Department of Veterans Affairs Veterans Health Administration Washington, DC 20420 VHA DIRECTIVE 2009-009

February 25, 2009

DOMESTIC HOT WATER TEMPERATURE LIMITS FOR LEGIONELLA PREVENTION AND SCALD CONTROL

1. PURPOSE: This Veterans Health Administration (VHA) Directive provides policy for establishing domestic hot water temperature policy and engineering procedures at VHA patient care facilities. *NOTE*: Outpatient facilities providing services that include patient contact with heated water (e.g., hydrotherapy) need to be cognizant of the risks and prevention of both scalding and Legionnaire's disease. Those outpatient facilities in which building maintenance is under direct oversight by the Department of Veterans Affairs (VA) need to implement this Directive. Other outpatient facilities need to implement this Directive to the extent feasible (e.g., within a leasing contract).

2. BACKGROUND

- a. Water temperatures exceeding 124 degrees Fahrenheit (°F) (51 degrees Celsius (°C)) are necessary to prevent the rapid growth of *Legionella*, the causative agent of *Legionella* pneumonia (traditionally known as Legionnaires' disease) in hot water systems. Cold water systems (below approximately 68°F (20°C)) tend to be too cold to foster rapid growth of the organism.
- b. For normal or otherwise healthy individuals, 120°F at the sink tap is adequate to minimize the risk of scalding. Some patients, due to illness, disabilities, advanced age or side effects of medication, may be less sensitive to temperature and thus be at increased risk for tissue damage caused by extended exposure to hot water.
- c. Patient exposure to heated water occurs via a number of mechanisms (e.g., bathing, hydrotherapy, showering). For immersion bath water, scalding is possible at temperatures exceeding normal body temperature; however, the risk is small below 105°F. At 117°F, scalding risk increases significantly. At 140°F, second degree burns may occur after only 3 seconds of exposure. Some patients are extremely sensitive to scalding.
- d. It is not possible to maintain water temperatures at the outlet that prevent the growth of *Legionella* and simultaneously eliminate the possibility of scald injury in persons partially or fully insensitive to hot water temperature.
- e. This Directive attempts to balance the risk of inhalation or aspiration of live *Legionella* bacteria with the risk of scalding from skin exposure to domestic hot water by addressing issues related to prevention of *Legionella* pneumonia, prevention of scalding, and energy conservation.

THIS VHA DIRECTIVE EXPIRES FEBRUARY 28, 2013

- **3. POLICY:** It is VHA policy that each individual facility must have written procedures established for domestic hot water temperatures adhering to the requirements of this Directive.
- **4. ACTION:** The Facility Director is responsible for ensuring that the facility develops written procedures regarding hot water temperature limits and *Legionella* control, to include the:
- a. Documentation of past experiences with furnishing too high (e.g., scalding) or too low (e.g., health care-associated *Legionella* pneumonia) water temperature and consideration of the facility's patient population.
- b. Documentation of the maximum domestic hot water temperature limit and consideration of the use of other techniques to prevent *Legionella* pneumonia, to minimize the possibility of scalding and to conserve energy (see Att. A).
- c. Written documentation of procedures according to the requirements in Attachment B. These procedures are for the prevention of scalding in the use of showers, bathtubs, and any appurtenance where full or partial immersion in, or patient contact with, heated water may occur.
 - d. Notification of patient care staff when:
 - (1) Maintenance procedures will be taking place that could affect the water system;
 - (2) Those procedures in subparagraph 4d(1) have been completed; and
 - (3) Affected systems have been tested and are returned to normal operation.
- e. Periodic evaluation of the inpatient facility for health care-associated *Legionella* transmission risk (see VHA Directive 2008-010).
 - f. Educational components for:
- (1) Employees charged with the engineering controls to safeguard against *Legionella* and patient scalding; and
- (2) Employees performing patient care activities that would include patient contact with heated water.

NOTE: A summary of required and recommended actions is found in Attachment C.

5. REFERENCES

a. American Society for Heating, Refrigerating and Air-conditioning Engineers (ASHRAE). Guideline 12-2000. Minimizing the Risk of Legionellosis Associated with Building Water Systems, 2000.

- b. Centers for Disease Control and Prevention (CDC). Guidelines for Environmental Infection Control in Health-care Facilities. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Morbidity and Mortality Weekly Reports (MMWR) 52 (RR10):1-42; 2003.
- www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm
- c. CDC. Guidelines for Preventing Health-Care-Associated Pneumonia, 2003. MMWR 53(RR03); 1-36, 2004 http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm
- d. Cerovac S, and Roberts AHN. Burns Sustained by Hot Bath and Shower Water. <u>Burns</u> 26:251-259; 2000.
- e. Henriques, FC. Studies of Thermal Injury; Predictability and Significance of Thermally Induced Rate Processes Leading to Irreversible Epidermal Injury. <u>Archives of Pathology</u> 43:489-502, 1947. *NOTE:* Although published several decades ago, this reference is a landmark study on thermal injury.
- f. Kelly AA, Danko LH, Kralovic SM, Simbartl LA, Roselle GA. *Legionella* in the Veterans Healthcare System: Report of an Eight-Year Survey. <u>Epidemiology and Infection</u> 131:835-839; 2003.
- g. Liu Z, Lin YE, Stout JE, Hwang CC, Vidic RD, Yu VL. Effect of Flow Regimes on the Presence of Legionella within the Biofilm of a Model Plumbing System. <u>Journal of Applied Microbiology</u> 101:437-442; 2006.
- h. Moritz AR and Henriques FC. Studies of Thermal Injury; the Relative Importance of Time and Surface Temperature in the Causation of Cutaneous Burns. <u>American Journal of Pathology</u> 23:695-720, 1947. *NOTE:* Although published several decades ago, this reference is a landmark study on thermal injury.
- i. Stephen FR, and Murray JP. Prevention of Hot Tap Water Burns a Comparative Study of Three Types of Automatic Mixing Valves. Burns 19(1):56-62, 1993.
- j. Stout JE and Yu VL. Experiences of the first 16 hospitals using copper-silver ionization for *Legionella* control: implications for the evaluation of other disinfection modalities. <u>Infection Control and Hospital Epidemiology</u> 24(8):563-8, 2003.
 - k. VHA Directive 2008-010. Prevention of Legionella Disease.
- **6. FOLLOW-UP RESPONSIBILITY**: The Chief Officer, Patient Care Services (11), is responsible for the contents of this Directive. Questions relating to *Legionella* transmission or *Legionella* disease may be referred to the Infectious Diseases Program Office at (513) 475-6398. Questions regarding engineering aspects of this Directive may be referred to the Director, Healthcare Engineering (10NB), at (202) 266-4604.

7. RESCISSIONS: VHA Directive 2002-073 is rescinded. This VHA Directive expires February 28, 2013.

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ATTACHMENT A

GUIDANCE FOR DOMESTIC HOT WATER TEMPERATURES

- 1. Maintaining certain water temperatures at various points in the hot water distribution system is a primary mechanism for inhibiting *Legionella* growth while also limiting the risk of scald injury. Facilities need to factor *Legionella* risk (e.g., from an annual *Legionella* risk assessment), the vulnerability of the patient population, and the local variability in hot water distribution systems when considering implementation of the following hot water temperatures:
- a. <u>Systems That Use Hot Water Storage Tanks.</u> If a facility uses hot water storage tanks, raise the water temperature of all domestic hot water storage tanks to a minimum of 140 degrees Fahrenheit (°F) to prevent growth of *Legionella*. A master thermostatic mixing valve assembly must be installed on the discharge side to reduce water temperature to 130°F before distribution, with a maximum decrement in water temperature of 10°F (120°F) at the tap. *NOTE:* The facility needs to consider the presence and operational requirements of any anti-scald devices when determining if 120°F to 129°F at the tap is feasible. If at least 120°F is not feasible at the tap, consider the periodic (at least annually) evaluation of the water distribution system for Legionella or the implementation of preventive measures to inhibit Legionella growth (e.g., hyperchlorination) or Legionella transmission to patients (e.g., point-of-use filters).

b. Systems That Use Instantaneous Hot Water Heaters

- (1) If the facility has an instantaneous hot water heater that feeds instantly heated water directly into a circulating distribution system, then the water can be discharged into the circulating distribution system at 130°F without the need of a mixing valve. The maximum decrement in water temperature at the tap shall be 10°F (120°F). *NOTE:* The facility needs to consider the presence and operational requirements of any anti-scald devices when determining if 120°F to 129°F at the tap is feasible. If at least 120°F is not feasible at the tap, consider the periodic (at least annually) evaluation of the water distribution system for Legionella or the implementation of preventive measures to inhibit Legionella growth (e.g., hyperchlorination) or Legionella transmission to patients (e.g., point-of-use filters).
- (2) If the facility has an instantaneous hot water heater that is configured to feed into a storage tank before the water enters the circulating distribution system, then raise the water temperature to a minimum of 140°F in the storage tank and distribute the hot water as described above (Att. A, subpar. 1a). It is encouraged that facilities that use instantaneous hot water heaters select systems that feed directly into circulating distribution systems to avoid the use of storage tanks and to conserve energy.
- c. <u>Water Temperature Check.</u> Routinely (e.g., three or four times per year) check the water temperature at various sites (e.g., water tanks, outlets) in the hot water distribution system to verify that temperatures are in accordance with facility policy.

- 2. Hot water distribution systems with constant recirculation need to be provided in patient care areas if feasible.
- 3. All VHA inpatient facilities need to perform periodic evaluation for *Legionella* disease prevention (see VHA Directive 2008-010). The evaluation may necessitate the implementation of a mitigation protocol to minimize *Legionella* in facility hot water distribution systems.
- a. If thermal eradication (i.e., super heat and flush) is used, the procedure involves the temporary resetting of the hot water temperature to 160°F 170°F (71 degrees Celsius (°C) 77°C) and the flushing of the system by selectively opening all outlet valves for at least 30 minutes. *NOTE:* Since scalding is a significant problem at these water temperatures, extreme care must be taken to protect end users of the hot water distribution system. Consideration needs to be given to the presence of mixing valves in the water distribution system that may affect the implementation of thermal eradication at some distal sites.
- b. Other mitigation measures to reduce *Legionella* in water systems, such as electronic copper-silver ionization or hyperchlorination, may be preferable to avoid the risk of scald injuries during thermal eradication. Furthermore, these types of systems may result in water and/or energy conservation. Copper-silver ionization systems avoid the piping system deterioration caused by hyperchlorination.
- c. Consider the elimination of stagnation points in the hot water distribution system. **NOTE:** Facilities should consider the history of Legionella in the hot water distribution system, past experience with elimination of stagnation points and Legionella mitigation, and what other, if any, Legionella control measures will be implemented when considering plumbing modifications as a Legionella mitigation option. However, post-construction commissioning does need to take into account the impact the construction had on the facility plumbing system.
- d. If a mitigation protocol is implemented to minimize *Legionella* in the facility water distribution system, monitor the system for *Legionella* after the mitigation effort.
- 4. Plumbed emergency equipment (e.g., eye washes and showers) are recommended to have tepid (i.e., moderately warm; 60°F 100°F) water flow to exposed areas, which generally necessitates the piping of hot and cold water to the equipment and mixing to the appropriate temperature. It is recommended that eye washes and "eye/face washes" are flushed weekly and emergency showers are flushed monthly to ensure proper working order and to prevent water stagnation. Check that the water temperature is tepid during scheduled emergency equipment inspections and testing, to prevent eye injury (from exposure to too hot or too cold water) and scalding. NOTE: For more information on plumbed emergency equipment activation and testing, see the VHA General Safety Guidebook Emergency Eyewash/Shower Guide at website: http://vaww.ceosh.med.va.gov/ceosh/Guidebooks/GenSafety/!SSL!/WebHelp/2006GenSafe.htm

ATTACHMENT B

GUIDELINES FOR THE USE OF EQUIPMENT FOR THE EXPOSURE OF PATIENTS TO HEATED WATER

- 1. <u>Examples of Equipment Where Patients Are Exposed to Heated Water.</u> Examples of equipment where patients are exposed to heated water include showers, bathtubs, whirlpool tubs, and foot baths.
- **2.** Equipment Where Full or Partial Immersion is the Means of Patient Contact with Heated Water. For equipment where full or partial immersion is the means of patient contact with heated water (e.g., bathtubs, footbaths), the following guidelines are provided for the prevention of scald injury:
- a. Mixing valves at the outlet (e.g., faucet) that are capable of blending the hot and cold water supply to hold water temperatures at or below 110 degrees Fahrenheit (°F) are required.
- b. All patient immersion baths must be equipped with a large digital readout device displaying the bath water temperature. The readout temperature must be verified by taking the temperature of the water with a hand held thermometer (preferably non-mercury containing) and comparing this reading with the reading of the tub thermometer. *NOTE:* Using sensation alone (e.g., hand, wrist, elbow) is <u>not</u> acceptable practice for determining safe water temperature. The actual temperature of water in the tub must be accurately monitored before and during each bath. Consideration needs to be given to the documentation of these temperatures. Facilities must determine an acceptable range of temperature for patient immersion baths.
- c. Documentation is required for procedures to be used to prevent patient burns caused by localized hot spots of water due to poor mixing, or introduction of water that is too hot.

3. Showers

- a. Preventing both the risk of *Legionella* exposure and the risk of scald injury from showers is complex. Showering creates aerosolized water, which can facilitate *Legionella* transmission from contaminated water to patients. However, increasing the water temperature at showers to a level that will prevent *Legionella* growth is problematic. Since patients are exposed to heated water as it is discharged from the shower outlet, scald injury could occur if the water is too hot or becomes too hot during the shower. Patients who may be at increased risk of scald injury from showers include, but are not limited to, those with decreased sensitivity to temperature, motor or psychomotor disorders, neurological disorders, psychiatric disorders, uncontrolled epilepsy, or decreased mobility (e.g., patients seated while showering). Burns could be exacerbated if the patient is unable to quickly exit the shower.
- b. The installation of an anti-scald device that can limit shower water temperature to 115°F or below is required on all showers used for patient care, including those that are accessible for use by patients.

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- (1) The facility is to determine the type of anti-scald device for installation on showers. An anti-scald device could be, for example, a scald guard at the shower head or a mechanical stop on the shower control knob to limit rotation of the knob and prevent the discharge of water that is too hot. Mixing valves installed in the piping of showers are another anti-scald option. However, these devices could hold the water temperature distal to the valve at a compatible temperature for *Legionella* growth and consideration would need to be given to regular *Legionella* monitoring and/or prevention at these sites. *NOTE:* When selecting anti-scald devices for installation, consideration needs to be given to the configuration of the shower systems (e.g., specialized shower fixtures in locked Behavioral Health Units) and the type(s) of device(s) that fit them.
- (2) Thermal eradication (i.e., the raising of the hot water temperature to 160 170°F and the flushing of distal sites) is an option for mitigating *Legionella* in hot water systems. If the facility would prefer to have the thermal eradication option available, then selection of an anti-scald device for showers that is amenable to this option is recommended. For example, a scald guard in the shower head that can be removed prior to thermal eradication would be a better option than a mixing valve, which would be difficult or impossible to bypass for flushing showers with super-heated water. *NOTE:* The detached scald guard would need to be decontaminated prior to re-installation. Alternatively, a facility could use a different *Legionella* mitigation option, such as hyperchlorination or copper-silver ionization, if mixing valves will be installed.
- **4.** Consider the use of anti-scald devices at other outlets in areas where patients may be insensitive to hot water temperatures, in areas where hot water may be used to cause injury to one's self or others, and in areas where patients are otherwise at increased risk for scald injury.
- **5.** Any mixing valves used to regulate the temperature of outlet water must be able to do so while inlet hot and cold water temperature and pressure vary, and must be capable of stopping flow in the event of loss of cold water pressure. For any new installation or when replacing a mixing valve(s), a "fail safe" device is to be used to prevent scalding.
- **6.** Mixing valves and other anti-scald devices must be regularly inspected for proper functioning. *NOTE:* Mixing valves need to be tested with varying temperatures and pressures of supplied hot and cold water. The outlet temperature must be measured with a regularly calibrated thermometer. The frequency of these inspections is to be determined locally, based on manufacturer's recommendations and the facility's experience with operation of the anti-scald device(s) (see The Joint Commission's most current Management of the Environment of Care function, specifically the standard on utilities management).

ATTACHMENT C

SUMMARY OF ACTIONS IN THIS DIRECTIVE

Attachment C is provided as an aid for implementation of this Directive. Details for the following actions are found within the Directive.

Criteria	Actions	Location in the
	(Actions with an asterisk (*) are required)	Directive
Hot water temperature limits	 a. Equipment for immersion of patients in heated water (e.g., tubs, footbaths): * Maximum water temperature at the outlet: 110° Fahrenheit (F) * Regulate water temperature at the outlet using a mixing valve. * Use a digital water temperature readout device to display the bath water temperature. Verify the water temperature using a thermometer. 	Attachment (Att.) B, par. 2
	 b. Showers * Maximum water temperature at the outlet: 115°F * Regulate water temperature at the outlet using an anti-scald device. 	Att. B, par. 3
	c. Systems that use hot water tanks Hot water tank minimum temperature limit: 140°F Reduce water temperature to 130°F before distribution from the hot water tank to the circulating system. Maximum decrement in water temperature at the tap: 10°F (120°F)	Att. A, subpar. 1a
	d. Systems that use instantaneous hot water heaters Discharge water to the circulating system at 130°F Maximum decrement in water temperature at the tap: 10°F (120°F)	Att. A, subpar. 1b
	e. Plumbed Emergency Equipment (e.g., eye washes, emergency showers) Tepid water flow: 60°F - 100°F	Att. A, par. 4

Criteria	Actions	Location in the
D 4.4	(Actions with an asterisk (*) are required)	Directive
Documentation	* Document past experiences with providing too	Subpar. 4a
	high or too low water temperature from the hot	
	water distribution system.	
	* De soume and the ansaying and bed southern terms anothern	Cylener 4h (see also A44
	* Document the maximum hot water temperature	Subpar. 4b (see also Att.
	limits in the hot water distribution system.	(A)
	* Document the policy for the use of equipment	Subpar. 4c and Att. B,
	for the immersion or partial immersion of patients	Subpar 2c (see also Att.
	in heated water.	B, Subpar. 2a, 2b)
		_, _, _, _, _,
	* Document the policy for the use of showers to	Subpar. 4c (see also Att.
	expose patients to heated water.	B, par. 3)
Notification	* Notify patient care staff when maintenance is to	Subpar. 4d
	be conducted on the hot water distribution	
	system, when the maintenance is complete, and	
	when the system is returned to normal operations.	
Facility	* All inpatient facilities need to periodically	Subpar. 4e;
evaluation for	evaluate Legionella risk in accordance with VHA	VHA Directive 2008-010
<u>Legionella</u>	Directive 2008-010.	
	* Provide education for staff charged with	Subpar. 4f
Education	engineering controls for hot water and for staff	
	who perform patient care activities that may	
	expose patients to heated water.	
	* Use a thermometer to verify the water	Att. B, par. 2b
<u>Water</u>	temperature of immersion equipment used to	
<u>temperature</u>	expose patients to heated water.	
<u>check</u>		
	* Routinely check the water temperature in the	Att. A, subpar. 1c
	hot water system at various sites.	
	* Mixing valves must function at varying water	Att. B, par. 5
Anti-scald devices	temperatures and pressures, stop water flow if	
	there is a loss of cold water pressure, and be	
	installed or replaced while using a "fail safe"	
	device.	
	* Inspect devices regularly for proper	Att D nor 6
	functioning.	Att. B, par. 6
	Tunouoming.	Att R per 1
	Consider using anti-scald devices at other	Att. B, par. 4
	outlets not specifically required in this Directive	
	to have them.	

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ATTACHMENT C

Criteria,	Actions	Location in Directive
	(Actions with an asterisk (*) are required)	
<u>Legionella</u>	If Legionella mitigation is necessary:	
mitigation	Consider the issues related to using thermal	Att. A, subpars. 3a and
	eradication and whether a different mitigation	3b
	method is preferable.	
	Elimination of stagnation points may be	Att. A, subpar. 3c
	warranted.	
Recirculating	Distribute hot water with constant recirculation in	Att. A, Par. 2
<u>water</u>	patient care areas, if feasible.	