Investigating an outbreak of surgical site infections among Orthopaedic and Ophthalmology patients

Professor Stephanie Dancer
NHS Lanarkshire & Edinburgh Napier University, Scotland
Recognition of an outbreak

April 2009:

Sudden increase in infection rate for ‘clean’ surgical procedures for orthopaedic patients receiving hip or knee prostheses;

There were also cases of acute endophthalmitis after eye surgery.

Since our hospital reports such infections promptly for surveillance purposes, a sudden increase in infection rates ought to have alerted Infection Control staff early;

BUT...there was no obvious ‘outbreak’ organism, so initial cases did not raise the alarm as they should have done.
Dates of operation and onset of surgical site infection for twenty orthopaedic and ophthalmic patients
Retrospective investigation revealed possible missed cases!

Then there was a second surge of cases because we had failed to rectify the underlying cause
Fifteen orthopaedic patients were involved in the outbreak.

Eleven had knee or hip implant surgery (two were revisions).

The remainder were bilateral osteotomies; internal fixation of an ankle fracture; bunion repair with screws; and a fasciotomy with external medullary fixation.

No obvious microbiological pathogen was found from submitted specimens (wound swabs, aspirates, tissue, etc.)

Six patients required further surgery, e.g. washouts; joint revision, etc.

One patient died.

One patient required two further attempts to replace his knee prosthesis.
Phacoemulsification is a method of cataract surgery in which the internal lens of the eye is emulsified using ultrasonic energy and replaced with an intraocular lens implant.

Five patients who underwent cataract surgery within the outbreak period suffered post-operative endophthalmitis.

This is potentially devastating for the patient since it can cause permanent visual deficit or even blindness.

All five patients required further surgery. One suffered permanent visual deficit.
Initial microbiology results

Orthopaedic specimens
Coagulase-negative staphylococci +/- Bacillus spp. with or without faecal-type flora (different species)

Ophthalmology specimens
The only organisms retrieved from submitted vitreous humour were coagulase-negative staphylococci or Bacillus spp.
Actions taken

Outbreak committee convened!

Review of ward and theatre practices
Epidemiological analyses
Inspection of orthopaedic theatres
Review of microbiological results

Infection control audit, including hand hygiene
Maintenance services for laminar flow
Terminal cleans for orthopaedic wards
Antibiotic prophylaxis changed
Theatres deep cleaned
Increased vigilance for further cases, with additional microbiological investigations
Two months later: Resurgence of outbreak with two cases of endophthalmitis

Outbreak committee reconvened, with medical director and hospital managers

Theatre staff volunteered concerns over damp and/or stained packs of surgical instruments returning from sterile services provider

Staining was usually orange/brown in colour

We decided to audit damp and/or discoloured packs;

Packs were selected for microbiological examination.

Surgical instruments used for high risk surgery (eyes, orthopaedics and vascular) were sent to another sterile services provider on a temporary basis.
Microbiological examination of surgical sets

Level 1 laminar flow cabinet with Hepa-A filtration in a Category 3 room was disinfected and allowed to run for 30 mins before processing; Control settle plates positioned within the cabinet.

Pack and media bottles sprayed with disinfectant (Trigene) before placing in the cabinet;

Gloved operator removes outer layer of pack;

Sterile gloves replace disposable gloves using aseptic technique.

*Adapted from Widmer et al, J Hosp Infect 1992; Webster et al, AmJIC 2005*
Microbiological sampling of surgical sets

Inner wrapping sampled with moistened sterile swab and broth inoculated;
Wrappings folded back to sample inner box or tray: swabs inoculated into broth;
Instruments sampled on untouched areas only: swabs inoculated into broth

Additional swab inoculated into broth to act as process and sterility control

Settle plates incubated aerobically for 48 hours;
Broths incubated for 5-7 days and sub-cultured if cloudy;
Terminal subcultures performed on clear broths at 7 days

Results discarded if any growth occurred on settle plates

Adapted from Widmer et al, J Hosp Infect 1992; Webster et al, AmJIC 2005
### Visual and microbiological findings from ‘sterile’ surgical packs

<table>
<thead>
<tr>
<th>Pack type</th>
<th>Visual appearance</th>
<th>Culture from wrappings</th>
<th>Culture from instrument(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ophthalmic set</td>
<td>Damp; discoloured</td>
<td>CNS</td>
<td>CNS x2</td>
</tr>
<tr>
<td>Cystoscopy set</td>
<td>Damp</td>
<td>NG</td>
<td>Bacillus &amp; CNS x4</td>
</tr>
<tr>
<td>Hysteroscope</td>
<td>Damp; discoloured</td>
<td>NG</td>
<td>Bacillus &amp; CNS x2</td>
</tr>
<tr>
<td>Maxidriver set</td>
<td>Normal</td>
<td>NG</td>
<td>Bacillus &amp; CNS x4</td>
</tr>
<tr>
<td>Maxidriver set</td>
<td>Damp</td>
<td>Bacillus spp.</td>
<td>Bacillus &amp; CNS x4</td>
</tr>
<tr>
<td>Medullary set</td>
<td>Damp</td>
<td>NG</td>
<td>Bacillus spp.</td>
</tr>
<tr>
<td>Tibial Nail set</td>
<td>Normal</td>
<td>NG</td>
<td>Bacillus x2</td>
</tr>
<tr>
<td>Phacoemulsifier</td>
<td>Normal</td>
<td>NG</td>
<td>CNS</td>
</tr>
<tr>
<td>Strabismus set</td>
<td>Discoloured</td>
<td>NG</td>
<td>Bacillus spp.</td>
</tr>
<tr>
<td>Phacoemulsifier</td>
<td>Damp; discoloured</td>
<td>NG</td>
<td>Bacillus &amp; CNS x3</td>
</tr>
<tr>
<td>Fasciotomy set</td>
<td>Slightly discoloured</td>
<td>NG</td>
<td>Bacillus x2</td>
</tr>
</tbody>
</table>
Microbiological results from all 20 patients

Twelve specimens grew CNS, three of which also had faecal-type flora
One specimen grew CNS and *Bacillus* sp.
One specimen (vitreous humour) grew *Bacillus* sp.
Four specimens grew faecal-type flora only
One specimen grew methicillin-susceptible *Staphylococcus aureus*

*There were no microbiological results for one patient*

*All patients were treated with vancomycin and gentamicin*

Six patients had aspirates/tissue sent from subsequent surgical revision:
Of these, three specimens grew CNS alone
One grew *Bacillus* sp.
There was no growth from specimens from two patients
Further actions following microbiological findings

Immediate site visit to the sterile services provider!

We found:

- Drab and dusty autoclave area, with poorly maintained fabric;
- No wash hand basin facilities within the autoclave area;
- No evidence of baffle plates or functioning indicators in the autoclaves;
- Sterilised packages were stored on, or just off, the floor of the autoclave area;
- Lack of assurance for adequate drying/cooling of packages;
- Metal gurneys used to transfer sterilised sets between autoclave and transfer cart were corroded with rust.
What did we do?

We set up a Healthboard Sterile Services Governance Committee, for better communication between sterile services, managers and NHS staff.

We review all aspects of procurement, cleaning, sterilisation and repair of surgical instruments used across the Healthboard. In addition, all sterile sets are routinely inspected and signed off by a senior theatre nurse on delivery at the theatre complex.
Actions agreed by sterile services provider and hospital managers

**Sterile services:**
Staff training review
Hand hygiene practices
Electronic tracking
Incident reporting process

**Hospital:**
Monitoring of sterile packs on receipt from provider
Computer based notification of faulty; missing; damaged or wet packs
Surgical site infection surveillance for high-risk specialties

**BOTH:**
*Creation of a governance committee to oversee sterile services*
*Review fault notifications and trends*
*Review new kit; missing kit; fast track service and overall turnaround times*
WHY were there no cases among vascular graft patients?

Surgical prophylaxis for orthopaedics was:

CEFUROXIME

Surgical prophylaxis for cataract surgery was:

CEFUROXIME

....but surgical prophylaxis for vascular surgery is:

VANCOMYCIN
Conclusion

This presentation has highlighted the importance of surgical instrument processing by sterile service facilities.

Surgical sets should always be carefully inspected on reception. There should be close collaboration between decontamination, theatre and infection control staff, particularly if sterile services are located off-site.

Faulty processing of reusable surgical instruments has serious clinical implications for patients.
Acknowledgements

We would like to acknowledge the huge amount of work performed by managers, clinicians, infection control, theatre and decontamination staff, some of which continues with regular meetings and audit exercises.

Without support from all the staff involved, we would not have been able to produce the relevant action plans or set up a long-term specialist group to safe-guard future practices.

Surgical site infection rates have remained within the expected range for Scotland over the last five years.

WHY CATS ARE NOT DOCTORS

Doctor loses medical license after licking self, instruments clean.