Surveillance of Surgical Site Infections

Data for practice improvement

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@emrsa15
Systematic review of the literature in reduction in HAI
Harbarth et al 2003 J Hosp Inf 54:4 p258-66

- Systematic review of intervention studies in the healthcare-associated infection field published between 1999-2002
  - Minimum reduction effect of 10% to a maximum effect of 70%, depending on setting, design, baseline rate and HAI type
Main findings

<table>
<thead>
<tr>
<th>HAI type</th>
<th>Reduction potential</th>
<th>Setting details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVC associated bloodstream infection</td>
<td>14-71%</td>
<td>70% neonatales 56% adult critical care</td>
</tr>
<tr>
<td>VAP</td>
<td>38-70%</td>
<td>ICUs</td>
</tr>
<tr>
<td>CAUTI</td>
<td>46-60%</td>
<td>All specialities</td>
</tr>
<tr>
<td>SSI</td>
<td>24-34%</td>
<td>Surgical specialities</td>
</tr>
</tbody>
</table>
Reduction of surgical site infections after Caesarean delivery using surveillance

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When continuous surgical site infection surveillance is interrupted: The Royal Hobart Hospital experience

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Reduction of orthopaedic wound infections in 21 hospitals.

Gastmeier P, Sohr D, Brandt C, Eckmanns T, Behnke M, Ruden H.

Institute of Medical Microbiology and Hospital Epidemiology, Medical School Hannover, Carl-Neuberg-Str. 1, 30625 Hannover, Germany.
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INTRODUCTION: The German national nosocomial infections surveillance system (KISS) has been collecting surveillance data from hip and knee prosthesis operations since 1997. The

Effectiveness of a nationwide nosocomial infection surveillance system for reducing nosocomial infections

P. Gastmeier a,*, C. Geffers b, C. Brandt b, I. Zuschneid a, D. Sohr b, F. Schwab b, M. Behnke b, F. Deschner c, H. Rüden b

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Received 27 May 2005; accepted 24 April 2006
Available online 3 July 2006

Reduced risk of surgical site infections through surveillance in a network.


Department of Infectious Diseases Epidemiology, National Institute of Public Health and the Environment, The Netherlands.

OBJECTIVE: To estimate the effect of multicentre surveillance for nosocomial infections on patients’ risk of surgical site infection (SSI). DESIGN: Prospective multi-centre cohort study, from January 1996 to December 2000. SETTING: Acute care hospitals
Why surveillance?
Three quotes

- **From the Internet**
  - In god we trust. All others must bring data
    - W. Edwards Deming (1900-93)

  - If you cannot measure it you cannot improve it
    - Lord Kelvin (1824-1907)

  - The trouble with quotes on the internet is that you cannot be sure that they are genuine
    - Abraham Lincoln (1809-65)
What is Surveillance?

• Ongoing, systematic collection, analysis, and interpretation of health data

• Timely dissemination to those who need to know

• Application of the data to preventing and controlling disease

Thacker SB, Berkelman RL. Epidemiol Rev 1998
Why do we need surveillance?

- Assessment of quality?
- Identify scale of any problem
  - But we have to get it right
- Low SSI rate from poor quality surveillance
  - Clinicians will not be interested
    - not important, they knew they had no problem anyway
  - underestimate cost of SSIs
    - management will not be interested
    - no funding for interventions
- Benchmarking may not be valid
Key considerations for effective surveillance

- Set clear objectives
  - Why?
- Engage clinical staff
- Identify resources
  - Who?
- Establish effective data collection systems
  - How?
- Rapid feedback of data
  - When?
- Take action on results
Measuring infection

- Definitions
- Prevalence or Incidence rates
- Denominator data (patients at risk)
- Numerator data (infections)
- Risk factors
  - case-mix adjustment & interpretation
NHSN Definition of SSI

- Most commonly used is the NHSN definition

- Categorised
  - Superficial (Primary and Secondary)
  - Deep Primary and Secondary
  - Organ/Space

- Clinical assessment

- If definitions are compared, application is inconsistent
  - Wilson et al, BMJ 2004; 329; 720
Prevalence

- The number of affected individuals present in a population at a specific point in time
  - Presented as a proportion or percentage of all individuals in the population at that point in time
  - A snapshot of the situation within a hospital at a specified point in time

- Cheap and quick

- Useful for SSI?
  - Not any more
Days from surgery to SSI

Barrett et al, HPA, 2000
Time to infection vs. Length of Stay

Data Source: HPA, July 2008-March 2010
### TABLE 3: Number of participating boards, procedures, inpatient SSI and inpatient cumulative SSI incidence rate by procedure, 2011

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No of NHS boards</th>
<th>No of procedures</th>
<th>Inpatient SSI</th>
<th>Inpatient SSI Rate (%)</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal hysterectomy</td>
<td>5</td>
<td>592</td>
<td>4</td>
<td>0.7</td>
<td>0.3 to 1.7</td>
</tr>
<tr>
<td>Breast surgery</td>
<td>5</td>
<td>1147</td>
<td>5</td>
<td>0.4</td>
<td>0.2 to 1.0</td>
</tr>
<tr>
<td>CABG</td>
<td>1</td>
<td>781</td>
<td>19</td>
<td>2.4</td>
<td>1.6 to 3.8</td>
</tr>
<tr>
<td>Caesarean section</td>
<td>14</td>
<td>15,801</td>
<td>49</td>
<td>0.3</td>
<td>0.2 to 0.4</td>
</tr>
<tr>
<td>Cardiac surgery</td>
<td>1</td>
<td>519</td>
<td>9</td>
<td>1.7</td>
<td>0.9 to 3.3</td>
</tr>
<tr>
<td>Hip arthroplasty</td>
<td>15</td>
<td>7,918</td>
<td>28</td>
<td>0.4</td>
<td>0.2 to 0.5</td>
</tr>
<tr>
<td>Knee arthroplasty</td>
<td>10</td>
<td>5,701</td>
<td>6</td>
<td>0.1</td>
<td>0.0 to 0.2</td>
</tr>
<tr>
<td>Large bowel</td>
<td>1</td>
<td>234</td>
<td>41</td>
<td>17.5</td>
<td>13.2 to 22.9</td>
</tr>
<tr>
<td>Major vascular</td>
<td>3</td>
<td>368</td>
<td>9</td>
<td>2.4</td>
<td>1.3 to 4.6</td>
</tr>
<tr>
<td>Reduction of long bone fracture</td>
<td>7</td>
<td>1,366</td>
<td>11</td>
<td>0.8</td>
<td>0.5 to 1.4</td>
</tr>
<tr>
<td>Repair of neck of femur</td>
<td>12</td>
<td>2,603</td>
<td>31</td>
<td>1.2</td>
<td>0.8 to 1.7</td>
</tr>
</tbody>
</table>
SSI: orthopaedic procedures
HPA England, 2010

April 2008 – March 2009
Measuring incidence

- Number of new cases occurring in a population at risk over a defined period of time
  - Requires all patients to be followed over time to determine if they develop the outcome (HCAI)
  - Presented as the proportion or % of those at risk that go on to develop the outcome
Numerator Data

- Passive
  - SSI identified by untrained staff
    - Unreliable: definition may not be applied consistently
    - Cheap
      - Low sensitivity: 14-34% (Perl, 1998)

- Active
  - Designated staff use multiple sources of data to assess for SSI
    - More expensive; data more reliable
    - Sensitivity = 85-100% (Perl, 1998)
Post-discharge Surveillance

- Is there someone that can help?
  - Specialist nurses (breast care, colorectal etc)

- General Practitioner
  - Err on side of caution and prescribe

- Patient reporting by letter
  - Variable, Poor return

- Telephone follow-up
  - 75%+ achievable (Elbur et al, J Infection and Public Health, October 2013)
Making use of a Surveillance Programme

- 2007/8 HPA SSI rate for Colorectal – 8.3%
- January 2008 – May 2008
  - Colorectal surgery
  - Used HPA SSI definition
  - 30 day follow up
  - Phone calls using a structured questionnaire
  - If a potential infection, surveillance nurse visited patient at home to confirm

Colorectal surgery - SSI

- Infection rate 27% (29/105), over three times the nationally quoted rate
  - Length of stay 8 days longer than no SSI
  - 38% of infections were classed as ‘deep’

- Calculated cost for 4 months
  - Cost of the SSI was £305K ($550,000)
  - Cost of the surveillance was <£6K ($9,000)

- £915K per year, 14% by primary care
  - Hospital funded a total surveillance programme

The ideal SSI surveillance programme

- Full 30 day follow up – in patient, readmission, post discharge

- Same method
  - Duration
  - Mandatory?

- Deep / superficial debate

- Compliance data
  - Interventions
    - Abx, warming, skin prep, etc etc

- Feedback
Interdisciplinary Team Formed

Developed communication networks for new practice or product changes to all team members

Phase I antimicrobial prophylaxis standardization

Phase II antimicrobial prophylaxis standardization

Chlorhexidine pre-op skin prep

Standardized pre and post op interventions, Bactroban, Peridex, hibiclens showers

CHG no rinse cloths for pre-op skin antisepsis

Emory Crawford Long Hospital Deep Sternal SSI
The message is clear

- Surveillance provides data that should enable reflection on practice
  -Clinicians need to be actively involved in programmes so that they ‘own’ the data

- Surveillance is worthwhile investing in
  - We can only convince with data
  - Need to convince
    - Managers, Commissioners
  - Others may mandate via the back door anyway
  - Even better if we can put some £££ on it

- The final challenge is the need to provide public information that is accessible
Valid comparison of SSI rates

- Can be affected by
  - Definition (and interpretation) of infection & other criteria
- Surveillance methods
  - How good the case-finding is
- Differences in case mix
- Small numbers – big confidence intervals
  - Rate variation may not be statistically significant
Surveillance Data

- Primarily mean something to those who collect and interpret it and may be organisation-specific

- Are national data are suitable for benchmarking? (Tanner, Padley et al JHI 2013)
  - Data collection and submission is variable
  - Lack of validation means clinicians may feel data are not trustworthy (Wilson, JIP 2013)
  - Publicly quoted rates do not equate with clinical reality
  - Case-mix, local demographics may differ (prob not)
Using surveillance data to improve practice

- Review practice in theatres & wards
  - theatre environment
  - pre-operative preparation
  - surgical technique
  - wound management

- Strategic programmes
  - adopt bundle intervention for SSI
  - develop the culture - encourage staff to challenge poor practice
  - training and supervision
  - theatre/ward audit programme

- Raise awareness of infection prevention
  - develop partnerships between clinical staff & infection control team
  - education/training on infection control
Summary

- SSI account for significant morbidity and mortality
  - There are real opportunities for prevention

- National schemes may provides a mechanism of benchmarking rates of SSI
  - but with caution – schemes must include validation
  - Need a standard approach to post-discharge surveillance
  - Evidence that rates of SSI can be reduced through participation in national SSI surveillance systems

- High quality surveillance and rapid feedback can affect the risk of SSI