

Full-cycle audit of the RCEM Best Practice Guidelines for the ingestion of super strong magnets in children using data from a UK prospective observational study

Strong rare-earth magnet ingestion by children is dangerous. Multiple magnets can attract one another from different parts of the gastrointestinal

tract to cause obstruction, fistulation or perforation.¹ The incidence of paediatric magnet ingestions appears to be increasing.² In response to this hazard, the Royal College of Emergency Medicine (RCEM) Best Practice Guidelines were published in 2021 to provide management recommendations for children presenting to the emergency department after ingesting strong magnets.³ In order to evaluate the adherence of these guidelines in clinical practice we audited the guidelines

using a national dataset from a prospective observational study of paediatric magnet ingestion. Eight audit standards were derived from the RCEM Best Practice Guideline for the purposes of this study (Table 1).

The Magnet Ingestion in Children (MAGNETIC) study was a national prospective observational study of children (≤ 16 years old) ingesting ≥ 1 magnetic foreign body over one year, starting May 2022 (ClinicalTrials.gov: NCT05375981). Study data describing

Table 1 Audit standard derivation and comparison of cycles one and two.

RCEM Best Practice Guideline ³	Derived audit standards	Cycle 1 (n=143)	Cycle 2 (n=68)	P value
'Do not use metal detectors for the assessment of children with suspected rare earth metal ingestion.' (p 4)	Metal detector use	21/143 (15%)	6/68 (9%)	0.234
'Chest X-ray and abdominal X-ray (with the patient lying down, ideally AP) should be requested to assess both the position of any magnets and the number of magnets.' (p 5)	Chest and abdominal radiograph performed	51/143 (36%)	20/68 (29%)	0.370
'In the case of a single magnet being identified on an abdominal X-ray, a lateral abdominal X-ray should also be requested to confirm that only one magnet has been ingested.' (p 5)	Lateral radiograph to confirm single magnet ingestion	32/61 (52%)	6/22 (27%)	0.075
'The following patients should be considered suitable for discharge after rare earth magnet ingestion: single magnet ingestion, accidental ingestion, no co-morbidities, tolerating oral intake, presents within 24hr of ingestion, caregiver able to provide close observation (there is no need to examine the child's faeces).' (p 6)	Discharged in accordance with guideline criteria	29/92 (32%)	15/48 (31%)	0.974
'All patients who are being discharged with rare earth magnet ingestion require follow-up imaging after 6–12 hours, repeated earlier imaging is not indicated. If the child becomes symptomatic before the repeat radiograph urgent surgical review will be required.' (p 6) 'Follow-up AXRs should continue to be performed until it can be demonstrated (and confirmed by a radiologist) that the magnet has passed through the stomach and serial X-rays (at least 6–12 hours apart) show that it is progressing through the small bowel or beyond.' (p 6)	Serial radiographs for asymptomatic children	44/110 (40%)	14/30 (47%)	0.512
'Patients who do not meet discharge criteria eg, symptomatic patients, signs of deterioration, ingestion of two or more rare earth magnets should be discussed with a specialist regional paediatric surgical centre in the first instance.' (p 6)	Discussion with paediatric surgery: symptomatic children	20/33 (61%)	10/16 (63%)	0.899
'Patients who do not meet discharge criteria eg, symptomatic patients, signs of deterioration, ingestion of two or more rare earth magnets should be discussed with a specialist regional paediatric surgical centre in the first instance.' (p 6)	Discussion with paediatric surgery: multiple magnet ingestion	64/82 (78%)	36/39 (92%)	0.053
'Failure of the magnet to progress through the gastrointestinal tract, (defined as: the magnet having not moved from the last demonstrated position on AXR irrespective of location in GI tract after a period of 6–12 hours and confirmed by a radiologist) is an indication for discussion with a specialist regional paediatric surgical centre.' (p 6)	Discussion with paediatric surgery: non-progression on serial radiographs	12/16 (75%)	6/6 (100%)	0.186

AP, anteroposterior; AXR, abdominal X-ray; RCEM, Royal College of Emergency Medicine.

clinical practice during the first four months were compared with the eight audit standards (cycle 1). Results of this initial audit and the guidelines were then disseminated to MAGNETIC collaborators (intervention). Data from the final four months were then compared with the audit standards (cycle 2). Practice during cycles 1 and 2 was then compared.

Data from 211 patients were included, including 143 children in cycle 1 and 68 children in cycle 2 (Table 1). Post-intervention, fewer children underwent assessment with a metal detector (15% vs 9%). Fewer patients underwent anteroposterior and lateral radiographs to check for multiple magnets (27% vs 52%), and a similar proportion were discharged meeting the guideline criteria (31% vs 32%). More children who had ingested multiple magnets were discussed with paediatric surgery post-intervention (78% vs 92%, $p=0.053$). Similarly, a greater proportion of children were discussed with paediatric surgery who had symptoms or non-progression on imaging.

Our simple intervention of feedback directly to each participating institution by sharing the results of cycle 1, their centre's results, and highlighting deviation from RCEM Best Practice Guideline through detailed discussion, appears to have been overall beneficial, with practice generally shifting to be more in alignment with the guidance. Although the differences were not statistically significant for the standards assessed, this may be due to the

relatively small sample. Importantly, when considering the escalation and treatment pathway, the proportion of children having unnecessary imaging studies decreased, while the proportion of children appropriately discussed with paediatric surgery increased, suggesting greater recognition of the dangers of multiple magnet ingestion. Despite being reminded of the guidance, variation remains in the management of children with magnet ingestion, especially regarding radiological investigations.⁴ Greater awareness of, and engagement with, published guidelines is needed to reduce this variation aiming to achieve optimal treatment, resource use and outcomes.

While this full-cycle audit showed improved adherence to the RCEM Best Practice Guidelines, it did not look at the impact of this on clinical outcomes. In the future, we aim to use the widening evidence base surrounding magnet ingestion to optimise the guidance and investigate the impact of this on clinical outcomes in patients.

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