54	70.83	6.25	0.00	32.47	Low
Mean ± SD	49.87 ± 29.76	34.34 ± 23.69	27.08 ± 21.62	66.41 ± 13.33	10.80 ± 10.37	21.02 ± 36.73		

NASPGHAN = North American Society for Pediatric Gastroenterology, Hepatology & Nutrition, BC = British Columbia

Intraclass reliability

The ICC for each quality domain of the AGREE II instrument can be found in Table 4. Every domain except domain 4 (clarity of presentation) achieved very good intraclass reliability per previously described criteria. Domain 4 (clarity of presentation) achieved an ICC of 0.603 and domain 5 (applicability) achieved an ICC of 0.826, while the remaining domains all achieved ICC > 0.90.

Table 4
Intraclass Correlation Coefficients for AGREE II Domains

AGREE II Domain	ICC (95% CI)
Domain 1: Scope and purpose	0.97 (0.93–0.99)
Domain 2: Stakeholder involvement	0.97 (0.91–0.99)
Domain 3: Rigor of development	0.95 (0.86–0.99)
Domain 4: Clarity of presentation	0.60 (0.09–0.87)
Domain 5: Applicability	0.83 (0.58–0.95)
Domain 6: Editorial independence	0.98 (0.95–0.99)

AGREE II = Appraisal of Guidelines for Research and Evaluation, ICC = intraclass correlation coefficient, CI = confidence interval

Discussion

Our analysis with the AGREE II appraisal instrument indicates that there are significant areas for improvement in CPGs produced for the diagnosis and management of pediatric foreign body aspiration and ingestion. Of the CPGs critically evaluated, only one was of high quality and two were of average quality. The remaining eight are lacking in developmental quality defined by the established standards of the AGREE II appraisal instrument.

Common Strengths

The CPGs scored highly in domain 4 (clarity of presentation), which assesses whether the recommendations are specific, easily identifiable, and present different options for management. The mean score of clarity of presentation was 66.41% (range 53.08–79.74%), achieving the highest overall rating among the six domains. Eight of the 11 guidelines (Norfolk and Norwich University Hospitals 2020, Royal Children's Hospital Melbourne 2020, SIGENP 2020, Arkansas Children's Hospital 2016, NASPGHAN 2015, ASGE 2011, SIGENP 2009, British Columbia's Children's Hospital 2007) met the quality threshold, suggesting that the large majority of CPG recommendations were unambiguous. Additionally, the CPGs scored well in domain 1 (scope and purpose), which aims to assess if the overall objective, health questions, and target population are clearly and specifically described. The mean score of scope and purpose was 49.87% (range 20.11–79.63%). Six out of 11 CPGs (Norfolk and Norwich University Hospitals 2020, SIGENP 2020, Whittington Health 2019, Children's Health Queensland Hospital and Health Service 2019, NASPGHAN 2015, British Columbia's Children's Hospital 2007) met the quality threshold of > 60%, suggesting that the majority of CPGs had clear objectives. The guideline SIGENP 2020 clearly stated the objective, highlighted important health questions, and described the target population and subsequently scored > 80% in the domain.

Common Weaknesses

Our analysis demonstrated that the CPGs performed poorly in the other four domains with only one CPG passing the quality threshold for domain 2 (stakeholder involvement), two CPGs passing the quality threshold for domain 3 (rigor of development), none passing the quality threshold for domain 5 (applicability), and two passing the quality threshold for domain 6 (editorial independence).

Foreign body aspiration and ingestion in children represents a challenging clinical scenario that requires a multidisciplinary approach to ensure patient safety. For example, the diagnosis and management require initial, careful evaluation from nurses, physician assistants, emergency room physicians quickly followed by endoscopic and medical expertise from pediatric gastroenterologists, otolaryngologists, and surgeons. Notably, several of the CPGs performed poorly in domain 2 (stakeholder involvement), which specifically investigates whether the CPG was developed by an appropriate, comprehensive group of relevant professionals and whether it accurately reflects the views of its target users. The CPGs failed to incorporate input from a diverse team of professionals, with only one CPG (SIGENP 2020) reaching the high quality threshold for including a group of expert specialties from relevant healthcare fields. Similarly, the low quality scores in domain 3 (rigor of development) suggest that these guidelines do not effectively and clearly articulate important steps such as the strategy used to search for evidence, inclusion/exclusion criteria, methods for formulating the recommendations, and external review by an expert panel.

Given the prevalence and potential life-threatening nature of foreign body aspiration or ingestion in children, domain 5 (applicability) is important to ensure that children receive the appropriate workup. Complicated and high acuity cases often require emergent management including radiographic, endoscopic, and surgical interventions, which all represent a significant cost to patients. Domain 5 (applicability) assesses important elements such as barriers and facilitators to implementation, strategies on how the recommendations can be put into practice, and the resource implications of applying recommendations. Unfortunately, this is the domain in which the CPGs performed the worst, with none of the guidelines achieving a high quality rating. Much of this stems from CPGs not accounting for minority populations, costs to patients, or barriers to care. Given the importance of translating recommendations into clinical practice, future guidelines should focus on providing advice on how the presented guidelines can be adequately utilized.

Lastly, it is important for CPGs to clearly report their funding body as well as for developers to report their financial relationships and conflicts of interest. Otherwise, it may be ambiguous if the recommendations presented are based on evidence or ulterior motives. Domain 6 (editorial independence) encompasses this idea, probing if each CPG addresses the competing interests of each author and whether the development of the recommendations was independent of the views of the funding body. As shown in Table 3, however, CPGs had the greatest variability in this domain. It can be assured that this spread of values is due to guideline-specific data rather than reviewer bias given that the ICC for domain 6 was calculated as 0.98 (Table 4)—the highest level of reviewer agreement seen across all domains. The CPG SIGENP 2020 scored the highest in this domain, receiving a 100% for clearly indicating there was no funding body, conflict of interest, or financial disclosures to report. Whereas seven of the 11 CPGs failed to completely report their conflicts of interest and

financial relationships and subsequently received a 0%. Omission of these important components can undermine the credibility and objectivity of the recommendations set forth. Therefore, future guidelines should address the competing interests of each guideline development group member, as well as explicitly state whether the views of the funding body influenced the content of the guideline.

Guideline Recommendations

During the appraisal process, the reviewers also synthesized recurring themes across the different CPGs. A summary of the key recommendations for the diagnosis and treatment of pediatric foreign body ingestion is presented in Table 5. These takeaways emphasize the importance of understanding the variability in presenting symptoms and assessing several different factors for timing considerations regarding endoscopic intervention.

Table 5
Key Recommendations from the Appraised Literature

	Key Takeaways
Symptoms of Foreign Body Aspiration or Ingestion	Drooling, gagging, food refusal, sensation of foreign body in throat/chest, vomiting, difficulty swallowing, abdominal pain, respiratory distress
Red Flag Symptoms	Drooling, dysphagia, cyanosis, chest pain, hematemesis, and respiratory symptoms such as choking, stridor, wheezing
Initial Assessment and Management of Known or Suspected Foreign Body	Inquire about exact time of ingestion and last meal, obtain details on the foreign body (size, nature, shape), ask about a twin object, collect information about preexisting diseases which may represent critical factors for the impact of the FB, obtain chest-abdomen X-rays, and reassure and cope with parental or guardian anxiety
Diagnostic Imaging Investigations	• Biplane radiographs are recommended in all patients with known or suspected foreign body ingestions, even in the absence of symptoms • Radiocontrast examination is suggested for radiolucent bodies • Radiological examinations should not delay an urgent endoscopy in any case
Endoscopic Treatment of Foreign Body	*Nonurgent Endoscopy* • Coins in esophagus may be observed for 12–24 hours before endoscopic removal in asymptomatic patients • Objects in stomach with diameter > 2.5 cm • Disk batteries and cylindrical batteries that are in the stomach of patients without signs of GI injury may be observed for as long as 48 hours—batteries remaining in the stomach > 48 hours should be removed *Urgent Endoscopy* • Esophageal foreign objects that are not sharp pointed • Esophageal food impaction in patients without complete obstruction • Sharp-pointed objects in stomach or duodenum • Objects > 6 cm in length at or above proximal duodenum • Disk batteries in asymptomatic patients and/or magnets within endoscopic reach *Emergent Endoscopy* • Patients with esophageal obstruction (i.e. unable to manage secretions) • Disk batteries in esophagus • Disk batteries in stomach or duodenum causing symptoms • Blunt foreign bodies in duodenum causing symptoms • Sharp-pointed objects

Study Limitations

This study has several limitations. The AGREE II instrument is a reliable tool designed to help assess the methodological quality of guidelines, but there is a degree of subjectivity and variability associated with using the tool. Specifically, the AGREE II tool requires reviewers to make subjective interpretations; therefore, variations in scores are inherently subject to bias and should be cautiously interpreted. The AGREE II tool also assigns equal weight to all six quality domains despite differences in relative importance. Domain 3 (rigor of development) focuses on the systematic process used to search for evidence, as well as the methodology used to develop and update the recommendations. It is considered one of the most important and strongest indicators of quality yet is weighed equally with all other domains, introducing mathematical discordance to scaled domain score calculations [23]. Additionally, although several CPGs may be evaluated as average or low quality with this type of analysis, it is important to note that they may still offer value and clinical relevance. The AGREE II instrument only assess for methodological rigor—not the validity of each recommendation made by CPGs. Finally, it is possible that some applicable guidelines were missed in the literature search (i.e. the excluded non-English CPGs) despite using systematic search strategies, introducing an element of publication bias.

Conclusion

CPGs based on systematic review of evidence can optimize patient care and provide recommendations for clinical use. Based on the AGREE II instrument, the methodologic rigor and quality of current guidelines and consensus statements for detection and management of pediatric foreign body aspiration and ingestion need to be improved. Only one CPG was evaluated as high quality, and the rest were average or low quality. This analysis demonstrated that areas for improvement include rigor of development as well as applicability and editorial independence.

Declarations

Funding: No funding was received for conducting this study.
Competing interests: The authors have no competing interests to declare.

Acknowledgements: None

Author Contributions:

Anza Rizvi (AR): Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Project Administration

Fatima Rizvi (FR): Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Project Administration

Kevin Chorath (KC): Methodology, Investigation, Data Curation, Writing - Review & Editing

Neeraj Suresh (NS): Methodology, Investigation, Data Curation, Writing - Review & Editing

Emma De Ravin (EDR): Methodology, Investigation, Data Curation, Writing - Review & Editing

Dominic Romeo (DR): Methodology, Investigation, Data Curation, Writing - Review & Editing

Deepak Lakshmipathy (DL): Conceptualization, Validation, Writing - Review & Editing

Louis-Xavier Barrette (LXB): Conceptualization, Validation, Writing - Review & Editing

Karthik Rajasekaran (KR): Conceptualization, Validation, Writing - Review & Editing, Supervision

References

1. Pugmire BS et al “Review of Ingested and Aspirated Foreign Bodies in Children and Their Clinical Significance for Radiologists.” *Radiographics: a review publication of the Radiological Society of North America, Inc* vol. 35,5 (2015): 1528-38. 10.1148/rg.2015140287
2. Orsagh-Yentis D et al “Foreign-Body Ingestions of Young Children Treated in US Emergency Departments: 1995–2015.” *Pediatrics* vol. 143,5 (2019): e20181988. 10.1542/peds.2018-1988
3. Seo JK (1999) “Endoscopic management of gastrointestinal foreign bodies in children.” *Indian journal of pediatrics* vol. 66,1 Suppl : S75-80
4. Shivakumar AM et al (2004) Foreign body in upper digestive tract. Indian J Pediatr vol 71:689–693. 10.1007/BF02730655
5. Romano L et al (1994) “Su un insolito caso di ascesso epatico guarito con procedure radio-endoscopiche” [An unusual case of a liver abscess cured by radiological endoscopic procedures]. *La Radiologia medica* vol. 87,6 : 893-5
6. Conners GP, Mohseni M “Pediatric Foreign Body Ingestion.” *StatPearls*, StatPearls Publishing, 18 July 2021
7. Grassi R et al (2015) “Application of imaging guidelines in patients with foreign body ingestion or inhalation: literature review.” *Seminars in ultrasound, CT, and MR* vol. 36,1 : 48–56. 10.1053/j.sult.2014.10.004
8. Hayes M et al (2011) “Cracking the case of foreign body aspiration.” *Journal of bronchology & interventional pulmonology* vol. 18,3 : 290-1. 10.1097/LBR.0b013e3182238374
9. Reilly J et al (1997) Pediatric Aerodigestive Foreign Body Injuries are Complications Related to Timeliness of Diagnosis. Laryngoscope 107(1):17–20
10. Yadav SP et al (2007) Airway foreign bodies in children: experience of 132 cases. Singap Med J vol 48(9):850–853
11. Lee JH (2018) Foreign Body Ingestion in Children. Clin endoscopy vol 51(2):129–136. 10.5946/ce.2018.039
12. Ikenberry SO, Jue TL, Anderson MA, Appalaneni V, Banerjee S, Ben-Menachem T, Decker GA, Fanelli RD, Fisher LR, Fukami N et al (2011) Management of ingested foreign bodies and food impactions. Gastrointest Endosc 73:1085–1091
13. Grol R (2001) “Successes and failures in the implementation of evidence-based guidelines for clinical practice.” *Medical care* vol. 39,8 Suppl 2 : II46-54. 10.1097/00005650-200108002-00003
14. Davis DA, Taylor-Vaisey A (1997) Translating guidelines into practice. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. CMAJ: Can Med Association journal = journal de l'Association medicale canadienne vol 157(4):408–416
15. Grimshaw J et al (2004) “Implementing clinical guidelines: current evidence and future implications.” *The Journal of continuing education in the health professions* vol. 24 Suppl 1 : S31-7. 10.1002/chp.1340240506
16. The AGREE Next Steps Consortium (2009) https://doi.org/10.1503/cmaj.090449. Published online.

17. Vlayen J, Aertgeerts B, Hannes K, Sermeus W, Ramakers D (2005) A systematic review of appraisal tools for clinical practice guidelines: multiple similarities and one common deficit. Int J Qual Health Care 17(3):235–242. https://doi.org/10.1093/intqhc/mzi027
18. Shawyer AC, Livingston MH, Manja V et al (2015) The quality of guidelines in pediatric surgery: can we all AGREE? Pediatr Surg Int 31:61–68. https://doi.org/10.1007/s00383-014-3623-6
19. Gong YY, Lv JJ, Yang T et al (2022) Systematic appraisal of the guidelines for the diagnosis and treatment of Hirschsprung's disease. Pediatr Surg Int 38:1197–1208. https://doi.org/10.1007/s00383-022-05151-w
20. Harris J, Chorath K, Balar E, Xu K, Naik A, Moreira A, Rajasekaran K (2022) Clinical Practice Guidelines on Pediatric Gastroesophageal Reflux Disease: A Systematic Quality Appraisal of International Guidelines. Pediatr Gastroenterol Hepatol Nutr 25(2):109–120 Epub 2022 Mar 10. PMID: 35360381; PMCID: PMC8958056
21. The AGREE Next Steps Consortium (2009) Appraisal of guidelines for research & evaluation II. The Agree Research Trust, Ontario, CA
22. Romeo V, Stanzione A, Cocozza S, Ugga L, Cuocolo R, Brunetti A, Bisdas S (2019) A critical appraisal of the quality of head and neck cancer imaging guidelines using the AGREE II tool: a EuroAIM initiative. Cancer Med 8(1):209–215
23. Hoffmann-Eßer W et al (2017) "Guideline appraisal with AGREE II: Systematic review of the current evidence on how users handle the 2 overall assessments." *PloS one* vol. 12,3 e0174831. 30 10.1371/journal.pone.0174831

Figures

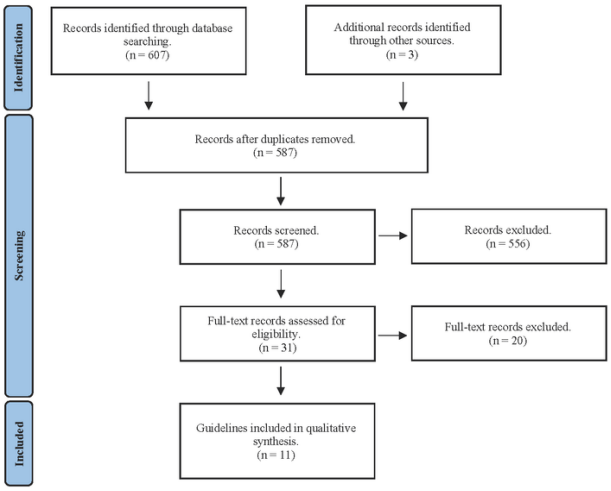

Figure 1

Flowchart of systematic search strategy following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocols