Development, Implementation and Audit of Locally Agreed Standards for Permanent Pacemaker Follow-Up

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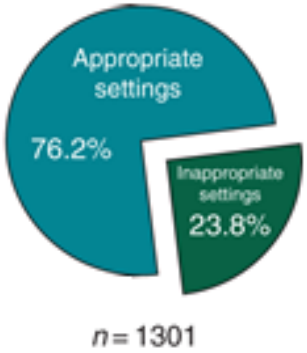
Outline

- Why is the quality assurance (QA) process needed?
- QA standards
- Data collection
- Results
- Conclusions

Why is QA needed?

- QA identifies variation in clinical practice
- No comprehensive standards
  - HRS/EHRA[1]
  - BHRS[2]
- BHRS recommend a formal QA process
- Suboptimal programming common[3]



1) Wilkoff et al. Europace 2008
2) BHRS Council, 2015
3) Ziacchi et al. Europace 2017

QA Standards

- **Patient symptoms documented ?**
  - Symptoms potentially ppm-related thoroughly investigated?
  - If heart failure symptoms reported, has appropriate referral been made or investigation been performed?
  - Appropriate advice given if non-pacemak
- **Wound check documented?**
  - If abnormal clinical features, h
- **Presenting ECG rhythm and rate, and**
  - If inappropriate device function seen,
- **Underlying rhythm recorded?**
  - If AV conduction seen, is algorithm programmed on to minim of why not)?
  - If previous AV node ablation, has CHB been confirmed?
  - Programmed mode appropriate for current pacing indication?
- **Battery status recorded (Longevity / voltage / magnet rate / impedance)?**
  - If discrepancy between battery parameters, has further advice been sought from manufacturer?
  - At 6/12 remaining has assessment of need for device, or a referral to the CRM nurses been made?
  - Changes made to maximise longevity where box change is less desirable?
- **Threshold measurements recorded?**
  - Measurements verified?
  - Pulse width / unipolar threshold performed if high?
  - riate output programmed / automatic capture management algorithm on?
  - **corded?**
  - rammed?
  - **ded?**
  - ?
  - ant change in impedance, have further investigations been performed (arm movements, chest X-ray)?
- **% Atrial and ventricular pacing recorded?**
- **Heart rate histograms assessed and documented?**
  - If inadequate heart rate variation, have settings been adjusted (or justification given if not)?
  - If high ventricular rates in AF seen, has letter been sent to GP / Consultant?
  - If increased proportion at max tracking rate, have settings been adjusted?

If inadequate heart rate variation, have settings been adjusted (or justification of why not)?

QA Standards

- **Appropriate lower rate limit programmed?**
  - Is AMS base rate appropriate?
- **Appropriate upper track**
- **Appropriat**
- **Atrial**
  - E
  - If episode
    been confirmed
  - If symptomatic SVT, has letter been sent to GP or Consultant?
  - Is rate response programmed on during mode switch?
  - Has the device been reprogrammed to VVIR if permanent AF (≥1 year)?

AHRE
- EGM correctly interpreted?
gulation confirmed
nt?

If MHRA advisory on device / lead, has it been adhered

VHRE
- If oversensing, have settings been adjusted?
- If symptomatic, has this been escalated?

les documented?

ns been performed (arm movements / st X-ray)?

been adjusted?

ode noted?

If symptomatic, has this been escalated?

PMTs documented?

- Is PMT prevention / termination algorithm on?
- If no algorithm available, or algorithm ineffective, has VA conduction been evaluated and PVARP adjusted?

- **Rate drop response / CLS programmed on for cardio-inhibitory patients?**
- **If MHRA advisory on device / lead, has it been adhered to?**
- **Changes to device programming documented?**
- **Next required follow-up documented?**
  - Is the time period appropriate?
- **Are reports printed?**

Data Collection

- Retrospective audit of pacemaker follow-ups

First audit cycle (100 patients)

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Results disseminated

↓

Changes implemented

↓

Second audit cycle (100 patients)

Demographics

- 200 patients

	Audit One	Audit Two
Mean Age (±SD)	75 (±13)	77 (±10)
Mean Device Age (±SD)	3.5 (±3)	3.6 (±3)
% Male	59	56
% Dual chamber	72	69

- p = NS between groups
- Abbott (69), Boston (64), Medtronic (55), Sorin (10), Vitatron (2)

Pacing Indications

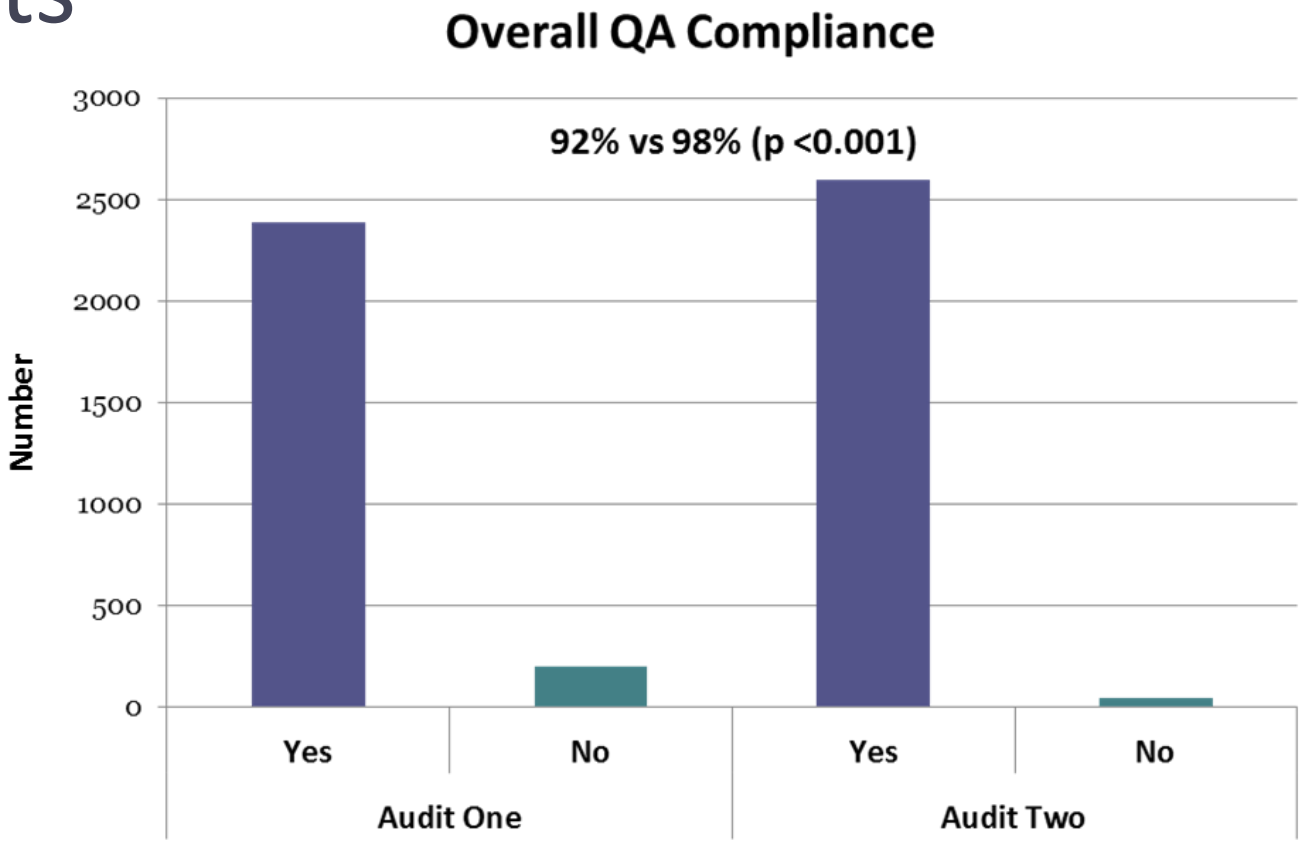
	Audit One	Audit Two
CHB	30	37
SND	26	25
AF + Brady	10	13
AF + AVNA	9	10
2:1 AVB	4	7
Mobitz I	6	4
Mobitz II	7	1
Trifascicular Block	5	2
Bifascicular Block	1	1
First Degree AVB	1	0
Cardioinhibitory VVS	1	0
Total	100	100

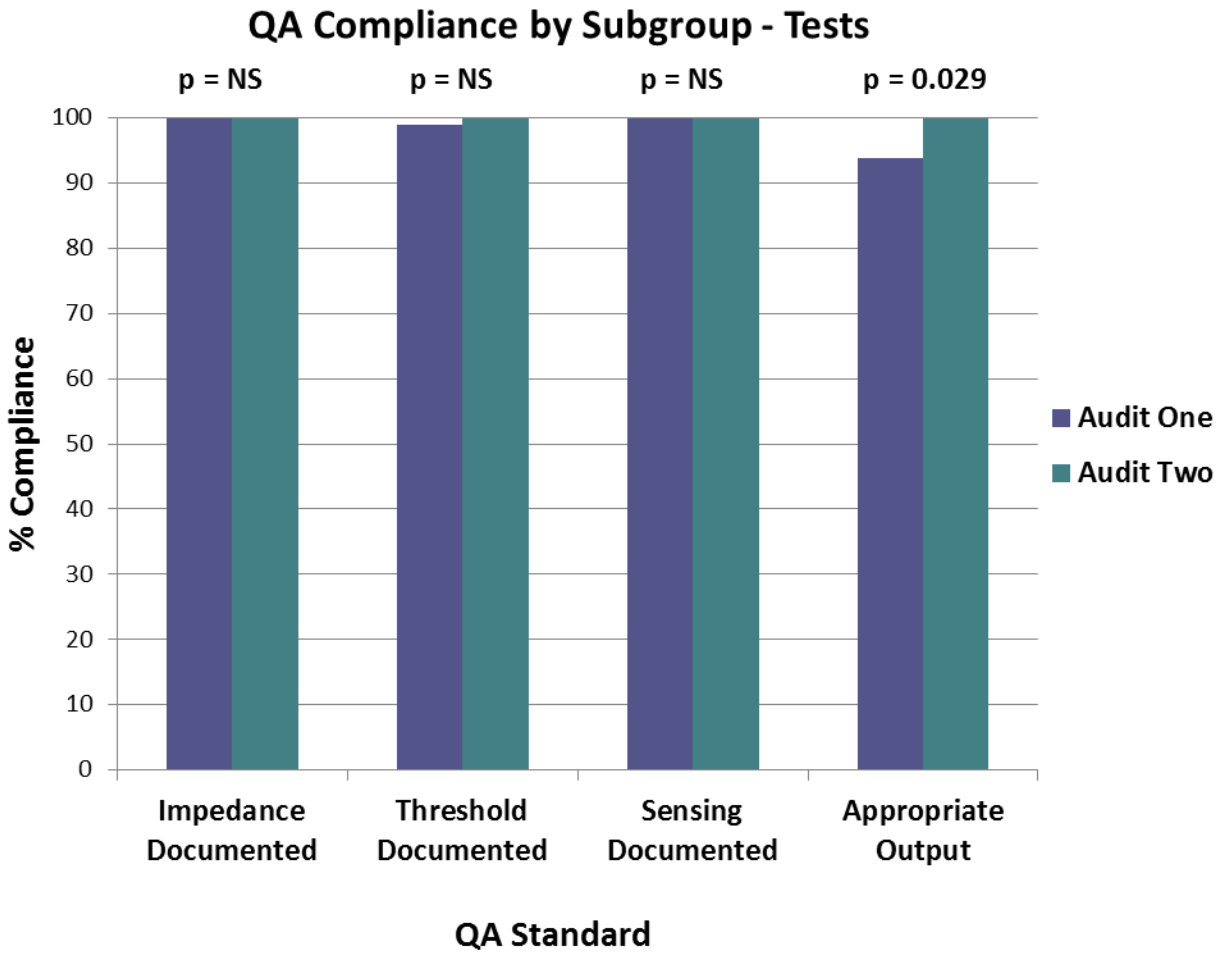
Changes Implemented

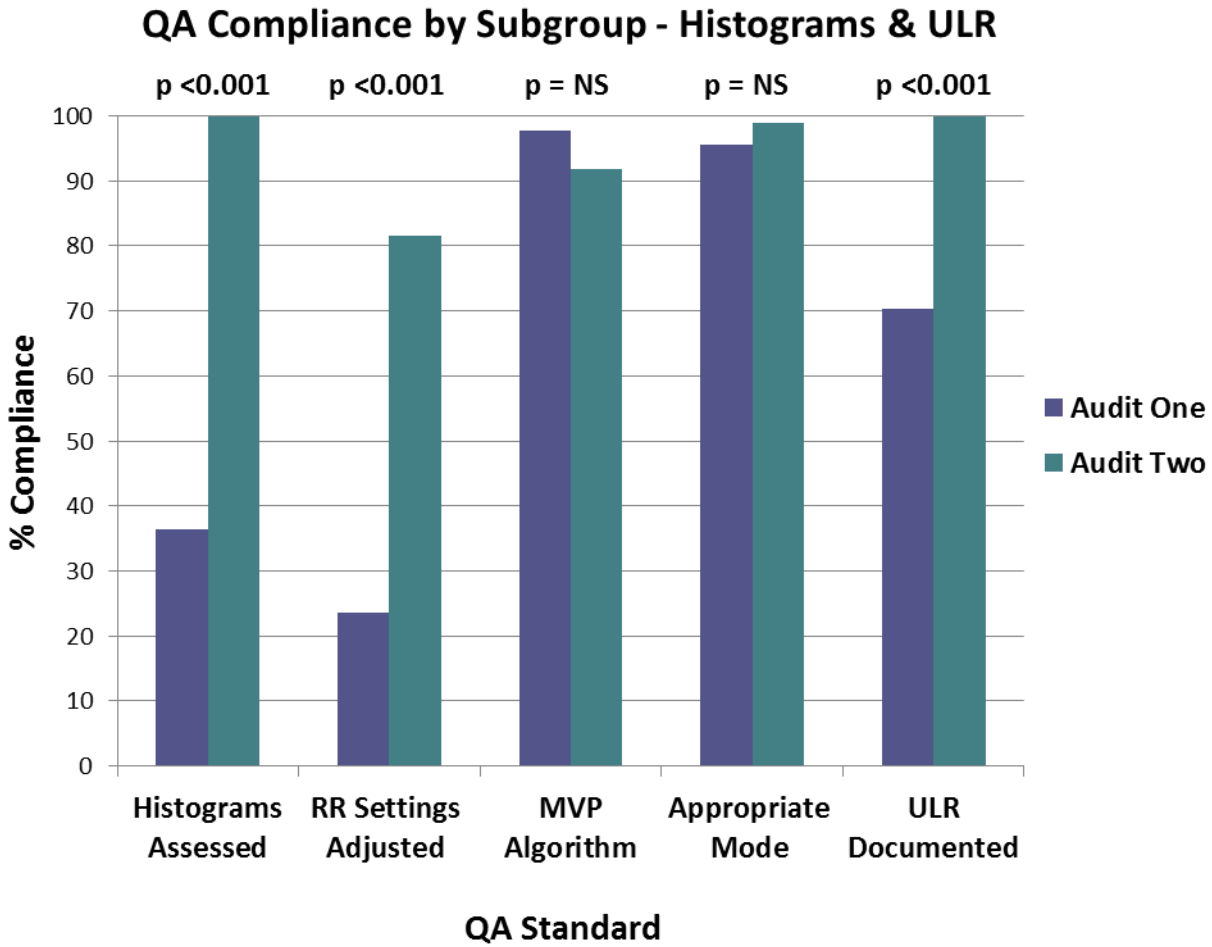
- **Areas for improvement**
  - Documenting heart rate histograms (36% compliance) PMTs (8%) & ULR (78%)
  - MHRA advisories (81%)
  - HF symptoms (67%)
  - Symptomatic SVT (50%)

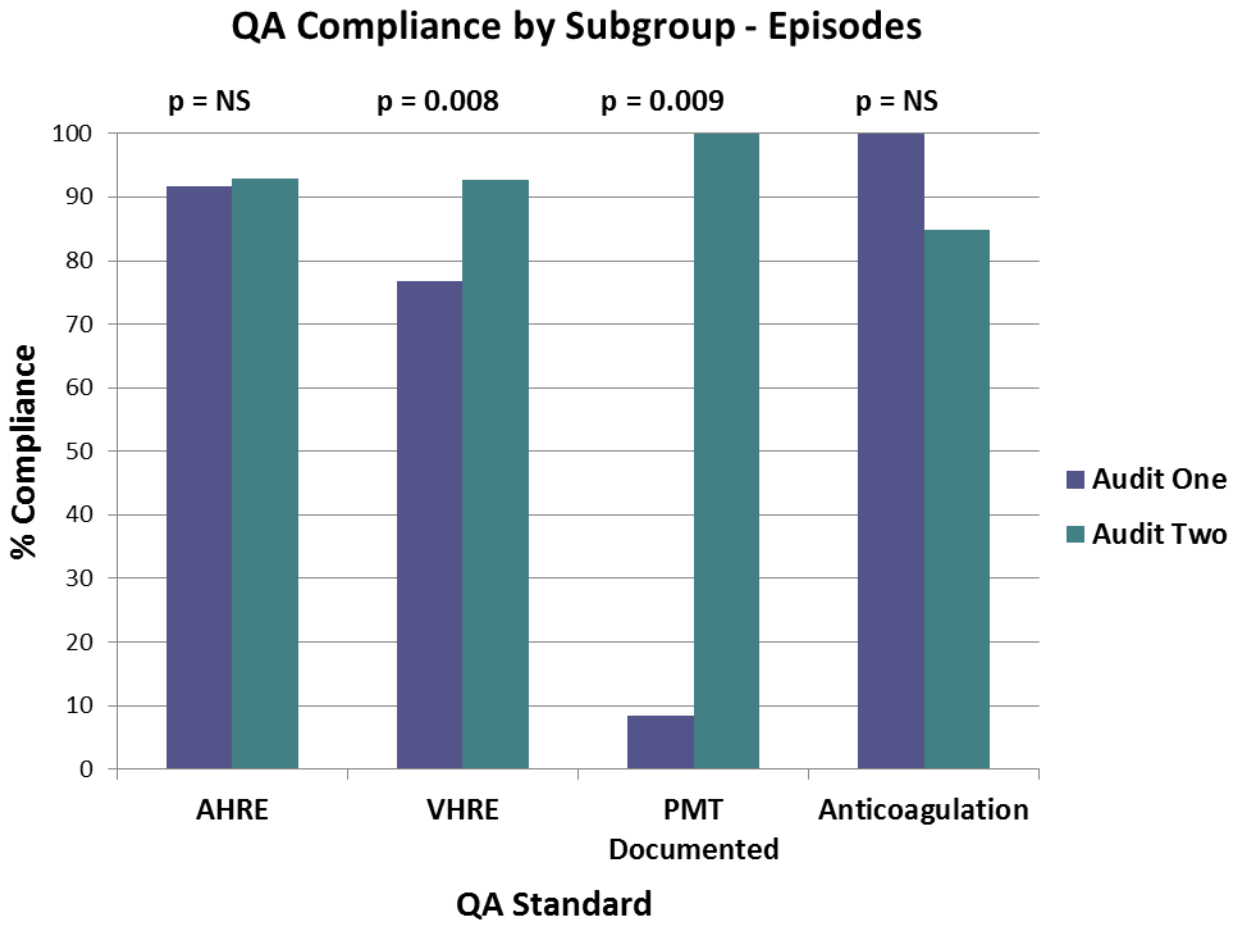
- **Changes implemented following result feedback**
  - Follow-up form adapted
  - Advisories listed
  - HF referral letter
  - Symptomatic SVT protocol
  - Anticoagulation status for permanent AF / VVIR devices

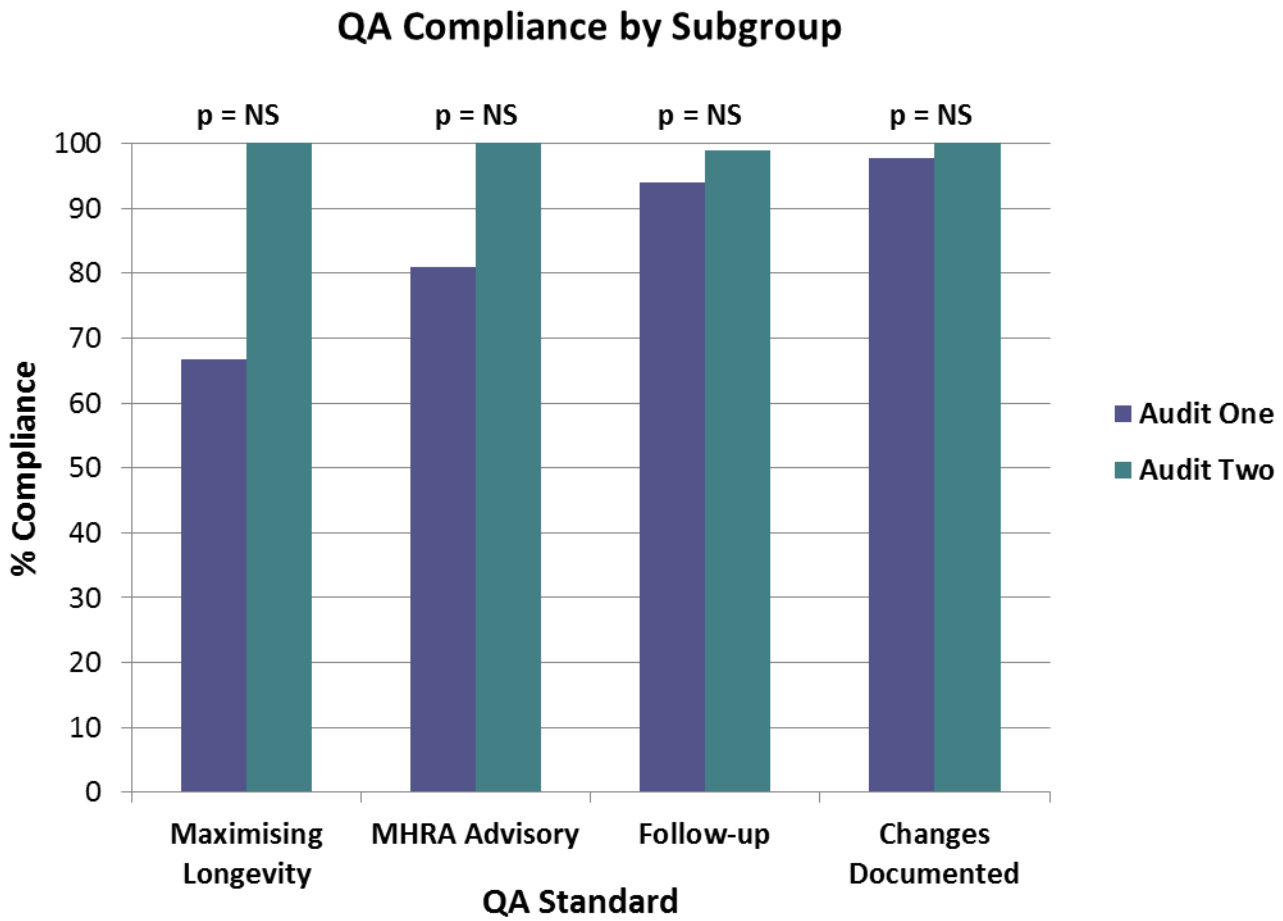
Results


Overall QA Compliance
92% vs 98% (p <0.001)
Number
3000
2500
2000
1500
1000
500
0
Yes
No
Yes
No
Audit One
Audit Two


QA Compliance by Subgroup - Tests
p = NS
p = NS
p = NS
p = 0.029
100
90
80
70
60
50
40
30
20
10
0
% Compliance
Audit One
Audit Two
Impedance Documented
Threshold Documented
Sensing Documented
Appropriate Output
QA Standard


QA Compliance by Subgroup - Histograms & ULR
p <0.001
p <0.001
p = NS
p = NS
p <0.001
100
90
80
70
60
50
40
30
20
10
0
% Compliance
Audit One
Audit Two
Histograms Assessed
RR Settings Adjusted
MVP Algorithm
Appropriate Mode
ULR Documented
QA Standard


QA Compliance by Subgroup - Episodes
p = NS
p = 0.008
p = 0.009
p = NS
100
90
80
70
60
50
40
30
20
10
0
% Compliance
AHRE
VHRE
PMT Documented
Anticoagulation
QA Standard
Audit One
Audit Two


QA Compliance by Subgroup
p = NS
p = NS
p = NS
p = NS
100
90
80
70
60
50
40
30
20
10
0
% Compliance
Maximising Longevity
MHRA Advisory
Follow-up
Changes Documented
QA Standard
Audit One
Audit Two

Conclusions

- National guidance for follow-up is lacking
- Local implementation has improved quality of care
- Highlighted areas of ambiguity
- QA standards do not replace clinical judgement
- Ongoing process - ?extended to ICD / CRT follow-up
- Robust QA process should be implemented across all follow-up centres

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Any Questions?

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