



## Topic Exploration Report

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

- Determine the quantity of evidence available for a technology of interest.
- Identify any gaps in the evidence.
- Inform decisions on topics that warrant fuller assessment by Health Technology Wales (HTW).

Topic exploration report number:	TER425
Topic:	Leadless cardiac pacemakers for bradyarrhythmias
Summary of findings:	<p>A NICE interventional procedures guidance (IPG626, 2018) and a more recent health technology assessment from Austria (2020) recommend restricted use of leadless pacemakers for people who cannot receive a conventional pacemaker. Both highlight that efficacy evidence for leadless pacemakers is lacking, but the Austrian HTA reported on two indirect comparisons showed favourable safety results against conventional pacemakers.</p> <p>Several systematic reviews have been published since, but all seem to report on safety and efficacy and do not appear to include comparisons to conventional pacemakers. We did not identify any evidence reporting on the clinical or cost effectiveness of leadless pacemakers, compared to conventional pacemakers. There also appears to be a lack of published long-term data.</p>

## Introduction and aims

Bradyarrhythmias are abnormal heart rhythms. They can result in a slow heart rate, also known as bradycardia. Standard management of bradyarrhythmias is implantation of a pacemaker, which can be either single-chamber (detects and paces one chamber, usually the right ventricle) or dual-chamber (detects and paces the right atrium and ventricle). However, there are some people who cannot have a conventional pacemaker implantation because it is contraindicated.

Leadless cardiac pacemakers are self-contained devices that detect and pace the right ventricle (single chamber). Leadless pacemakers have the potential to avoid lead-related complications that are associated with conventional pacemakers. They may also be an option where conventional pacemakers are contraindicated.

Health Technology Wales researchers searched for evidence on leadless pacemaker implantation for bradyarrhythmias.

## Evidence overview

We identified three health technology assessment publications and four systematic reviews reporting on leadless pacemaker implantation. All the evidence identified focuses on safety and efficacy, and none appear to report evidence directly comparing leadless pacemakers with conventional pacemakers.

### Guidance and health technology assessments (HTAs)

The National Institute for Health and Care Excellence published interventional procedures guidance (IPG626) in 2018. Due to well-recognised safety complications and a lack of efficacy evidence, the NICE IPG recommended that

- For people who can have conventional pacemakers, leadless pacemakers should only be used in the context of research.
- For people who cannot have conventional pacemakers due to contraindications, leadless pacemakers should only be used with special arrangements for clinical governance, consent and audit or research.

The rapid review for NICE IPG626 identified seven case series, three retrospective matched comparative studies and one registry (searches were undertaken up to 28 November 2017).

Two additional health technology assessments were identified that were published after NICE IPG626; however, these may only be partially relevant as they do not focus on bradyarrhythmias specifically. The most recent, from the Austria Institute for Health Technology Assessment (AIHTA), which was an update of a 2017 HTA, recommended the use of leadless pacemakers with restrictions, as an option for people with contraindications or where conventional pacemakers are considered inappropriate (e.g. high-risk). The review included evidence up to January 2020. Since 2017, they identified nine studies, including case series, single-arm studies and a case-control study. AIHTA stated that evidence on efficacy compared to conventional pacemakers was considered insufficient, but based on two indirect comparisons with conventional pacemakers appeared to have a good safety profile.

### Systematic reviews

We identified four systematic reviews that were published after the NICE and AIHTA evidence reviews. All four systematic reviews reported on safety and efficacy-related outcomes; however,

none compare leadless pacemakers to conventional pacemakers. Three of the reviews conclude that leadless cardiac pacemakers are safe and effective; the fourth review specifically reports on tricuspid valve regurgitation (TR) events, and concludes that there is no evidence of TR after leadless pacemaker implantation.

### **Primary evidence**

We searched for additional primary evidence that aimed to assess the clinical or cost effectiveness of leadless pacemakers compared to conventional pacemakers, but no relevant evidence was identified.

## **Areas of uncertainty**

Evidence on leadless cardiac pacemakers appears to be limited primarily to evaluating the safety and efficacy of the device. We did not identify any evidence reporting on clinical and cost effectiveness of leadless cardiac pacemakers compared to conventional pacemakers.

The majority of evidence in this report includes a population of adults who are indicated to receive leadless implants; this includes a broader population of adults with conditions other than bradyarrhythmias, e.g. atrial fibrillation. A fuller appraisal would be necessary to isolate evidence relevant to the population.

This report looked for evidence of leadless pacemakers for people with bradyarrhythmias, regardless of whether they could receive a conventional pacemaker. The topic proposer has suggested that leadless cardiac pacemakers may be an option for people who cannot have conventional pacemakers. Were an appraisal to focus on this population, this may impact on the amount of available evidence.

## Literature search results

### Health technology assessments and guidance

National Institute for Health and Care Excellence (NICE) (2018). Leadless cardiac pacemaker implantation for bradyarrhythmias Interventional procedures guidance. <https://www.nice.org.uk/guidance/ipg626>

Fagerlund BC HI, Giske L, Movik E, Ørjasæter IK, Tjelle TE., . (2018). The Micra™ Transcatheter Pacing System, a leadless pacemaker, in patients indicated for single-chamber ventricular pacemaker implantation: A single technology assessment. [https://www.fhi.no/en/publ/2018/The-Micra™-Transcatheter-pacing-System-A-single-technology-assessment/](https://www.fhi.no/en/publ/2018/The-MicraTM-Transcatheter-pacing-System-A-single-technology-assessment/)

Semlitsch TaL, C., . (2020). Leadless pacemaker for right ventricle pacing (Update 2020). <https://eprints.aihta.at/1252/>

### Evidence reviews and economic evaluations

Darlington D, Brown P, Carvalho V, et al. (2022). Efficacy and safety of leadless pacemaker: a systematic review, pooled analysis and meta-analysis. *Indian Pacing Electrophysiol J.* 22(2): 77-86.

Haerberlin A, Bartkowiak J, Brugger N, et al. (2022). Evolution of tricuspid valve regurgitation after implantation of a leadless pacemaker - a single center experience, systematic review and meta-analysis. *J Cardiovasc Electrophysiol.* 33(7): 1617-27.

Ngo L, Nour D, Denman RA, et al. (2021). Safety and efficacy of leadless pacemakers: a systematic review and meta-analysis. *J Am Heart Assoc.* 10(13): e019212.

Oliveira SF, Carvalho MM, Adao L, et al. (2021). Clinical outcomes of leadless pacemaker: a systematic review. *Minerva Cardiol Angiol.* 69(3): 346-57.

### Individual studies

We looked for primary studies that compared clinical effectiveness of leadless and conventional pacemakers in people with bradyarrhythmias, but no relevant studies were identified.

**Date of search:**

October 2022

**Concepts used:**

leadless (cardiac) pacemaker, bradyarrhythmia(s)

## Proposed research question and evidence selection criteria (if selected)

<b>Proposed research question</b>	What is the clinical and cost effectiveness of leadless cardiac pacemakers for bradyarrhythmias?
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	<b>Included</b>	<b>Excluded</b>
<b>Population</b>	Adults with bradyarrhythmias	
<b>Intervention</b>	Leadless cardiac pacemakers	
<b>Comparison/comparators</b>	Standard care Conventional cardiac pacemakers (single- or dual-chamber)	
<b>Outcomes</b>	Cardiovascular-related outcomes (strokes, embolism, atrial fibrillation) Survival/mortality Adverse events and device/procedure-related events Hospitalisation rates Quality of life Costs	
<b>Study design</b>		