# Device Infection Surveillance

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# Overview

- Local definitions & classification
- Inclusion/exclusion
- Local trends in device infection
- Root cause analysis/ duty of candour
- Measures to reduce device infection
- Summary

A lifetime of specialist care

Royal Brompton & Harefield NHS
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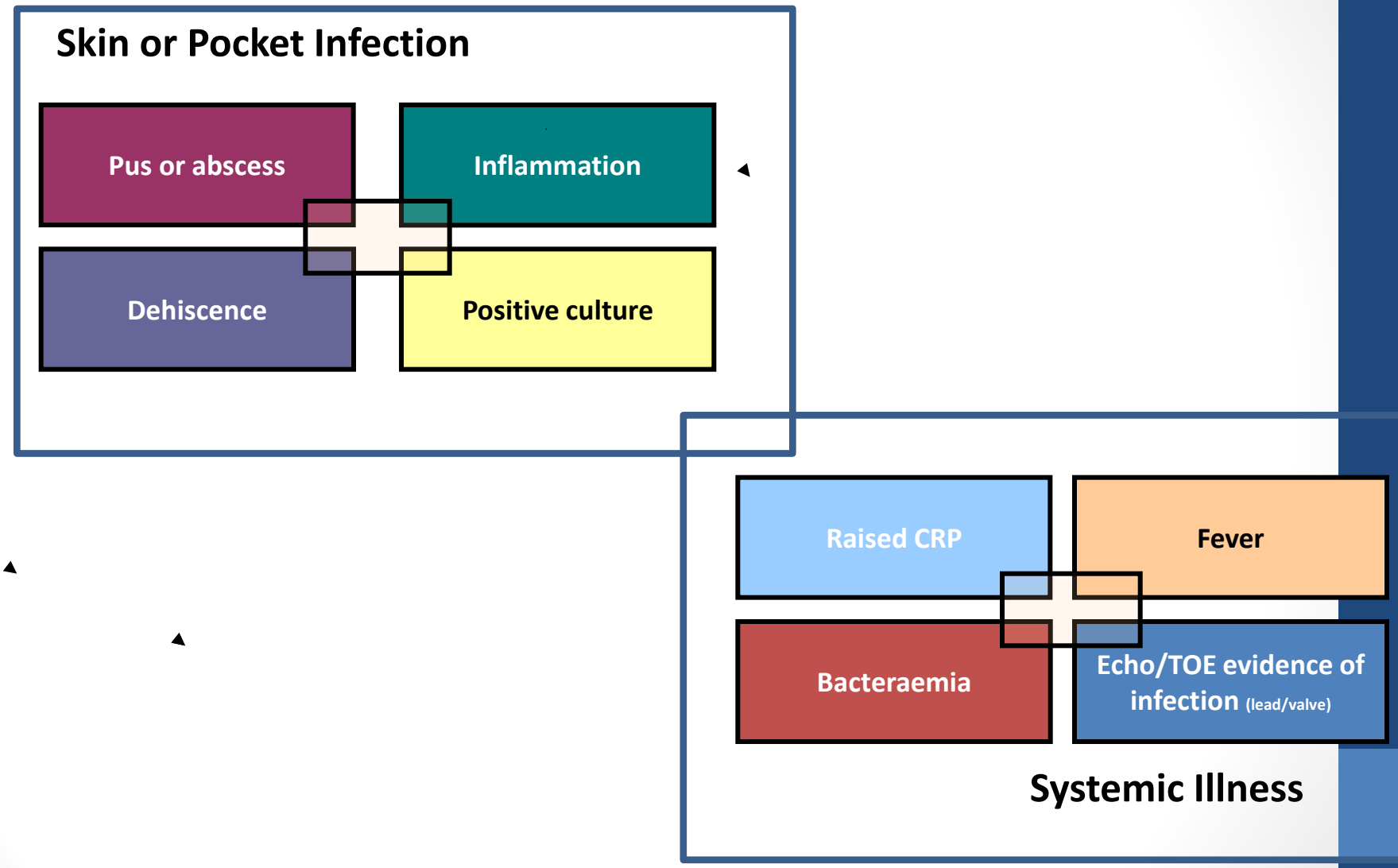
# Background

- Shift towards more new implants, fewer revisions
- ICDs – approximately 650 (Trust 2015/16 FY data)
- Pacemaker – approximately 900( Trust 2015/16 FY data)
- In 2010 complications were MDT reviewed, including device infections

# Steep learning curve

- **New patient group** – predominantly post-discharge surveillance (Systematic Review: 60% post-discharge Woelberg *et al.* 2016– ? >90% for implant device infection)
- **Active Surveillance**: ward checks, microbiology reports, 'Wound Book' in Pacing Clinic, MDT complications list
- '**Light surveillance**' – prospective, detailed data collected on infected cases
- **Risk of over-reporting**

# Local and Systemic Criteria



| | |
|---|---|
| **Mr XXX XXXXX**<br>**XXXXXXXXX**<br>**DOB: Age: , M**<br>Previous medical history<br>IHD, CABG & MV repair 20XX<br>Multiple PCI<br>Poor LV – EF 23%<br>LV thrombus on warfarin | ICD implant 3/2/2012 Lab 5 at HH (transferred from Lister for device).<br>Operator: Dr X<br>Left subpectoral pocket cephalic vein routine closure Dermabond. Reaction to ABx: rash, itching, urticania<br>At HH discharge: no issues with wound and rash gone.<br>Post Discharge: patient reported ongoing bleed and pain following implant for which he went to local hospital for analgesia and dressing. |

Transfer Details: A&E East & North Hertfordshire NHS Trust: patient presented 4/3/2012 erythema and swelling overlying ICD. L anterior chest wall from ICD incision line blood and pus expressed approx. 40 mls appearance of 10cm abscess. Patient admitted with fever, dizziness and nausea. Microbiology: Lactose penetrating coliform. B/C negative to date on transfer

Harefield Admission 6/3/2012 – 30/4/2012: WBC 16.8, CRP 57, Temp 36.8

**Invasive Management/ Treatment**

Extraction (7/3/2012) Procedure Notes: incision through old scar. Pus +++upon breach of the capsule. The silk securing the ventricular ICD lead had been eroded with infection. Device explanted. Leads unscrewed as stylet inserted and removed easily with gentle traction. Wound debrided lavage $H_20_2$ closed. **Dr X**

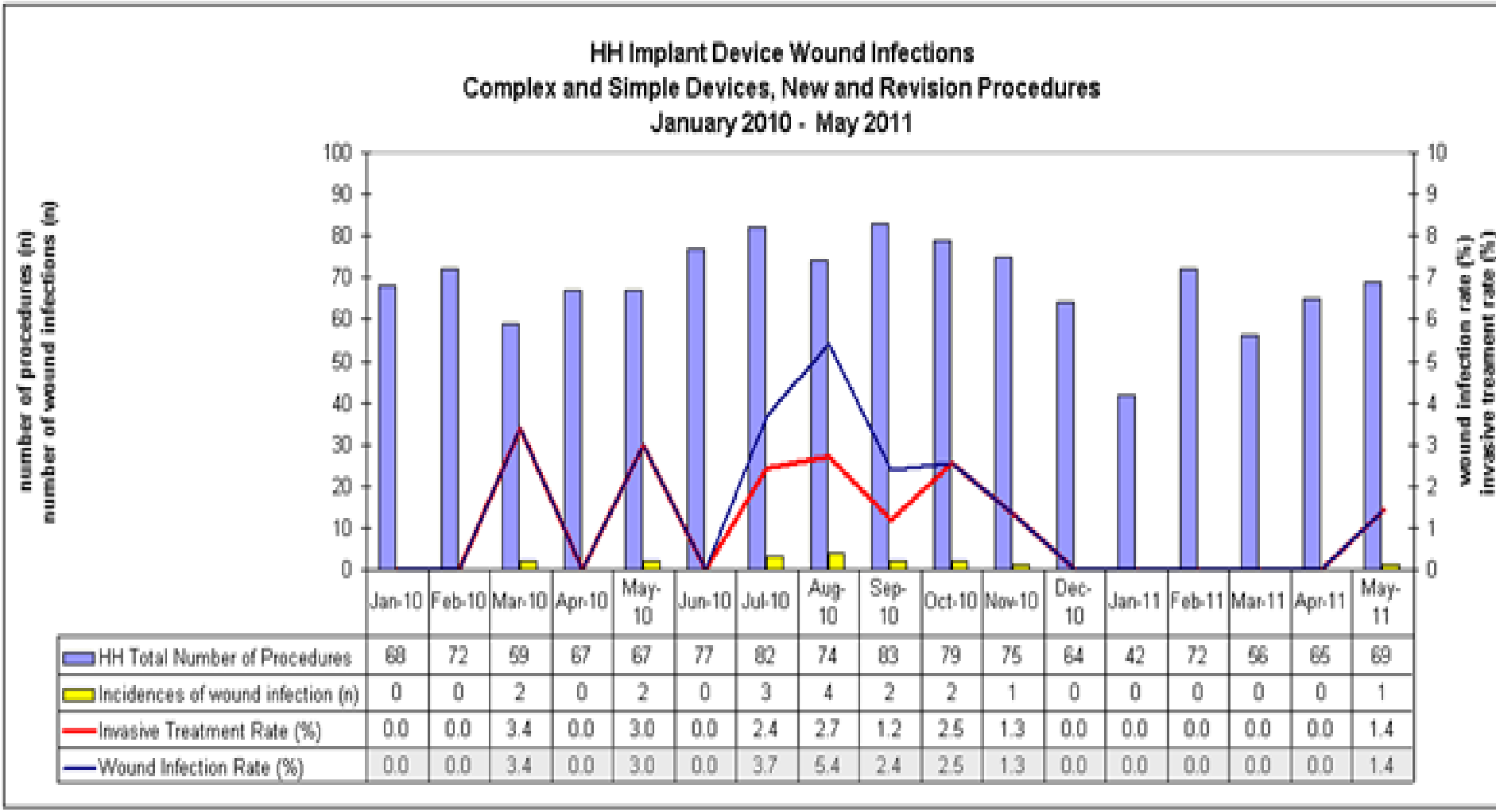
**Microbiology**

- Wound swabs: 7/3/2012 and 24/4/2012 MRSA negative; 12/3/2012 and 2/4/2012 culture negative
- Pus sample: 8/3/2012 moderate growth of coliform
- Tissue sample: N/A
- Lead: Pacing wire tip: 8/3/2012 Not tested as not received in sterile container
- Blood culture: 7/3/2012 venous blood negative

**Echo** 23/3/2012: No clear evidence of thrombus or vegetation on this scan

New implant dual chamber ICD right sided 26/4/2012 by Dr X
Surgical review 23/5/2012 noted both sites healing
Next OPA: 31/05/2012 Dr X
30/5/2012 confirmed infection

# Record Infection in Month Procedure




| | Jan-10 | Feb-10 | Mar-10 | Apr-10 | May-10 | Jun-10 | Jul-10 | Aug-10 | Sep-10 | Oct-10 | Nov-10 | Dec-10 | Jan-11 | Feb-11 | Mar-11 | Apr-11 | May-11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HH Total Number of Procedures | 68 | 72 | 59 | 67 | 67 | 77 | 82 | 74 | 83 | 79 | 75 | 64 | 42 | 72 | 56 | 65 | 69 |
| Incidences of wound infection (n) | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 4 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Invasive Treatment Rate (%) | 0.0 | 0.0 | 3.4 | 0.0 | 3.0 | 0.0 | 2.4 | 2.7 | 1.2 | 2.5 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 |
| Wound Infection Rate (%) | 0.0 | 0.0 | 3.4 | 0.0 | 3.0 | 0.0 | 3.7 | 5.4 | 2.4 | 2.5 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 |

# Considerations

- MDT adjudication
- Classification vs invasive treatment
- <> 1 year of procedure
- ‘Homegrown’ vs Other Institution

# Rates vs ward level activity

**The 'ward burden' higher than infection rates**

- Month of procedure is usually different from month when infection presents
- Patients from other hospitals
- Device infections can arise in our patients >1 year
- Protrusion/erosion

# Ward Burden

**Inpatient Data**

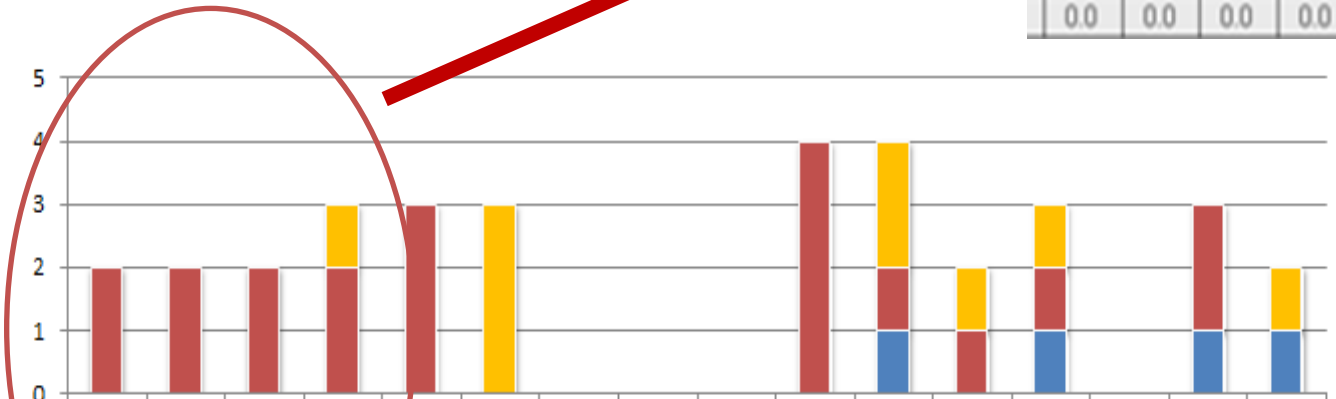
**Number (n) Patients of Device Infection Management at Ward Level**

**Max one episode inpatient stay per patient**

**January 2011 - April 2012**

(data as at 30/5/2012)

| | Jan-11 | Feb-11 | Mar-11 | Apr-11 |
|---|---|---|---|---|
| | 42 | 72 | 56 | 65 |
| | 0 | 0 | 0 | 0 |
| | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.0 | 0.0 | 0.0 | 0.0 |

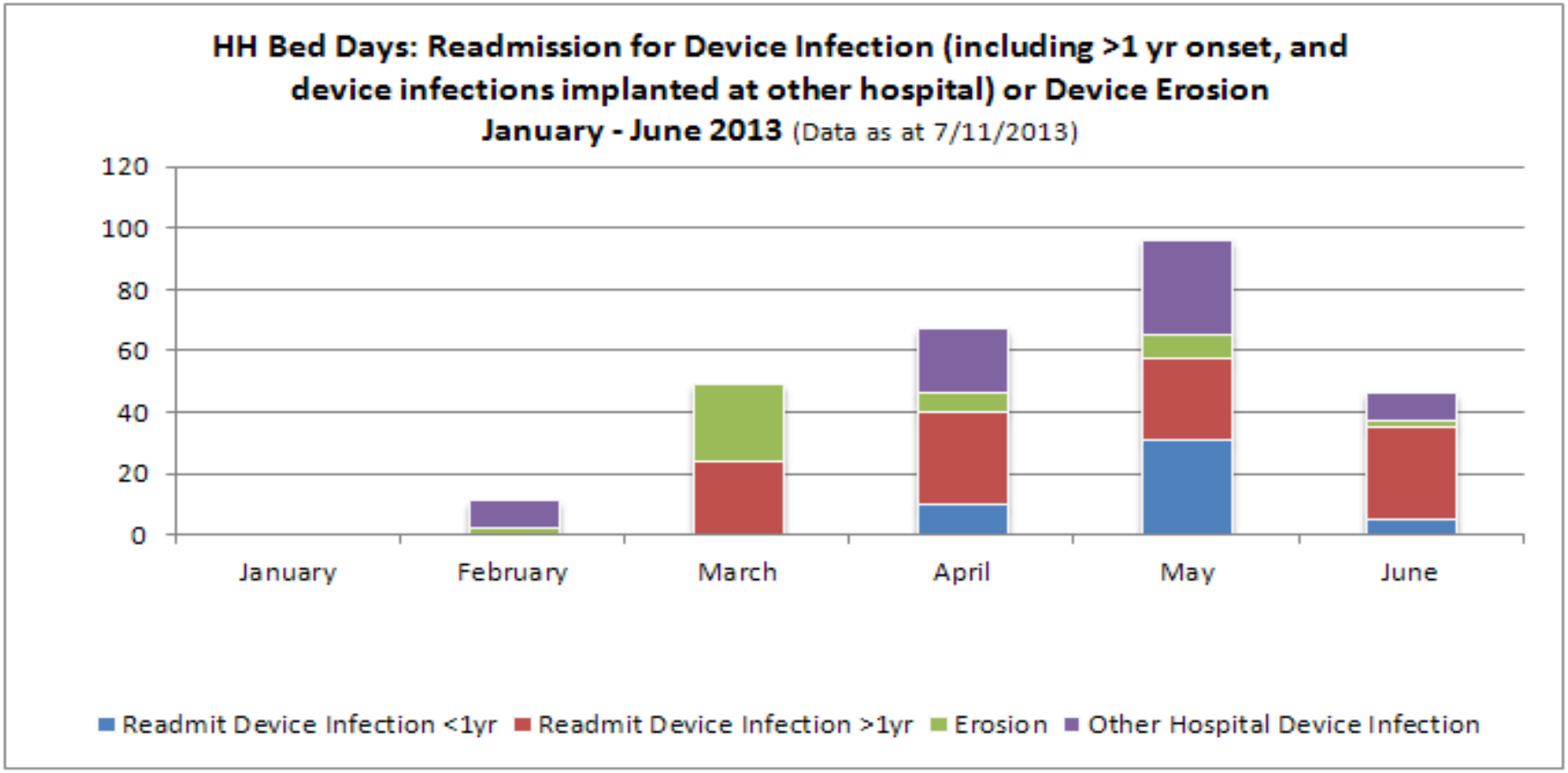



| | Jan-11 | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan-12 | Feb | Mar | Apr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Erosion | | | | 1 | | 3 | | | | | 2 | 1 | 1 | | | 1 |
| Device Infection (Homegrown) | 2 | 2 | 2 | 2 | 3 | | | | | 4 | 1 | 1 | 1 | | 2 | |
| Device Infection (St Elsewhere) | | | | | | | | | | | 1 | | 1 | | 1 | 1 |

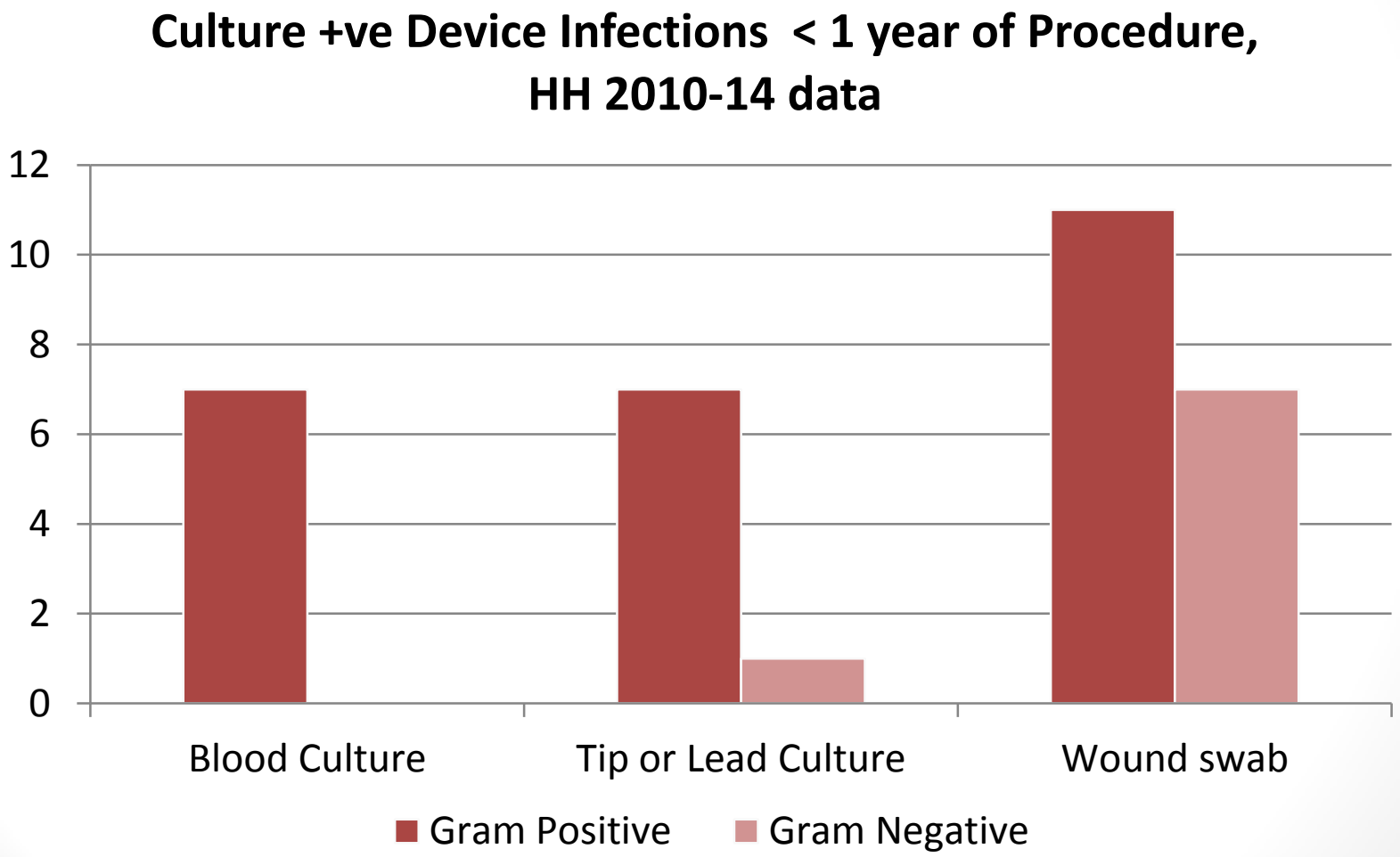
Six Month Audit of Bed Days

Total 269 bed days for device wound management, mean stay 30 days

Device infections with onset >1 yr procedure represent **41% of the bed days**



# Most Common Microbial Cause



# Sample type, by specimen

**Blood Cultures: 41% culture positive**

- Within 24 hours. 5/15 culture positive

8/23 patients did not have BC on admission. Later samples:

- MRSA culture BC positive, 12 days after admission
- CNS culture BC positive, 7 days after admission

**Lead Tip: 100% culture positive**

6/6 were culture positive

**Pus *: 100% culture positive**

2/23 patients had samples of pus sent. 2/2 were positive micro (Staph A and coliform)

**Tissue: 0% culture positive**

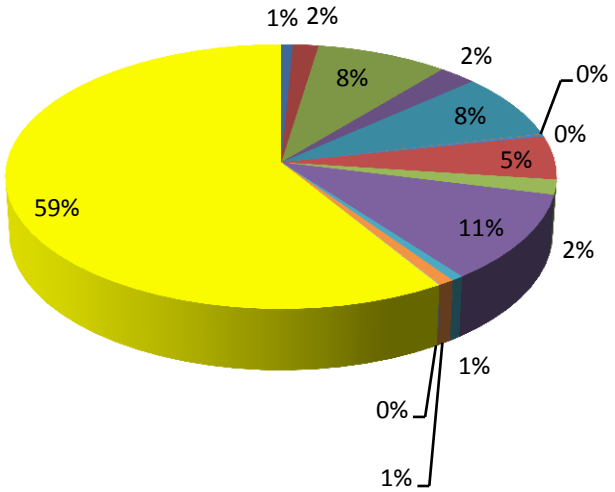
3/23 patients had tissue samples sent.

**Wound swabs: 76% culture positive**

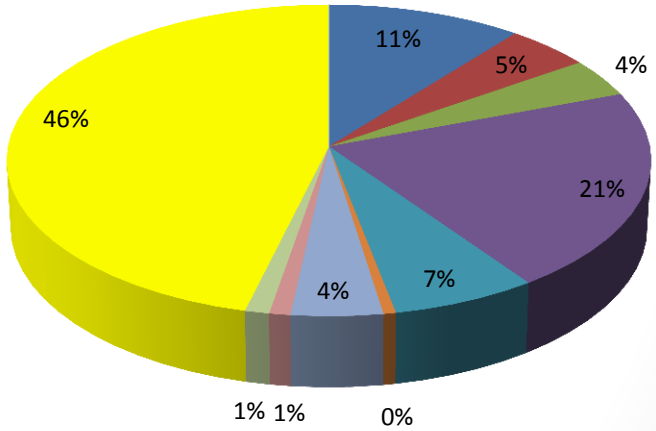
16/21 had positive swab

# Cost HCAI, device infection/SSI

**2011/12 Financial Year**
**Implant Device**
**Readmission for Infection**




**2011/12 Financial Year**
**Cardiac Surgery**
**Readmission for Infection**



# Data

Dimensions of Data Quality – accurate, valid, reliable, timely, relevant, complete

MDT adjudication – increased confidence in dataset

| Point | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| **ABx** | | Clarification: Re-dosing for prolonged procedures; timing (within one hour KTS) re-administration, revision devices and transfer patients | New antibiotic guidelines. Integrated Care Pathway (ICP) adapted | Guidelines for Empirical Antimicrobial Therapy for Cardiac Implantable Electronic Device (CIED) Infection | National trends in prophylaxis, decolonisation protocol (mupiricin?) |
| **Cath Lab** | | | Cath Lab 7: larger space, 15 air changes | Cath Lab 6: refurbishment & improvement of infastructure (more storage, better scrub facility etc) | Cath Lab 4: planned work includes theatre standard - 25 air changes |
| **New Practices** | Chloraprep | Clarification on MRSA +ve management | Collatamp trialled. All treat-and-returns to be washed onsite | Sterillium HibiScrub+ | Replace monitor dots daily (at wash) for all pts moving forward for implants |

# Care Bundle to Reduce SSI

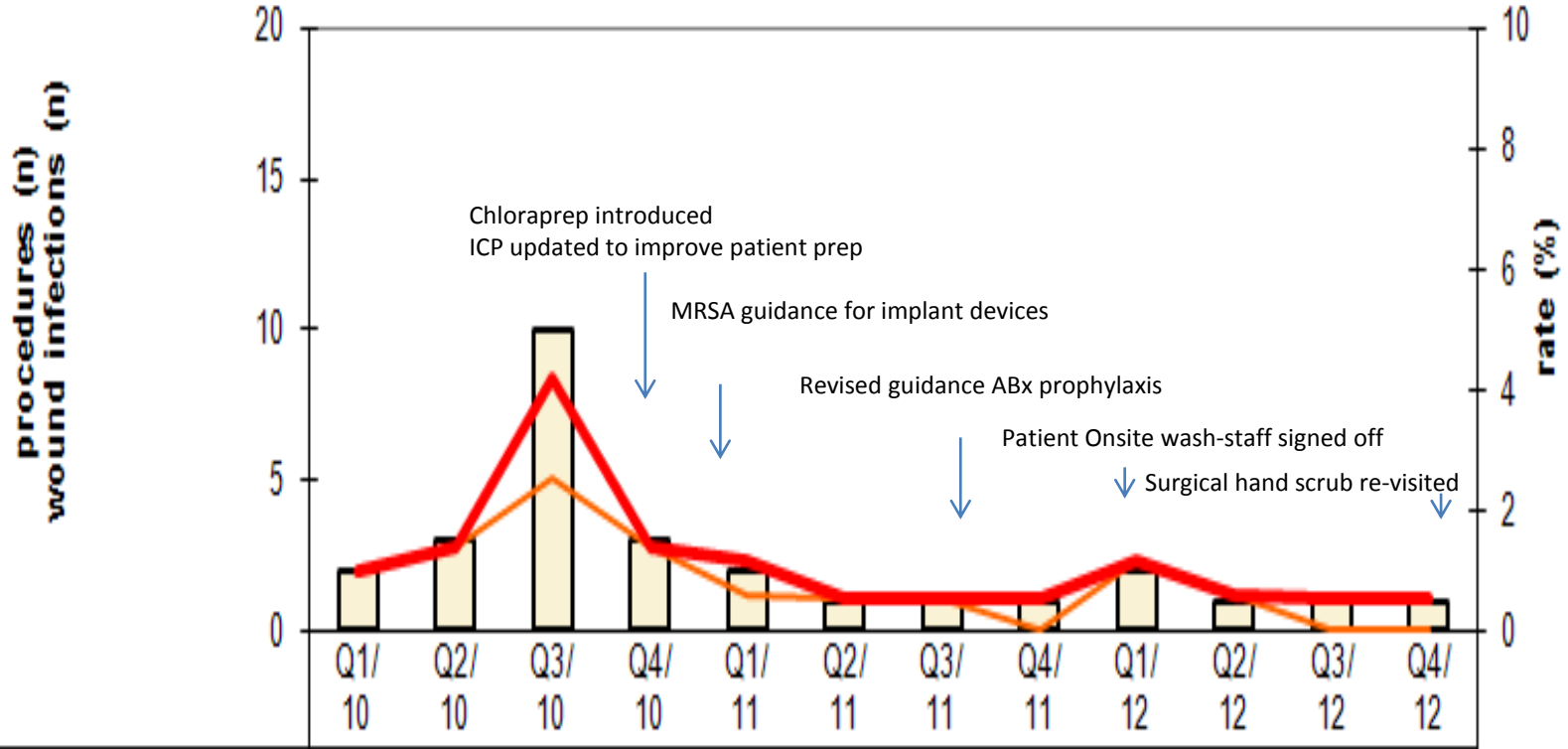
| MRSA screen | Normothermia | Blood glucose control | ABx within 1 hr KTS | Wash |
|---|---|---|---|---|
| Yes | 36, -, 36 | N/A | ABx 12:10 Proxy 12:15 | Yes |
| Yes | 35.7,36 (36.9),35.7 | N/A | ABx 15:00 [illegible]xy 15:00 | Yes |
| Yes | 36,-,35.1 | N/A | [illegible] | No |
| Yes | 35.2,-,35.2 | | | No |
| Yes | 35.6,-,36.8 | | | No |
| Yes | 35.8, -,35.8 | | [illegible]26 | Yes |
| Yes | 36.5,-,36.5 | | | No |
| Yes | 35.7,-,35.7 | N/A | ABx 16:00 [illegible]16:05 | No |
| Yes | 35.9,-,- | N/A | ABx 17:26 [illegible]roxy 17:35 | Yes |

# Example: Patient Preparation

- Wash x 2 with antimicrobial solution
  - Treat-and-return
- Adhesive removal (i.e. electrodes)
- Hair removal – reduces skin prep solution dry time

# Harefield Cardiology Implantation Device Infection and Interventions
## Calendar Quarter (Q), January 2010 - December 2012

Data as at 6/3/2013




| | Q1/ 10 | Q2/ 10 | Q3/ 10 | Q4/ 10 | Q1/ 11 | Q2/ 11 | Q3/ 11 | Q4/ 11 | Q1/ 12 | Q2/ 12 | Q3/ 12 | Q4/ 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wound Infections (n) | 2 | 3 | 10 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| Exploration/Removal for Infection (%) | 1.0 | 1.4 | 2.5 | 1.4 | 0.6 | 0.5 | 0.5 | 0.0 | 1.2 | 0.6 | 0.0 | 0.0 |
| Wound Infection Rate (%) | 1.0 | 1.4 | 4.2 | 1.4 | 1.2 | 0.5 | 0.5 | 0.5 | 1.2 | 0.6 | 0.5 | 0.5 |

# RCAs & Duty of Candour

Review case as well as environment (building works/cleaning scores etc), practices (hand hygiene etc) and processes (instrument sterile services, other incidents)

Findings from root cause analysis to go to patients, ‘closes the loop’

# New Initiative – Pacing Clinic

Wound Photo:

1) Prior to discharge

2) 6 week follow up

3) Wound issues

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PCW Report

**Name:** [redacted] **Date of assessment:** 13 July 2016

**Reason for Assessment:** Pre-Discharge Check;

**HCW proving assessment:** [redacted] **Responsible Consultant:** [redacted]

**Exudate:** Dry/ no exudate;

**Wound description:** Suture material

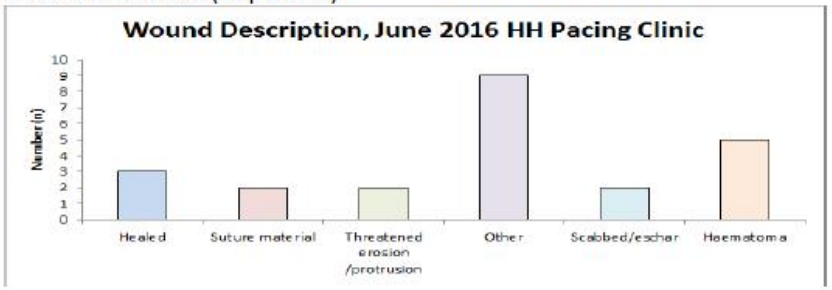
**Action:** Consent for Photo Obtained and No Action Required

**Wound care environment:** Pacing Clinic

**Dressing selected:** None Required;

## Pacing Clinic- June 2016 Photo Feedback

The new PCW Registry on Dendrite tracks the progress of wounds (Figures 1 &2) and facilitates MDT review and documentation. From 7th June -30th June, 24 records were added (22 patients).




Data Completeness: HCW and Consent

- HCW field completed 22/24 (two entries without name of person completing form/photo)
- Consent for photo completed on 50% forms (12/24)

Data Capture: Actions (not all will apply! )

'Bloods taken' documented on two records
'Medic informed' recorded on five records
No swabs taken and no wounds listed with exudate
Dressing provided (Mepore) for one patient

**Good practice noted**

**√Picture taken at right angle (straight on) and comparison angle (if applicable)**
**√Ruler provides overview of size (if applicable)**
**√Patient face not shown**
**√ Form completed with all applicable fields (inc patient consent for photo)**
**√ Photo clear /brightness well set**

Figure 1: pre discharge check

Figure 2: follow up check

June 2016 Cases Examples: erosion/ protrusion

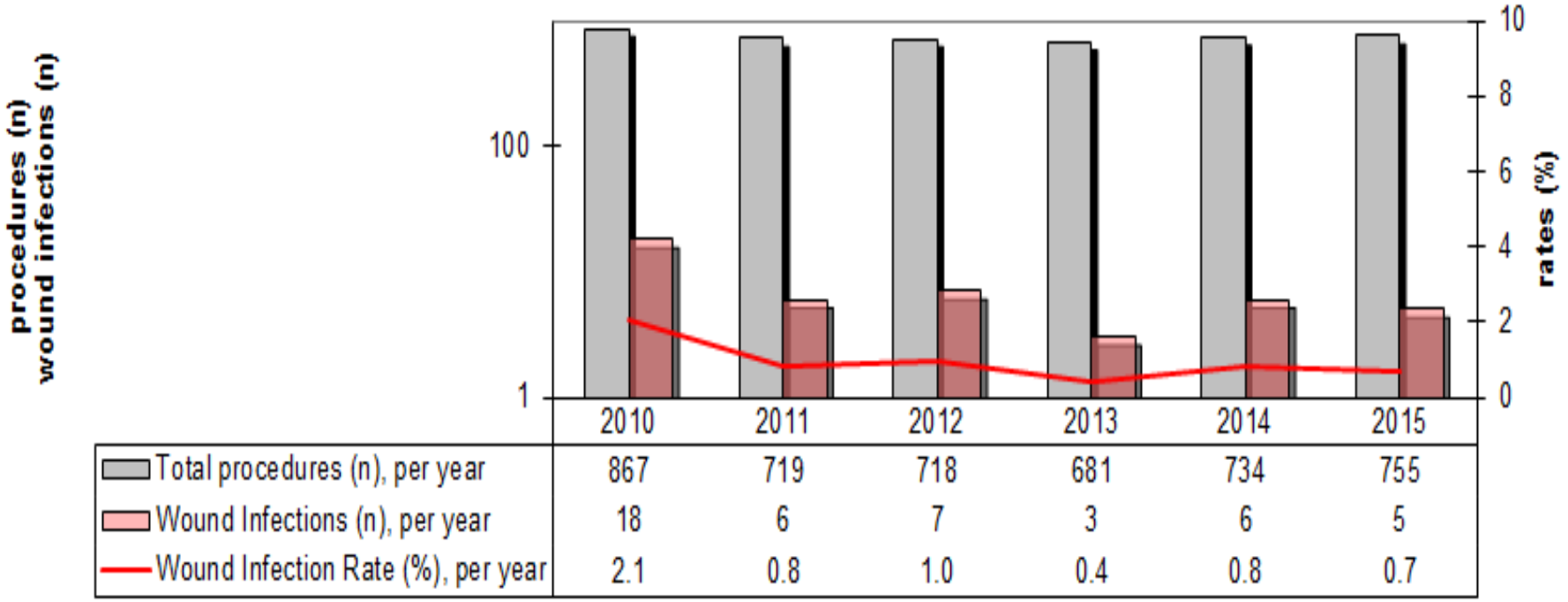
# Advantages

- Remote MDT review
- Better documentation /standard upload (not on mobiles)
- Assessment overtime
- Paper light
- Data analysis
- Existing database (Dendrite)

# Surveillance Data Collection

- Onset (<> 1 year)
- Homegrown/St Elsewhere
- Classification Superficial/Pocket/Systemic vs invasive treatment
- Microbiology
  - Sample: Wound Swab, Tissue, Lead or Tip, Blood Culture

## Harefield Hospital: Cardiac Implantable Electronic Device Infection
## January 2010 - December 2015
Data as at 4/10/2016




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| Total procedures (n), per year | 867 | 719 | 718 | 681 | 734 | 755 |
| Wound Infections (n), per year | 18 | 6 | 7 | 3 | 6 | 5 |
| Wound Infection Rate (%), per year | 2.1 | 0.8 | 1.0 | 0.4 | 0.8 | 0.7 |

# Summary

Future for device infection surveillance

- Important outcome measure
  - Benchmarking
  - Improving patient outcome measures

# Thanks & Acknowledgements

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