Care and Handling of Basic Surgical and Powered Instruments

The Association of Hong Kong Operating Room Nurses Limited

APN HO CHI HOI
Operation Theatre
Prince of Wales Hospital
New Territories East Cluster
Hospital Authority

12th November, 2021
Objective

- Identify the classification, material, use & function of each type of surgical instrument
- Describe the proper care and handling of instruments
- Common defect of instruments
- Understand the process of cleaning
- Understand the cause of corrosion and common surface changes of instruments
- Introduce SITS, electronic counting & mSITS
# CDC Spaulding Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Risk of Infection</th>
<th>Type of procedure</th>
<th>Appropriate level of decontamination</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical items</td>
<td>High</td>
<td>Entry into blood stream or sterile organ / cavity of the body</td>
<td>Sterilization</td>
<td>Surgical instruments, implants</td>
</tr>
<tr>
<td>Semi-critical items</td>
<td>Intermediate</td>
<td>Contact with mucous membrane</td>
<td>High level disinfection</td>
<td>Flexible Endoscope and accessories Respiratory or anaesthetic equipment</td>
</tr>
<tr>
<td>Non-critical items</td>
<td>Low</td>
<td>Contact with only intact skin, environmental surfaces</td>
<td>- Low level disinfection&lt;br&gt;- Cleaning with soap and water</td>
<td>EKG leads, noninvasive U/S probes, blood pressure cuffs</td>
</tr>
</tbody>
</table>

Classification of Surgical Instruments

- Cutting and Dissecting
- Grasping and Holding
- Clamping and Occluding
- Exposing and Retracting
- Dilating and Probing
- Suctioning and Irrigating
- Suturing and Stapling
- Power Instruments
- Micro Instrumentation
- Arthroscopic Instruments
Common Materials for Instruments

- Stainless Steel
- Titanium
- Glass
- Plastic
- Rubber
Cutting and Dissecting Instruments

- Instrument with cutting edges or pointed tip that is used to cut or dissect tissue

Scalpel
Scissor
Pin Cutter
Cutting and Dissecting Instruments

- Bone cutter/rongeurs
- Dissectors/elevators
Grasping and Holding Instruments

Tissue Holding Forceps

- Plain or non-tooth:
  - For soft structures such as mucosa, serosa or intestine

- Toothed:
  - For tough tissues such as skin, fascia, rectus sheath
Grasping and Holding Instruments

**Allis Forceps**
- To grasp large tissue

**Babcock Forceps**
- To grasp delicate tissue (e.g. intestines, appendix) without crushing or traumatizing
Grasping and Holding Instruments

**Sponge Forceps**

- To hold gauze to “mop up” the surgical site
Clamping and Occluding Instruments

- Compress blood vessels or hollow organs for hemostasis or to prevent spillage of contents

<table>
<thead>
<tr>
<th>Hemostatic Clamps</th>
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<tbody>
<tr>
<td><img src="image1.png" alt="Hemostatic Clamp 1" /></td>
</tr>
<tr>
<td><img src="image2.png" alt="Hemostatic Clamp 2" /></td>
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<tr>
<td><img src="image3.png" alt="Hemostatic Clamp 3" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Noncrushing Vascular Clamps</th>
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<tbody>
<tr>
<td><img src="image4.png" alt="Noncrushing Vascular Clamp 1" /></td>
</tr>
<tr>
<td><img src="image5.png" alt="Noncrushing Vascular Clamp 2" /></td>
</tr>
<tr>
<td><img src="image6.png" alt="Noncrushing Vascular Clamp 3" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occluding Clamps</th>
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<tbody>
<tr>
<td><img src="image7.png" alt="Occluding Clamp 1" /></td>
</tr>
<tr>
<td><img src="image8.png" alt="Occluding Clamp 2" /></td>
</tr>
<tr>
<td><img src="image9.png" alt="Occluding Clamp 3" /></td>
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</table>
Exposing and Retracting Instruments

To retract organs or tissue to gain exposure to the operative site

- Handheld
- self-retaining
Dilating and Probing Instruments

- **Dilators**
  - Ranging in size used for gradually dilating an opening

- **Speculums**
  - To enlarge body cavity expose by widening for better viewing
Suctioning and Irrigating Instruments

To remove blood, tissue, body fluid and irrigation fluid from the operative site

- Suction Tip

- Lap. Suction & Irrigation Tube

**Beware the integrity of the suction end tip or any cap removal**
Suctioning and Irrigating Instruments

Disposable (Single use)
Combined suction/irrigation tube
Suturing and Stapling Instruments

**Needle Holders**
- To hold and guide suture needles

**Staplers**
- Internal anastomosis Stapler
- Terminal end Stapler
- End-to-End Stapler
Clip Applicator

- Mark tissue or occlude the vessels
- Multi-Fire
Powered Surgical Instruments

To use for precision, drilling, cutting and shaping the bone

- Attachments: Drill, bur, blade, reamer

- Battery power

- Pneumatic (with cord)

- Permanent damage can result if fluid enters the internal mechanisms of handpiece
Micro Instrument

- Small and delicate
- Titanium / Stainless steel made
- Tips easily bent - Aware of fine tips
- Gentle handle with care
- No place heavy instruments on top

**Check of any damage and the integrity of those fine instruments**
Micro Instrument
Arthroscopic Instrument

Contains a lens and lighting system that allows a surgeon to view inside a joint or cavity.
TV systems

Different system consoles
Arthroscopic Instrument

Consumables

- Shaver
- Valcun
Handling of instruments

Principles
- Safety
- Economy of movement
- Relaxed handling
- Avoid award movements
Handling of instruments

- **Needle Holder**
- **Index** to steady the instrument
- **Thumb**
  - distal phalanges within the ring
- **Ring Finger**
  - only distal phalanges within the ring
Handling of instruments

Tip up handle down

Hand-free technique

YES! NO!

DECISIVELY and FIRMLY
Sharps Handling

1) Non-touch technique

2) Be aware of needle sharp

3) Place the sharp of suture needle downward

4) Use hand-free technique

Photo source: UCH OR
Sharps Handling

Assembly or disassembly of scalpel blades by Needle holder

Photo source: UCH OR
Sharps Handling

Avoid using hands to load or unload scalpel blades
Sharps Handling

- Needle Counter
- Blade Remover
- Disposable Scalpel with cover
Sharps Handling

No-recap needles / sharp instruments

One-Hand Scoop Technique
BBSO
Verbal Announcement

Announce the sharps and its location
Visual Contact

Photo source: UCH OR
Verification of Neutral Zone

Photo source: UCH OR
Handling of Power Instrument

Ensure the power instrument in **Safe Lock** when not in use (eg. Burr, Saw, drill)
Handling of Power Instrument
Handling of Power Instrument
Specific care of arthroscopic instrument

- Use of protective measures:
  - protective sheath
  - securing and shock absorbable plastic
Specific care of arthroscopic instrument

– After operation
  • separate instrument into two categories
    – fine: need extra care during transportation, cleansing and inspection of used instrument
    – regular: routine transportation, cleansing, and inspection
Common Defects in Basic Instruments

- Scissors
- Tissue Forceps
- Needle holders
- Laparoscopic Instruments
Common Defects in Scissors

- **Visual inspection**
  - Organic residue in joints and surfaces
  - Bent or broken tips
  - Deformation or cracks on the cutting edge
  - Loose screw

- **Functional Test**
  - Should not grind, feel loose or too tight

- **Cutting test**
  - Plain gauze
Common Defects in Tissue Forceps

- **Visual inspection**
  - Organic Residues
  - Bent tips

- **Functional test**
  - Tips meet evenly, no overlap
  - Tips align and fit together
Common Defects in Needle holders

- **Visual Inspection**
  - Organic Residues, rust or stains
  - Cracks in the insert
  - Jaw surface tread wear or corrosion
  - No gap between tip jaws
Common Defects in Needle holders
Common Defects in Laparoscopic Instruments
Common defects of arthroscopic instrument

- Scratched
- Dents
- Bend
- Broken
- Burns
Risk Alert in SITS

Reamer Head Completeness
Risk Alert in SITS

ONE Screw Present
Risk Alert in SITS

Inspect Carefully before & After operation
## AORN Standard No. 2.5 - Use of Surgical Instruments

<table>
<thead>
<tr>
<th>Process Standard</th>
<th>AORN Recommended Practices</th>
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<tbody>
<tr>
<td>1. Prepare appropriate instruments for the operative procedure(s)</td>
<td>Use ‘Right’ instrument for ‘Right’ procedure</td>
</tr>
</tbody>
</table>
| 2. Check sterility of instruments before use | • Ensure all items used within the sterile field are sterile  
• Inspect the integrity of the package, status of sterilization indicator and sterilization/expiry date |
<p>| 3. Check integrity of instruments before use | Check for cleanliness, alignment, any crack and teeth intact |
| 4. Ensure good functioning of instruments before application | Check for any defect, loose joint or screws |</p>
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<td>5. Handle instruments in a manner to minimize potential injury to patient</td>
<td>• Handle instruments carefully and gently, either individually or in small lots</td>
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<tr>
<td></td>
<td>• Ensure the safety lock of power instrument when no use</td>
</tr>
<tr>
<td>6. Keep instruments free of gross soil during the operative procedure(s)</td>
<td>• Rinse instruments with lock opened in sterile water after each use to remove blood and organic debris</td>
</tr>
<tr>
<td></td>
<td>• Flush the lumens / channels of instruments with sterile water periodically</td>
</tr>
<tr>
<td>7. Identify any unintentional injury to patient caused by the use of surgical instruments</td>
<td>• Ensure the function of power instrument properly and that saw blades do not loosen during use</td>
</tr>
<tr>
<td></td>
<td>• Use kidney dish / neutral zone to place sharps instrument (blade, saw, hook...etc.) after use</td>
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<tr>
<td>8. Check the integrity and function of instruments throughout the operative</td>
<td>All instruments are checked functioning well after each use</td>
</tr>
<tr>
<td>procedure(s)</td>
<td></td>
</tr>
<tr>
<td>9. Ensure reusable instruments are tracked and traceable</td>
<td>Surgical Instrument Tracking System</td>
</tr>
<tr>
<td>10. Initiate appropriate actions if required</td>
<td></td>
</tr>
<tr>
<td>11. Maintain an accurate documentation</td>
<td></td>
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</tbody>
</table>
Instruments Reprocessing

Re-usable Medical Device Life Cycle

- Disinfection
- Inspection
- Packaging
- Sterilization
- Transport
- Storage
- Distribution
- Cleaning
- Used
CLEANING

- Removal of all visible dirt, tissue, blood and foreign particles.
- Removal of breeding ground for surviving micro-organisms.
- Reducing the bioburden (Viable micro-organism on surgical instrument)
Cleaning

Machine Washing – Washer disinfector

- Heat-resistant instrument eg. Stainless steel
- Reduce risk to staff
- Pre-cleaning is needed for stubborn coagulation residues.
Manual Cleaning

1. Micro-Instrument and Diamond knife
   Power machine
   Navigation instrument
   Endoscopes
2. Use Enzymatic detergent
3. Use Cleaning Tools: Soft cloths, plastic brushes, spray gun
Cleaning

Automatic Endoscope Reprocessor (AER)
Disinfection

**Definition**

- Chemical or physical process of destroying most forms of pathogenic micro-organisms except bacterial spores.

**Type of Disinfection**

- Thermal disinfection - A0 Value (Washer-disinfector)
- Chemical disinfection - Common liquid chemical disinfectants: Cidex OPA (High level disinfection)
Operation of Steam Sterilizer
Incident on Steam Sterilizer

21/10/2013
Chemical Disinfection
Problem of instrument return after surgery
Problem of instrument return after surgery
Problem of instrument return after surgery
Cleaning area
General care of instrument

• Most commonly used Stainless steel
• An alloy of iron, chromium & carbon
  – Solutions used: Sterile water
  – Prevention of rusting and corrosion
  – Pre-clean of used instrument
Why normal saline cannot be used as the cleansers?
Mechanism of rusting

- Stainless steel means stain/less, not stain proof

- A thick passive layer forms to have more resistance to corrosion
  - Formed by chromium enrichment process

- Damage to passive layer (physical, harsh cleansers, exposure to chlorine compounds)

- Invasion of gross soil during procedure (blood, body fluid, disinfectants)

- Rusting and corrosion occur

  - Green: chromium
  - Grey: iron
  - Orange: chromium oxide
  - Red: iron oxide
Mechanism of rusting

Chloride-induced damage called "pitting"

Corrosion caused by immersion in physiological salt solution over a period of several hours.
Spotting, staining, & corrosion

- IMPAIR the instruments’ function
- INTERFERE with the effectiveness of sterilization
- SHORTEN the instrument life
Spotting Caused by Lime
Discoloration – Caused by Titanium Oxide

- Caused by heavy metal ions in water - such as iron, manganese ions and silicates
Pitting Corrosion

- High chloride content in
  - Make up water
  - Rinse water
  - Steam

- Soaking instruments in saline
- Corrosive detergent
Surgical instrument & tracking system (SITS) (手術儀器追蹤系統)

• SITS implementation started at Princes of Wales Hospitals since 2012/2013
Surgical instrument & tracking system (SITS)

- **Purpose**
  - patient- instrument tracing
  - provide information of instrument such as impaired record, expiry date, issue status, handling methods
  - addressing operational needs
  - help formulating purchase plan
  - help maintaining circulation of instrument and equipment
Electronic instrument counting

- Past
  - Counting book

- Now
  - IPAD
Electronic instrument counting

- Advantages
  - Environmental friendly
  - Pictures: visualize parts of instrument
  - Facilitate counting and care of instrument
**Setting of Hip Arthroscopy in the workshop for reference**

1. Positioning of the patient and x-ray checking
2. Another view
3. Another view
4. Another view
5. Setting after draping
6. Close up

**Remarks:**
- Hair hugger for the upper part of the body is a must for the arthroscopy case as hypothermia is a major post-op complication for the patient.
- For right knee arthroscopy, the right arm should be put on the chest instead and only the TV system and the Arthroscopic equipment trolley need to be exchanged.
METS Modular Proximal Tibia

2.0 Operation instructions and guidelines

Insert the IM rod into the distal cutting guide for right or left femur – as required – and lock it in position using the locking screw located in front of the distal cutting guide. The relevant marking should be proximal when inserting the rod into the guide.

Assemble the distal cutting guide, guide slider, distal cutting guide slider bolt and the distal cutting plate. According to the chart below, adjust the guide slider for the amount of femoral resection measured from the femoral condyles and secure it by tightening the locking screw positioned above it.

<table>
<thead>
<tr>
<th>Size of SMILES Knee</th>
<th>Slider reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>22mm</td>
</tr>
<tr>
<td>Standard</td>
<td>24mm</td>
</tr>
</tbody>
</table>
mSUD Real time Counting

登入系統

方法一：
使用Barcode登入

方法二：
使用帳號及密碼登入

或

Login ➔  Cancel ✗

fppt.com
mSITS

**Electronic count sheet**

- **Phase 1**
  1) View set request
  2) UA check in & out
  3) Count sheet (including report issue by drop down list)
  4) Show issue in CSSD
  5) Offline plain Count Sheet PDF

**Source: HAIT**

- **Phase 2**
  1) Raise ad hoc request
  2) Requesting queue for
     - CSSD
     - OT
  3) Library
     (Set Template, Item Set, Operation Picking List)

- **Phase 3**
  1) Item Set item level photo (TBC)
  2) Report issue by photo
  3) Follow up issue by CSSD
  4) Instrument replacement request
     (Reprocessing area -> Sterilized store)
  5) Reporting
  6) Voucher by multiple teams
User can see the detail by clicking the info icon

Source: HAIT