Regulatory Advisories

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Waterborne Pathogens - Compliance with JCAHO Requirements

Introduction
The Joint Commission's accreditation manuals for 2001 will include a new, standard that will appear in the Environment of Care - Utility Systems Management standards and require health care facilities to develop program that will reduce organization-acquired illness. Since its introduction six months ago, the standard has been a source of frequent discussion among hospital engineers, facility managers, infection control practitioners, ASHE and JCAHO staff members. As a means to respond to the questions regarding the expectations of these new standards (particularly the waterborne pathogen requirements) and to provide clarification to the confusing and somewhat contradictory literature ASHE provides the following information to develop a briefing to clearly state the issues and provide guidance for assessing the potential risk and dealing with compliance issues.

In an effort to offer a uniform strategy on the management of waterborne pathogens, ASHE and JCAHO staff have collaborated and drafted the following interim guidance and executive brief on Legionella. Over the course of 2001, through the ASHE *Technical Document Series (formerly called Healthcare Facilities Management Series)*, ASHE will continue to provide information that will further assist you in the assessment and management of airborne and waterborne pathogens in an effort to reduce the rate of organizational-acquired illnesses.

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Suggested Compliance with **JCAHO Standard EC.1.7** - Utility Systems Management

New Standards - Effective 1/1/2001
A management plan describes how the organization will establish and maintain a utility systems management program to…*reduce the potential for organizational-acquired illness;*

The plan provides processes for…*managing pathogenic biological agents in cooling towers, domestic hot water, and other aerosolizing water systems.*
(Note: new language is underlined)

Note: While the JCAHO standards do not specifically identify Legionella, standards exist today for the environmental control of Legionella. In addition, it is believed that implementing standards, already developed for the control of Legionella, will impact the colonization of other water borne pathogens.

JCAHO Surveyor expectations for hospitals
The Facility Manager should:
Step 1) Risk Assessment

- Work with the Infection Control Practitioner to assess the clinical risk of the organization's patient population to identify and review:
  - The treatment/care areas for patients at greatest risk (most susceptible) of contacting legionellosis (e.g. transplant units, oncology units, surgical intensive care units, etc.)
  - Any cases or current history of infections resulting from water borne pathogens including legionellosis.
- Assess the environmental risk from potential amplification factors such as:
  - Domestic hot water systems
  - Design (i.e. dead legs of low flow conditions)
  - Operation (i.e. water temperature)
  - Maintenance (i.e. flushing and cleaning of hot water tanks)
- Cooling and humidifying system which produce an aerosol
  - Design (i.e. drift eliminators)
  - Operation (i.e. sterile water in room humidifiers)
  - Maintenance (i.e. cleaning cooling towers and use of an effective biocide)

Step 2) Risk Mitigation
If susceptible patients are identified, work with the Infection Control Practitioner to determine what aerosolizing systems are present in that patient environment (i.e. showers) and limit their access to these systems.
Step 3) Operational Management of Risk
a) Develop a management plan as a result of the assessment (step 1) that includes standard operating procedures (SOP's) for maintenance and operation of water systems
b) Develop a system to document and log findings as a result of these SOP's such as temperatures, blow down of hot water tanks, cooling tower inspections etc.
c) Included in these SOP's should be a maintenance and audit program for any systems

that are currently installed to limit Legionella amplification in aerosolizing systems such as cooling towers and /or potable water treatment systems (e.g. copper silver or chlorine dioxide).
d) Inspect cooling towers/evaporative coolers to ensure that they are in proper condition and operate as designed.

Step 4) Remediation (if required)
Work with the organization based Infection Control and Safety committee to establish a contingency plan for water system decontamination to be implemented if Infection Control identifies an outbreak of Legionellosis and corrective steps are needed.
Note: Take caution if any vendor/supplier urges you to proactively culture, or install a new system water treatment system, based on "new Joint Commission standards". Work with your Infection Control Practitioner and outside consultants, if required, to identify risks and measures appropriate for your organization.
12/20/00
Legionellosis - Executive Brief
1. Establish the Risk:

- Legionellosis is a collective term describing infection produced by the pathogen Legionella, a bacterium found in water environments.
- Most hospital hot water systems are colonized with legionellae, which is introduced into institutional water distribution systems from public/municipal water systems (that do not routinely screen water for the presence of Legionellae). Since legionellae is chlorine tolerant, it will survive many of the standard municipal water treatment protocols.
- The CDC estimates 10,000 to 15,000 infections per year.

2. Transmission method:
Inhalation of airborne droplets (aerosol), contaminated with legionella bacteria, from:

- Showers and facets,
- Room-air humidifiers,
- Cooling towers,
- Evaporative condensers,
- Decorative fountains
- Clinical equipment such as nasogastric tubes and bronchoscopes. (Tap water should not be used to rinse clinical equipment.)

3. Risk Assessment - key risk factors for developing illness:

a. Exposed persons health status - the individual resistance (susceptibility) of the patient (host) to infection at low levels
   i. Persons with severe immunosuppression such as:
   · Bone marrow & solid organ transplant patients (anti-rejection therapy)
   · Chemotherapy patients (for neoplastic disease)
   · Corticosteroid therapy patients

· COPD (chronic obstructive pulmonary disease)
ii. Chronic underlying illnesses such as
· Hematologic malignancies
· End-stage renal disease

b. The type and intensity of exposure (number of legionellae reaching the body). Factors which enhance colonization and amplification of legionellae are:
i. Warm water (77 - 108oF)
ii. Water stagnation (dead legs)
iii. Food for bacteria (scale, sediment, biofilms)

4. Surveillance - CDC recommendations:

A. Primary Prevention of Legionnaires' Disease (no cases Identified)
i. General healthcare facilities without transplant or oncology units
Clinical Approach:
· Establish mechanism(s) to provide clinicians with appropriate laboratory tests for the diagnosis of Legionnaires' disease
· Maintain a high index of suspicion for the diagnosis of nosocomial Legionnaires' disease.
Note: There is **No Recommendation** for routinely culturing water systems for Legionella spp.

ii. Special infection control measures for settings providing care to Immunosuppressed patients. Approach is aimed at reducing aerosol production and direct contact of immunosuppressed patients with tap water. Refer to CDC Draft Guideline for Environmental Infection Control in Healthcare Facilities, Table 31. Additional measures to prevent exposure of high-risk patients to waterborne pathogens. These measures include:
· Restrict patients from taking showers if water is contaminated with legionellae.
· Perform supplemental treatment of water for the unit.
· Consider periodic monitoring (culturing) of the unit water supply
· Do not use large-volume room air humidifiers that create cold aerosols unless these are subjected to high-level disinfection daily and filled with sterile water

B. Secondary Prevention of Legionnaires' Disease (with identified cases)
Refer to CDC Draft Guideline for Environmental Infection Control in Healthcare Facilities, Table 24. Steps to conducting an epidemiologic investigation for Legionellosis. These steps include collecting water samples from environmental sources and other aerosolizing water sources.

5. Management of Legionellae - Engineering Controls

A. **Potable Water Treatment Methods**
· Elimination or reduction of Legionellae in a hot water "ecosystem" is difficult.

· Success depends on the design and condition of the system
· If a system is old, cleaning and descaling may be an important component

Engineering Systems (treatment methods and issues created by methods)

a. Temperature - Hot water stored at 140oF, circulate with minimum return of 124oF
   · Must use thermostatic mixing valves to prevent scalding (near facets/heads).
   · Higher energy and maintenance costs.
   · This is considered a passive type control method. After the mixing valve water will be at prime temperature for colonization and can be seeded with Legionella from the cold water.
b. Chlorine Concentration - placement of flow-adjusted continuous injectors of chlorine. Leaks (accelerated corrosion of plumbing system) - three years after implementation of hyperchlorination at the University of Iowa hospital, the incidence of pipe leaks was 30 times the rate before chlorination.
   - Potentially carcinogenic trihalomethanes (THM's) depending on the level of chlorine and level of organic impurities in the source water.
   - Effected by pH. Many cities now are elevating pH to minimize potential for lead leaching from old pipes. Above 7.6 pH efficacy of chlorine drops off dramatically.

c. Copper-Silver Ion - Electrolytically generated Cu/Ag ions build up in recirculation system
   · Initial capital investment to buy and install the necessary equipment
   · Efficacy affected by pH. Water pH should be at or below 8.0.
d. Chlorine Dioxide - Chlorine dioxide like ozone must be produced on site
   · Initial capital investment to buy and install the necessary equipment
   · No THM or pH limit as with chlorine

B. **Remediation of potable water (contingency planning)**

- **Superheating of water** to at least 149oF - Legionellae die rapidly at 131oF and are killed almost immediately at temperatures over 140oF. Water outlets are flushed for at least 30 minute (Pittsburgh) or 5 minutes (CDC). While superheating may result in a reduction in system colonization, Legionellae is usually not eradicated, and often recolonizes the system within a matter of weeks, necessitating recurrent superheating cycles.
- **"Shock" hyperchlorination** >10 mg/L of chlorine in water, flush all outlets for at least 5 minutes) Again, this method may only suppress Legionellae, permitting subsequent recolonization.

The above methods should be considered short-term emergency procedures.

C. **Cooling Towers (and evaporative coolers)**
Cooling towers typically operate at 85 - 95oF (with a range of 70 - 120). Biofilms, which form at surfaces of heat exchanger, structure, and sump, serve as nutrients for Legionellae bacteria. Cooling towers should be designed and constructed so that tower drift is directed away from the hospital's air intake system and the volume or aerosol drift is minimized.
For all operational cooling towers, hospitals should:

- Install drift eliminators
- Use an oxidizing biocide continuously to prevent the formation of biofilms and control biological growth. (E.g. bromine, chlorine, iodine, chlorine dioxide, ozone, etc.) And intermittently a non-oxidizing biocide (e.g. DBNPA, isothiazoline, etc.)
- Maintain towers according to manufacturers recommendations. If the tower/cooler is subject to seasonal shutdown, equipment should be cleaned and treated prior to shutdown and again before starting up the system for the first time in the season.
- Keep adequate maintenance records