Ingested foreign body - Emergency management in children

Purpose

This document provides clinical guidance for all staff involved in the care and management of a child presenting to an Emergency Department (ED) in Queensland with a suspected or confirmed ingested foreign body.

This guideline has been developed by senior ED clinicians and Paediatricians across Queensland, with input from ENT, Surgery and Gastroenterology, Queensland Children's Hospital, Brisbane. It has been endorsed for use across Queensland by the Queensland Emergency Care of Children Working Group in partnership with the Queensland Emergency Department Strategic Advisory Panel and the Healthcare Improvement Unit, Clinical Excellence Queensland.

Key points

- Oesophageal button batteries require removal within **two hours** of ingestion to avoid serious complications including death.
- Seek the most senior assistance available onsite to manage airway as needed (such as critical care/ENT/anaesthetics).
- Seek urgent paediatric surgical advice (onsite or via Retrieval Services Queensland (RSQ)) for a child with suspected gastrointestinal obstruction or perforation.
- Seek urgent ENT advice (onsite or via RSQ) for a child with a history of foreign body ingestion and inspiratory stridor, cough, wheeze or inability to swallow secretions.
- While approximately 80% of ingested foreign bodies that reach the gastrointestinal tract pass spontaneously, those that become impacted can cause significant harm and even death.

Introduction

Ingested foreign bodies are more common in the following children:

- aged six months to three years
- pica
- intellectual impairment
- with older siblings

Commonly ingested objects include coins, small toys and household objects. Older children and adolescents with psychiatric problems may intentionally ingest non-food items.

While most foreign bodies (80%) that reach the gastrointestinal tract (GI) pass spontaneously, those that become impacted are at risk of causing significant harm and even death. An estimated 10-20% of objects require endoscopic removal with less than 1% needing further surgical intervention.
Objects may lodge in areas of physiological narrowing in the oesophagus including the upper and lower oesophageal sphincter and level of aortic arch.\(^3\) Impaction in other areas of the oesophagus may indicate underlying pathology.

Complications of ingested foreign bodies include:
- complete or partial oesophageal obstruction in immediate phase
- oesophageal perforation from sharp foreign bodies which may present with neck swelling, crepitus +/- pneumomediastinum
- erosion of surrounding structures leading to tracheo-oesophageal or aorto-oesophageal fistula which can be fatal
- strictures
- weight loss due to feeding difficulties or recurrent aspiration in delayed diagnosis
- intestinal obstruction or injury if object lodges more distally (rare)

**Button batteries**

The incidence of button battery ingestions resulting in significant morbidity or death is increasing. The majority of ingestions occur in children aged from one to five years but have also occurred in younger children (possibly fed batteries by siblings) and older children.

For the majority of cases with severe outcomes, diagnosis was delayed as the event was unwitnessed and the clinical presentation was non-specific.

Be vigilant for the risk of button battery ingestion in a child presenting to ED. A denial of ingestion in a child of any age cannot exclude it.

There are two main mechanisms by which button batteries can cause necrosis:
- where there is sufficient retained battery charge, hydrolysis and creation of hydroxide ions in adjacent tissues leads to mucosal burn at battery’s negative pole
- direct pressure

Oesophageal perforation has been reported within **two hours** of ingestion. Further erosion of structures can result in fistulae (tracheo-oesophageal / into adjacent vessels). Aorto-oesophageal fistulae can be fatal. Despite prompt removal, the risk of injury can continue up to weeks post-ingestion due to residual alkali and weakened tissues.\(^4\)

Damage is proportionate to charge. Spent batteries greater than 15mm diameter may still have sufficient residual charge to cause injury.
Magnets
Magnets pose a risk if ingested in multiples or with other ferrous objects (including batteries) as they may attract across layers of bowel leading to pressure necrosis, fistula development, volvulus, perforation, infection or obstruction. Ulceration and indentation of the mucosa may occur within eight hours.

Superabsorbent polymers (expandable foreign bodies)
Toys and beads composed of superabsorbent polymers (original size 1mm-1cm) are designed to expand when placed in water so can expand following ingestion when contact is made with gastrointestinal fluids introducing the risk of pyloric or more distal obstruction.

Food bolus impaction
Oesophageal soft food bolus impaction is rare in children and more frequent in children with eosinophilic oesophagitis or prior oesophageal surgery such as tracheo-oesophageal fistula repair.

Assessment
Conduct an initial assessment of airway, breathing and circulation as per APLS guidelines and undertake appropriate action.

**ALERT** – Button batteries and paired magnets require immediate removal to prevent necrosis of surrounding tissue. Can be fatal if not managed urgently.

When to suspect an ingested foreign body
Most children with an ingested foreign body are asymptomatic. A history of ingestion may be reported by the child or the caregiver. Where the history of the foreign body ingestion is unknown, children may present with non-specific symptoms rather than with a history of an ingested foreign body. This makes diagnosis difficult.

Ingested foreign body must be considered in children presenting with the following symptoms regardless of history of ingestion:5,3,2

- drooling / pooling secretions
- odynophagia / dysphagia
- food refusal / poor feeding
- retrosternal pain / grunting (may be due to chest pain in preverbal child)
- coughing / choking
- cyanotic episode
- stridor / wheezing
- vomiting or regurgitation
- unexplained gastrointestinal bleeding

Consider the possibility of foreign body ingestion in a pre-verbal child with sudden onset of symptoms.

All children with suspected foreign body ingestion should be kept nil by mouth until fully assessed.
History

Initial questioning should identify the risk of button battery or multiple magnet ingestion to enable early referral.

Questioning should include the following:

- time of ingestion – crucial for button battery or multiple magnet ingestion
- specific details on the ingested foreign body including:
  - size – objects greater than 2cm are unlikely to pass through the pylorus or ileocaecal valve, objects greater than 6cm often become impacted in the ileocaecal region
  - nature and shape – sharp objects carry risk of perforation; superabsorbent polymers pose risk of obstruction
  - likelihood of being radio-opaque – consult local medical imaging department if unsure

In the event of a missing button battery, consider the potential for ingestion by a sibling/other child.

Examination

Conduct a systematic physical examination and cardio-respiratory monitoring with an initial focus on airway and breathing. All children at risk following a missing button battery incident should be assessed.

Abdominal examination should focus on signs of obstruction or perforation.

A child with a sharp object lodged in the tonsil usually presents with odynophagia, focal pain and may drool.

A child who has ingested a foreign body containing lead may experience acute toxicity (presents as vomiting and lethargy) within 90 minutes.

Urgent referral to ENT (onsite or via Retrieval Services Queensland (RSQ)) is required for children with a history of:

- button battery ingestion
- foreign body ingestion and inspiratory stridor, cough or wheeze or inability to swallow secretions

Urgent referral to Paediatric Surgery (onsite or via RSQ) is required for child with suspected GI perforation or obstruction.

Investigations

Contact RSQ to arrange urgent transfer of child with suspected button battery ingestion if no X-ray facilities onsite.

Button batteries

- Plain neck, chest and abdominal films are recommended to localise the button battery.
- When more than one child is involved in a missing button battery incident, X-rays should begin with one child and continue until the button battery is identified or can be excluded in all children.
- Review imaging for signs of perforation or obstruction.
- The presence of double rim or halo effect on a battery on an AP X-ray may differentiate it from a coin. Treat as a button battery if unsure as appearance can be subtle and affected by windowing.
• Lateral films may be required on specialist advice. On a lateral film, the step off is on the negative side of the battery (as the negative pole has a slightly smaller diameter). Damage is more severe in the tissue adjacent to negative pole (think 3Ns: negative-narrow-necrotic).
• Contrast studies are not recommended prior to removal due to the risk of aspiration with oesophageal obstruction and potential to obscure visualisation on subsequent endoscopy.
• X-rays should NOT be repeated prior to theatre in acute oesophageal button battery presentations. The child will undergo exploratory endoscopy regardless of subsequent passage.
• CT imaging prior to theatre may be required on specialist advice to detect the risk of a catastrophic bleed in a child who presents more than 24 hours post-ingestion.

Other foreign bodies

Cases not requiring imaging
Consider **not** proceeding with X-rays for children who meet **ALL** of the following criteria:

- asymptomatic
- normal clinical examination
- no known gastrointestinal abnormalities
- certain history of ingesting an object that is **ALL** of the following:
  - less than 2cm in diameter and less than 6cm in length
  - not sharp or pointed
  - not a magnet or battery
  - non-expandable
  - non-toxic (examples of toxic objects include lead-containing objects, mothballs, cockroach traps)
- reassuring period of observation
- able to eat and drink

For all other children, plain neck, chest and abdominal films are the recommended first-line investigation to localise radiopaque foreign body or bodies. Review imaging for signs of perforation or obstruction. Indirect evidence of ingestion such as an air-fluid level in the oesophagus may be present in a child who has ingested a non-radiopaque object.

In addition, lateral X-rays are recommended in a child with a history of magnet ingestion to differentiate single from multiple magnets which may overlap on a single view. They may be required for other children on specialist advice.

Contrast studies are not recommended prior to removal due to the risk of aspiration with oesophageal obstruction and potential to obscure visualisation on subsequent endoscopy.

Serum lead levels are recommended if acute lead toxicity is suspected (lethargy and vomiting).

Seek advice from Poisons Helpline (Ph: 13 11 26) if:
- acute lead toxicity is suspected
- unsure of toxicity of object
Management of suspected button battery ingestions

Refer to Appendix 1 for a summary of the emergency management for children presenting with suspected button battery ingestions.

ALERT – Oesophageal button batteries require removal within two hours of ingestion to avoid serious complications including death. Transfer immediately to theatre. Do not delay for fasting.

Evaluate and manage airway compromise in accordance with APLS guidelines.²

- Urgently seek the most senior assistance available onsite (such as critical care/ENT/anaesthetics) to manage airway as needed
- Seek urgent paediatric surgical advice (onsite or via RSQ) for a child with suspected GI perforation or obstruction

Management is directed by the location of the ingested battery.

### Management of child following button battery ingestion

<table>
<thead>
<tr>
<th>Time-critical endoscopy</th>
<th>Emergency endoscopy</th>
<th>Expectant management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Button battery in oesophagus</td>
<td>Button batteries in stomach in symptomatic patients</td>
<td>Batteries in stomach or beyond without signs of gastrointestinal injury up to four days post-ingestion (at which point failure to advance on serial imaging should prompt endoscopic / surgical removal).</td>
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</tbody>
</table>

- Seek urgent ENT advice (onsite or via RSQ) for child with oesophageal button battery
- Seek prompt paediatric gastroenterology advice (onsite or via Children’s Advice and Transport Coordination Hub (CATCH)) for a child with button battery in stomach or below

Honey is recommended for children over one year of age with an oesophageal button battery who present within 12 hours of ingestion to reduce the risk of caustic damage whilst awaiting theatre.

### Honey post button battery ingestion for children over 1 year of age

| Dose | 10mL every 10 minutes to maximum 6 doses. Child should otherwise be nil by mouth. Do NOT delay transfer to theatres for administration of honey. |

### Deliberate ingestions

- Refer to mental health team after removal as per local practice in deliberate ingestions
Management of non-button battery ingestions

Refer to Appendix 1 for a summary of the emergency management for children presenting with suspected non-button battery ingestions.

**ALERT** – Button batteries can be fatal if not managed urgently. If unsure of the object ingested, manage as per button battery ingestion until proven otherwise. Refer to section on Management of Button Battery Ingestions.

Evaluate and manage airway compromise in accordance with APLS guidelines.6

- Urgently seek most senior assistance available onsite (such as critical care/ENT/anaesthetics) to manage airway as needed
- Seek urgent ENT advice (onsite or via RSQ) for child with a confirmed or suspected oesophageal foreign body and any of:
  - inspiratory stridor, cough or wheeze
  - unable to swallow secretions
  - suspected GI perforation or obstruction

All children with suspected foreign body ingestion should be kept nil by mouth until fully assessed.

Consider applying topical amethocaine (or equivalent) in preparation for IV cannulation.

The need for, and urgency of, endoscopic removal is determined by the object (including size, nature and shape) and its location (in consideration of time of ingestion). Patients with known gastrointestinal tract abnormalities or previous surgery may require additional intervention such as oesophageal dilatation.

<table>
<thead>
<tr>
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<tr>
<td>Single magnet</td>
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<td>Food bolus</td>
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<tr>
<td>Other not listed above</td>
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*Will refer to Paediatric Surgery if required
Seek urgent advice via RSQ if not onsite
Seek prompt advice via CATCH if no local service
Seek advice if:
  - symptomatic or
  - greater than 24 hours post-ingestion in case of oesophageal foreign body
  - GI abnormalities

Deliberate ingestions
Refer to mental health team as per local practice for deliberate ingestions

Specific foreign bodies

Magnets
Ingestion of multiple magnets or a magnet and a metallic object mandates endoscopic removal, if accessible, or serial imaging and examination if beyond reach and there is no concern about the objects joining. Surgical intervention may be required to reduce the risk of bowel adhesion across the bowel wall in symptomatic children and those who fail to pass the magnets.

If a single magnet past the oesophagus is confirmed on X-ray and the child is asymptomatic, expectant management is appropriate. Caregivers, however, must be educated with regards to the need for a safe environment and close supervision to avoid ingestion of another magnet or metallic object.

Food bolus impaction
Administration of hyoscine butylbromide or glucagon is not routinely recommended.

The use of effervescing agents such as carbonated drinks is supported by case reports and retrospective cohort studies but may be associated with vomiting.

Seek gastroenterology advice regarding management of a child with a history suggestive of eosinophilic oesophagitis (such as recurrent food impaction, feeding difficulties, atopy, and failure to thrive).

Expectant management
Expectant management is recommended for all children not requiring specialist referral.

Repeat X-ray and follow-up is only routinely recommended for oesophageal foreign bodies as complications can occur (including transmural erosion, perforation and fistulae) if not passed spontaneously. In such cases, close observation is recommended with repeat X-rays within 24 hours. Consider admission to an inpatient service during this time.

Prompt referral to relevant subspecialty team as per local practice is required for a foreign body that remains in the oesophagus after 24 hours.

Escalation outside of ED
Clinicians can contact the services below to escalate the care of a paediatric patient as per local practices. Transfer is recommended if specialist removal is required and no onsite facilities are available.
**Critically unwell or ingested foreign body requiring time-critical care**

**Ingested foreign bodies potentially requiring time-critical care**

Depending on the location* the following objects may require urgent removal to avoid serious harm:
- button battery
- multiple magnets or magnet plus metallic object
- sharp or pointed objects (e.g. fish bone, pins or needles)
- lead-containing objects (e.g. fishing sinker, curtain weight or air rifle pellet) or other toxic objects

**Oesophageal button batteries require removal within two hours of ingestion to avoid serious complications including death.**

*Refer to Management section for further details

<table>
<thead>
<tr>
<th>Service</th>
<th>Reason for contact</th>
<th>Contact</th>
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| Immediate assistance with airway | For onsite help with the management of airway, including intubation and ventilation. | The most senior resources available onsite at the time as per local practices. Options may include:  
  - Paediatric Critical Care  
  - Critical Care  
  - ENT  
  - Anaesthetics                                                        |
| ENT                      | For management of the following children with oesophageal foreign bodies:          | Onsite or via Retrieval Services Queensland (RSQ). If no onsite service contact RSQ on 1300 799 127:  
  - button battery  
  - inspiratory stridor, cough or wheeze  
  - inability to swallow secretions  
  - other foreign bodies requiring urgent removal  
  - for access to specialist telephone advice  
  - to coordinate transfer of a child with a button battery or other foreign body requiring time-critical removal  
  - to coordinate transfer of a child requiring X-rays if button battery is suspected and no X-ray facility onsite (as time-critical)  
  - RSQ (access via QH intranet)  
  - Notify early of children potentially requiring transfer. In the event of retrieval, inform your local Paediatric service. |
| Paediatric Surgery       | The first point of call for a child with suspected GI perforation or obstruction (will contact Paediatric Gastroenterology as needed). | Onsite or via Retrieval Services Queensland (RSQ). See above.                               |
| Poisons Information Centre | For advice:                                                                      | 13 11 26 (24-hour service)                                                                  |

*Refer to Management section for further details.
Non-critical child or requiring non-time critical care

**Ingested foreign bodies requiring prompt referral**

Depending on the location and clinical presentation the following objects may require prompt removal to avoid serious harm:

- greater than 2cm in diameter
- greater than 6cm in length
- expandable (superabsorbent polymers)
- single magnet
- impacted food bolus
- other foreign body in the oesophagus for greater than 24 hours post-ingestion

*Refer to Management section for further details*

<table>
<thead>
<tr>
<th>Reason for contact by clinician</th>
<th>Contact</th>
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</table>
| For specialist advice on the management/disposition and follow-up of a child with an ingested foreign body in the oesophagus. | Onsite/local ENT service as per local practice.  
Contact Children's Advice and Transport Coordination Hub (CATCH)  
(07) 3068 4510 if no local service. |
| For specialist advice on the management/disposition and follow up of child with an ingested foreign body in the stomach or below. | Onsite/local Paediatric Gastroenterology service.  
Contact CATCH (07) 3068 4510 if no local service. |
| For assistance with local inter-hospital transfers of non-critical patients. | Onsite/local Paediatric service as per local practice. |
| For assistance with inter-hospital transfer of non-critical patients into and out of Queensland Children’s Hospital. View QH Inter-hospital transfer request form (QH only) | Children's Advice and Transport Coordination Hub (CATCH)  
(07) 3068 4510 (24-hour service) |
| For access to generalist and specialist acute support and advice via videoconferencing, as per locally agreed pathways, in regional, rural and remote areas in Queensland. | Telehealth Emergency Management Support Unit (TEMSU)  
1800 11 44 14 (24-hour service)  
TEMSU (access via QH intranet) |
| To request aeromedical inter-hospital transfer in Queensland. | Retrieval Services Queensland (RSQ)  
1300 799 127 (24-hour service)  
RSQ (access via QH intranet) |
| For advice regarding toxicity of ingested object | Poisons Information Centre  
13 11 26 (24-hour service) |
Disposition

When to consider discharge from ED

Discharge and follow-up as per advice for children requiring specialist referral.

Consider discharge for the following children not requiring specialist referral:

- X-ray not required (refer to Investigation section for criteria)
- X-ray is normal or shows the object is beyond the oesophagus, the child is asymptomatic and able to eat and drink
- X-ray shows the object is in the oesophagus, the child is asymptomatic and able to eat and drink and the caregiver is able to return for repeat X-ray within 24 hours or earlier if symptomatic.

On discharge educate the caregivers regarding:

- potential complications such as obstruction or perforation and advise to seek prompt medical attention if any of the following occur:
  - breathing or feeding difficulties
  - abdominal pain or distension
  - cramping
  - bleeding
  - vomiting
  - other concerns
- in the case of single magnet ingestion, the need to provide a safe environment and close supervision to avoid the ingestion of another magnet or metallic object
- accident prevention including:
  - safe storage of small objects including marbles, coins, button batteries and balloons to ensure out of reach of infants and young children
  - age-appropriate toys for play (follow the age recommendations on packages)

Follow-up

Advise caregivers to re-present to ED if early review is required to ensure completion of care.

When to consider admission

Children requiring an endoscopy will usually require admission to an inpatient service.

Consider inpatient admission for observation of children with oesophageal foreign bodies not requiring specialist referral. Admission of other children with ingested foreign bodies for expectant management is at the discretion of speciality teams.

References

6. ALSG APLS
Guideline approval

<table>
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- Ingested, foreign body, button battery, paediatric, emergency, guideline, children, 60019

Accreditation references
- NSQHS Standards (1-8): 1, 3, 8

Disclaimer
This guideline is intended as a guide and provided for information purposes only. The information has been prepared using a multidisciplinary approach with reference to the best information and evidence available at the time of preparation. No assurance is given that the information is entirely complete, current, or accurate in every respect.

The guideline is not a substitute for clinical judgement, knowledge and expertise, or medical advice. Variation from the guideline, taking into account individual circumstances may be appropriate.

This guideline does not address all elements of standard practice and accepts that individual clinicians are responsible for:
- Providing care within the context of locally available resources, expertise, and scope of practice
- Supporting consumer rights and informed decision making in partnership with healthcare practitioners including the right to decline intervention or ongoing management
- Advising consumers of their choices in an environment that is culturally appropriate and which enables comfortable and confidential discussion. This includes the use of interpreter services where necessary
- Ensuring informed consent is obtained prior to delivering care
- Meeting all legislative requirements and professional standards
- Applying standard precautions, and additional precautions as necessary, when delivering care
- Documenting all care in accordance with mandatory and local requirements

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Appendix 1

Child presents to ED with suspected foreign body (FB) ingestion (based on history and/or symptoms)

Assessment (History and examination)
Aim to identify size, shape and nature of FB and time of ingestion. Keep child nil by mouth.
Assess all children at risk in missing button battery incident.

- Button battery ingestion excluded
- No signs of airway or GI obstruction or perforation

X-ray required? (Box A)

- X-rays: neck, chest and abdomen
- +/- lateral X-rays (to identify >1 magnet)

Period of observation

- Close observation
- Repeat X-ray within 24 hours only required for oesophageal body (consider inpatient admission)

Symptoms?

- Inspiratory stridor, cough or wheeze
- Inability to swallow secretions

Yes

Specialist advice required? (Box B)

- Button battery ingestion possible
- Urgent neck, chest and abdomen X-rays (contact RSQ if no X-ray facility onsite)

Confirmed or suspected button battery?

- Button battery in oesophagus?
- Time-critical endoscopy required
  If <12 hours post-ingestion & child aged >1 year give 10 mL honey every 10 mins (max 6 doses) as first aid while awaiting theatre. Otherwise nil by mouth.

- Button battery in stomach or intestine.

Yes

Button battery in oesophagus?

- Oesophageal FB and any of:
  - inspiratory stridor, cough or wheeze
  - inability to swallow secretions

- Manage airway as required
- Consider seeking senior assistance available onsite (such as critical care, ENT, anaesthetics) as per local practice

Specialist advice required?

- Seek urgent advice via Retrieval Services Queensland (RSQ) on 1300 799 127 if not onsite
- Seek prompt advice via CATCH on (07) 3068 4510 if no local service
- Seek advice if any of:
  - symptomatic or
  - > 24 hours post-ingestion of oesophageal FB
  - gastrointestinal abnormalities

Box A: Consider not proceeding with X-rays if child meets ALL of the following:
- asymptomatic
- normal clinical examination
- certain history of ingesting object that is ALL of:
  - <2 cm in diameter and <6 cm long
  - not sharp or pointed
  - not a magnet or battery
  - non-expandable
  - non-toxic
  - able to eat and drink
  - no known GI abnormalities

Discharge with advice
Consider discharge with advice +/- early review as indicated
Seek advice as indicated
Seek prompt referral to Paeds Gastro
Prompt referral to ENT
Urgent referral to Paeds Surgery
Urgent referral to ENS

Box B: Specialist advice recommendations

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* Will refer to Paediatric Surgery if needed
** Seek toxicologist advice via Poisons Information Line (Ph: 13 11 26) if unsure

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