

Infection Prevention and Construction Bed Bug Management

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Objectives:

- ▶ Review ICRA and process to complete risk assessment prior to construction
- ▶ Describe the infection prevention measures required during construction/renovation in a healthcare facility.
- ▶ Review examples of healthcare construction projects, Do's and Don'ts.
- ▶ Identify processes for Bed Bug Management in Healthcare facilities.

Infection Prevention Key Points

- ▶ Infection Control Risk Assessment (ICRA) is a plan created for all new construction and renovation projects.
- ▶ An ICRA plan protects patients, visitors, and staff from the risks associated with construction.
- ▶ Dust barriers are designed and built to contain dust and other airborne particles.
- ▶ Negative air pressure is the *most* important component of dust protection

REGULATIONS AND DOCUMENTATION

ENTITIES AND REGULATIONS (BUT NOT LIMITED TO):

- THE JOINT COMMISSION
- CMS
- OSHA
- ADA (AMERICANS WITH DISABILITIES ACT)
- HIPAA (PATIENT PRIVACY ACT)
- SD, MN, IA Departments of Health
- State Fire Marshalls
- City Building Inspectors
- Local Fire Department (Local Authority)

Construction Activities

In the healthcare setting, construction activities usually fall into one of the following categories:

- ▶ Minor repair and system replacements
- ▶ Major system upgrades
- ▶ Major additions
- ▶ Major area renovations
- ▶ Construction adjacent to the hospital

Areas of Focus

To ensure a safe project, develop a plan for each healthcare job site.

Depending on the type of job some or all of these steps will be needed:

- ▶ Containment of the job site
- ▶ Entry and exit of workers from the job site
- ▶ Containment and transport of materials and debris
- ▶ Methods of decontaminating crews
- ▶ Monitoring of site by project officers, safety and/or infection control
- ▶ Cleanup of the job site

Infection Prevention Insight

- ▶ Dialysis water – design/plumbing/piping/water processing and installation specifications
- ▶ Protective Isolation ventilation design and specifications
- ▶ Sinks: locations, hand-washing stations
- ▶ OR ventilation design and specifications
- ▶ Special procedure room design and specifications

CONSTRUCTION ISSUES ENCOUNTERED IN A HOSPITAL ENVIRONMENT

- ▶ SITE SAFETY PRACTICES 
- ▶ INFECTION CONTROL 
- ▶ SITE CONTAINMENT & FILTRATION 
- ▶ FIRE PROTECTION 
- ▶ PATIENT CONFIDENTIALITY 
- ▶ SECURITY
- ▶ REGULATIONS AND DOCUMENTATION 
- ▶ STANDARDS OF BEHAVIOR 

ICRA

Infection Control Risk Assessment Matrix of Precautions for Construction & Renovation

Step One:

Using the following table, *identify* the Type of Construction Project Activity (Type A-D)

| | |
|---------------|--|
| TYPE A | Inspection and Non-Invasive Activities. Includes, but is not limited to: <ul style="list-style-type: none">▪ removal of ceiling tiles for visual inspection only, e.g., limited to 1 tile per 50 square feet▪ painting (but not sanding)▪ wallcovering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection. |
| TYPE B | Small scale, short duration activities which create minimal dust Includes, but is not limited to: <ul style="list-style-type: none">▪ installation of telephone and computer cabling▪ access to chase spaces▪ cutting of walls or ceiling where dust migration can be controlled. |
| TYPE C | Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies Includes, but is not limited to: <ul style="list-style-type: none">▪ sanding of walls for painting or wall covering▪ removal of floorcoverings, ceiling tiles and casework▪ new wall construction▪ minor duct work or electrical work above ceilings▪ major cabling activities▪ any activity which cannot be completed within a single workshift. |
| TYPE D | Major demolition and construction projects Includes, but is not limited to: <ul style="list-style-type: none">▪ activities which require consecutive work shifts▪ requires heavy demolition or removal of a complete cabling system▪ new construction. |

Description of Required Infection Control Precautions by Class

| | During Construction Project | Upon Completion of Project |
|------------------|---|---|
| CLASS I | <ol style="list-style-type: none"> 1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection | <ol style="list-style-type: none"> 1. Clean work area upon completion of task. |
| CLASS II | <ol style="list-style-type: none"> 1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area 6. Remove or isolate HVAC system in areas where work is being performed. | <ol style="list-style-type: none"> 1. Wipe work surfaces with cleaner/disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 4. Upon completion, restore HVAC system where work was performed. |
| CLASS III | <ol style="list-style-type: none"> 1. Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Contain construction waste before transport in tightly covered containers. 5. Cover transport receptacles or carts. Tape covering unless solid lid. | <ol style="list-style-type: none"> 1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Department. 2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 3. Vacuum work area with HEPA filtered vacuums. 4. Wet mop area with cleaner/disinfectant. 5. Upon completion, restore HVAC system where work was performed. |
| CLASS IV | <ol style="list-style-type: none"> 1. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area. | <ol style="list-style-type: none"> 1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Dept. 2. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction. 3. Contain construction waste before transport in tightly covered containers. 4. Cover transport receptacles or carts. Tape covering unless solid lid. 5. Vacuum work area with HEPA filtered vacuums. 6. Wet mop area with cleaner/disinfectant. 7. Upon completion, restore HVAC system where work was performed. |

Step Two:

Using the following table, *identify the Patient Risk Groups* that will be affected.

If more than one risk group will be affected, select the higher risk group:

| Low Risk | Medium Risk | High Risk | Highest Risk |
|--|---|---|---|
| <ul style="list-style-type: none"> ▪ Office areas | <ul style="list-style-type: none"> ▪ Cardiology ▪ Echocardiography ▪ Endoscopy ▪ Nuclear Medicine ▪ Physical Therapy ▪ Radiology/MRI ▪ Respiratory Therapy | <ul style="list-style-type: none"> ▪ CCU ▪ Emergency Room ▪ Labor & Delivery ▪ Laboratories (specimen) ▪ Medical Units ▪ Newborn Nursery ▪ Outpatient Surgery ▪ Pediatrics ▪ Pharmacy ▪ Post Anesthesia Care Unit ▪ Surgical Units | <ul style="list-style-type: none"> ▪ Any area caring for immunocompromised patients ▪ Burn Unit ▪ Cardiac Cath Lab ▪ Central Sterile Supply ▪ Intensive Care Units ▪ Negative pressure isolation rooms ▪ Oncology ▪ Operating rooms including C-section rooms |

Step 2

Step Three: Match the

Patient Risk Group (*Low, Medium, High, Highest*) with the planned ...

Construction Project Type (*A, B, C, D*) on the following matrix, to find the ...

Class of Precautions (*I, II, III or IV*) or level of infection control activities required.

Class I-IV or Color-Coded Precautions are delineated on the following page.

IC Matrix - Class of Precautions: Construction Project by Patient Risk

| Patient Risk Group | Construction Project Type | | | |
|---------------------------|---------------------------|--------|--------|--------|
| | TYPE A | TYPE B | TYPE C | TYPE D |
| LOW Risk Group | I | II | II | III/IV |
| MEDIUM Risk Group | I | II | III | IV |
| HIGH Risk Group | I | II | III/IV | IV |
| HIGHEST Risk Group | II | III/IV | III/IV | IV |

Note: Infection Control approval will be required when the Construction Activity and Risk Level indicate that **Class III** or **Class IV** control procedures are necessary.

Step 3

Infection Control Considerations

- Location of sinks and dispensers for hand-washing products and hand hygiene products
- Types of faucets (e.g., aerated vs. nonaerated)
- Air-handling systems engineered for optimal performance, easy maintenance, and repair
- ACH and pressure differentials to accommodate special patient-care areas
- Location of fixed Sharps containers
- Types of surface finishes (e.g., porous vs. nonporous)
- Well-caulked walls with minimal seams
- Location of adequate storage and supply areas
- Appropriate location of medicine preparations areas (e.g., ≥ 3 ft. from a sink)
- Appropriate location and type of ice machines (e.g., preferably ice dispensers rather than ice bins)
- Appropriate materials for sinks and wall coverings
- Appropriate traffic flow (e.g., no "dirty" movement through "clean" areas)
- Isolation rooms with anterooms as appropriate
- Appropriate flooring (e.g., seamless floors in dialysis units)
- Sensible-use carpeting (e.g., avoiding use of carpeting in special care areas or areas likely to become wet)*
- Convenient location of soiled utility areas
- Properly engineered areas for linen services and solid waste management
- Location of main generator to minimize the risk of system failure from flooding or other emergency
- Installation guidelines for sheetrock

*Use of carpet-cleaning methods (e.g., "bonneting") that disperse microorganisms into the air increases the risk of airborne infection among at-risk patients, especially if they are in the vicinity of the cleaning activity.

INFECTION CONTROL



Education is needed for everyone involved with construction:

Infection control is one of the most important factors when doing construction work within a hospital. Many of the patients are immuno suppressed and are highly prone to infection. The slightest contamination with construction dust can prove harmful.

- Always follow infection control practices as directed per the facilities polices
- Erect proper containments. Containments are to be inspected for leakage, tears and that they are under negative pressure. All contractors are to observe and maintain containments through each shift. If something comes loose or opens up, STOP what you are doing and repair it.
- Use negative air machines to control airborne particles.
- Use walk-off mats (keep them damp) or sticky mats to help contain dust.
- Use booties and coveralls when directed.
- Each construction project is assigned a risk category. The required containments and protections are specifically described in the risk assessment.
- Containments should be inspected and approved by Project Supervisor or designated person before demolition or construction begins.

CONSTRUCTION AREA SIGNAGE

PROPER SIGNAGE IS REQUIRED IN CONSTRUCTION ZONES
TO PROTECT ALL WHO COME NEAR OR ENTER.

INSPECT DAILY!



Ensure that proper signage goes up
before the project begins and stays up
until the project has been completed.



Life safety exiting requirements must
be maintained in and around all
worksites.

Entry and Exit

Avoid dragging dust and dirt from your work site into other parts of the hospital:

- ▶ Use tacky mats, also known as walk-off mats, to collect dust and other contaminants from footwear whenever entering and exiting the job site.
- ▶ Change the tacky mats as often as necessary. When they get dirty, they are not as effective in removing dust and debris from shoes.
- ▶ Depending upon the type of construction
 - may be required to wear a coverall and shoe covers in the construction site. Coveralls and shoe covers must be removed each time someone leaves the site, not just at the end of the shift.
- ▶ If the workspace is very dusty, buddy with a co-worker to ensure that clothing is as dust-free as possible before leaving the space, by using a HEPA-equipped vacuum.

CORRIDOR ACCESS



Hospital corridors are to be kept clear of carts, ladders and tools whenever possible.

Unattended carts may not be placed in a corridor longer than 15 minutes.

At the end of the workday you must remove any items in corridors or egress pathways.

Maintain an unobstructed path to area egress point at all times.



Containment

To ensure proper containment of the job site:

- ▶ Seal unused doors with tape.
- ▶ Construct all barriers, i.e., sheetrock, plastic, or plywood, as required to seal the construction area from the non-work area.
- ▶ Use high-efficiency particulate air (HEPA) filters to control any dust and purify the air. The HEPA unit also helps keep the construction site under negative air pressure relative to the surrounding environment.
- ▶ Block vents. Work areas that contain air vents could spread dust and debris to nearby locations. Seal them tightly with plastic and duct tape or other form-fitting material.

Why Negative Air?

- ▶ A negative pressure environment will help to contain the construction dust and contaminants within the construction space.
- ▶ A negative pressure space eliminates the possibility of contaminants passing outside of the construction area through leaks in the construction barriers.

Air Scrubber

- ▶ An **air scrubber** is a portable filtration system that removes particles, gasses, and/or chemicals from the **air** within a given area. These machines draw **air** in from the surrounding environment and pass it through a series of filters to remove contaminants.

Difference?

- ▶ Air scrubber
 - Stands alone in the center of a room with no ducting attached.
 - The air is filtered and recirculated, greatly improving the general air quality. An air scrubber can be used as a negative air machine, but it requires ducting.
- ▶ Negative air Machine
 - uses ducting to remove contaminated air from a sealed containment area.
 - The filtered air is exhausted outside of the containment area. This creates negative air pressure (a vacuum effect), which helps limit the spread of contaminants to other areas inside the structure.

Negative Pressure



If possible, a window exhaust is used to generate negative pressure at the construction site.



If there is no window for exhaust, an anteroom is constructed and the air is passed through a HEPA filter before being exhausted from the site.

Air Exchange

- ▶ The general rule of thumb is that at least 10% more air must be exhausted from the area than is supplied to it.
- ▶ For example, if 500 CFM is coming in through the facility HVAC system, then at least 550 CFM must be filtered and exhausted by the PAS.
- ▶ Six or more air changes per hour (ACH) are recommended for effective air cleaning during construction and renovation work.

HEPA Filter

- ▶ According to the latest [2003 CDC Guidelines for Environmental Infection Control in Health-Care Facilities](#)
 - HEPA filtration is required for the capture of microbial spores and other contaminants that can potentially cause fungal infections and Aspergillosis. Airborne bacteria and fungi are typically 3 microns (0.0001”) and smaller in size, small enough to easily pass through most filters.
- ▶ Air filtration devices must therefore be equipped with true HEPA (High Efficiency Particulate Air) filters, designed to capture at least 99.97% (9,997 out of 10,000) particles as small as 0.3 microns (0.00001”) in size.

DUST CONTAINMENT



These photos represent the proper containment of areas under construction with signage and negative air equipment in place, flooring protected, walk-off mat in place, etc.



Wet Mat

Types of Mats – There are two types of mats to be used to aide in dust containment. The first type of walk off mat is carpet and is to be kept moist at all times and must be cleaned regularly. The second type of mat is a sticky mat. The sticky mat should be used when there is danger of slipping due to moisture.



Sticky Mat

Mat?





PROTECTION OF FINISHES / EQUIPMENT

ELEVATORS OR STAIRWELLS UTILIZED FOR DEBRIS REMOVAL OR MATERIALS TRANSPORT SHALL BE LINED WITH PROTECTIVE MATERIALS TO PREVENT DAMAGE.

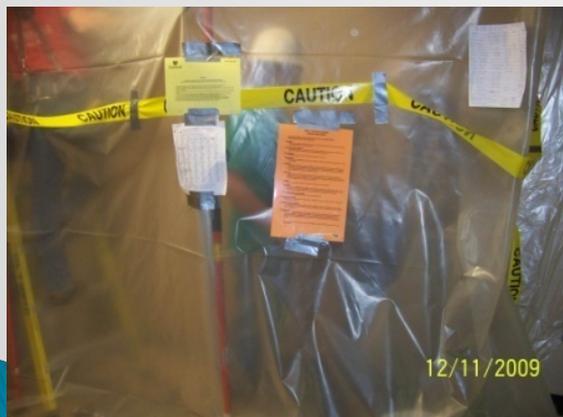
ALL FLOORING (OLD OR NEW) SHALL BE COVERED AND PROTECTED DURING ALL CONSTRUCTION PHASES.

ALL HOSPITAL EQUIPMENT & COMPUTERS IN A WORKZONE SHALL BE COVERED AND PROTECTED AT ALL TIMES WHEN DUST WILL OCCUR .



DUST CONTAINMENT

These photos represent the proper containment of areas under construction with signage and negative air equipment in place, flooring protected, walk-off mat in place, etc.



***Make sure
containment is
sealed tight***

The “Clean Booth” is a self-contained unit used when working in a small area below a removed ceiling tile.

DUST CONTAINMENT



CLEAN BOOTH OPERATION – Example of Use of the clean booth in a red line area (Class IV).

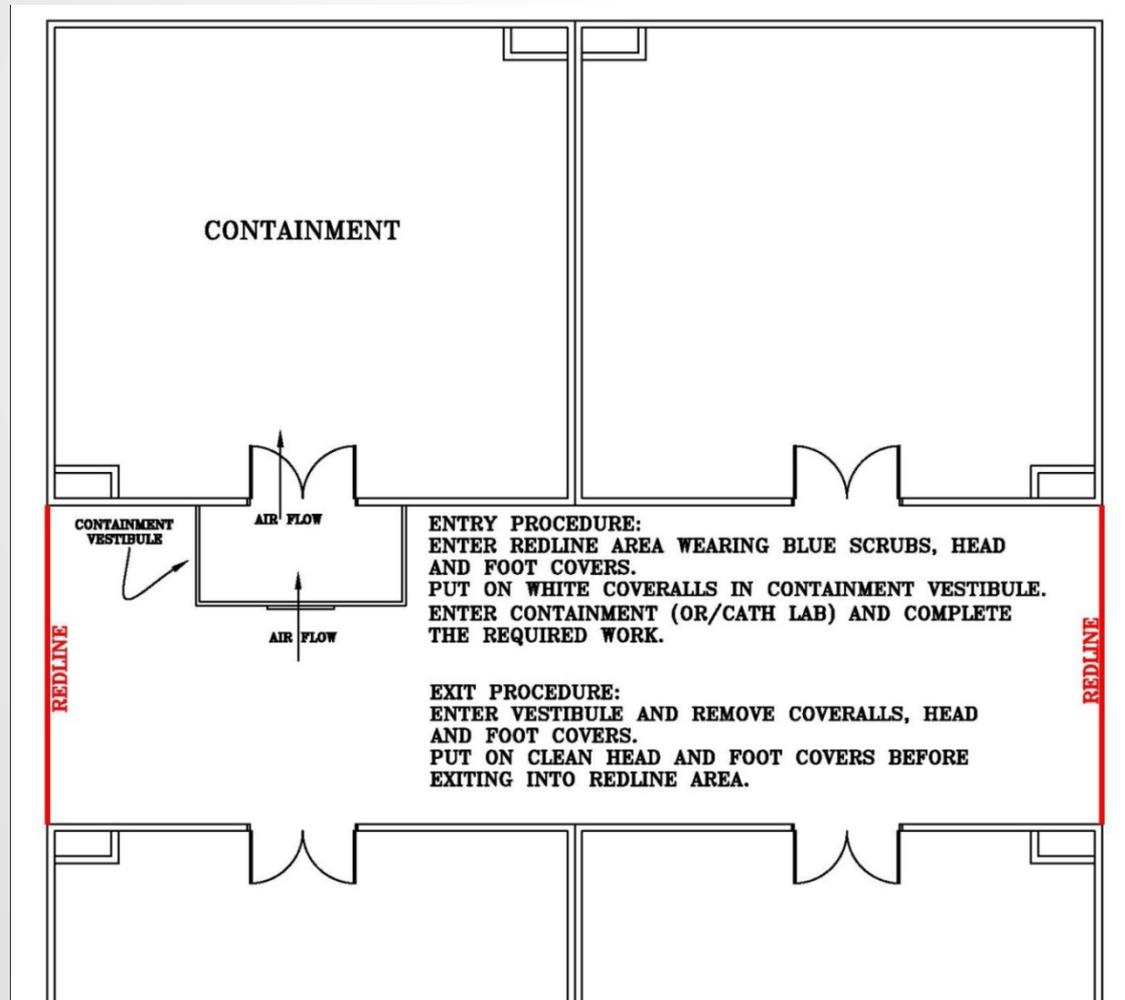
Procedure:

1. While the clean booth is outside of the red line area the first person (in plain clothes or hospital supplied white coveralls) enters the clean booth and closes the door.
2. The first person will use the ladder or the side bars inside for stabilizing themselves while the booth is being moved.
3. The second person will need to gown up as per requirements for working within a red line area.
4. The second person will then push the clean booth carefully into the area where the ceiling needs to be accessed and will lock the wheels when positioned correctly.
5. The second person will arrange to plug the clean booth in for power. When the booth is plugged in, the first person will turn on the vacuum cleaner and then extend the booth up to the ceiling.
6. Once the contact with the ceiling is complete the top cover may be removed and the ceiling may be accessed.
7. Upon completion of the work in the ceiling, the ceiling tile must be installed and the top cover of the clean booth reinstalled.
8. At this point the top may be lowered down, the vacuum can be shut off and the second person can unplug the booth.
9. The booth is to be carefully pushed back outside of the red line area and the first person may then exit the booth.

Safety Items:

- Any time the clean booth is moved the person inside must hold onto either the ladder or the side bars to stabilize themselves during the move.
- The vacuum must be running any time that the booth is in the red line area and the ceiling is open.
- The door of the booth must remain closed at all times while in the red line area.
- The clean booth must be cleaned after every use.

Containment-Procedure Area



CONTAINMENT

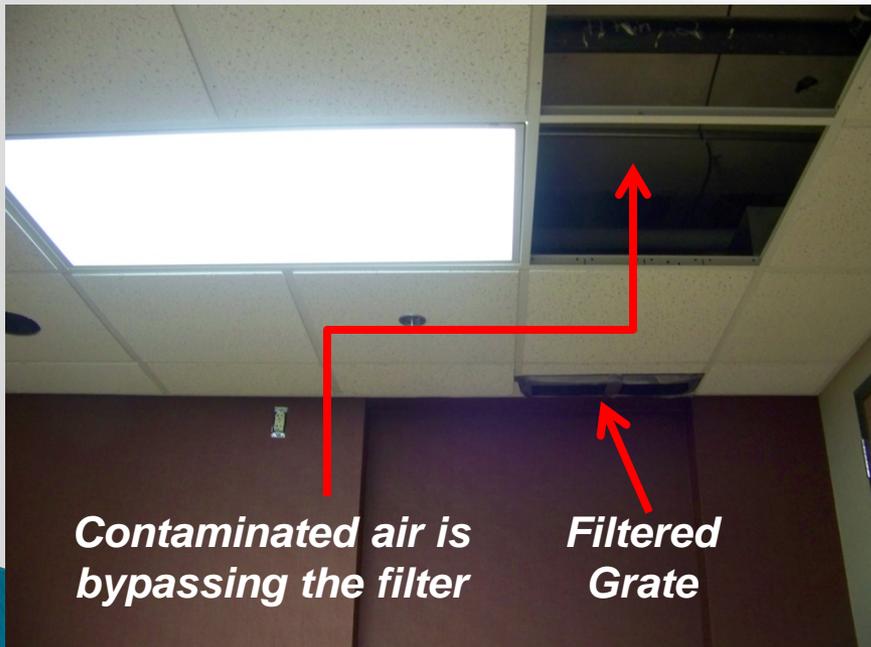
Know the air system in your hospital: ducted air return or plenum air return above ceilings.

In all Infection Control containments, in both ducted and plenum systems, it is mandatory that return air is filtered or blocked. If filtering or construction procedures are done incorrectly, the containment is compromised and contaminated air can enter the return air plenum and be distributed throughout the system.

In the photo below, the return air grate is covered with filter media (this is correct). However, if more than one ceiling tile is removed, the filter becomes useless and contaminated return air is drawn into the plenum through the opened ceiling.

In this example, the Plenum opening in the wall is blocked preventing contamination being drawn from the work area.

Blocking or filtering is contractor choice as long as the containment negative air conditions are not compromised.



NOTE: In plenum ceiling work where no dust will be generated it is acceptable to temporarily remove ONE ceiling tile without blocking / filtering the plenum return. If the tile is to be left out for any length of time, the return must be filtered or blocked.

CONTAINMENT DETAILS



CORRIDOR
CONTAINMENT FOR
ENTERING / LEAVING
THE WORKZONE



TIGHT dust containments are CRUCIAL in OR or Sterile Procedure Areas
Negative air machine manometers should register 2.0 (as a minimum). Filter should be changed at 1.0.

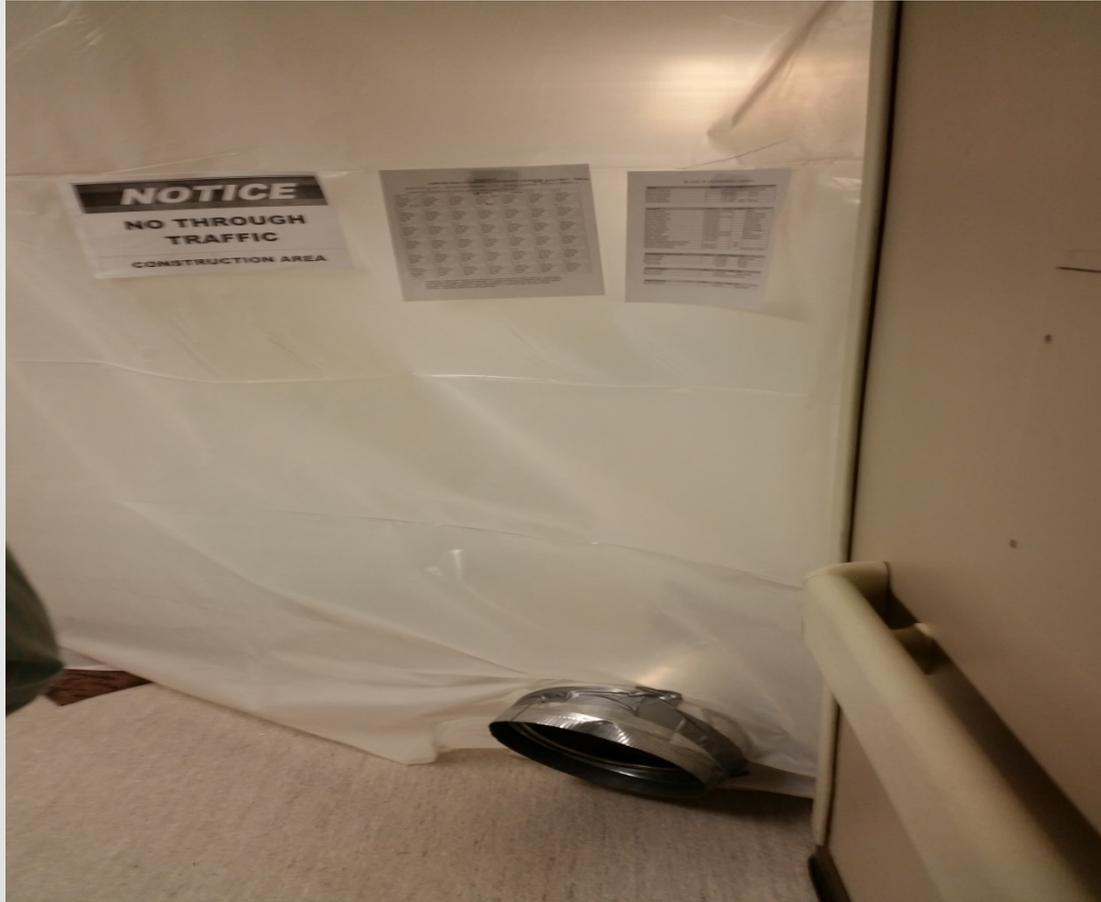
DO YOU SEE WHAT'S WRONG IN THIS PICTURE? THE PLASTIC IS BULGING OUTWARDS.
THIS WORK AREA IS UNDER A POSITIVE PRESSURE CONDITION. IT SHOULD BE UNDER
NEGATIVE PRESSURE!!!

ALWAYS BE ALERT FOR
TEARS OR LOOSE TAPE
SEALS...REPAIR
IMMEDIATELY.



DON'T ALLOW DUST
TO ESCAPE THE
CONTAINMENTS!

Correct?



Blood Borne Pathogens

Contractors need education regarding blood borne pathogens and process for exposure events

- ✓ AVOID DIRECT CONTACT WITH ANY SUSPECTED BODY SUBSTANCE
- ✓ PLACE A BARRICADE OR SIGN BY THE SUBSTANCE TO WARN OTHERS TO AVOID CONTACT.
- ✓ CONTACT SANFORD ENVIRONMENTAL SERVICES PROMPTLY TO CLEAN AND DISINFECT THE AREA.





SHARPS & BIOHAZARDS



DURING DEMOLITION OR REMODELING, YOU MAY ENCOUNTER A SHARPS OR BIOHAZARD CONTAINER WITH USED SYRINGES OR OTHER POTENTIALLY HAZARDOUS ITEMS IN THEM.

1. Sharps Safety:

- Inner container has been removed, then sharps cabinets can be removed from their mounting location.
- Special disposal is required so do not discard sharps biohazard containers in regular garbage



Transport Waste

CONSTRUCTION DEBRIS MUST BE TRANSPORTED IN COVERED CARTS OR TUBS.



1. Tightly cover carts when moving debris out of the construction site.
2. Clean off the outside of the cart before exiting the work site.

CEILING CAVITIES

Polices should address ceiling cavities

Remove all debris and vacuum dust from top of ceilings upon completion of work.



Things to observe on rounds:

Ceiling tiles must be replaced as soon as the work above is complete. Tiles should be installed before leaving the area.

When running cabling, no more than three (3) tiles should be removed at a time to keep open ceilings to a minimum or per hospital policy

**NEVER LEAVE AN OPEN CEILING
UNATTENDED, OR CABLING
HANGING DOWN.**

Ceiling



WATER DAMAGE/INCURSION

- Water damaged surfaces and construction materials must be dried promptly to prevent the growth of mold/fungus. If this does not occur, mold/fungus will contaminate the environment when work with the materials begins.
- All water damage must be addressed immediately so that it completely dries within 48 hours. Vinyl wall coverings on wall board must be lifted from the wet areas to allow the wall board beneath to dry. If only plaster is beneath the vinyl, this does not apply.
- Assure that thorough drying has occurred by use of a water meter.
- If the surfaces are not completely dried within 48-72 hours, the materials will need to be discarded and replaced.



IF MOLD IS SUSPECTED...



SUSPECTED MOLD Construction Project Supervisor and Infection Prevention immediately

MOLD SHOULD BE ABATED BY PROFESSIONALS.

DO NOT REMOVE OR DISTURB THE SUSPECTED SUBSTANCE

CLEANING

Process for cleaning work areas at the end of the day if occupied by hospital



**REMOVE CARTS,
TOOLS, MATERIALS,
ETC.**

**VACUUM AND WIPE
DOWN THE AREA TO
REMOVE ANY
LINGERING DUST.**

Resources

- ▶ *Facility Guidelines Institute (FGI). 2014*

<http://fgiguidelines.org/index.php>

- ▶ *Guidelines for the Design and Construction of Residential Health, Care, and Support Facilities*

<Http://www.fgiguidelines.org/residential.php>

- ▶ *Resources for Selecting Architectural Details, Surfaces, and Furnishings for Health Care Facilities*

http://www.fgiguidelines.org/pdfs/Resources_SelectingArchDetailsSurfacesFurnishings.pdf

- ▶ *Centers for Disease Control and Prevention (CDC)*

http://www.cdc.gov/hicpac/pdf/guidelines/eic_in_hcf_03.pdf

- ▶ *American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)*

<https://www.ashrae.org/standards-research--technology/standards--guidelines>

- ▶ *American Society of Healthcare Engineering (ASHE)*

<http://www.ashe.org/>

References

- ▶ APIC Infection prevention Manual for Construction & Renovation. 2015
- ▶ Centers for Disease Control and Prevention (CDC). Guidelines for Environmental Infection Control 2003.

Bed Bug Management

Bed Bugs



Bed Bug Management

- ▶ *Cimex lectularius*, the common bed bug most adapted to living with humans, is a reddish brown bug with an oval, flattened body. They are approximately 1/4 inch long (about the size of a small apple seed) and are sometimes mistaken for cockroaches.
- ▶ Bed bugs do not fly or jump but can move quickly over floors, walls, ceilings, and other surfaces.
- ▶ Female bed bugs lay their eggs in secluded areas, depositing up to five a day and five hundred in a lifetime.
- ▶ Symptoms after the bite vary by individual but usually include itchy, red welts and localized swelling. Some persons have little to no reaction to the bites making diagnosis difficult.

How do I get bed bugs?

- ▶ Bed bugs are experts at hiding.
 - Their slim flat bodies allow them to fit into the smallest of spaces and stay there for long periods of time.
 - Bed bugs are usually transported from place to place as people travel.
- ▶ The bed bugs travel in the seams and folds of luggage, overnight bags, folded clothes, bedding, furniture, and anywhere else where they can hide.
 - Most people do not realize they are transporting stow-away bed bugs as they travel from location to location, infecting areas as they travel.
- ▶ Usually these areas are marked by dark spotting and staining, which is the dried excrement of the bugs.
- ▶ Also present will be eggs, eggshells, molted skins of maturing nymphs, rusty or reddish spots of blood, the bugs themselves, and sometimes a sweet, musty or “buggy” smell (though smell is not always present).

What should I do?

- ▶ The environment will be inspected to determine extent of bed bug infestation.
- ▶ Examine the environment, pay special attention to cracks and crevices, mattresses, bed frames, behind wallpaper, behind picture frames, outlets, and door and window molding. Look for dark spots of dried bug excrement, light-brown molted skin of nymphs, and the bugs themselves.
 - Remove any unnecessary equipment (i.e. isolation carts, bedside tables, chairs, etc.)
 - Send belongings home with family
 - Treat/wash clothes if recommended

Treatment

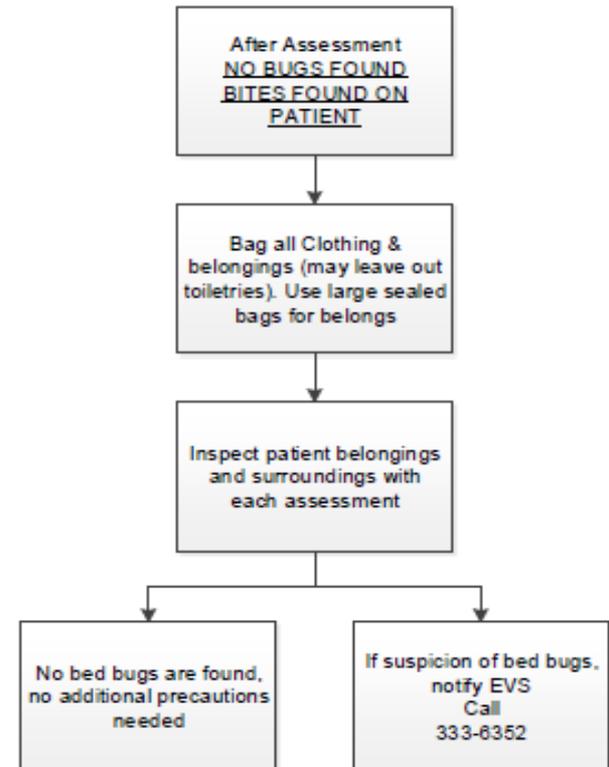
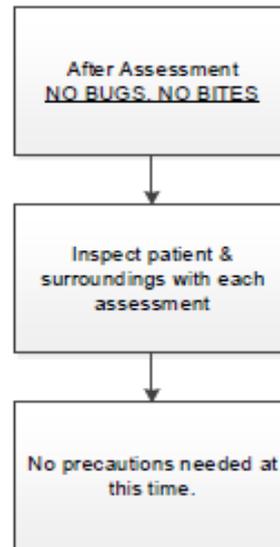
- ▶ Minimal symptomatic treatment and good hygiene to prevent itching and secondary infections are usually sufficient treatment for most cases of bed bug bites.
- ▶ A wide range of empirical treatments, including antibiotics, antihistamines, topical and oral corticosteroids, and epinephrine have been used for bite reactions with varying results.
- ▶ In more extensive or severe cases, topical steroid creams with or without systemic anti-H1 receptor antihistaminics may be given.
 - Topical antiseptics or antibiotics as well as systemic antibiotics may be needed in the case of secondary infection.

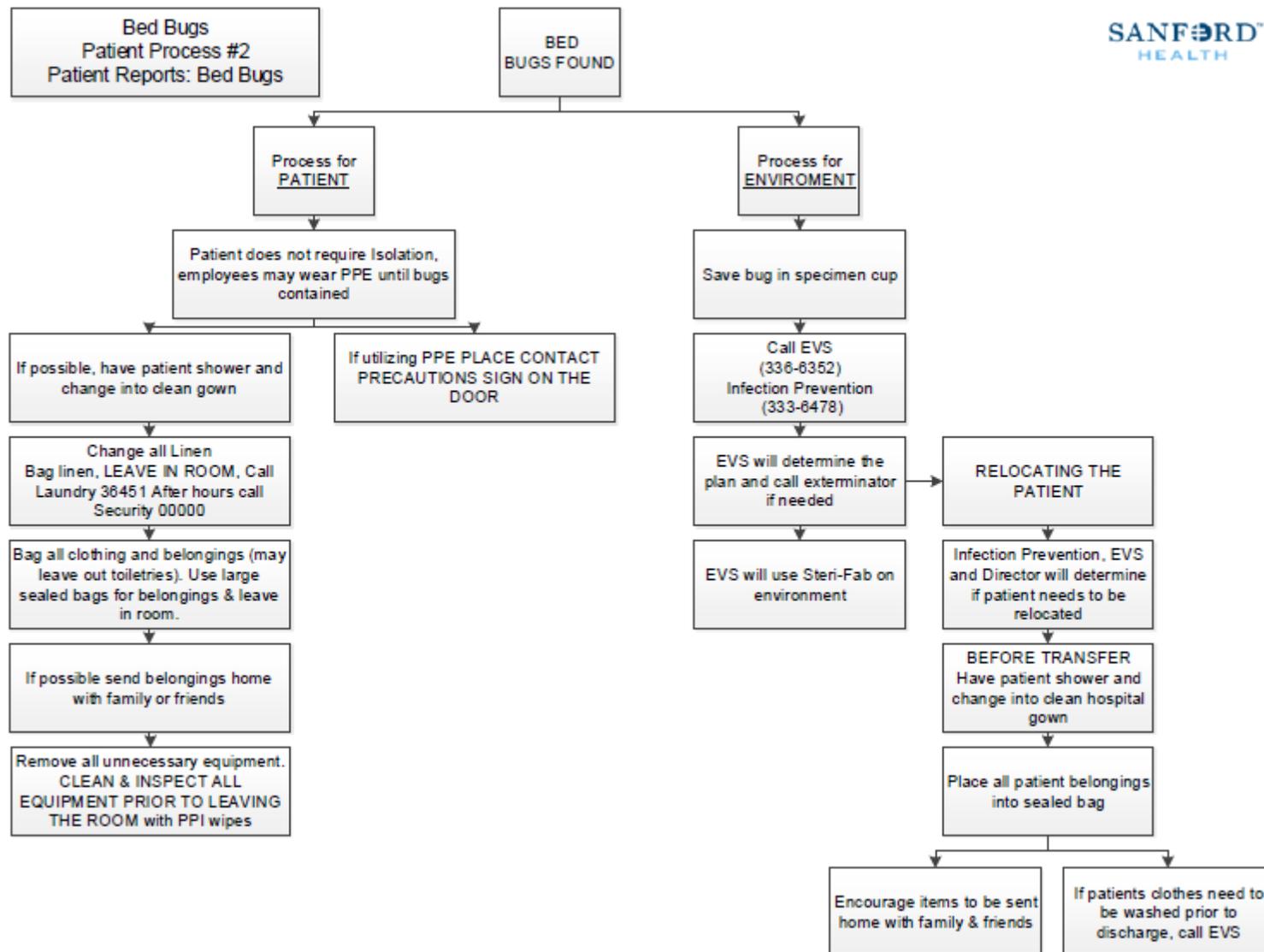
Decision Grid for Bed Bug Management

| | |
|---|---|
| Report of bed bugs-no bed bugs found or no bites on patient | <ol style="list-style-type: none">1. Continue to inspect patient periodically. No precautions needed at this time. |
| Report of bed bugs-no bugs found. Bites found on patient. | <ol style="list-style-type: none">1. Double bag all clothing & belongs.2. Clean room thoroughly. Continue to inspect patient periodically. No additional precautions needed at this time |
| Report of bed bugs-bugs found | <ol style="list-style-type: none">1. Save bug in specimen cup for identification. Call Environmental Services to ID and they determine a strategy.2. Once confirmed remove all unnecessary equipment from the room and double bag all clothing and belongings. |
| Outpatient management of patients with a chronic | <ol style="list-style-type: none">1. If possible: Schedule patient last appointment of the day, remove all unnecessary furniture & equipment from room. Avoid using space with carpet or upholstered furniture, bring patient directly to an exam room & minimize patient movement. |

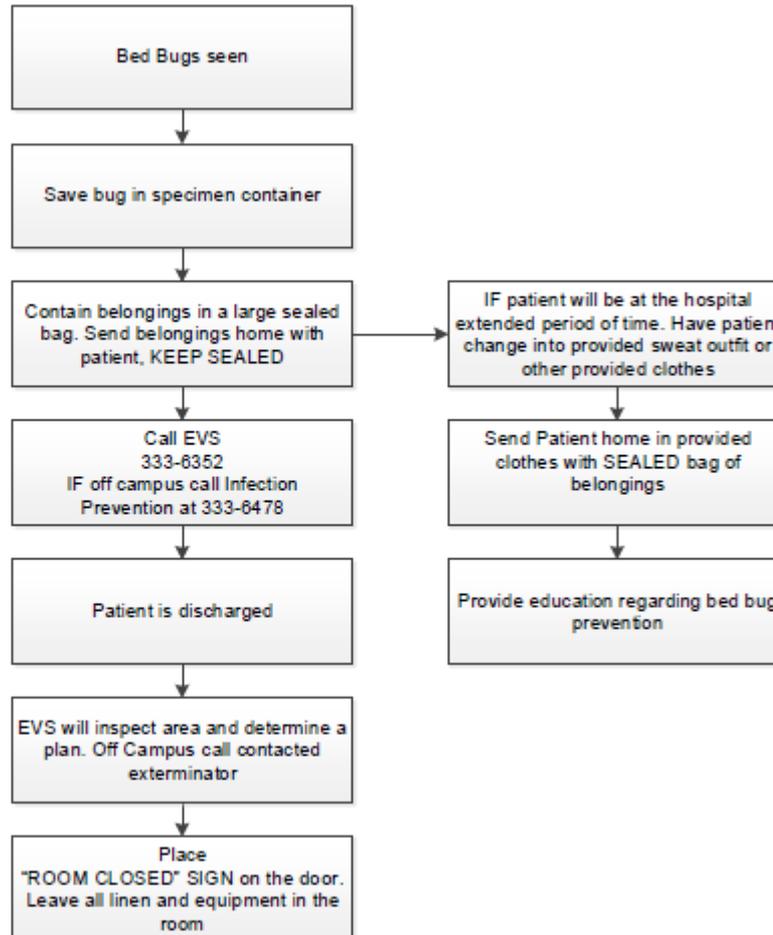
Bed Bugs
Patient Process #1
Patient Reports: Bed Bugs

S

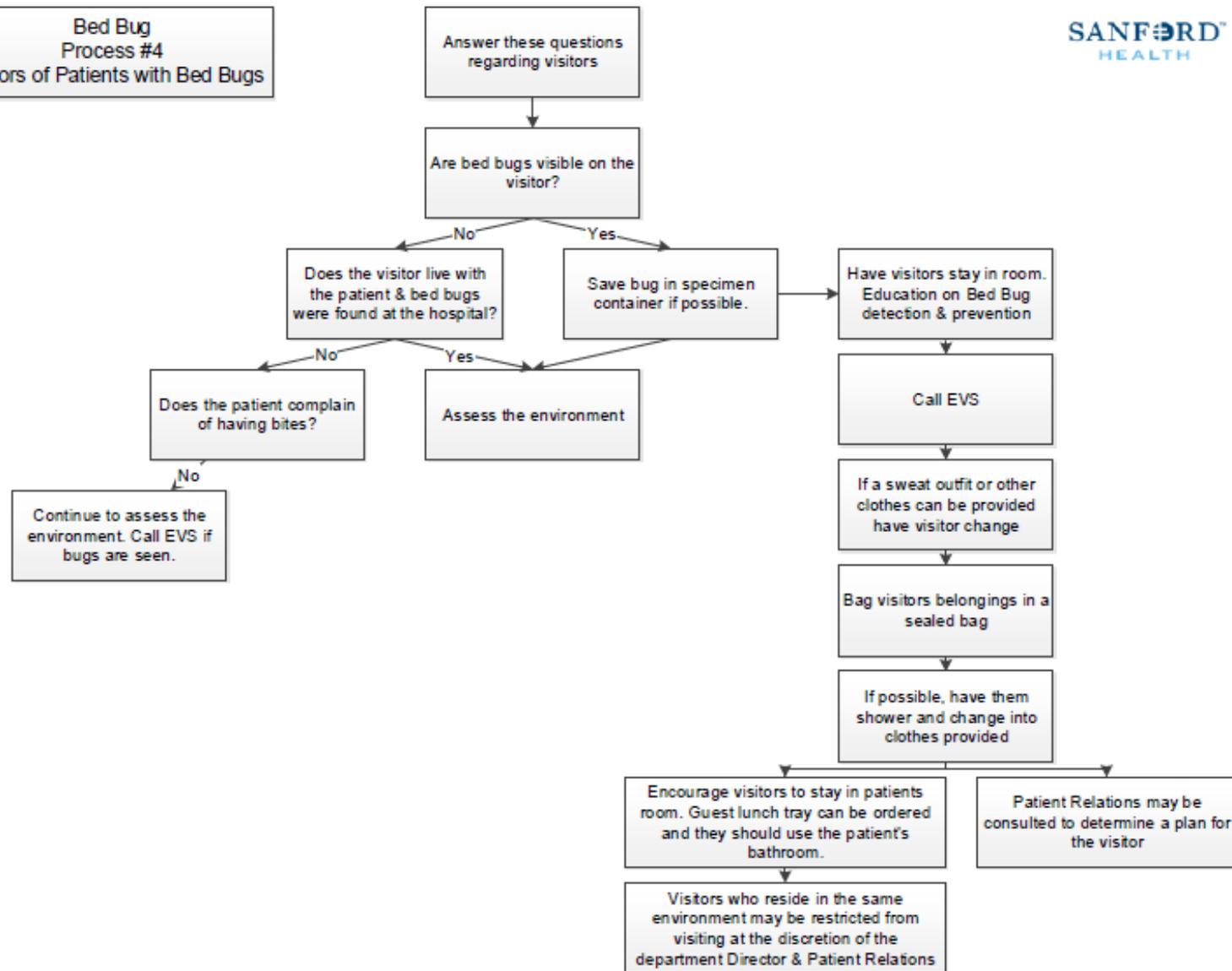




Bed Bug
Process #3
Outpatient areas and Clinics



Bed Bug
Process #4
Visitors of Patients with Bed Bugs



Heat

Thermal Heat

- ▶ The thermal death point is determined by two things;
 - Temperature, and exposure time. Bed bugs exposed to 113°F will die if they receive constant exposure to that temperature for 90 minutes or more.
 - Bed bugs will die within 20 minutes if exposed to 118°F.
 - Bed bug eggs must be exposed to 118°F for 90 minutes to reach 100% mortality.

Clothes Dryer

- ▶ A loosely filled dryer set on “high” is capable of killing all bed bug life-stages and their eggs in 30 minutes.
- ▶ A dryer with a removable shelf is excellent for killing bed bugs on items that cannot be tumbled, like leather shoes, handbags, knick-knacks, even books.
- ▶ Drying time may need to be increased to reach the bed bug thermal death point.

Portable Heating Devices



- ▶ The bag is heated to a temperature above 120°F killing all bed bugs life stages, including eggs.
- ▶ The PackTite® takes much longer to treat infested items (several hours) than a hot dryer but it is completely portable and is able to treat items (like packed suitcases) that a dryer cannot.
- ▶ The PackTite® sells for around \$310.

Thermal Containment

- ▶ Pest management specialize in bed bug control typically use steam as part of their treatment process.
- ▶ A professional steamer is used to treat bed bugs on mattresses, on upholstered furniture, carpet, behind baseboards and other locations where insecticide applications may be undesirable.
- ▶ Target temperatures 160-180°F

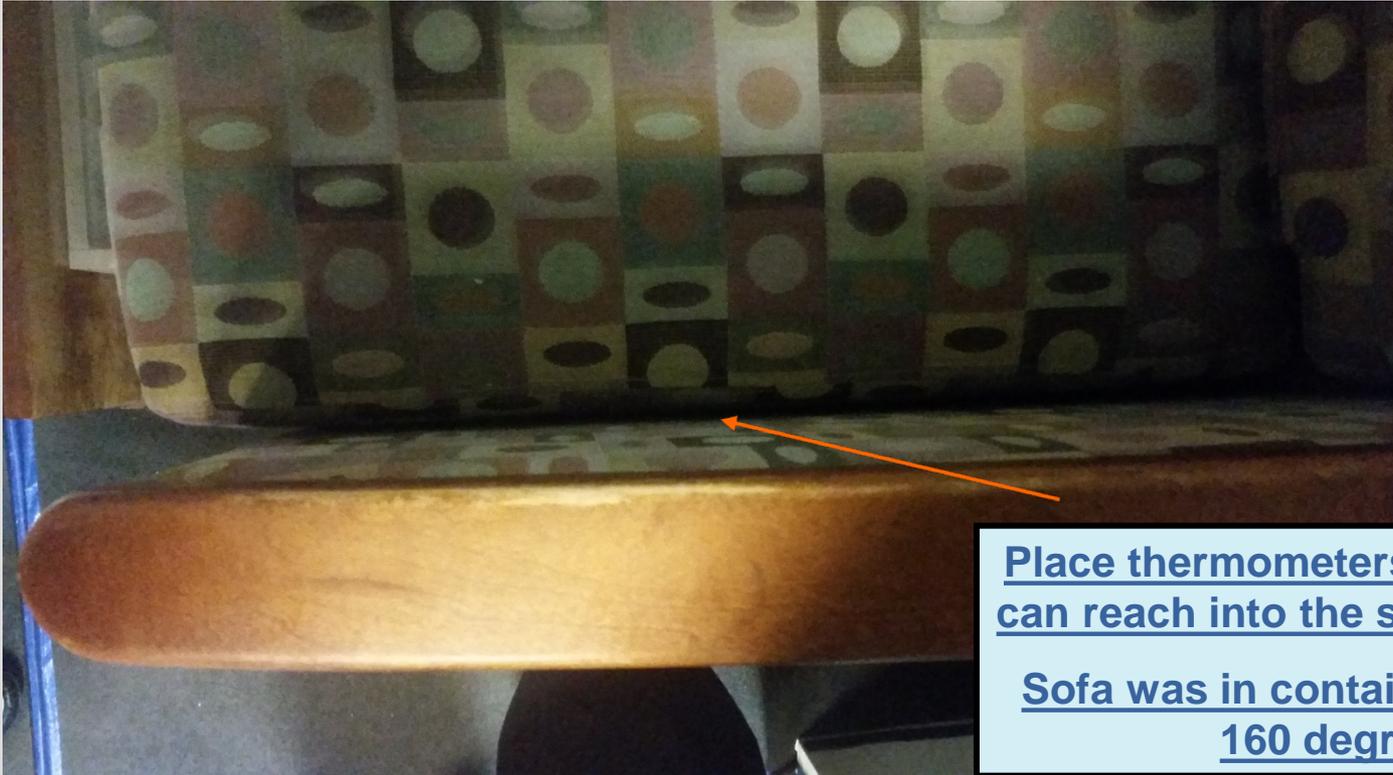


Thermal Containment

- ▶ Leave Linen in room, open draws



Thermal Heat



Place thermometers on sofa. Heat can reach into the side of the sofa.

Sofa was in containment 4hrs at 160 degrees.

Dakota Bedbug Detection



References

- ▶ CDC: Parasites – Bed bugs. <http://www.cdc.gov/parasites/bedbugs>
- ▶ University of Kentucky Entomology and Nematology Department. <http://www.ca.uky.edu/entomology/entfacts/ef636.asp>
- ▶ Using Heat to Kill Bed Bugs. Dini M. Miller, Ph.D., Department of Entomology, Virginia Tech