Sterilization and Disinfection in the Ambulatory Surgical Center
Objectives

Upon completion of this program, the learner will be able to:

• Describe the Spaulding classification system
• Express the critical steps in processing methods
• Differentiate between immediate-use and standard sterilization procedures
• Identify opportunities for improvement in sterilization processes at the facility level
• Describe a mitigation strategy when sterilization fails
Dr. Earle H. Spaulding

• Developed the microbiology department at Temple University in 1936
• Tested disinfectants and antiseptics against a host of microbes for 15 years, resulting in the Spaulding classification system
Spaulding Classification System

Critical items

• All objects that enter sterile tissue or the vascular system, such as:
  – Surgical instruments
  – Cardiac and urinary catheters
  – Implants
  – Ultrasound probes used in sterile body cavities

• Ideally purchased sterile or sterilized by steam
Spaulding Classification System

Semicritical items
• All items that contact mucous membranes or nonintact skin, such as:
  – Respiratory equipment
  – Anesthesia equipment
  – Laryngoscope blades
  – Endoscopes
  – Cystoscopes
• Should be disinfected to remove all microorganisms, but small spore counts may be permissible—referred to as high-level disinfection

(CDC)
Spaulding Classification System

Noncritical items

• All items that contact intact skin and have no involvement with mucous membranes, such as:
  – Reusable blood pressure cuffs
  – Monitor leads
  – Computers
  – Stethoscopes

• Bedside equipment used between patients, referred to as low-level disinfection

(CDC)
Sterilization

Applies to all critical items

• May purchase sterile
• Processing items with steam is ideal
• Heat-sensitive objects may be processed with:
  – Ethylene oxide (EtO)
  – Hydrogen peroxide gas plasma
• Liquid chemical sterilants
  – Only if the above methods are unsuitable

(CDC)

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Workflow

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Critical Steps for Sterilization

• Always follow the manufacturer’s written information for use (IFU).
  – Provides information for the use and safe and effective processing of the instrument or equipment

(AAMI)
Critical Steps for Sterilization (cont.)

• Separate waste and reusable items at the point of care.
• Package reusable items for transport to the decontamination area.
• Decontaminate and sterilize reusable items that require processing quickly.
Critical Steps for Sterilization (cont.)

• Sort and disassemble items as per the IFU.
• If rapid decontamination and sterilization is not possible:
  – Preclean items with an enzymatic to prevent biofilm formation.
• Retain small parts to prevent loss.
  – Hidden areas and surfaces need to be exposed to the process for sterilization to be effective.

(AAMI)

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Critical Steps for Sterilization (cont.)

• Cleaning
  – Manual
  – Automated

• Cleaning solutions
  – Enzymatic cleaners
  – High pH detergents
    • Or combinations

• Cleaning methods
  – Mechanical scrubbing
  – High-pressure water
    • Or combinations

(AAMI)

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Critical Steps for Sterilization (cont.)

• Ideal cleaning agents should:
  – Be effective at removing all encountered soil types
  – Be free-rinsing
  – Be nontoxic
  – Have low foam
  – Be nonabrasive
  – Be biodegradable
  – Have a respectable shelf life
  – Be cost-effective

(AAMI)
Critical Steps for Sterilization (cont.)

• Rinsing
  – Ensures loose soil and residual cleaner is removed.
  – Requires copious quantities of water.

• Water quality
  – Do not use saline due to deposits and corrosion.
  – Tap water may be used, but the final rinse water should be of high quality in order to avoid staining.

(AAMI)
Verification of Cleaning

• Visually inspect each item after cleaning to ensure there is no visible soil remaining.
• Magnification may be required.
  – For pieces that can not be visualized, follow the IFU regarding test procedures for this step.
  – Independent double checks may be employed.
Bins, Baskets, Dividers, and Pins

• Follow the IFU.
• Cleaning usually requires the same steps that are used for instruments.
  – Some can be sterilized with the instruments.
  – Some require a separate process.
Pennsylvania Patient Safety Advisory
Produced by ECRI Institute and ISMP under contract to the Pennsylvania Patient Safety Authority

Bioburden on Surgical Instruments

Pennsylvania hospitals have submitted a number of reports to PA-PSRS describing cases in which sterilized surgical instruments have been contaminated with organic material from a prior procedure—something healthcare workers call “bioburden.” While most of these cases are recognized before the devices reach the patient, in some instances these soiled instruments have contaminated the sterile field.

These occurrences put patients at risk of surgical site infection (SSI), even if the instrument never touches the patient, because of the potential for contaminating the surgical field. Additionally, when contaminated equipment is recognized after a procedure has begun, precious operating time is lost, and the patient experiences prolonged anesthesia while properly sterilized equipment is obtained.¹

Background

Despite modern infection control practices, the incidence of SSIs remains high. SSIs have been estimated as the third most frequently reported type of healthcare-associated infection.² Despite advances in asepsis, environmental controls, and antimicrobial prophylaxis, SSIs continue to cause morbidity and mortality among surgical patients. Various explanations include an increase in the number of frail patients with chronic debilitating diseases who undergo surgery, increased utilization of implants and organ transplants, and the presence of antibiotic-resistant organisms.²

In July 2005, the Pennsylvania Health Care Cost Containment Council (PHC4) reported on hospital-acquired infections in the state, estimating that patients with SSIs had a mortality rate of 3.1%.³

Reports to PA-PSRS
Indicators

• External
  – Chemical indicator (CI) tape—unless internal chemical indicator is readily visible—on case packs
  – Bowie-Dick—routine sterilizer check

• Internal
  – Chemical indicators
  – Biologic indicator (BI)
  – Process challenge device (PCD)—sterilizer check

(AAMI)
<table>
<thead>
<tr>
<th>Monitor</th>
<th>Frequency of use</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical monitors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time, temperature, and pressure recorders, displays, digital printouts, and gauges</td>
<td>Should be used for every load of every sterilizer.</td>
<td>Part of load release criteria.</td>
</tr>
<tr>
<td>Chemical indicators (CIs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External CIs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 1/process indicators</td>
<td>Should be used on outside of every package unless the internal CI is visible.</td>
<td>Part of load and package release criteria.</td>
</tr>
<tr>
<td>Bowie-Dick-type indicators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 2 (Bowie-Dick)</td>
<td>For routine sterilizer testing (dynamic-air-removal sterilizers only), should be run, within a test pack, each day in an empty sterilizer before the first processed load. For sterilizer qualification testing (dynamic-air-removal sterilizers only), should be run, within a test pack, after sterilizer installation, relocation, malfunction, and major repairs and after sterilization process failures; test should be run three times consecutively in an empty chamber after BI tests.</td>
<td>Test of sterilizer for efficacy of air removal and steam penetration; part of release criteria for using sterilizer for the day. Part of release criteria for placing sterilizer into service after qualification testing.</td>
</tr>
<tr>
<td>Internal CIs</td>
<td>Should be used inside each package.</td>
<td>Part of package release criteria at use site.</td>
</tr>
<tr>
<td>Class 3 (single-variable indicator)</td>
<td>Should be used in periodic product quality assurance testing.</td>
<td>Part of package release criteria for changes made to routinely sterilized items, load configuration, and/or packaging. Release criteria should include BI results.</td>
</tr>
<tr>
<td>Class 4 (multi-variable indicator)</td>
<td>May be used to meet internal CI recommendation.</td>
<td>Part of package release criteria at use site; NOT to be used for release of loads.</td>
</tr>
<tr>
<td>Class 5 (integrating indicator)</td>
<td>May be used to meet internal CI recommendation. Within a PCD, may be used to monitor nonimplant sterilizer loads. Within a PCD, should be used to monitor each sterilizer load containing implants. The PCD should also contain a BI.</td>
<td>Part of package release criteria at use site. Part of load release criteria for nonimplant loads. Part of release criteria for loads containing implants. Except in emergencies, implants should be quarantined until BI results are known.</td>
</tr>
<tr>
<td>Class 6 (emulating indicator)</td>
<td>May be used to meet internal CI recommendation. Within a PCD, may be used to monitor sterilizer loads.</td>
<td>Part of package release criteria at use site. Part of load release criteria for nonimplant loads. Part of release criteria for loads containing implants. Implants should be quarantined until BI results are known, except in emergency situations.</td>
</tr>
<tr>
<td>Biological indicators (BIs)</td>
<td>Within a PCD, may be used to monitor nonimplant loads. Within a PCD, should be used in every load containing implants. The PCD should also contain a Class 5 integrating indicator. Within a PCD, should be used for weekly, preferably daily (each day the sterilizer is used), routine sterilizer efficacy testing. (The PCD may also contain a CI.) Should be run in a full load for wrapped items; for table-top sterilization, should be run in a fully loaded chamber; for flash sterilization, should be run in an empty chamber. Within a PCD, should be used for sterilizer qualification testing (after sterilizer installation, relocation, malfunction, major repairs, sterilization process failures). (The PCD may also contain a CI.)</td>
<td>Part of load release criteria. Part of release criteria for loads containing implants. Implants should be quarantined until BI results are known, except in emergency situations. Part of release criteria for loads containing implants. Except in emergencies, implants should be quarantined until BI results are known. Part of sterilizer/load release and recall criteria. Part of release criteria for placing sterilizer into service after qualification testing.</td>
</tr>
</tbody>
</table>
Steam Quality

- Dryness fraction between 97% and 100%
- Noncondensable gases at <3.5% v/v condensate
- Superheat of steam <25°C (77°F)
- No steam line dead legs
Steam Quality (cont.)

• Feed water
  – Particulate filter
    • Install as close to the sterilizer as possible.
  – pH and hardness
    • Avoid additives spilling over to sterilizers.
Handling Failures

CI Failures

BI Failures

Physical Monitoring Failures

Quarantine load, remove sterilizer from service, and investigate cause of failure

Review scope/extent of failure

If cause of failure is immediately identified (usually operator error) and confined to one load or one item within the load (internal CI), correct the cause and reprocess the load. If cause of the failure is not immediately identified, quarantine the load and recall all loads back to the last negative BI.

Determine cause of failure

Sterilizer/utilities malfunction (10.6.4, 10.6.8)

Positive BI (10.6.4)

CI failure (10.5.2.2)

Operator error

Unknown

Determine cause of sterilizer/utilities malfunction

Failure cannot be attributed to cause other than sterilizer/utilities malfunction

Failure can be attributed to cause other than sterilizer/utilities malfunction

Correct error

Repair sterilizer/utilities

Minor repair

Major repair

Minor repair

Run 3 consecutive BI PCD tests (all sterilizers). For dynamic-air removal sterilizers, also run 3 consecutive Bowie-Dick tests.

Test results fail

Test results pass

Return sterilizer to service

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• In 1942, Underwood defined flash sterilization as three minutes at 250°F for instruments when there is an “extreme emergency.”

• In 1969, Perkins redefined flash sterilization of an unwrapped item to the current definition of 270°F for three minutes in a gravity sterilizer.

• At the time, there were no special biological indicators designed for flash sterilization and no flash sterilization containers, and the time/temperature was suboptimal.

(Rutala)
Pennsylvania Ambulatory Surgical Facility (ASF) Survey Results

Opportunity for Improvement

<table>
<thead>
<tr>
<th>Sterilization</th>
<th>Percentage</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>The facility performs &quot;immediate use&quot; flash sterilization.</td>
<td>53%</td>
<td></td>
</tr>
<tr>
<td>Flash sterilization is used solely for sterilizing items that have been contaminated during a procedure.</td>
<td>38%</td>
<td></td>
</tr>
<tr>
<td>Flash sterilization instruments are wrapped and covered.</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>A rapid read device is used for flash sterilization.</td>
<td>43%</td>
<td></td>
</tr>
</tbody>
</table>
Immediate-Use Sterilization (cont.)

• Always follow the manufacturer’s written IFU.
  – Provides information for the use and safe and effective processing of the instrument or equipment
Immediate-Use Sterilization (cont.)

• NOT intended for routine sterilization of items
• Ideally performed in close proximity to the operating room suite
• Requires the same rigor related to:
  – Cleaning and decontamination
  – Rinsing
  – Verification of cleanliness
  – Indicator—interior/exterior
    • Quality check of sterilizer
  – Processing—racking for exposure
  – Packaging
  – Delivery
  – Indicator check at point of care
## Examples of Flash Steam Parameters

<table>
<thead>
<tr>
<th>Type of sterilizer</th>
<th>Load configuration</th>
<th>Temperature</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravity displacement</td>
<td>Nonporous items only (i.e., routine metal instruments, no lumens)</td>
<td>132°C (270°F)</td>
<td>3 minutes</td>
</tr>
<tr>
<td></td>
<td>Nonporous and porous items (e.g., rubber or plastic items, items with lumens) sterilized together</td>
<td>132°C (270°F)</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Prevacuum</td>
<td>Nonporous items only (i.e., routine metal instruments, no lumens)</td>
<td>132°C (270°F)</td>
<td>3 minutes</td>
</tr>
<tr>
<td></td>
<td>Nonporous and porous items (e.g., rubber or plastic items, items with lumens) sterilized together</td>
<td>132°C (270°F)</td>
<td>4 minutes</td>
</tr>
<tr>
<td>Steam-flush pressure-pulse</td>
<td>Nonporous or mixed nonporous/porous items</td>
<td>132°C (270°F)</td>
<td>4 minutes</td>
</tr>
</tbody>
</table>

(CDC)  

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The Centers for Disease Control and Prevention lists germicides appropriate for use as liquid chemical sterilants; the list includes:

- >2.4% glutaraldehyde-based formulations
- 0.95% glutaraldehyde with 1.64% phenol/phenate
- 7.5% sterilized hydrogen peroxide
- 7.35% hydrogen peroxide with 0.23% peracetic acid
- 0.2 % peracetic acid
- 0.08% peracetic acid with 1.0% hydrogen peroxide

(CDC)

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Liquid Chemical Sterilants

• In order to be effective:
  – Cleaning must precede treatment
  – Manufactures guidelines must be followed for:
    • Concentration
    • Contact time
    • Temperature
    • pH
    • Rinsing if needed
    • Storage

(CDC)
High-Level Disinfection

• A process that eliminates or destroys all forms of microbial life
  – Classically excludes bacterial spores
    • Some liquid sterilants may eliminate spores within determined contact times set by the maker.
  – Uses liquid chemicals or wet pasteurization

(CDC)
Workflow


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Critical Steps for High-Level Disinfection

• Always follow the manufacturer’s written IFU.
  – Provides information for the use and safe and effective processing of the instrument or equipment

(AAMI)

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Critical Steps for High-Level Disinfection (cont.)

• Point-of-care precleaning/separation
• Containment and transport—wet
• Cleaning and decontamination
• Rinsing
• Verification of cleanliness
• Testing of chemical concentration
• Testing of processor function
• Processing—racking for exposure
• Packaging
• Storage
• Delivery
• Package inspection—at point of care (if appropriate for process)
High-Level Disinfection of Endoscopes

Endoscopes are implicated as the source of outbreaks more than any other reprocessable instrument.
Critical Steps for Endoscope Reprocessing

Precleaning

• Performed in the procedure room
• An enzymatic detergent solution is used to:
  – Wipe the exterior of the endoscope
  – Flush all the channels
• Irrigating the channels with an enzymatic detergent solution:
  – Helps moisten and soften debris
  – Prepares for more vigorous manual cleaning

("The Dirt on Flexible Endoscope Reprocessing")
Leak testing

• Performed in the processing room
  – After precleaning
  – Before manual cleaning begins

• Consists of pressurizing the endoscope with air and submerging it in water to check for damage
  – If damaged, air bubbles should be visible while the endoscope is submerged.
  – Remove from service for repair.

(“The Dirt on Flexible Endoscope Reprocessing”)
Endoscope Reprocessing (cont.)

Manual cleaning

• Endoscope is immersed in an enzymatic detergent solution.
  – Debris is wiped and/or brushed from the endoscope’s exterior surfaces.
• All the channels—even those not used during the endoscopic procedure are brushed, aspirated, and flushed with the detergent.
• All the endoscope’s removable parts are cleaned separately.
• The endoscope is then rinsed with water.
• Rinsing may also include using forced air to remove excess water from the endoscope.
Endoscope Reprocessing (cont.)

High-level disinfection/sterilization

• The endoscope is either high-level disinfected or sterilized.
  
  – Sterilization inactivates all microbes, including bacterial endospores.
  
  – High-level disinfection inactivates all vegetative bacteria, mycobacteria, fungi, and viruses, but not necessarily all bacterial endospores.

• This step can be performed manually or by using an endoscope reprocessor.

(“The Dirt on Flexible Endoscope Reprocessing”)

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Endoscope Reprocessing (cont.)

• The decision to high-level disinfect or sterilize an endoscope is typically based on:
  – The Spaulding classification system
  – The scope manufacturer’s recommendations
Rinsing and drying (high-level disinfection)

• The first part of rinsing includes flushing the endoscope with filtered water.
  – Performed for endoscopes that are exposed to a liquid chemical germicide.
  – Pressurized air is then passed through the endoscope to remove the water.

• Flush endoscope channels with 70% to 90% ethyl or isopropyl alcohol.
  – Dry channels using forced air.
Endoscope Reprocessing (cont.)

Storage
• For endoscopes that have undergone high-level disinfection:
  – Hang vertically with caps, valves, and other detachable components removed.
  – Store in a well-ventilated area that is not prone to moisture collection.
Endoscope Reprocessing (cont.)

Storage

• For endoscopes that have undergone sterilization:
  – Some endoscope reprocessor manufacturers recommend not storing *sterilized* endoscopes but using them immediately.
  – Other reprocessor manufacturers may require that *sterile* endoscopes be wrapped for storage and only unwrapped in a sterile environment.
The Dirt on Flexible Endoscope Reprocessing

ABSTRACT

To avoid cross contamination of infectious pathogens, endoscopes and their associated accessories are cleaned and disinfected or sterilized (reprocessed) between each patient use. Failure to properly reprocess endoscopes and accessories could potentially expose patients to bloodborne pathogens and harmful bacteria, which may result in serious patient injury or death. Often, these exposures affect large numbers of patients who must be notified of the potential risk and may need to return to the facility for testing. Patient notification of endoscopy-related cross contamination or suspected contamination can be challenging when appropriate identifying information associating a specific endoscope with a specific patient is not captured. Between 2004 and 2009, the Pennsylvania Patient Safety Authority received 107 reports describing potential patient contamination due to inadequate or improper endoscope reprocessing techniques. Of the 107 reports, 62 made reference to potentially contaminated endoscopes being used on patients, while the remainder described potentially contaminated endoscopes getting to the patient (e.g., surgical field), but not used, or lacked information to determine patient involvement. To reduce the likelihood of cross contamination, healthcare facilities need to consider developing and adhering to comprehensive, model-specific reprocessing protocols.

Endoscopes are optical instruments used to visually examine internal organs or cavities within the human body to diagnose and treat various medical conditions. Endoscopes and their accessories (e.g., irrigation tubing) need to be reprocessed (cleaned and disinfected or sterilized) between each patient use. Failure to reprocess or inadequate reprocessing of endoscopes and accessories places patients at risk of exposure to various pathogens. Because of the severity of this potential risk, ECRI Institute designated cross contamination from flexible endoscopes as the number 1 hazard of the top 10 medical technology hazards for 2010.1 A March 2006 Patient Safety Advisory article described potential contamination of surgical instruments, including endoscopes, due to inadequate cleaning and inspection of the instruments before sterilization.
Steps for All Processing Types (Review)

• Follow the written IFU
• Point-of-care precleaning/separation
• Containment and transport - wet
• Cleaning and decontamination
• Rinsing
• Verification of cleanliness
• Indicator—interior/exterior
  – Quality check of sterilizer
  – Quality check of chemical concentration for high-level disinfection
• Processing—racking for exposure
• Packaging
• Storage
• Delivery
• Package inspection—at point of care
• Indicator check (if appropriate for process)—at point of care

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Personal Protective Equipment for Reprocessing

- Facilities managing personnel responsible for the processing of contaminated items must adhere to the Occupational Safety and Health Administration (OSHA) bloodborne pathogen standard.

(AAMI)
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Documentation and Tracking

• Logs
  – Electronic/manual
  – Daily equipment checks
  – Scheduled maintenance
  – Return-to-service tests
  – Indicators
  – Printed receipts
  – Load numbers matched to patients and equipment
Rust and Corrosion

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Biofilm Formation

5 stages of biofilm development:
- Initial surface contact – planktonic cells
- Irreversible attachment to surface
- Maturation of film stage I
- Maturation of film stage II
- Dispersion of planktonic cells

http://biology.plosjournals.org/perserv/?request=slideshow&type=figure&doi=10.1371/journal.pbio.0050307&id=89595

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Biofilm

Source: http://www.youtube.com/watch?v=ZI7mTOh0eok&feature=youtu.be

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Prions

• Abnormal, pathogenic agents that are transmissible
• Able to induce abnormal folding of specific normal cellular proteins
  – Called prion proteins
  – Found most abundantly in the brain
• Requires special handling and sterilization arrangements

(CDC)
Noncritical Items

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Noncritical Items (cont.)

• Items that are reusable fitting the noncritical definition.
• Ideal solutions are tuberculocidal.
• Bleach containing products for *Clostridium difficile*.
• Check with equipment manufacturers for risk of surface degradation.

(CDC)
Environment of Care

Analyzing, Educating and Collaborating for Patient Safety
Pennsylvania ASF Survey Results
Opportunity for Improvement

| Environmental | 84%  | Operating room suites are terminally cleaned and disinfected after each procedure |
|               | 93%  | Operating rooms are terminally cleaned at the end of the day. |
|               | 91%  | Anesthesia and surgical items and equipment is cleaned between uses in all patient care areas. |
III. Single Use Devices, Sterilization, and High Level Disinfection

Pre-cleaning must always be performed prior to sterilization and high-level disinfection.

Sterilization must be performed for critical equipment (i.e., instruments and equipment that enter normally sterile tissue or the vascular system, such as surgical instruments).

High-level disinfection must be performed for semi-critical equipment (i.e., items that come into contact with non-intact skin or mucous membranes such as reusable flexible endoscopes, laryngoscope blades).

Observations are to be made of staff who perform equipment reprocessing (e.g., surgical techs), unless these activities are performed under contract or arrangement off-site from the ASC.
Pennsylvania Patient Safety Reporting System (PA-PSRS) Reporting

• Incident
  – “An event, occurrence or situation involving the clinical care of a patient in a medical facility which could have injured the patient but did not either cause an unanticipated injury or require the delivery of additional health care services to the patient.”

• Serious Event
  – “An event, occurrence or situation involving the clinical care of a patient in a medical facility that results in death or compromises patient safety and results in unanticipated injury requiring the delivery of additional health care series to the patient.”

(Commonwealth of Pennsylvania Patient Safety Authority)
PA-PSRS Taxonomy

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Unsafe Conditions: Circumstances that could cause adverse events (e.g., look-alike medications, confusing equipment, etc.)</td>
</tr>
<tr>
<td>B1</td>
<td>An event occurred but it did not reach the individual (&quot;near miss&quot; or &quot;close call&quot;) because of chance alone.</td>
</tr>
<tr>
<td>B2</td>
<td>An event occurred but it did not reach the individual (&quot;near miss&quot; or &quot;close call&quot;) because of active recovery efforts by caregivers.</td>
</tr>
<tr>
<td>C</td>
<td>An event occurred that reached the individual but did not cause harm and did not require increased monitoring (an error of omission such as a missed medication dose does reach the individual).</td>
</tr>
<tr>
<td>D</td>
<td>An event occurred that required monitoring to confirm that it resulted in no harm and/or required intervention to prevent harm.</td>
</tr>
<tr>
<td>E</td>
<td>Event, Harm: An event occurred that contributed to or resulted in temporary harm and required treatment or intervention.</td>
</tr>
<tr>
<td>F</td>
<td>An event occurred that contributed to or resulted in temporary harm and required initial or prolonged hospitalization.</td>
</tr>
<tr>
<td>G</td>
<td>An event occurred that contributed to or resulted in permanent harm.</td>
</tr>
<tr>
<td>H</td>
<td>An event occurred that resulted in a near-death event (e.g., required ICU care or other intervention necessary to sustain life).</td>
</tr>
<tr>
<td>I</td>
<td>Event, Death: An event occurred that contributed to or resulted in death.</td>
</tr>
</tbody>
</table>
# Event Type Examples

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Event Type Sub1</th>
<th>Event Type Sub2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment/supplies/devices</td>
<td>Sterilization problem</td>
<td></td>
</tr>
<tr>
<td>Error related to procedure/treatment/test</td>
<td>Surgery/invasive procedure problem</td>
<td>Break in sterile technique</td>
</tr>
<tr>
<td>Complication of procedure/treatment/test</td>
<td>Maternal complication</td>
<td>Infection</td>
</tr>
<tr>
<td></td>
<td>Nosocomial Infection</td>
<td>Intravascular catheter infection</td>
</tr>
<tr>
<td></td>
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<td>Wound/surgical site infection</td>
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<tr>
<td></td>
<td></td>
<td>Nosocomial pneumonia</td>
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<td></td>
<td></td>
<td>Sepsis 48 hours post-admit</td>
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<td></td>
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<td>Antibiotic-associated diarrhea</td>
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<tr>
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<td></td>
<td>Antibiotic-resistant organism</td>
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<td>Urinary tract infection</td>
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<td>Other nosocomial infection</td>
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References


The dirt on flexible endoscope reprocessing. Pa Patient Saf Advis [online] 2010 Dec [cited 2013 Feb 26].

Questions?
Sterilization and Disinfection

Case Report Discussion
Case Report Discussion

• RN reports that at the end of the case, it was discovered that the outside shell of the sterile tray used for the procedure had a small crack in it.

• Surgeon spoke with the parents regarding the break in sterility of the equipment used and showed the tray to the family.
Case Report Discussion

• Physician reported six cases of toxic anterior segment syndrome (TASS) one day postoperatively.

• Two new surgeons were using instruments previously not used by the medical staff in the facility.

• Protective sleeves were used during the sterilization of these new instruments.

• It is thought that perhaps the sleeves did not allow for adequate sterilization.
Case Report Discussion

• A sizer was opened with sterile technique.
• The case holding the breast sizer and the sizer wrapper was opened; the sizer was removed and placed in breast.
• The steam sterilization integrator that was in the case was not looked at when the sizer was removed.
Case Report Discussion

• Upon placing forceps under microscope for use during cataract procedure, a suture needle with piece of suture attached was found wrapped around the forceps.

• The needle and forceps were removed from the sterile field, and the forceps were replaced.
Case Report Discussion

• During ACL reconstruction, the surgeon noticed the cannulated screwdriver did not slide easily over the guidewire.

• When using a second guidewire to try to determine why it did not slide easily, a piece of black material fell from the channel of the screwdriver.

• Upon inspection, it was determined to be a piece of the black coating of the cleaning tool used in clearing the channel of the screwdriver prior to processing the instrument for sterilization.
Case Report Discussion

• At completion of the sterilization process, the central sterile tech opened the autoclave following manufacturer’s instructions and found the pack to be wet.

• The tray was immediately removed from service.
Case Report Discussion

• Instruments used for a previous case were washed and then placed in the autoclave for immediate-use sterilization.

• The parameters were met for sterilization, but the scrub nurse did not initially check the indicator, which showed marginal sterilization at best.