

Pre-hospital Use of Abdominal Thrusts to Treat FBAO

Paramedic Mini CAT – Fanshawe College

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Clinical Scenario:

Paramedics arrive on scene to a 45-year-old male who has aspirated on a foreign object and is visibly struggling to breathe. The patient is unable to successfully clear his own airway resulting in a complete airway obstruction and becomes unable to breathe. Paramedics decide a combination of abdominal thrusts and back blows are appropriate to clear the foreign body airway obstruction (FBAO).

Background:

Choking is an emergency and can quickly result in death if not treated immediately. A lack of oxygen caused by choking can result in hypoxia. If the airway is completely obstructed and not treated immediately it can result in cardiac arrest, brain damage or death.

Current practice as per the current *Heart and Stroke Foundation of Canada Guidelines* is 5 back blows, 5 chest thrusts in children <1 year old until airway is clear of patient becomes unresponsive and 5 back blows and 5 abdominal thrusts or oropharyngeal/nasopharyngeal suction in adults, until airway is cleared, or patient becomes unresponsive (BLS PCS, 2021.).

However, the effectiveness of these interventions to clear foreign body airway obstructions it is underexamined with largely retrospective, anecdotal, weak, or outdated evidence.

Review question:

Patient/Problem – Foreign body obstruction, pre- and post-arrest. In adults and children.

Intervention – Effectiveness of abdominal thrust maneuvers to clear the airway.

Comparison/control – Currently accepted interventions: abdominal thrusts, back blows, chest thrusts, laryngoscopy, and Magill forceps, cricothyrotomy, oxygen.

Outcome – Measure the effectiveness of interventions in the pre-hospital setting.

Search strategy (Basic): PubMed and CINAHL.

Choking OR foreign body OR foreign-body airway obstruction OR FBAO OR foreign body airway obstruction OR airway obstruction
OR foreign body airway

AND

Abdominal thrust maneuver OR abdominal thrust OR Heimlich OR Heimlich maneuver

AND

Effectiveness

AND

For PubMed: ((y_10[Filter]) AND (english[Filter]))

For CINAHL: 20110101-20201231; Peer Reviewed; Research Article

Modes – Boolean operators

Limits:

Limited to English literature, published within the last 10 years.

Search results:

PubMed – 44

CINAHL – 50

Included for review:

Table 1. Critical Appraisal of Included Papers

Title, author, year	Study design & LOE	Population	Intervention	Outcomes	Results	Weaknesses & Strengths
<p><i>“Choking on a foreign body: A physiological study of the effectiveness of abdominal thrust manoeuvres to increase thoracic pressure.”</i></p> <p>M. Pavitt, L., et al. (2017)</p>	<p>Quantitative study – Controlled trial.</p>	<p>4 adult male researchers ages (46-74) and body mass index (BMI) (25-26 kg/m²).</p>	<p>Circumferential ‘horizontal’ abdominal thrust (A).</p> <p>Heimlich manoeuvre (B).</p> <p>Auto ‘upthrust’ abdominal thrust (C).</p> <p>Chair thrust (D).</p> <p>Volitional maximal cough and sniff pressures (E).</p> <p>All performed at functional reserve capacity with airways closed.</p>	<p>Oesophageal (Poes) and gastric (Pgas) balloon catheters used to record pressures generated by maneuvers.</p>	<p>Peak oesophageal pressure (Poes):</p> <p>A: 53 (±11) B: 57 (±17) C: 74 (±29) D: 115 (±27) E: 189 (±33)</p> <p>Peak gastric pressure (Pgas):</p> <p>A: 115 (±19) B: 112 (±18.5) C: 100 (±52) D: 238 (±34) E: 207 (±29)</p> <p>Values are cmH₂O and Median (±SD)</p>	<p>Strengths:</p> <p>Presents simple, effective alternatives to Heimlich maneuver in humans.</p> <p>Weaknesses:</p> <p>All subjects were healthy, non-obese, male, and middle aged. In addition, the sample size was only 4. Therefore, data may not be representative of larger populations or varying physical characteristics (i.e. obesity).</p> <p>The study only examined outcomes of thoracic pressure without a FBAO.</p>

<p><i>Influence of body position during Heimlich maneuver to relieve supralaryngeal obstruction: a manikin study.</i></p> <p>M. Ichikawa, S. et al. (2017).</p>	<p>Quantitative study – Controlled trial using choking simulation manikins.</p>	<p>Participants: 5 emergency physicians with Immediate Cardiac Life Support certification.</p> <p>Subjects: Laryngeal models of adult or children with choking simulation manikins.</p>	<p>5 successive compressions were carried out (6 times) each in standing, prone, and supine positions.</p> <p>For children, added a supine position with a pillow under the back.</p>	<p>Expiratory volume (EV) of manikin produced with and without a FBAO (konjac jelly).</p> <p>Opened cases after 5 compressions (FBAO removed). Vs.</p> <p>Unopened cases after 5 compressions (FBAO not removed)</p>	<p>EV without FBAO: Standing (0.66 ± 0.04 L), Supine - (1.15 ± 0.10 L), and Prone – (0.82 ± 0.09 L). (P<0.001).</p> <p>Adult: Opened cases: supine (97%), prone (80%), Unopened cases: standing (100%) (all <i>P</i> < 0.001)</p> <p>Child: Opened cases: supine (63%), prone (93%), supine with pillow (77%) Unopened cases: standing (100%)</p>	<p>Strengths:</p> <p>Examines possible effectiveness of Heimlich maneuver in different positions in both children and adults.</p> <p>Weaknesses:</p> <p>Study conducted on manikins, with different physiological structure to humans. Therefore, difficult to determine adverse health outcomes.</p> <p>Maneuvers preformed by trained physicians may not be representative of other populations (i.e., layperson or EMT).</p> <p>Konjac jelly used as FBAO may not represent all types of obstructions in larynx.</p>
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<p><i>Prehospital removal improves neurological outcomes in elderly patient with foreign body airway obstruction.</i></p> <p>Y. Igarashi, S., et al. (2017).</p>	<p>Retrospective observational study at Nippon Medical School Hospital between 2008-2014.</p>	<p>155 patients (79 men and 76 women) with FBAO included based on medical records.</p>	<p>Determine the factors that influence prognosis of FBAO.</p>	<p>Patient outcomes: based on cerebral performance categories.</p> <p>CPC 1 (good recovery) or 2 (moderate disability), 3 (severe disability), 4 (vegetative state), or 5 (death).</p> <p>A P value of < 0.05 was considered statistically significant.</p>	<p>19 patients treated by bystanders on scene. 22 patients treated by EMT's on scene. 114 patients were transferred to hospital.</p> <p>CPC 1 (14.2%) CPC 2 (6.5%) CPC 3 (7.7%) CPC 4 (14.8%) CPC 5 (56.8%)</p> <p>Successfully removed by Heimlich maneuver = 10.</p> <p>Favorable outcome noted in patients with witness on scene (68.8% vs. 44.7%, P = 0.0154) and those treated on scene.</p>	<p>Strengths: Good inclusion and exclusion criteria to find human patients diagnosed with FBAO.</p> <p>Able to analyze specific patient outcomes based on medical records.</p> <p>Weaknesses: Data is from a single medical institution in Japan and may not represent all patients with FBAO. Data does not include patients who were successfully treated for FBAO and did not activate emergency services.</p> <p>Data is almost exclusively from elderly patients and may not be representative of FBAO in pediatric patients.</p>
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						No data available on the exact time of FBAO or treatment.
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Comments:

After removing duplicates and irrelevant research papers only 3 were maintained for use in this review. These included evidence for/against the use of abdominal thrusts. Several review papers were also papers excluded to ensure the use of modern primary research studies. Overall, based on my database searches there is a significant lack of modern research within this field of study, making finding research papers with strong or even moderate evidence difficult.

Considerations:

Despite current *Heart and Stroke Foundation of Canada Guidelines* practices in Ontario to clear FBAO the studies reviewed here provide minimal evidence to support best practice and suggest that alterations to positioning may improve the effectiveness of clearance maneuvers. There is evidence to support the use of abdominal thrusts, and other maneuvers to clear FBAO. However, this evidence is largely outdated.

Additionally, Japan has a rising incidence of FBAO resulting in death (Igarashi, Y, et. Al. 2017.) which appears to have prompted researchers to more recently focused on evaluating the effectiveness of maneuvers to clear airway obstructions. As a result, when looking for recent evidence (within the past 10 years) of the effectiveness of maneuvers it is difficult to find studies of different geographical origins. This can be considered a limitation of my review as varying population demographics between Japan may not represent those of populations in North America.

Clinical bottom line:

The consensus between reviews is early prehospital intervention by bystander or medical personnel. Airways obstructions that are cleared faster will have less adverse outcomes and higher rates of survival. As a result, I would not change current practice based on the evidence above. However, this area does require more research to determine the exact effectiveness of abdominal thrust maneuvers and how altering those maneuvers (i.e., position changes) may improve their effectiveness. It also highlights the importance of individuals to attempt self administered maneuvers when an unwitnessed incident occurs.

References:

- Ichikawa, M., Oishi, S., Mochizuki, K., Nitta, K., Okamoto, K., & Imamura, H. (2017). Influence of body position during Heimlich maneuver to relieve supralaryngeal obstruction: a manikin study. *Acute Medicine & Surgery*, 4(4), 418–425.
<https://doi.org/10.1002/ams2.297>
- Igarashi, Y., Yokobori, S., Yoshino, Y., Masuno, T., Miyauchi, M., & Yokota, H. (2017). Prehospital removal improves neurological outcomes in elderly patient with foreign body airway obstruction. *American Journal of Emergency Medicine*, 35(10), 1396–1399.
<https://doi.org/10.1016/j.ajem.2017.04.016>
- Ministry of Health. (2021). *Basic Life Support Patient Care Standards v 3.3* (Issue January).
http://www.lhsc.on.ca/About_Us/Base_Hospital_Program/Medical_Directives/AdvancedLifeSupportPatientCareStandardsVersion3.3.pdf%5Cnpapers3://publication/uuid/F3CB3BBC-CC52-497F-BB35-9BBD54773BCA
- Pavitt, M. J., Swanton, L. L., Hind, M., Apps, M., Polkey, M. I., Green, M., & Hopkinson, N. S. (2017). Choking on a foreign body: A physiological study of the effectiveness of abdominal thrust manoeuvres to increase thoracic pressure. *Thorax*, 72(6), 576–578.
<https://doi.org/10.1136/thoraxjnl-2016-209540>

Appendix:

#	Query	Limiters/Expanders	Last Run Via	Results
S69	TI foreign body airway obstruction OR TI FBAO OR TI Choking OR TI foreign body airway OR TI airway obstruction AND TI abdominal thrust OR TI abdominal thrust maneuver OR TI heimlich OR TI heimlich maneuver AND TI (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; Peer Reviewed; Research Article Narrow by Language: - english Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	49
S68	TI foreign body airway obstruction OR TI FBAO OR TI Choking OR TI foreign body airway OR TI airway obstruction AND TI abdominal thrust OR TI abdominal thrust maneuver OR TI heimlich OR TI heimlich maneuver AND TI (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; Peer Reviewed; Research Article Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	50
S67	TI foreign body airway obstruction OR TI FBAO OR TI Choking OR TI foreign body airway OR TI airway obstruction AND TI abdominal thrust OR TI abdominal thrust maneuver OR TI heimlich OR TI heimlich maneuver AND TI (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; English Language; Peer Reviewed Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	169
S66	TI foreign body airway obstruction OR TI FBAO OR TI Choking OR TI foreign body airway OR TI airway obstruction AND TI abdominal thrust OR TI abdominal thrust maneuver OR TI heimlich OR TI heimlich maneuver AND TI (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; Peer Reviewed Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	172
S65	foreign body airway obstruction OR FBAO OR Choking OR foreign body airway OR airway obstruction AND abdominal thrust OR abdominal thrust maneuver OR heimlich OR TI heimlich maneuver AND (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; Peer Reviewed Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	620
S64	foreign body airway obstruction OR FBAO OR Choking OR foreign body airway OR airway obstruction AND abdominal thrust OR abdominal thrust maneuver OR heimlich OR MH heimlich maneuver AND (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; Peer Reviewed Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	620
S63	foreign body airway obstruction OR FBAO OR Choking OR foreign body airway OR airway obstruction AND abdominal thrust OR abdominal thrust maneuver OR heimlich OR MW heimlich maneuver AND (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; Peer Reviewed Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	620
S62	foreign body airway obstruction OR FBAO OR Choking OR foreign body airway OR airway obstruction AND abdominal thrust OR abdominal thrust maneuver OR heimlich OR SU heimlich maneuver AND (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; Peer Reviewed Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	620
S61	foreign body airway obstruction OR FBAO OR Choking OR foreign body airway OR airway obstruction AND abdominal thrust OR abdominal thrust maneuver OR heimlich OR heimlich maneuver AND (effectiveness or efficacy or effective or success or outcome)	Limiters - Published Date: 20110101-20211231; Peer Reviewed Narrow by Language: - english Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	598
S60	foreign body airway obstruction OR FBAO OR Choking OR foreign body airway OR airway obstruction AND abdominal thrust OR abdominal thrust maneuver OR heimlich OR heimlich maneuver AND (effectiveness or	Limiters - Published Date: 20110101-20211231; Peer Reviewed Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	620

Figure 1. CINAHL Search

History and Search Details					Download	Delete
Search	Actions	Details	Query	Results	Time	
#2	...	▼	<p>Search: (((((((((((((choking) OR (foreign body)) OR (foreign-body airway obstruction)) OR (FBAO)) OR (foreign body airway obstruction)) OR (airway obstruction)) OR (foreign body airway)) AND (abdominal thrust maneuver)) OR (abdominal thrust)) OR (Heimlich)) OR (Heimlich maneuver) AND ((y_10[Filter]) AND (english[Filter]))) AND (effectiveness)) AND ((y_10[Filter]) AND (english[Filter])) Filters: in the last 10 years, English</p> <p>((("airway obstruction"[MeSH Terms] OR ("airway"[All Fields] AND "obstruction"[All Fields]) OR "airway obstruction"[All Fields] OR "choked"[All Fields] OR "choking"[All Fields] OR ("foreign bodies"[MeSH Terms] OR ("foreign"[All Fields] AND "bodies"[All Fields]) OR "foreign bodies"[All Fields] OR ("foreign"[All Fields] AND "body"[All Fields]) OR "foreign body"[All Fields]) OR ("foreign bodies"[MeSH Terms] OR ("foreign"[All Fields] AND "bodies"[All Fields]) OR "foreign bodies"[All Fields] OR ("foreign"[All Fields] AND "body"[All Fields]) OR "foreign body"[All Fields]) AND ("airway obstruction"[MeSH Terms] OR ("airway"[All Fields] AND "obstruction"[All Fields]) OR "airway obstruction"[All Fields])) OR "FBAO"[All Fields] OR (("foreign bodies"[MeSH Terms] OR ("foreign"[All Fields] AND "bodies"[All Fields]) OR "foreign bodies"[All Fields] OR ("foreign"[All Fields] AND "body"[All Fields]) OR "foreign body"[All Fields]) AND ("airway obstruction"[MeSH Terms] OR ("airway"[All Fields] AND "obstruction"[All Fields]) OR "airway obstruction"[All Fields])) OR ("airway obstruction"[MeSH Terms] OR ("airway"[All Fields] AND "obstruction"[All Fields]) OR "airway obstruction"[All Fields]) OR ("airway obstruction"[MeSH Terms] OR ("airway"[All Fields] AND "obstruction"[All Fields]) OR "airway obstruction"[All Fields]) OR ("foreign bodies"[MeSH Terms] OR ("foreign"[All Fields] AND "bodies"[All Fields]) OR "foreign bodies"[All Fields] OR ("foreign"[All Fields] AND "body"[All Fields]) OR "foreign body"[All Fields]) AND ("airway s"[All Fields] OR "airways"[All Fields])))) AND (("heimlich maneuver"[MeSH Terms] OR ("heimlich"[All Fields] AND "maneuver"[All Fields]) OR "heimlich maneuver"[All Fields] OR ("abdominal"[All Fields] AND "thrust"[All Fields]) OR "abdominal thrust"[All Fields]) AND ("maneuver"[All Fields] OR "maneuvered"[All Fields] OR "maneuvering"[All Fields] OR "maneuverings"[All Fields] OR "maneuvers"[All Fields] OR "manoeuvrability"[All Fields] OR "manoeuvrable"[All Fields] OR "manoeuvre"[All Fields] OR "manoeuvred"[All Fields] OR "manoeuvres"[All Fields] OR "manoeuvring"[All Fields])) OR ("heimlich maneuver"[MeSH Terms] OR ("heimlich"[All Fields] AND "maneuver"[All Fields]) OR "heimlich maneuver"[All Fields] OR ("abdominal"[All Fields] AND "thrust"[All Fields]) OR "abdominal thrust"[All Fields]) OR ("heimlich"[All Fields] OR "heimlich s"[All Fields]) OR ("heimlich maneuver"[MeSH Terms] OR ("heimlich"[All Fields] AND "maneuver"[All Fields]) OR "heimlich maneuver"[All Fields])) AND ("2011/02/26 00:00":"3000/01/01 05:00"[Date - Publication] AND "english"[Language]) AND ("effect"[All Fields] OR "effecting"[All Fields] OR "effective"[All Fields] OR "effectively"[All Fields] OR "effectiveness"[All Fields] OR "effectivenesses"[All Fields] OR "effectives"[All Fields] OR "effectivities"[All Fields] OR "effectivity"[All Fields] OR "effects"[All Fields]) AND ("2011/02/26 00:00":"3000/01/01 05:00"[Date - Publication] AND "english"[Language])) AND ((y_10[Filter]) AND (english[Filter]))</p> <p>Translations</p>	44	11:16:42	