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Remote only device follow up: Is it the future?

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Conflicts of Interest: *None*

Overview

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- Why
- How
- Hints and tips
- The evolving service

Overview of service

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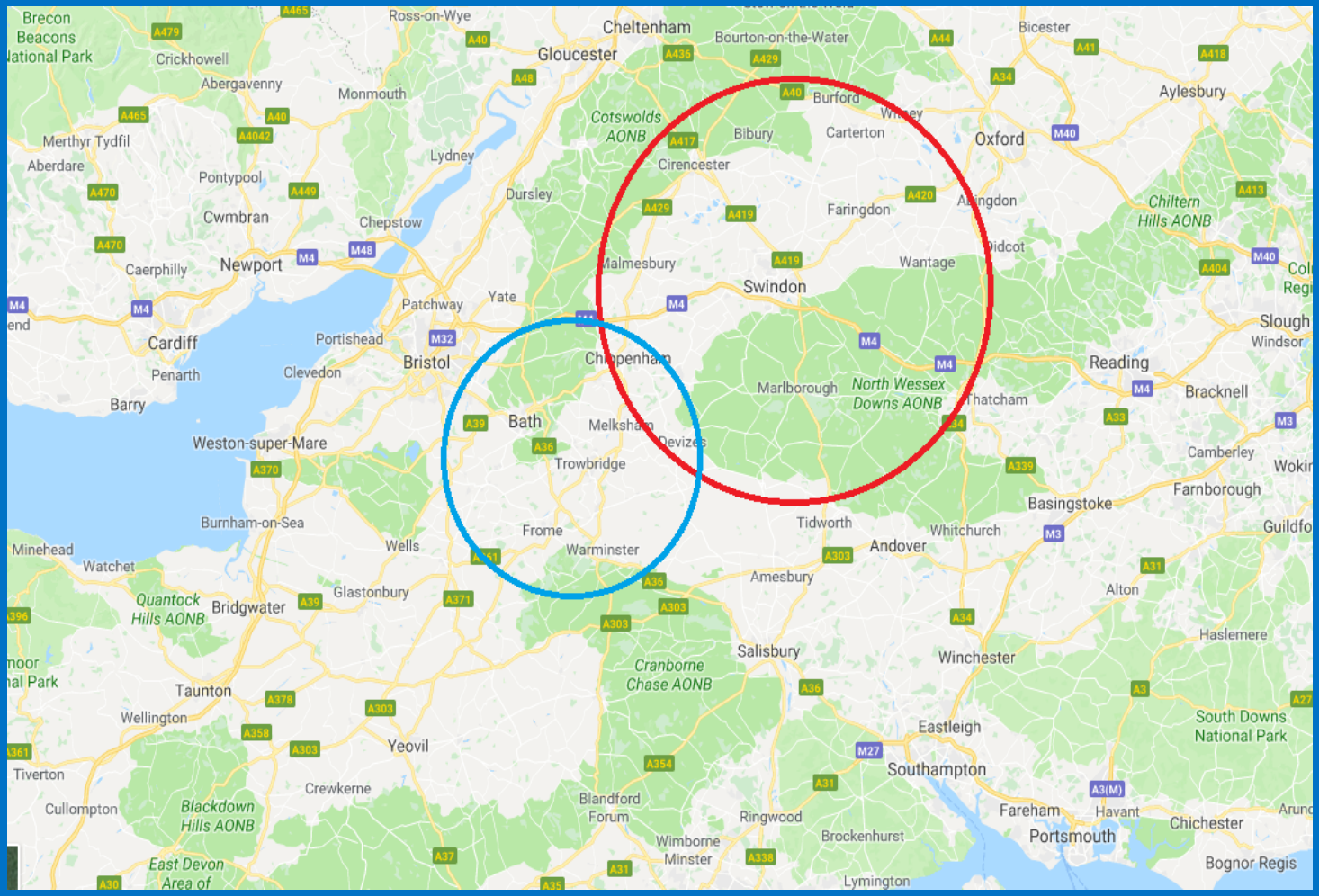

Service Teamwork Ambition Respect

A bit of history

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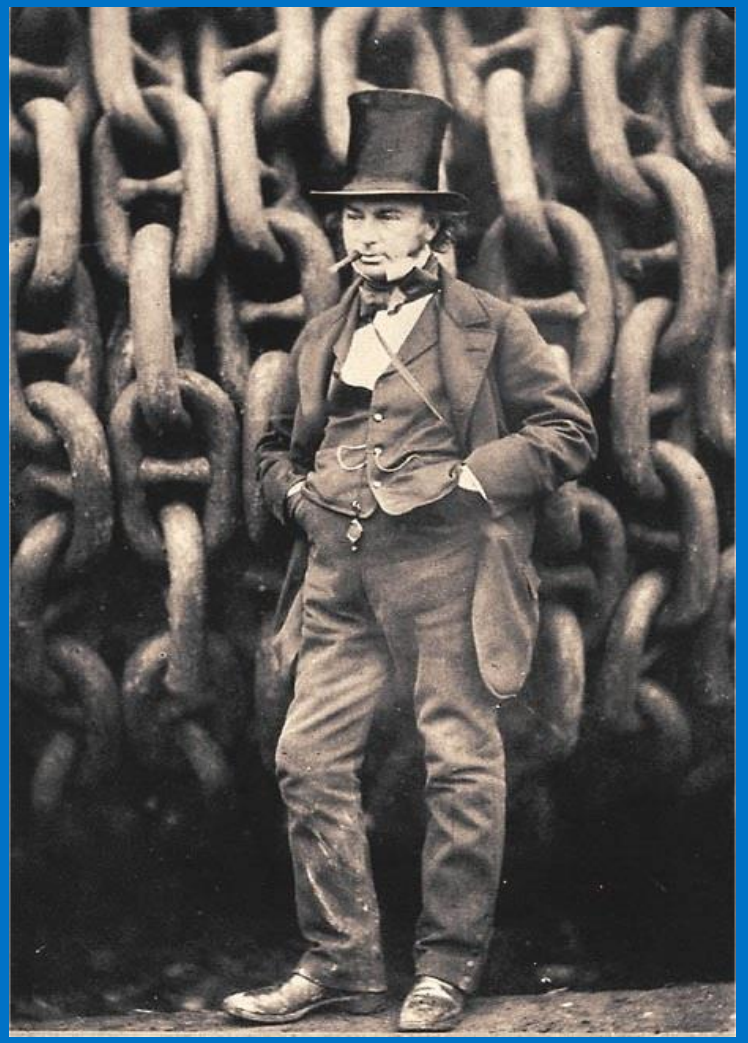
Great Western Railway

- Opened 1838
- Linking the port of Bristol with London
- Designed to compete with the large Northern industrial cities
  - Liverpool
  - Manchester



A bit of geography

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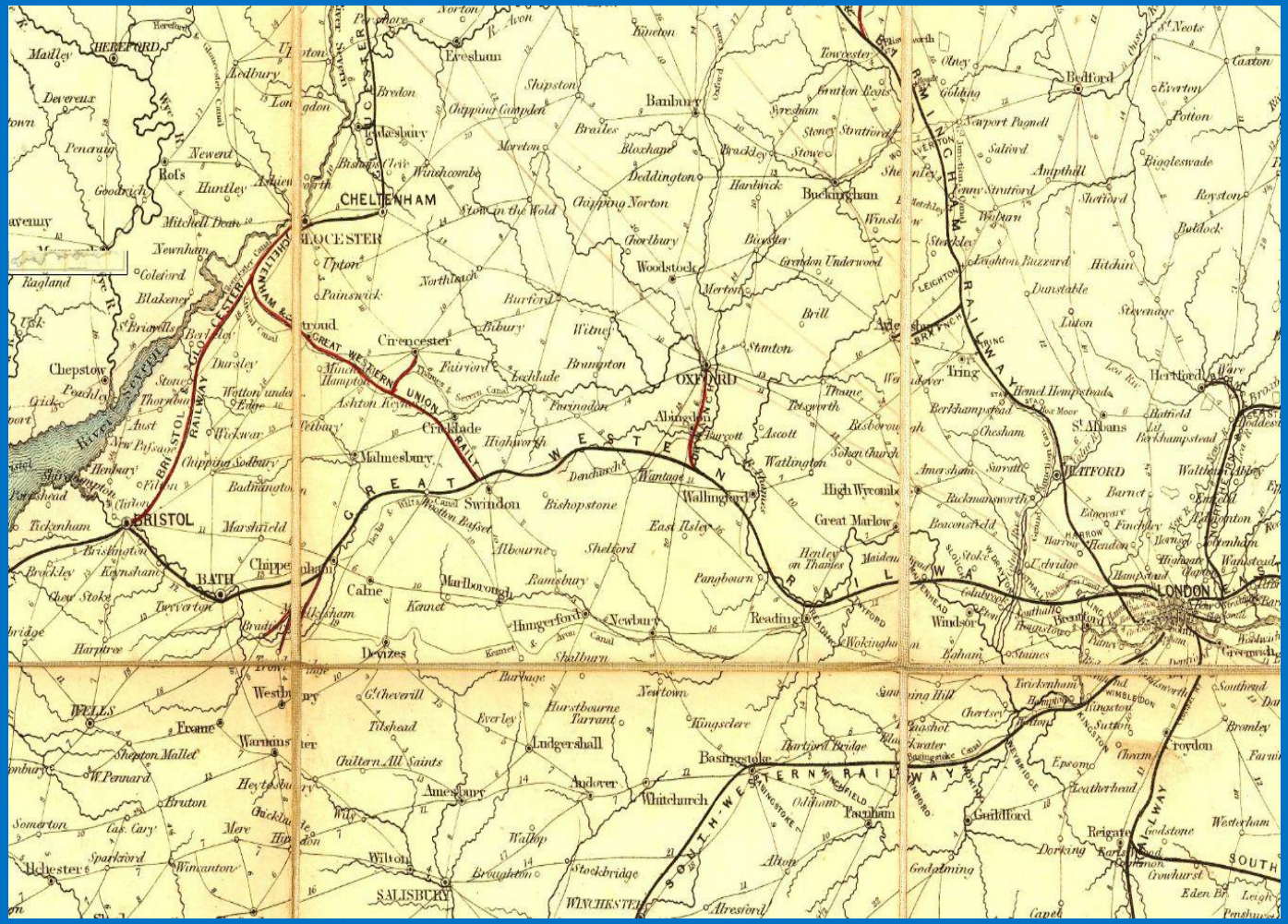

Service Teamwork Ambition Respect

Swindon 1966

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Population 101,000

Swindon 1966

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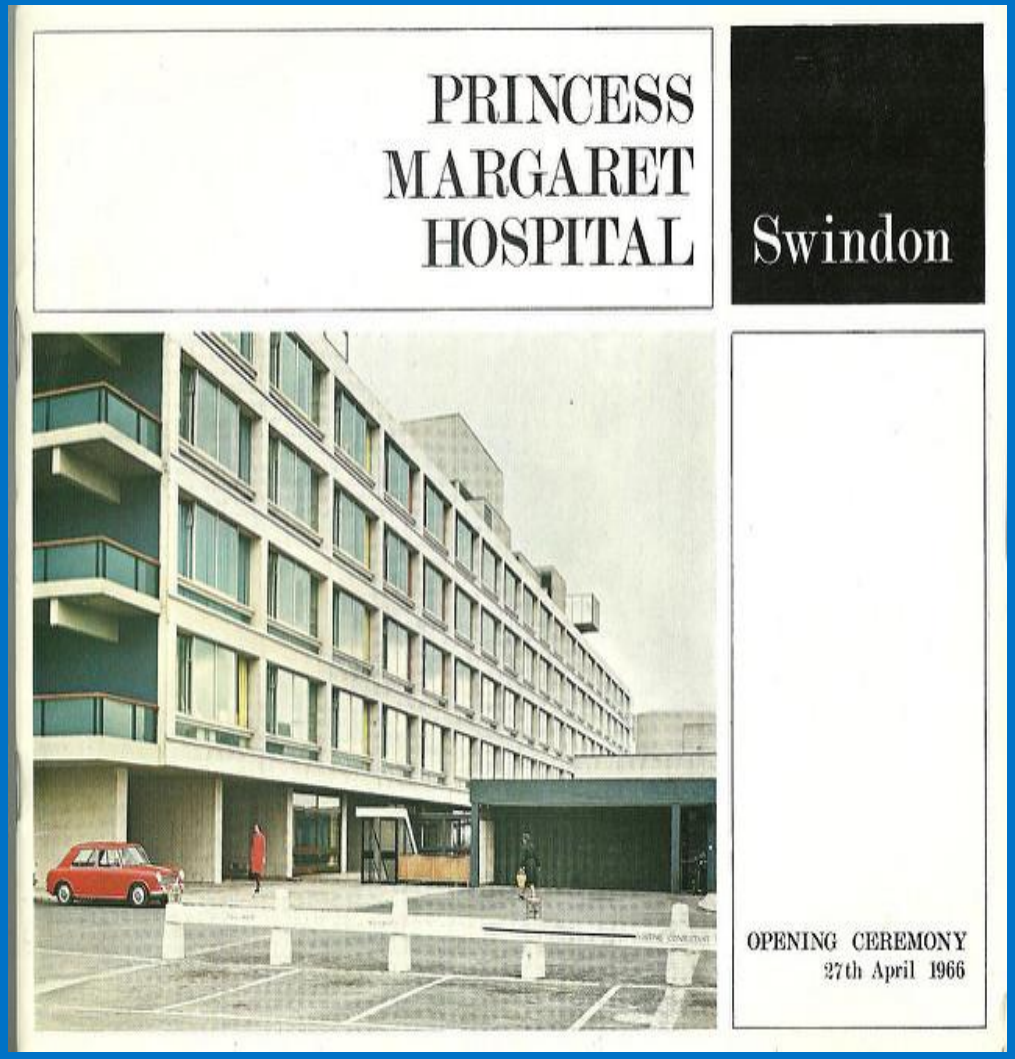

Swindon 1998

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Population 187,000

- In last 50years population doubled
- Compared to 20% increase in total UK population

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A new hospital for Swindon

Great Western Hospital

- Opened 2002
- Built on wasteland near M4 J15

One of the first to be built under PFI

- Built and maintained by Carillion

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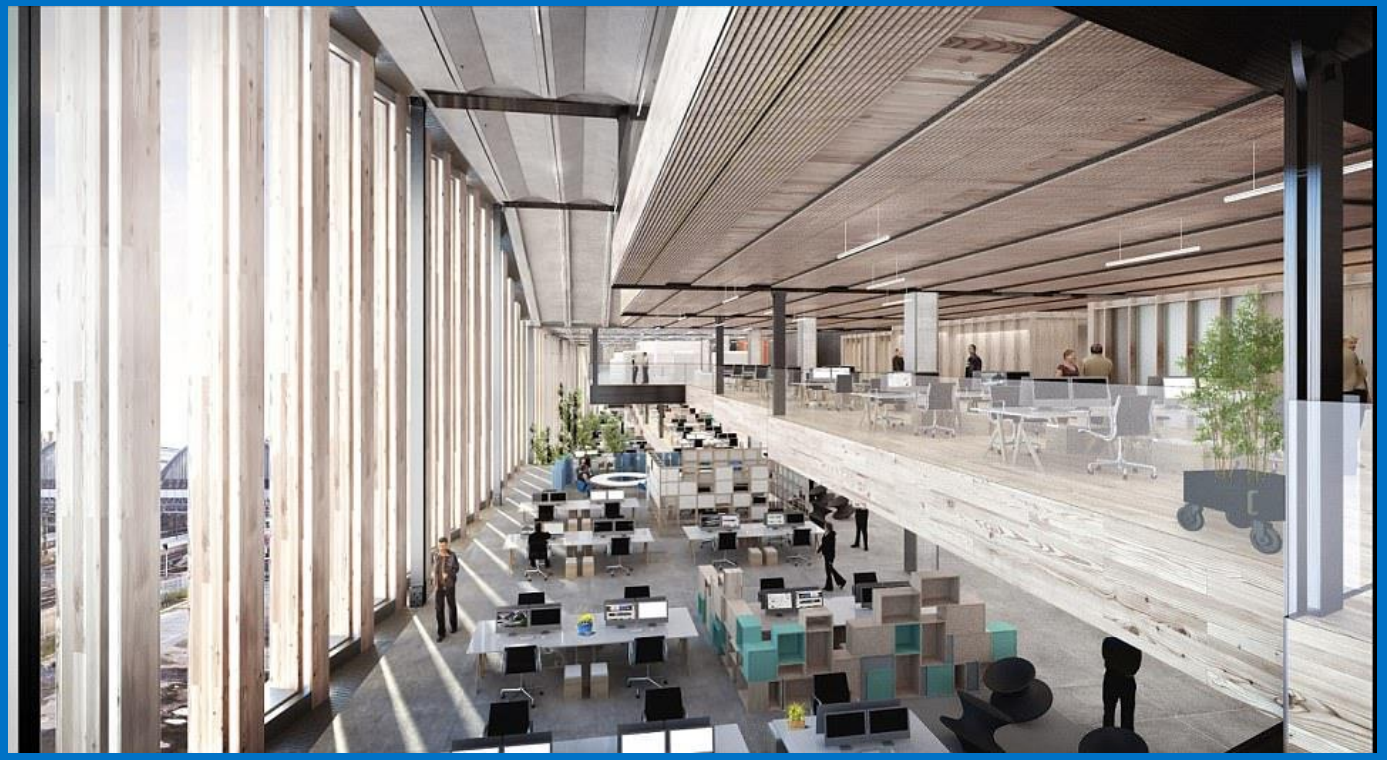
21st century Cardiology department



Service Teamwork Ambition Respect

GWH Pacing clinic

Increasing demand for diagnostic testing

- Echo

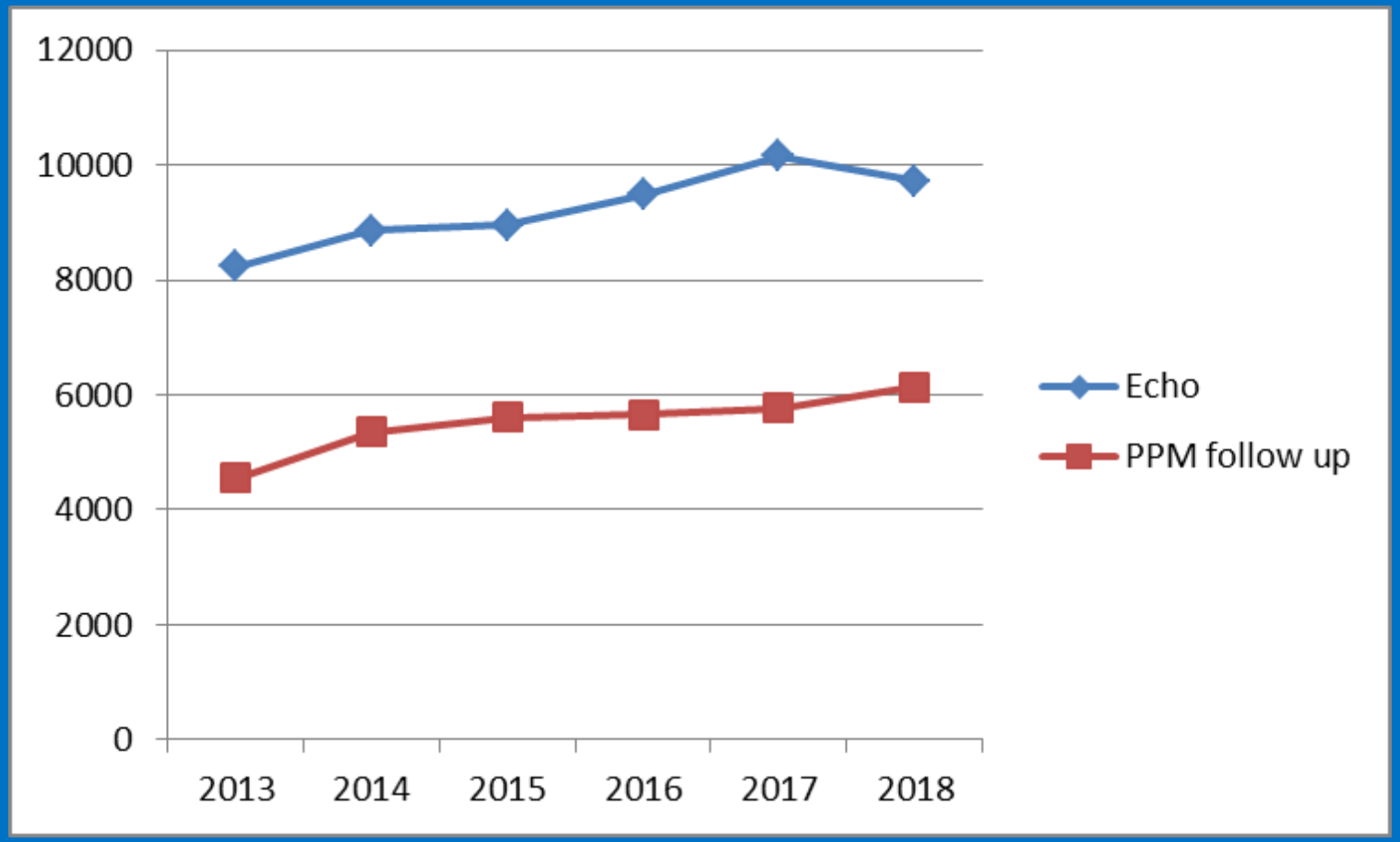
Lack of space for device patients in clinic

- 1 pacing room

>6000 patients actively FU

- 19 patients per day/each day
- If seen once per year

Workload


12000
10000
8000
6000
4000
2000
0
2013
2014
2015
2016
2017
2018
Echo
PPM follow up

Remote Monitoring Overview

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- **Remote monitoring offered to all patients**
  - – Since 2011
- **RM service runs 7 days per week**
- **>2500 current patients actively followed up**
- **>18,000 remote device follow ups**
  - – 2011-mid 2016

Remote Follow up Schedules

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Loop Recorders

- No formal clinic FU
- Ad hoc remote alerts

Pacemakers

- 12/12 Fully Remote FU
  - Automatic Threshold Functions ON

CRTP/D, ICD & PHBP

- 12/12 in clinic
- 6/12 remotely (if stable)

Completely Remote Follow up

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- RM is given post implant
- Patient is seen in clinic at 2/52
- If auto capture thresholds are on
  - 100% remote FU
- Only use brady devices with automatic alert functions
- Patients are educated as to wound and device functions
  - Advised of symptoms to watch out for
  - Ease of contact with department

Staffing the RM Service

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- **Core team of 7 physiologists**
  - Bands 6/7/8
- **All hold current post-graduate qualification in devices**
  - BHRS
  - IBHRE
  - EHRA
- **Flexible working patterns/Work from home**
  - Retention
  - Recruitment

Paperless Department

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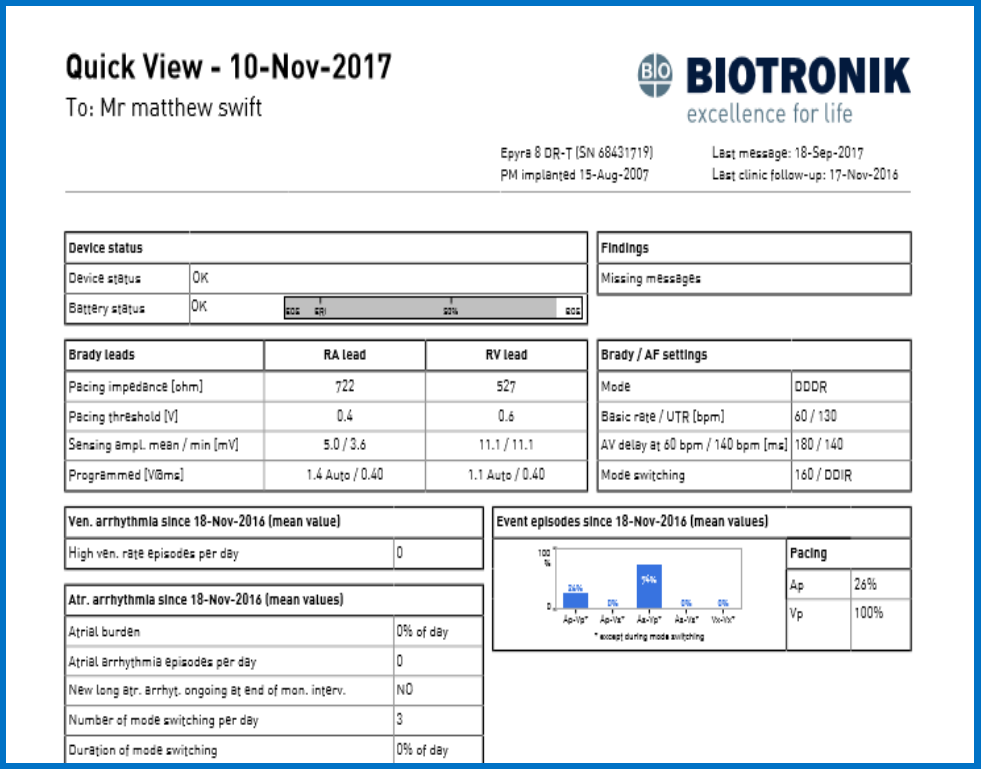
- 2010 moved to a fully paperless system
- Scanned all previous pacing documentation in to CVIS data base
- Now use USB sticks to save in clinic PDF files to CVIS
- Attach remote monitoring PDFs in a similar fashion
- We will soon be using the Fysicon system as a “middle man”



Quick View - 10-Nov-2017

To: Mr matthew swift

BIOTRONIK excellence for life

Epyra 8 DR-T (SN 68431719) — Last message: 18-Sep-2017
PM implanted 15-Aug-2007 — Last clinic follow-up: 17-Nov-2016

Device status	
Device status	OK
Battery status	OK

Findings
Missing messages

Brady leads	RA lead	RV lead
Pacing impedance [ohm]	722	527
Pacing threshold [V]	0.4	0.6
Sensing ampl. mean / min [mV]	5.0 / 3.6	11.1 / 11.1
Programmed [V@ms]	1.4 Auto / 0.40	1.1 Auto / 0.40

Brady / AF settings	
Mode	DDDR
Basic rate / UTR [bpm]	60 / 130
AV delay at 60 bpm / 140 bpm [ms]	180 / 140
Mode switching	160 / DDIR

Ven. arrhythmia since 18-Nov-2016 (mean value)	
High ven. rate episodes per day	0

Atr. arrhythmia since 18-Nov-2016 (mean values)	
Atrial burden	0% of day
Atrial arrhythmia episodes per day	0
New long atr. arrhyt. ongoing at end of mon. interv.	NO
Number of mode switching per day	3
Duration of mode switching	0% of day

Event episodes since 18-Nov-2016 (mean values)

Pacing	
Ap	26%
Vp	100%

Managing alerts

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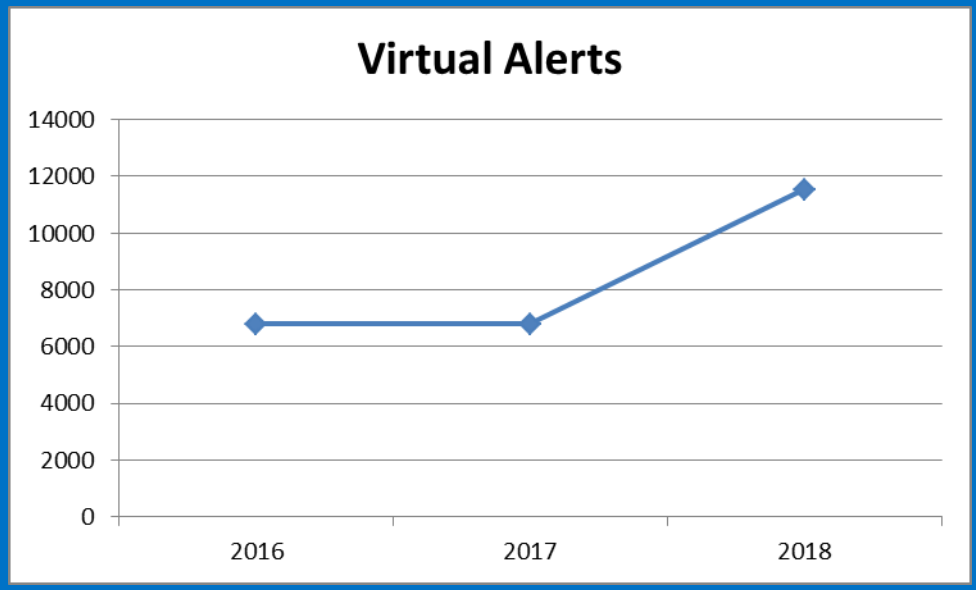
- **Alerts can be labour intensive**
  - "see a lot of normal"
- **Managing alerts**
  - Implant programming
  - Proactive disabling



Individually tailored alerts

Lead Measurements
- Threshold
- Sensing
- Impedance

Arrhythmias
- AF
- HVR
- % Paced Burden

Episodes

Home Monitoring
- HM no signal
- PIEGM arrived

Continuous evolution

No system is perfect from day 1

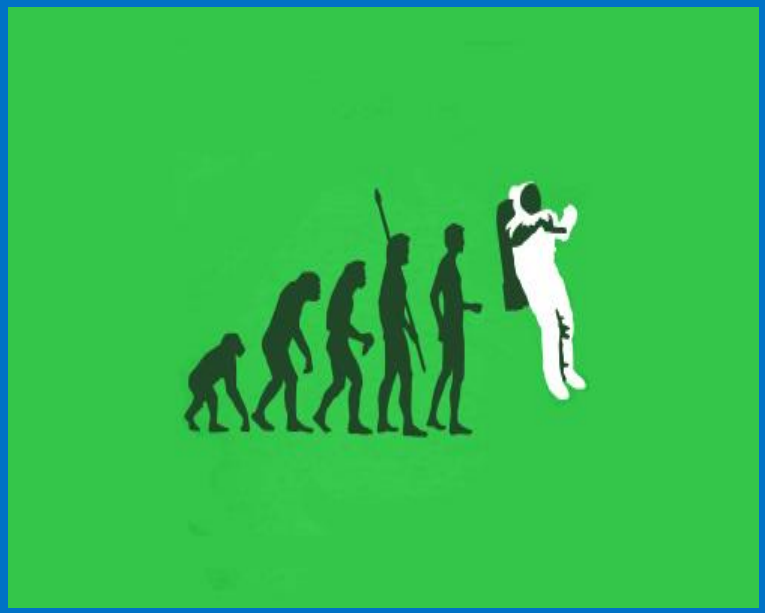
Continuous audit and improvements

Systems and protocols

- IT
- Clinical
- Administrative

Audit of remote loop recorder implants

- New implantation programming guidance
- Reduced alert burden by 80%



Potential Issues

- **Patient compliance**
  - "Tech Savvy"
  - Mean age 74.4years ±13.9
- **Technical Issues**
  - Phone/Mobile Connection
  - Remote device failure
- **Medical cover**
  - Weekend issues
    - Shocks
    - Device failures

The evolving service

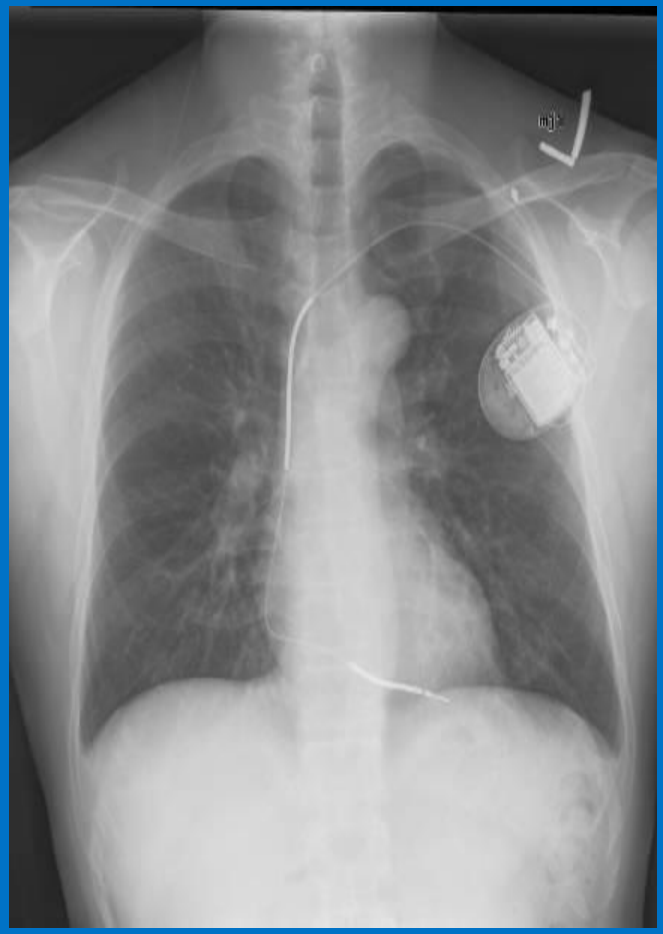
Primary Prevention ICDs

- Low pacing burden
- Unlikely therapy

Move to 100% remote follow up

Currently auditing 4 years of primary prevention ICD implants

- Clinically significant information discovered in clinic
  - That had not been previously reported by home monitoring



In clinic Follow up

- **100% remote FU does not allow for patient interaction**
- **Assessment of pt symptoms**
  - HR response/ symptoms
  - Wound Checks
  - Heart Failure

Clinical assessment of Heart Failure

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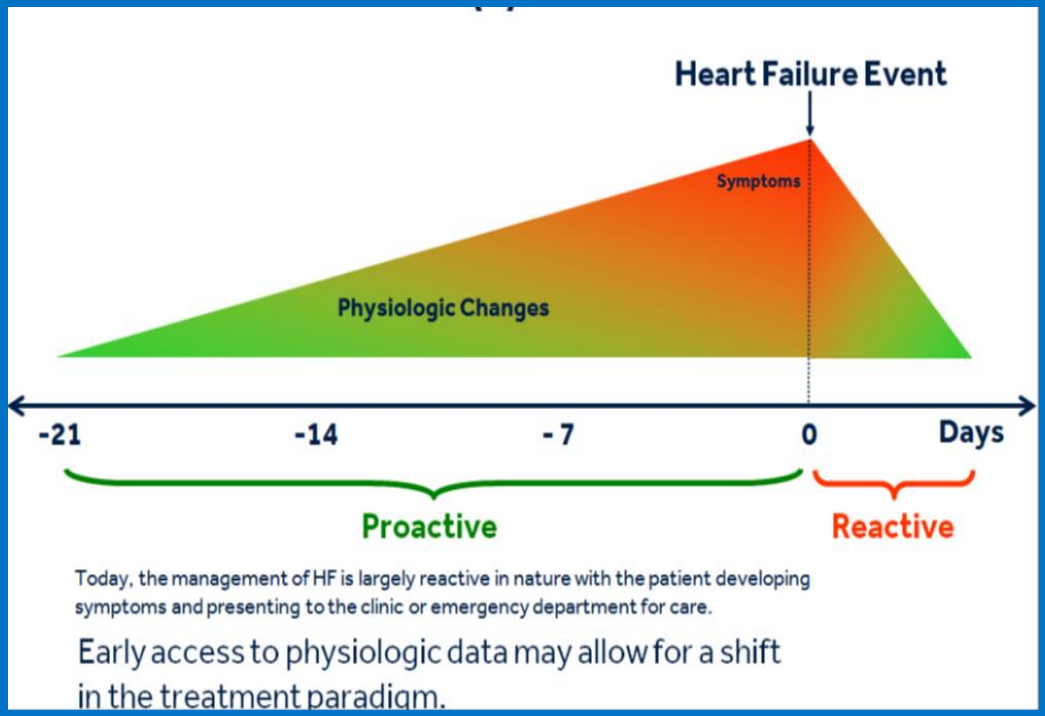
4.1 Symptoms and signs

Symptoms are often non-specific and do not, therefore, help discriminate between HF and other problems (*Table 4.1*).[42–46] Symptoms and signs of HF due to fluid retention may resolve quickly with diuretic therapy. Signs, such as elevated jugular venous pressure and displacement of the apical impulse, may be more specific, but are harder to detect and have poor reproducibility.[18,46,47] Symptoms and signs may be particularly difficult to identify and interpret in obese individuals, in the elderly and in patients with chronic lung disease.[48–50] Younger patients with HF often have a different aetiology, clinical presentation and outcome compared with older patients.[51,52]

European Heart Journal, Volume 37, Issue 27, 14 July 2016, Pages 2129–2200

Heart Failure Diagnostics

Remote detection and management of Heart Failure



Early Intervention

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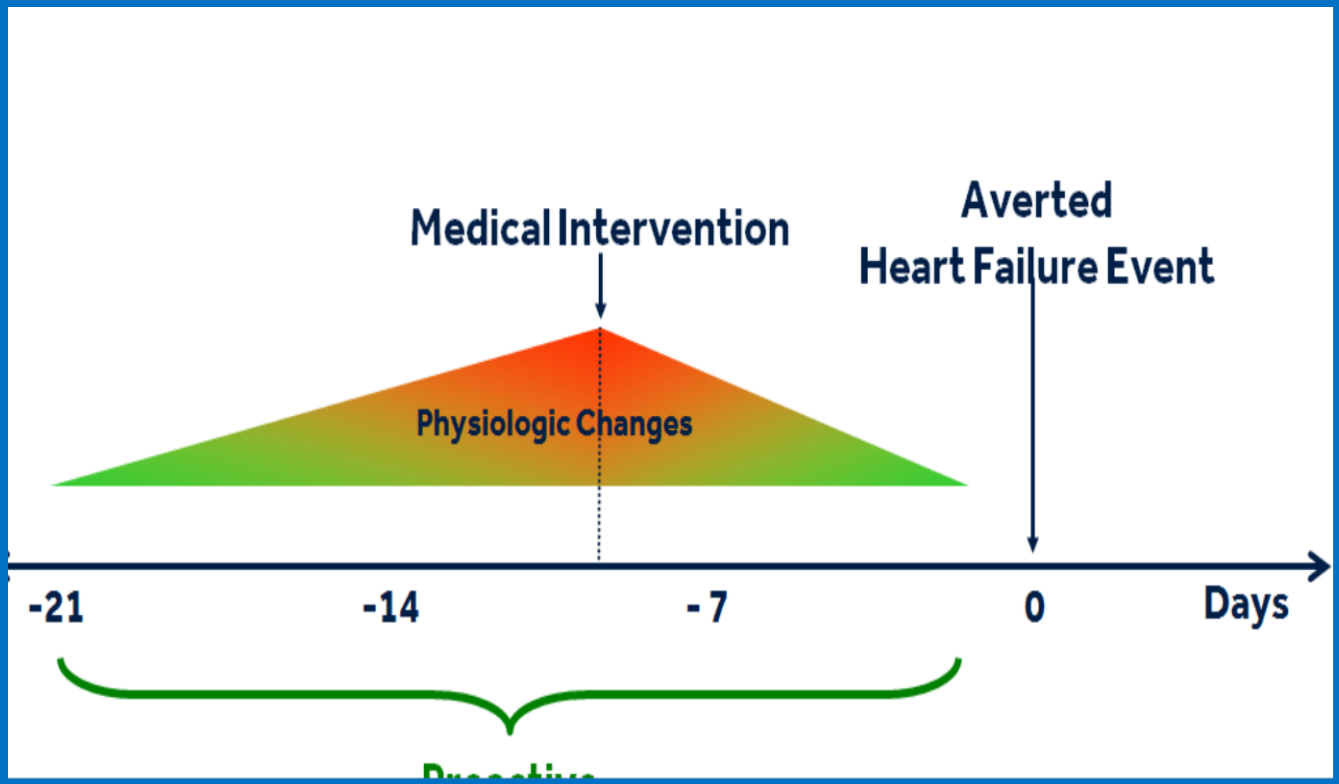


Remote HF Diagnostic tools

Thoracic Impedance monitoring

- Optivol
- Corvue
- Thoracic Impedance

Pt activity

AF burden

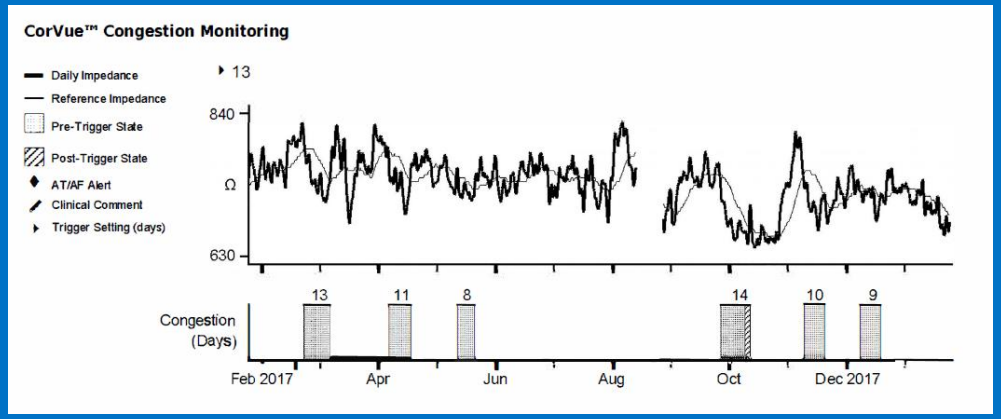
- V rate during AF

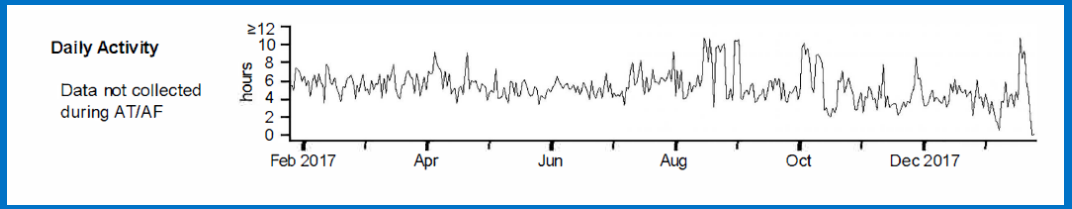
HR variability

% pacing

- A,RV&CRT

PVC/h

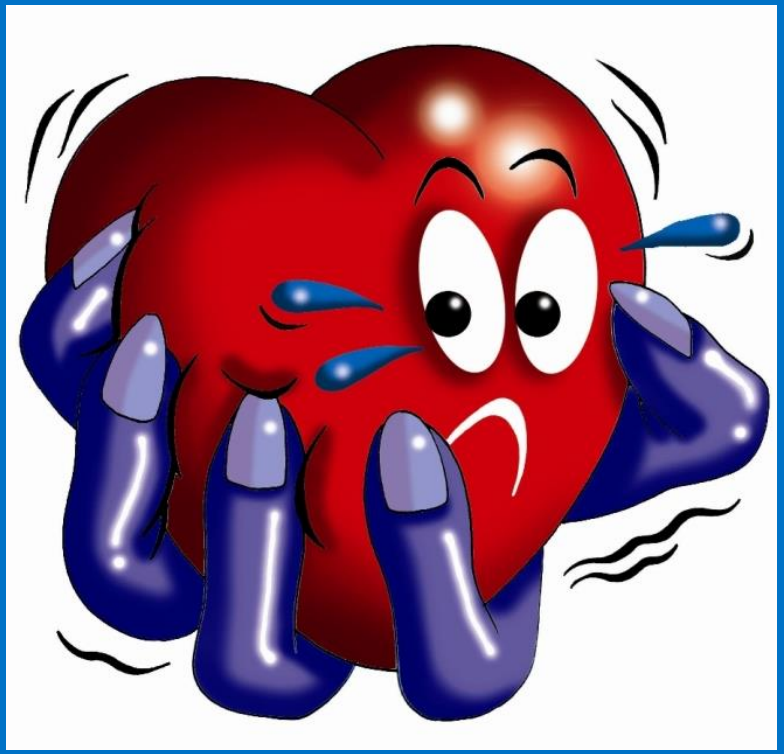




HF Detection Pathway

Home Monitoring triggers

- Mean PVC/h above limit (> 100 PVC/h)
- CRT pacing below limit (< 80%)
- RV pacing >limit
- Atrial monitoring episode detected
- Atrial burden above limit (> 50%)
- VT1/ VT2 and VF events



HF Referral

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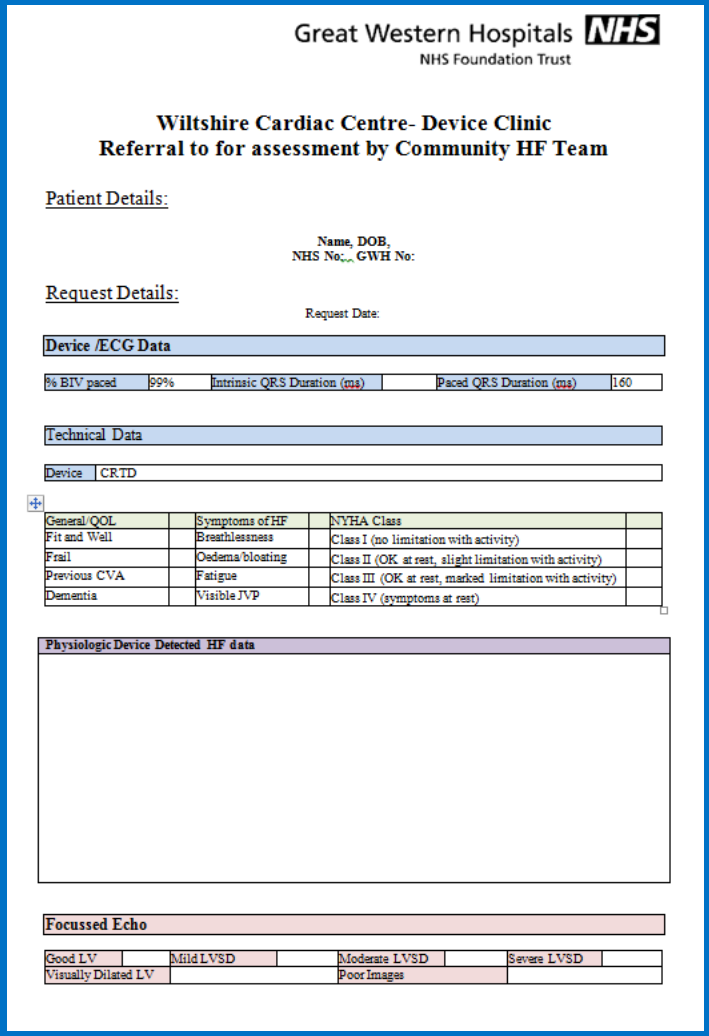
Rolling 3/52 window

- Alerts “REMOTE HF MONITORING ALERT”

Allied to secondary information

- Thoracic Impedance Monitoring
- Pt activity
- HR variability

Forward information to HF team if suspicion of HF



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Wiltshire Cardiac Centre- Device Clinic
Referral to for assessment by Community HF Team

Patient Details:

Name, DOB,
NHS No:,., GWH No:

Request Details:

Request Date:

Device /ECG Data

% BIV paced	99%	Intrinsic QRS Duration (ms)		Paced QRS Duration (ms)	160

Technical Data

Device	CRTD

General/QOL		Symptoms of HF		NYHA Class	
Fit and Well		Breathlessness		Class I (no limitation with activity)	
Frail		Oedema/bloating		Class II (OK at rest, slight limitation with activity)	
Previous CVA		Fatigue		Class III (OK at rest, marked limitation with activity)	
Dementia		Visible JVP		Class IV (symptoms at rest)	

Physiologic Device Detected HF data

Focussed Echo

Good LV		Mild LVSD		Moderate LVSD		Severe LVSD	
Visually Dilated LV				Poor Images			

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Remote Monitoring Conclusion

- A tool which can ease the burden of in clinic FU
- Follow up our patients 7 days a week
- Greater flexibility for staff around working patterns
- Long process to set up
- The remote follow up of devices can be tricky