

CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

# Magnetic Resonance Imaging Compatible Pumps: Clinical Effectiveness and Guidelines

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## Research Questions

1. What is the clinical effectiveness of MRI-compatible pumps compared with regular extended tubing pumps for patients receiving an MRI?
2. What are the evidence-based guidelines regarding the use of MRI-compatible pumps for patients receiving an MRI?
3. What are the evidence-based guidelines regarding the use of MRI-compatible pumps versus regular extended tubing pumps for patients receiving an MRI?

## Key Findings

One evidence-based guideline was found regarding the use of magnetic resonance imaging (MRI) compatible pumps versus regular extended tubing pumps for patients receiving an MRI. No relevant health technology assessments, systematic reviews, randomized controlled trials, or non-randomized studies were found regarding the clinical effectiveness of MRI-compatible pumps compared with regular extended tubing pumps for patients receiving an MRI.

## Methods

A limited literature search was conducted by an information specialist on key resources including Medline, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were Intravenous pumps and Magnetic Resonance Imaging. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2015 and January 31, 2020. Internet links were provided, where available.

## Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

**Table 1: Selection Criteria**

<b>Population</b>	Patients receiving a magnetic resonance imaging (MRI) scan while having an intravenous pump
<b>Intervention</b>	MRI-compatible pumps (i.e., remote controls for intravenous medication that have been specifically designed to work in MRI scan room and monitored/adjusted in control room; pumps not influenced to magnetic field of MRI)
<b>Comparator</b>	Q1: Regular extended tubing pumps (i.e., pumps that are not compatible with MRI, and the tubing is several feet long and placed out of range of the MRI so it is not affected by the magnetic field of MRI) Q2-3: Not applicable
<b>Outcomes</b>	Q1: Clinical effectiveness (e.g., timeline of occlusion without medication), safety, harms/risks (e.g., disconnecting of tubing) Q2-3: Recommendations regarding the use of MRI-compatible pumps for patients receiving an MRI
<b>Study Designs</b>	Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, and evidence-based guidelines.

MRI = magnetic resonance imaging.

## Results

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports and systematic reviews are presented first. These are followed by randomized controlled trials, non-randomized studies, and evidence-based guidelines.

One evidence-based guideline<sup>1</sup> was found regarding the use of MRI-compatible pumps versus regular extended tubing pumps for patients receiving an MRI. No relevant health technology assessments, systematic reviews, randomized controlled trials, or non-randomized studies were found regarding the clinical effectiveness of MRI-compatible pumps compared with regular extended tubing pumps for patients receiving an MRI.

Additional references of potential interest are provided in the appendix.

## Overall Summary of Findings

One evidence-based guideline<sup>1</sup> was found regarding the use of MRI-compatible pumps versus regular extended tubing pumps for patients receiving an MRI. This guideline from the American Society of Anesthesiologists recommends that an MRI-safe/conditional pump be used for total intravenous anesthesia in Zone IV (i.e., the MRI magnet room).<sup>1</sup> Alternatively, an MRI-unsafe pump can be used with extended tubing running through a waveguide in Zone III, a restricted area where screened MRI patients are under supervision by MRI personnel.<sup>1</sup>

## References Summarized

### Health Technology Assessments

No literature identified.

### Systematic Reviews and Meta-analyses

No literature identified.

### Randomized Controlled Trials

No literature identified.

### Non-Randomized Studies

No literature identified.

### Guidelines and Recommendations

1. Practice advisory on anesthetic care for magnetic resonance imaging: an updated report by the American Society of Anesthesiologists task force on anesthetic care for magnetic resonance imaging. *Anesthesiology*. 2015 Mar;122(3):495-520.  
<https://anesthesiology.pubs.asahq.org/article.aspx?articleid=2091587>  
See: Appendix 2. Summary of Recommendations (V. Patient Management during MRI) (p.506)

## Appendix — Further Information

### Clinical Practice Guidelines

2. Safe provision of anaesthesia in magnetic resonance units. London (GB): Association of Anaesthetists of Great Britain and Ireland. 2019: [https://anaesthetists.org/Portals/0/PDFs/Guidelines%20PDFs/Guideline\\_Safe%20provision%20of%20anaesthesia%20in%20magnetic%20resonance%20units.pdf?ver=2019-05-05-083934-863](https://anaesthetists.org/Portals/0/PDFs/Guidelines%20PDFs/Guideline_Safe%20provision%20of%20anaesthesia%20in%20magnetic%20resonance%20units.pdf?ver=2019-05-05-083934-863)
3. Diabetes Obesity Nutrition Strategic Clinical Network. Guidelines for the Safe Management of Insulin Pump Therapy in Hospital Diabetes. Edmonton (AB): Alberta Health Services; 2017 <https://extranet.ahsnet.ca/teams/policy/documents/1/clp-ahs-scn-don-guidelines-for-safe-management-of-ipt-in-hospital.pdf>
4. MRI unit protocols for ventilation and monitoring: clinical practice guideline. Perth (AU): Government of Western Australia; 2015: <https://www.kemh.health.wa.gov.au/~media/Files/Hospitals/WNHS/For%20health%20professionals/Clinical%20guidelines/NEO/WNHS.NEO.MRIUnitProtocolsforVentilationandMonitoring.pdf>

### Review Articles

5. Gandhe RU, Bhave CP. Intraoperative magnetic resonance imaging for neurosurgery - An anaesthesiologist's challenge. Indian J Anaesth. 2018;62(6):411–417. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6004746/>

### Additional Articles

6. Radiology policy and procedure: MRI safety. Bronx (NY): Montefiore Medical Center; 2015. <https://www.einstein.yu.edu/uploadedFiles/Centers/MRRC/center-use/MRI%20Safety%20Policy.pdf>