

digitalhealth

**REWired**  
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# Dr Anish Bhuva

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Consultant Cardiologist, Hon. Associate Professor  
Barts Health NHS Trust and University College London

# Pace MRI

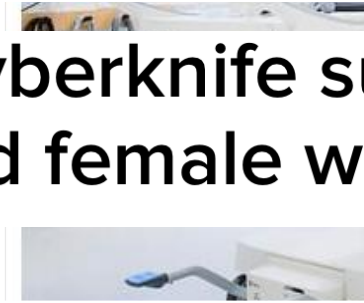
Helping half a million people with pacemakers access stroke and cancer care reliant on MRI, just like the rest of us.



# 75% of us will need an MRI



Cyberknife surgery  
old female with



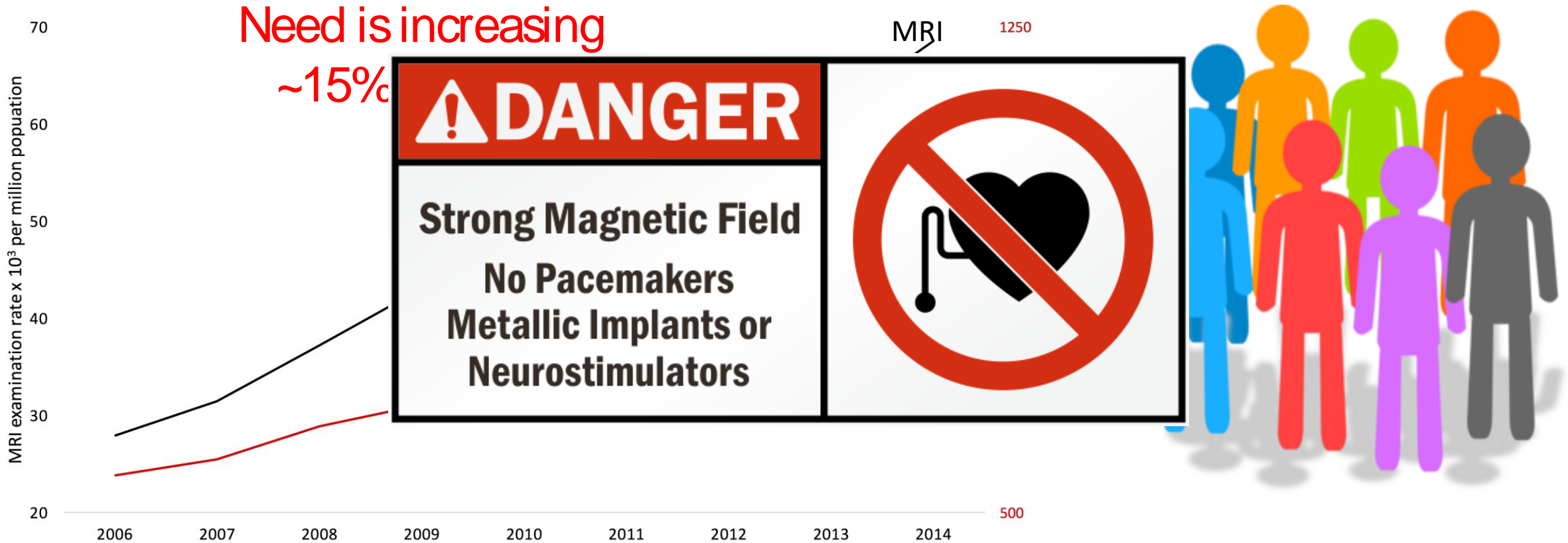
↑ comorbidities  
↑ older



Half a million people in England

# Pace MRI

# A growing problem



The NHS has already invested in the solution

The screenshot shows the MailOnline website's health section. The main article is titled "At last! The implant that makes it safe for heart patients to have vital MRI scans: £20,000 device can be 'switched off' for lifesaving checks". The article text includes:

- New £20,000 pacemaker allows patients to have lifesaving MRI scans
- Penelope Wybrow, 41, from London has been fitted with the new ICD
- It can be 'blinded' from detecting abnormal heart rhythms during MRI

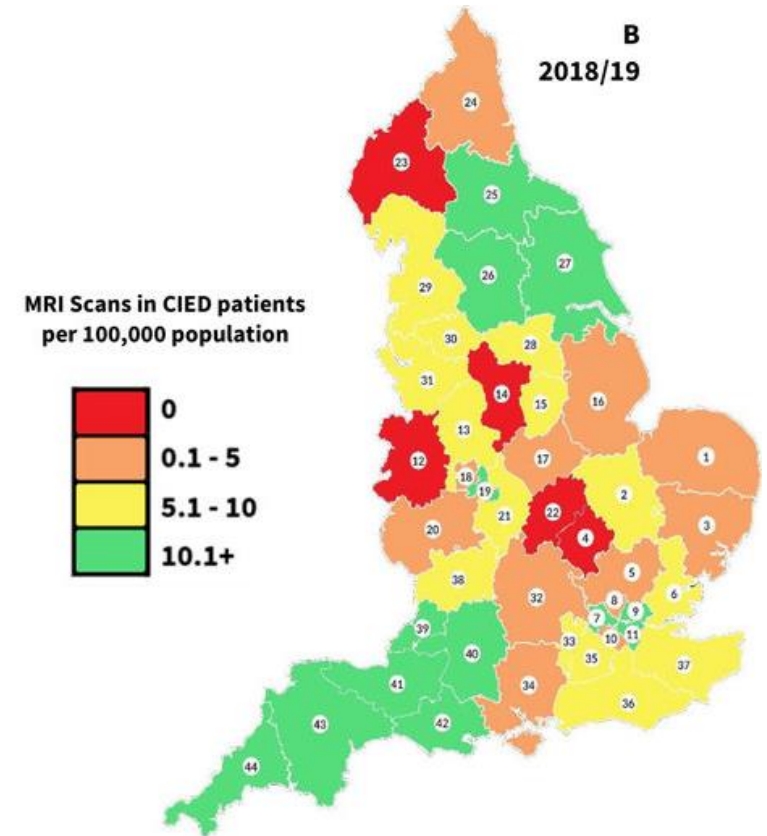
The article is attributed to Sophie Goodchild for the Mail on Sunday, published on August 16, 2014, and updated on August 17, 2014. It has 141 shares and 18 comments. The page also features a search bar, a Regent's University London advertisement, and social media sharing options for Facebook, Twitter, Pinterest, and Google+.

Pace MRI

# Poor service provision across the NHS

- Referrals are **50 x** as likely to be rejected.
- **Half** of centres in the UK do not provide a service.

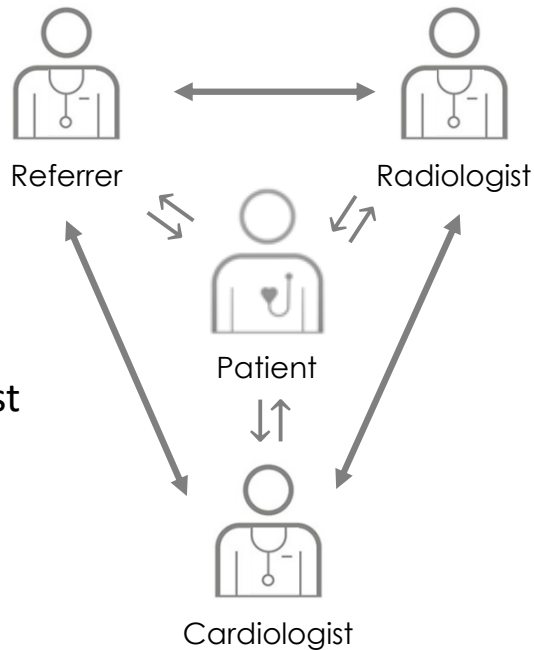
1-5,000 scans per year  
50,000 scans required  
10-50 fold service provision  
1/3 for cancer, stroke or other  
urgent care



General population – 56 MRI scans per 1000 population  
*500 x lower rate in CIED patients*

# Service provision is logistically complex

## Time-consuming



## Staff:

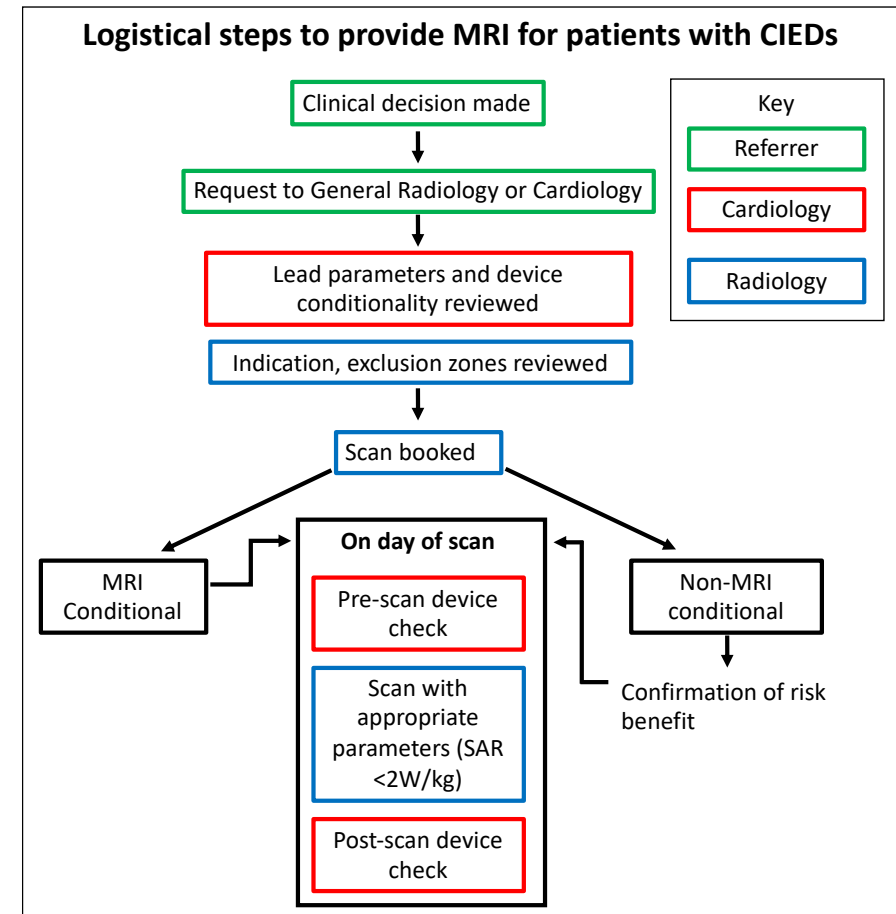
Radiographer  
MR physicist  
Cardiac physiologist  
Administration  
Radiologist  
Cardiologist  
Referrer

Average **2.5 months delays** planning scans, multiple emails

**Logistic hurdles:** patient, referrer, MRI-device teams.

60% referrals with **missing data**, 17% with **incorrect information**

1 in 3 referrals require **>3 repeat discussions** with referrers

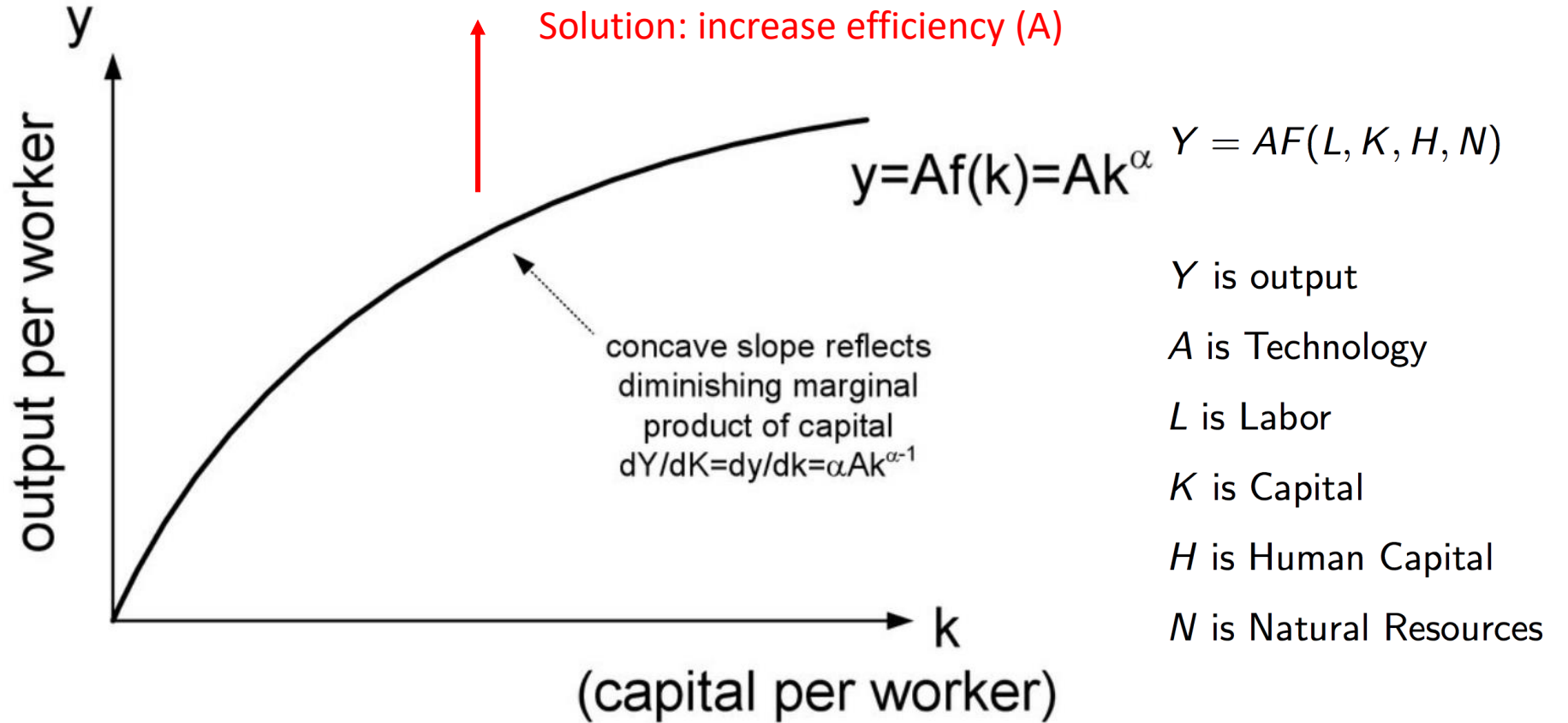


Dowsing B, et al Abstract BCS 2021; National Clinical Imaging Board MRI equipment report 2017

Bhuva AN BMJ Qual & Safety 2019, 0:1-6, Dowsing Heart 2021;107:A129

# Avoiding a zero-sum game

Improving our  
production  
function





# Avoiding a zero-sum game

Digital referral pathways need to be:

- User friendly
- Faster than paper
- Interoperable (not just one hospital)
- Support safe clinician decision-making

# Our goal

- To develop a **dedicated online web platform** to a streamlined pathway for MRI scans in cardiac device patients, offering:
  - Networked services
  - Cross-silo working, combining technical expertise
  - Time-saving communication
- Addressing a **health inequality** with multiple barriers

# Referrals management platform

## Refer

Patient Details

NHS Number: e.g. 123 456 7890

MRI Body Part: PLEASE SELECT A BODY PART

Given name: [text entry]

Surname: [text entry]

Clinical Indication: Indication (free text entry)

Urgent Referral?

Enter device details

Need help? I am new to this and need more information

Generator: SELECT DEVICE

Right Atrial Lead: NO LEAD

Right Ventricle Lead: NO LEAD

The system is: Not MRI Conditional

## Automated protocols and consent

Device approval

Non-MRI Conditional

Please follow published guidelines, considering the following:

Will Change Clinical Management: Yes

No Other Imaging Modality: Yes

The following risks have been discussed with the patient: Yes

Please inform the patient of the following risks:

1.5T - MRI Radio Frequency (RF) Power

Normal Operating Mode

- Whole-body averaged specific absorption rate (SAR) must be  $\leq 2.0$  W/kg
- Head SAR must be  $\leq 3.2$  W/kg

Device check after scan & follow-up

ROUTINE FOLLOW-UP ADVISED

## Communicate

Referral approved clinically?

Yes

Send a message to the referrer

Messages

Radiographer: Thanks. Scan booked for Monday with consent. Send

Before scan:

- Clinical approval
- Device approval
- Scan scheduling

Day of scan:

- Device check pre-scan
- MRI settings
- Device check after scan & follow-up

Referrer Patient

Radiologist

Cardiologist

*“to ensure that patients with cardiac devices have the same access to MRI scanning as everyone else.”*

- Funded by the British Heart Foundation and professional societies.
- Developed with Barts Health NHS Trust.

# Referrals network

- Referrals network: 60 centres, 4 countries
- Supporting service development
- Trained British Heart Foundation and Cardiomyopathy UK helplines
- 600-1000 users per month
- Link ~5-10 individual patients to MRI centres per month for cancer/stroke and other care

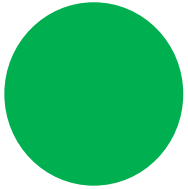
*“Thanks for creating your website, it gave me the confidence to keep pushing for this scan.” – patient with suspected brain metastases*

I have had to give up my job as a nurse, have suffered the most awful pain, become extremely disabled, lost my independence and suffered awful mental anguish. This simply should not be happening. I am incensed. I have asked for help from my MP and have now found your organisation via a google search. I am likely to need MRI in the future and I am not going to suffer this humiliating and physically damaging process again. Can you help me in any way, or point me to where I can get appropriate support.



# Benefits

> £666 per inpatient

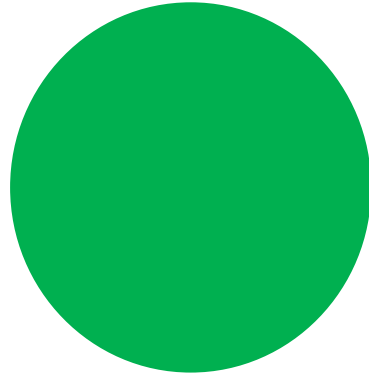


Early discharge

**3 bed days** faster discharge for internal referrals

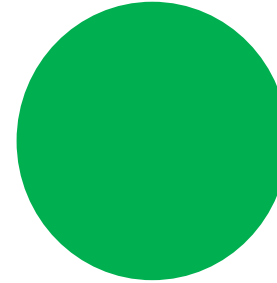
**83%** expedited patient flow

£4,000 per Cancer diagnosis



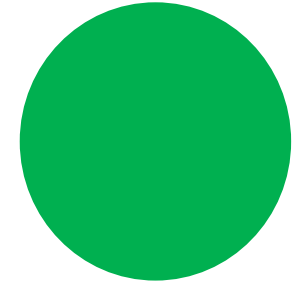
Early diagnosis

**83%** cancer treatment within 62 day national target



Timely treatment

Fewer invasive procedures



Access to standard cost-effective NHS pathways

# Referral pathway experience

- Increased **referral volume**
  - $5.6 \pm 1.6$  to  $6.6 \pm 2.2$  per week,  $p=0.003$
- Increased **external referrals**
- **Fewer inaccuracies** in referrals
- **Reduced logistical burden** , ~1 day/week of cumulative time saved.

Completed referrals over a 6 month period pre and post platform Implementation	Pre-Online Referral Platform		Utilising <a href="http://www.pace-mri.org">www.pace-mri.org</a>	
	N (116)	%	N (129)	%
External Referral	62	53%	100	78%* $p<0.05$
Cardiology Referral	55	47%	46	36%
In-patient Referral	27	23%	20	16%
Urgent Referrals	73	63%	83	64%
MRI for Cancer Diagnosis	35	30%	38	29%
MRI for Cord Compression	5	4%	11	9%
MRI for Stroke	6	5%	14	11%
Device Conditionality Correct	43	37%	95	74%* $p<0.05$
Device Information Inadequate	88	76%	46	36%* $p<0.05$

# MRI My Pacemaker campaign

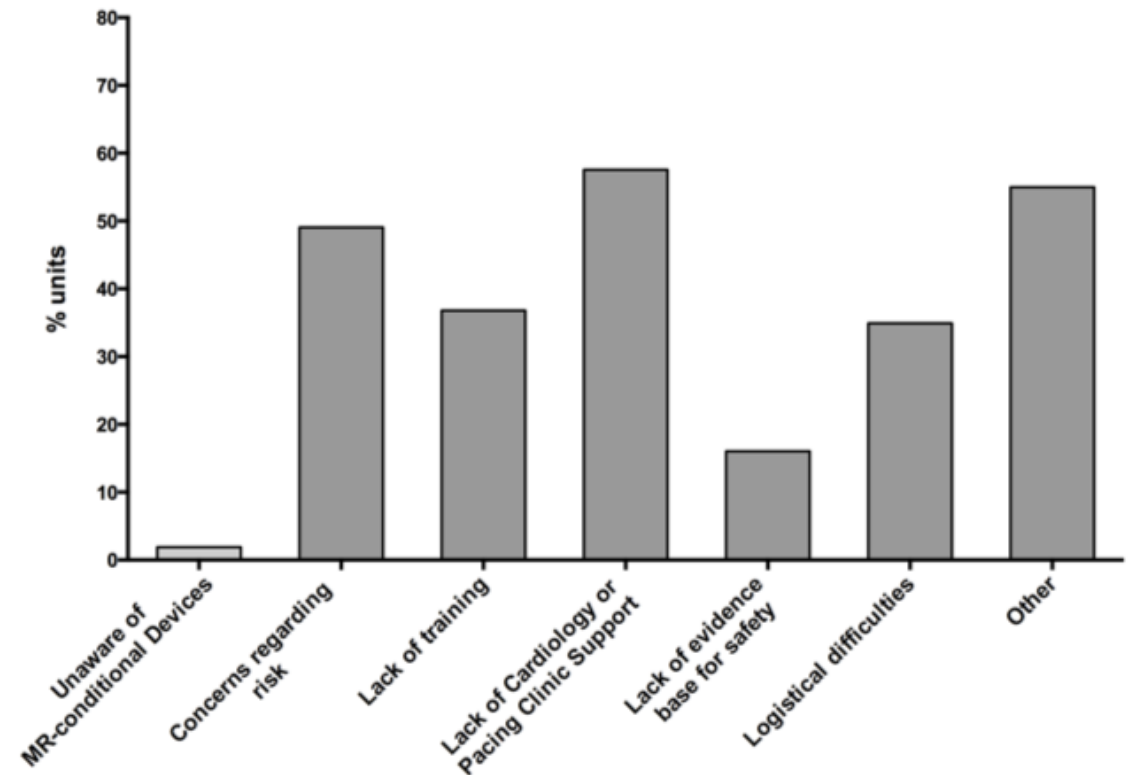
## Our Mission

To ensure that pacemaker and cardiac device patients can access cancer and stroke care reliant on MRI, just like the rest of us.

Digital support is the apex of a strategy to address the health inequality

Other work includes:

- clinician/patient leaflets,
- educational courses,
- ongoing NHS England tariff discussions,
- national guidelines (in draft)
- Training Cardiomyopathy UK and Arrhythmia Alliance helplines



# Helping local champions

Regular national training courses

- > 500 clinicians
- > 100 hospitals
- 9 countries

Digital support tools following national guidelines

Pace MRI

## MRI for patients with cardiac implantable electronic devices

The image shows a screenshot of a BMJ article. The main article is titled "Wideband MOCO LGE changes management in patients with implantable cardiac defibrillators" by Anish Bhuva, Manish Ramlal, Neha Sekhri, Richard Schilling, and Peter Centre. It includes an introduction, background, methods, results, and safety sections. A secondary article is also visible, titled "Safe use of MRI in people with cardiac implantable electronic devices" by Martin D Lowe, Christopher J Plummer, Charlotte H Manisty, and Nicholas J Linker. This article includes an abstract, background, and introduction. The screenshot also shows the BMJ logo, navigation links, and a list of authors.





# Educational resources

Patients and referrers

Leaflets and videos (multiple languages)

Developed by 6 professional societies and 2 patient charities

Automatically sent through to patients at the point of referral

#### Does it matter what kind of device I have?

Yes. Both **MR Conditional** and **MR Unlabelled** devices can be scanned, but the referral process and the device adjustments depend on which kind you have. If you have an implanted heart monitor, you should also let the MRI team know.

#### What are the risks of having an MRI scan?

**MR Conditional devices:** safe

**MR Unlabelled devices:** low risk of complications, occurring in less than 1 in 2000 patients. Risks include:

- Damage to your device
- Abnormal heart rhythms
- Unexpected shocks from your device

#### How can I check if my device is MR Conditional?

1. Check your device identification card – some cards will state if your device is MR-Conditional (see example below)
2. Contact the cardiology team that looks after your device
3. Call the manufacturer directly

Your lead and generator combination will always be carefully checked before the scan to confirm the type of device you have.

Hospital Heart Centre, UK	
DEVICE DATE	01/01/10
MFG	St Jude Medical
TYPE	PM1272
S/N	1234567
MRI CONDITIONAL SYSTEM?	Yes

#### Why have I previously been told I can't have a scan?

People with **MR Unlabelled** devices couldn't have MRI scans until recently. We now know that with careful planning the risks are lower than previously thought. These scans usually take place at specialised MRI centres. They need an important reason for being done, with no alternative test available.

#### What if my hospital cannot scan patients with cardiac devices?

For more information, referral centres or support visit [mrimypacemaker.com](http://mrimypacemaker.com)



**MRI my pacemaker**

#### We have a team to support you if you have a problem



[heartrhythmalliance.org](http://heartrhythmalliance.org)  
[info@heartrhythmalliance.org](mailto:info@heartrhythmalliance.org)

**Cardiomyopathy**<sup>UK</sup>  
the heart muscle charity

[cardiomyopathy.org](http://cardiomyopathy.org)  
[contact@cardiomyopathy.org](mailto:contact@cardiomyopathy.org)

This has been produced with the support of  
Arrhythmia Alliance / British Association of MRI Radiographers  
British Cardiovascular Society / British Heart Rhythm Society  
British Institute of Radiology / British Society for Heart Failure  
British Society of Cardiovascular Magnetic Resonance /  
Cardiomyopathy UK / Institute of Physics and Engineering in  
Medicine / Royal College of Radiologists / The Society of  
Radiographers



Illustration by Design Science

**MRI\* and your pacemaker**  
An easy guide for patients with pacemakers, defibrillators or implantable cardiac monitors

The cover features a green background with a white icon of a pacemaker and a heart. Below the title, there are six cartoon illustrations of diverse people (three men and three women) with a heart icon on their chest, representing patients with various cardiac devices.

**MRI and your pacemaker**

The video thumbnail shows a green background with the title in white. At the bottom, there are six cartoon illustrations of diverse people (three men and three women) with a heart icon on their chest, matching the leaflet cover.

Pace **MRI** Download [www.mrimypacemaker.com](http://www.mrimypacemaker.com)



# Other supporting organizations



# Conclusion

We are working to ensure half a million people with pacemakers have the same access to MRI as everyone else.

To make coal-face digital implementation work:

- Recognize the complex patient journeys
- Dig foundations deep
- Make complex processes easier than paper

Use the platform in your service: [pace-mri.org](https://pace-mri.org)

Find/register a referrals centre: [mrimypacemaker.com](https://mrimypacemaker.com)



# Thank you



**British Heart Foundation  
British Society for Heart Failure**

**Arrhythmia Alliance - Trudie Loban  
Patients at Barts Heart Centre**

**Tackling the health inequality**  
Royal College Radiology  
British Cardiovascular Society  
British Heart Rhythm Society  
National MRI Cardiac Device Working Group  
Barts Health NHS Trust



[Anish.bhuva@nhs.net](mailto:Anish.bhuva@nhs.net)  
[contact@mrmypacemaker.com](mailto:contact@mrmypacemaker.com)

