Hazardous Exposure Prevention in the Operating Theatre

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I declare that in the past three years I have:

- held shares in: nil
- received royalties from: nil
- done consulting work for: Stryker
- given paid presentations for: Stryker
- received institutional support from: nil
Martlie Horn

- Nursing experience across general, psychiatric, community, midwifery, neurology, and orthopaedic surgery
- Theatre management
- Quality Projects
  - Tourniquets in Orthopaedic surgery
  - Orthopaedic orientation for OT
  - Procedure pack working group
  - Neurosurgery learning package for new staff
Legislation: Waste Management

Your WHS obligations

Under WHS legislation you are obliged to provide:

- safe premises
- safe machinery and materials
- safe systems of work
- information, instruction, training and supervision
- a suitable working environment and facilities.

Complying with these duties can prevent you from being prosecuted and fined, and help you to retain skilled staff.
Hazardous exposure risk in the OT

- OT staff are particularly at risk of being exposed to blood-borne pathogens and body fluids during surgical procedures.
- Accidental exposure of the skin or mucosa to body fluids remains a major occupational hazard for healthcare workers.
- In one Australian study:
  - 48.1% of all blood and body fluid exposures occurred in the emergency, perioperative, and surgical divisions.
  - 57% of the 337 mucocutaneous exposures documented involved splashes of blood and blood products.


Current methods of fluid disposal

Traditional canisters

Canister with wall disposal

Closed mobile system
**Study Title:** Canister-based open waste management system versus closed system: hazardous exposure prevention and operating theatre staff satisfaction
Primary objectives:
• Quantify the opportunity for hazardous exposure to HCPs by counting the number of contact events when using the closed system vs. an open system
• Quantify the incidence of manual handling when using the closed vs. open system

Secondary objectives:
• Amount of time typically spent setting up, maintaining, and cleaning each system
• Amount of time and distance involved to transport and dispose of fluid waste
• Volume of waste generated for disposal in landfills
• Ascertain level of staff satisfaction with both systems
Method

- 1 Sydney metropolitan hospital
- 6 operating suites
- 6 surgeons
- 30 operations; arthroscopic, orthopaedic, and urology
- Conducted by KM&T (a global healthcare consulting firm)
Traditional canister system

Pre-theatre set-up
- Carousel set up in utility room
- Carousel put into OR & connected to suction port

In theatre
- Attach Y bridge + suction lines
- Monitor canisters throughout case
  - Change canisters when full
  - Disconnect from suction port at end of case
    - Put used canisters in bin/bag

Post-theatre
- Remove bin/bag to utility
- Load bags to trolley (6 per trolley)
- Wheel trolley to dumpster
  - Load bags into dumpster
    - Wheel dumpster to loading bay store
      - Restock utility room with canisters
Pre-theatre set-up

- Wheel to OR & connect closed system to power socket

In theatre

- Attach manifold & suction lines
- Select suction & switch on
- At end of procedure switch off & reset volume
- When case completed manifold is changed

Post theatre

- Wheel to docking station when full or not required for other cases
- Dock, select wash cycle
- Restock manifolds

Closed system
For each procedure the following observations were recorded on an observation chart:

- Name of surgeon
- Type of surgery
- Equipment used (i.e. open or closed canister)
- Distance covered (measured by tape measure)
- Total time taken to perform each of the steps involved in using either system (measured by stopwatch)
- Total number of contact events
- Duration of contact event
- Total amount of waste fluid generated
Data collection-Staff satisfaction

- Ease of use
- Safety - Spills and splashes and manual handling
- Time taken to set up equipment, maintain during surgery and clean/dispose of fluid waste
- System preference
Study results

Observed incidence of hazardous exposure in the operating theatre

- **Zero** hazardous exposure events were observed when the closed system was in use

- **Three** events were observed when the open system was in use
Incidence of manual handling

- Manual handling was observed to be minimal with the closed system
  - 40% less contact events in arthroscopy
  - 25% less contact events in urology
## Time savings in set-up, maintenance, and disposal

<table>
<thead>
<tr>
<th>Process</th>
<th>Closed system</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel to OR and connect to power socket</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Attach manifold, suction lines/select suction setting</td>
<td>7</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Switch off and reset</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnect manifold with suction lines</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Wheel to docking station</td>
<td>30</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Dock, select wash cycle</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Restock manifolds</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>92</strong></td>
<td><strong>103</strong></td>
<td></td>
</tr>
</tbody>
</table>

*92 secs for the closed system vs. 320 seconds for the open system*
Time savings

- Set-up, handling and maintenance time was **3.5 times longer** with the **open system** than that required with the closed system.

- Based on an average of 450 cases per week (arthroscopy, urology, and orthopaedic), it is estimated the **open system** would require an **additional 25 hours** of theatre staff’s time.
Waste generation

• **Closed system**: After each case, the only items requiring separate disposal were the manifold and attached tubing (weighing approximately 150 g in total).

• **Open system**: the full canisters were disposed of in contaminated-waste bags and eventually transferred to landfill.

*Images not to scale*
Staff satisfaction

Overall satisfaction

- 90% closed system
- 60% open system
Conclusions

- Results suggest the **closed system is more efficient** than the open system.
- Risk of exposure to blood and bodily falls when fluid is collected into a closed system.
- Compared with a traditional canister-based open waste management system, a **closed system**:
  - **reduces** the number of opportunities for theatre staff to be exposed to hazardous fluid waste during surgical procedures.
  - Offers superior **ease-of-use** and has **less environmental impact**.
A few tips and tricks

- Implementation of the Neptune system
  - Department buy-in
  - Set-up
  - Policy documentation
  - Training

- Ongoing maintenance
Future research

- Costing tool
  - Budget impact
  - ROI
  - Cost-effectiveness, cost-consequences etc.

- Sustainability Assessment