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Healthcare Inspection

Prevention of Legionnaires' Disease in VHA Facilities

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Executive Summary

The VA Office of Inspector General Office of Healthcare Inspections conducted a review to assess how Veterans Health Administration (VHA) medical facilities manage prevention of Legionnaires' Disease (LD) at the request of the VA Secretary, Senator Robert P. Casey, Jr., Congressman Tim Murphy, and the Chairmen and Ranking Members of the House Committee on Veterans' Affairs and the Senate Committee on Veterans' Affairs.

VHA Directive 2008-010, Prevention of *Legionella* Disease, outlines specific measures that VA facilities should follow to monitor and reduce *Legionella* in the water distribution system. We found that all facilities had written plans addressing LD management locally, but compliance with the directive was variable. We found that facilities did not consistently document their annual LD evaluations; conduct an appropriate risk assessment; or confirm proper functioning of municipal monochloramine treatment on a routine basis. They also did not accurately convey LD testing results to the Infection Control Committee.

VHA is currently in the process of revising Directive 2008-010. We recommended that the Under Secretary for Health address the reported compliance issues when revising the directive. We recommended that the Under Secretary for Health provide a plan that simplifies implementation of the directive, and that provides guidance, education, and monitoring of the implementation of the revised Prevention of *Legionella* Disease directive when issued.

VHA Directive 2008-010's risk stratification criteria are based at the facility level and focus on transplant facilities. We found that most patients were immunosuppressed from diseases unrelated to transplantations. Immunosuppression is one of several conditions that place patients at increased risk for contracting *Legionella,* so an alternative risk stratification methodology may be more effective in preventing *Legionella*. We recommended that the Under Secretary for Health consider re-evaluation of the current stratification of facilities that focuses on transplant status.

Because management of *Legionella* and other waterborne diseases requires an interdisciplinary effort among clinicians, laboratory personnel, engineers, and others, a national-level committee that provides structure for these interactions would allow improved communication among the different departments. We recommended that the Under Secretary for Health institute a national-level water safety committee that will provide expert and technical assistance for collaborative decision-making at the local level in the control and prevention of waterborne disease.

Comments

The Under Secretary for Health concurred with the inspection results (see Appendix A pages 24–28, for the full text of his comments). We will follow up on the planned actions until they are completed.

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Purpose

The VA Office of Inspector General (OIG) Office of Healthcare Inspections (OHI) conducted a review to assess how Veterans Health Administration (VHA) medical facilities manage prevention of Legionnaires' disease (LD) at the request of the VA Secretary, Senator Robert P. Casey, Jr., Congressman Tim Murphy, and the Chairmen and Ranking Members of the House Committee on Veterans' Affairs and the Senate Committee on Veterans' Affairs. A report that evaluated their concerns regarding VA Pittsburgh Healthcare System's maintenance of its LD prevention system was issued in April 2013. Additional questions regarding mitigation of risk at other VHA hospitals are addressed in this report.

Background

Legionella and Legionellosis

As noted in the recent OIG report, *Legionnaires' Disease at the VA Pittsburgh Healthcare System, No. 13-00994-180,* April 23, 2013, infections caused by bacteria of the genus *Legionella* have been recognized since the outbreak at a convention of the American Legion in Philadelphia in 1976. *Legionella* is present in natural and artificial water environments worldwide.[1] It can survive temperature ranges of 0-63°C (32-145.4°F) and pH ranges of 5-8.5.[2] *Legionella* is also known to multiply intracellularly within protozoan hosts and thrive in the biofilm lining water pipes. The hosts and biofilm provide nutrients for growth as well as additional protection from wider ranges of temperature or pH, biocides and/or other disinfection efforts. Even when present at undetectable levels at lower temperatures, it can colonize a water system and proliferate when temperature, sediment, scale, and supporting microorganisms provide optimal conditions for growth.[3]

Although more than 50 species of *Legionella* have been described, fewer than half of these cause disease in humans. The most common species, *L. pneumophila*, includes at least 16 serogroups. *L. pneumophila* serogroup 1 is responsible for at least 70% of proven cases.[4]

Legionellosis refers to any infection caused by *Legionella*. LD is a serious and potentially fatal infection of the lungs and other organs. Pneumonia is the most common manifestation of LD. Person-to-person transmission of LD does not occur. In most cases, infection develops when a susceptible person aspirates or inhales

[1] Bartram J, Chartier Y, Lee JV, Pond K, Surman-Lee S, eds. *Legionella* and the prevention of legionellosis. Geneva: World Health Organization, 2007.
[2] U.S. Environmental Protection Agency. *Legionella: Drinking Water Health Advisory 2001.* www.epa.gov. Accessed May 17, 2013.
[3] U.S. Department of Labor. Occupational Safety & Health Administration. OSHA Technical Manual. Section III: Chapter 7, Legionnaires' Disease, January 20, 1999.
[4] Edelstein PH, Cianciotto NP. *Legionella*. In: Mandell GL, et al, eds. Principles and Practice of Infectious Diseases, 7th ed., 2009. Churchill Livingstone.

contaminated water into the lungs. The number of organisms required to cause infection is unknown.[5] Persons at greatest risk are immunocompromised or have impaired respiratory systems.

Sources of *Legionella* outbreaks include air conditioning systems, drinking water, humidifiers, spas, and other sources of contaminated aerosols. Within healthcare environments, drinking water is the most common source of infection.[6]

Mitigation of Risk

A. Environmental Controls

Eradication of *Legionella* in the drinking water is unlikely because it is ubiquitous in the outdoor environment.[7] Low numbers of the organism may enter buildings from public water sources and colonize pipes despite disinfection treatment by local utility companies.[8,9] Clinical risk is increased when conditions for growth are optimal. The goal of mitigation is to maintain an acceptably low level of risk and to avoid conditions that would enhance amplification (rapid rate of growth).

Among available strategies for limiting exposure to *Legionella* from hospital drinking water are disinfectants and maintenance of elevated water temperatures. The use of chemical disinfectants must balance the benefits of controlling bacterial growth with the potential hazards. Various approaches to disinfection have been employed with some success, but only the treatment of circulating hot water with copper and silver ions has been systematically evaluated at multiple sites.[10] Water treated with monochloramine by utilities (as opposed to free chlorine) appears to confer a reduced risk of LD.[11]

Disinfection may be monitored by testing for the disinfectant level and/or by monitoring the levels of *Legionella* bacteria in a hospital's water system. Experts generally agree that lower levels of *Legionella* in the water will decrease the risk of disease despite the

[5] Edelstein et al.
[6] Lin YE, Stout JE, Yu VL. Prevention of hospital-acquired legionellosis. Curr Opin Infect Dis. 2011;24:350-6.
[7] ASHRAE Technology Council. *Position Document on Legionellosis*. Approved, June 25, 1998; Reaffirmed January 25, 2012.
[8] Environmental Health Division, Vermont Department of Health. *Public Health Review of Monochloramine*. October 2012. Water is treated at local treatment plants (primary disinfection) using various filtration and/or chemical methods. After water leaves the plant, secondary disinfection may be accomplished with chlorine, chlorine dioxide or monochloramine (addition of ammonia to free chlorine in water). www.healthvermont.gov. Accessed May 24, 2013.
[9] US EPA. Water utility companies in the US treat almost 34 billion gallons of water every day. In the US and Canada, approximately one million miles of pipes or other constructed conveyance (enough to circle the globe 40 times) carry water to consumers. www.epa.gov. Accessed May 17, 2013
[10] Lin YE, Stout JE, Yu VL. Controlling *Legionella* in hospital drinking water: an evidence-based review of disinfection methods. Infect Control Hosp Epidemiol. 2011;32:166-73.
[11] Flannery, B. et al. *Reducing Legionella Colonization of Water Systems with Monochloramine*, Emerging Infectious Diseases Vol. 12, No. 4, April 2006. www.cdc.gov/eid. Accessed May 17, 2013; Kool JL, Bergmire-Sweat D, Butler JC, et al. Hospital characteristics associated with colonization of water systems by *Legionella* and risk of nosocomial Legionnaires' disease: a cohort study of 15 hospitals. Infect Control Hosp Epidemiol.1999; 20:798-805; Tablan, OE, Anderson LJ, Besser R, Bridges, C, Hajjeh, R. Guidelines for preventing health-care-associated pneumonia, 2003. Recommendations of CDC and the Healthcare Infection Control Practices. www.cdc.gov. Accessed 6.2.2013.

lack of an established dose–response relationship for *Legionella* infections.[12] The effectiveness of environmental cultures to assess risk requires strict attention to procedures for the handling of samples and specialized laboratory testing.

Maintenance of hot water at temperatures sufficient to prevent *Legionella* growth throughout a hospital is challenging and requires special care to avoid scalding patients and staff. Episodic renovations, common in many hospitals, often involve water system modifications leading to unexpected mixing of hot and cold water as well as areas with decreased or no circulation of water (dead legs). These connections/disconnections can lead to dilution of disinfectants and reduced temperatures in one or more locations within a water system thereby enhancing the growth conditions for *Legionella.*

B. Clinical Controls

Another component of risk mitigation is careful attention to the clinical presentation of patients. Clinicians should consider the possibility of LD when patients present with pneumonia that is severe or that occurs temporally with a hospitalization. When suspicion is high that *Legionella* is the causative agent for pneumonia*,* antibiotic therapy known to be effective against *Legionella* should be initiated while awaiting diagnostic test results.[13]

Testing for LD in most cases can be accomplished with a simple urine test. However, the urinary antigen test only detects *L. pneumophila* serogroup 1, the form of the pathogen most commonly associated with disease. Cultures from lower respiratory tract specimens allow identification of other serogroups and species of *Legionella*. Additionally, collecting clinical cultures allows for epidemiological matching when *Legionella* bacteria are also found in environmental samples.[14] However, a good-quality specimen is often difficult to obtain and may require an invasive procedure.[15] Particular vigilance is required in hospitals caring for vulnerable populations and where LD has previously been associated with the hospital environment.

Legionnaires' Disease in VHA

A. VHA Directive 2008-010, Prevention of *Legionella* Disease

VHA convened a multidisciplinary expert working group to address the prevention of healthcare-associated (HCA) LD at VHA inpatient facilities in 2007. The working group developed VHA Directive 2008-010, Prevention of *Legionella* Disease, which requires

[12]Bartram J, Chartier Y, Lee JV, Pond K, Surman-Lee S, eds. *Legionella* and the prevention of legionellosis. Geneva: World Health Organization, 2007.
[13] Edelstein PH, Cianciotto NP. *Legionella*. In: Mandell GL, et al, eds. Principles and Practice of Infectious Diseases, 7th ed., 2009. Churchill Livingstone.
[14] Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Disease Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Inf Dis. 2007;44:S27-72.
[15]Edelstein et al.

that each inpatient facility implement an annual evaluation for LD in accordance with a written plan.[16]

Evaluation of the risk of LD involves coordination of multiple services and departments. Clinicians must be knowledgeable about the diagnosis and treatment of the disease process, and laboratory personnel must be appropriately trained. Diagnostic services must be available for the testing and reporting of results. Facility/engineering personnel who are knowledgeable must be available to maintain the water system appropriately, and an infection control/prevention committee (ICC) or equivalent must have expertise and be available to develop an Action Plan when an Action Plan is necessary.[17] The ICC or equivalent must record the annual evaluation along with summaries of the laboratory and facility/engineering department reports in the committee's meeting minutes.[18]

The expert working group determined that risk evaluation would be stratified according to the following facility classifications: VHA-designated Transplant Center, immediate post-transplant centers (facilities who care for at least 5 patients within 3 months of the transplant procedure), acute care (non-transplant) facilities, and Community Living Centers (CLC--formally known as Nursing Home Care Units) not physically housed within an acute care facility building. Two algorithms were developed to guide facility annual evaluations—one for the transplant and post-transplant facilities and one for the acute care facilities and CLCs.

Epidemiologically-Linked HCA LD

Both algorithms require that each facility ascertain whether there has been a history of epidemiologically-linked HCA LD. Epidemiologically-linked refers to the association of a suspected HCA LD case with exposure to *Legionella* at the facility. Such cases include, but are not limited to, those that are temporally associated (10 or more days of continuous inpatient care prior to onset of illness) and those that are environmentally associated (that is, when pathogenic *Legionella* has been isolated from the facility environment). Centers with a history of epidemiologically-linked HCA LD must initiate an Action Plan to reduce the risk of *Legionella* exposure to patients. Monitoring of the Action Plan must occur on a routine basis and revisions made as necessary.

[16] VHA Directive 2008-010. Prevention of *Legionella* Disease, February 11, 2008.

[17] An Action Plan is implemented when a facility has a history of epidemiologically-linked HCA LD, or when indicated in routine assessments by positive clinical screening or positive environmental samples that exceed the facility's threshold. The annual evaluation plan is conducted on a routine basis (yearly) to assess the facility's level of risk.

[18] VHA Directive 2008-010 identifies specific annual reporting requirements to the ICC. Laboratory personnel must report the number of urinary antigen tests and clinical cultures ordered for LD, number of persons with positive results, and the results of any environment testing. Facility management/engineering departments must provide a report on water system maintenance and monitoring as well as any mitigation actions taken.

Transplant and Post-Transplant Centers

For transplant and post-transplant centers without a history of epidemiologically-linked HCA LD, testing for *Legionella* in the water distribution system is completed twice a year. At least 10 distal sites (points at which patients come into contact with the water system) must be tested on each occasion. Positive results must be reported to the ICC or equivalent. Historically, a 30% positivity rate of distal sites was considered a threshold level for implementation of an Action Plan[19] despite the lack of a definitive dose-response relationship between positive cultures and disease.[20] Transplant/post-transplant centers with a history of epidemiologically-linked HCA-LD and those with the requisite number of positive sites showing serogroup 1 organisms, must test all patients with HCA pneumonia (not just transplant patients) using the urinary antigen test. If the distal water sites are positive with another type of *Legionella* organism, the facility must obtain respiratory tract specimens from transplant patients with HCA pneumonia.

Acute Care Facilities and Community Living Centers

The annual evaluation of risk for acute care facilities and CLCs without a history of epidemiologically-linked HCA LD includes an assessment of the facility's water source. If the water source is treated with monochloramine, the facility must routinely verify proper functioning of the monochloramine treatment system with appropriate municipal officials and maintain a high index of suspicion for LD in patients, but no further action is required. Acute care facilities and CLCs without monochloramine-treated water must continue the annual evaluation process by completing a Risk Assessment.

To comply with the annual Risk Assessment requirement, acute care facilities and CLCs may elect one of two options--environment testing or clinical screening. Environmental testing (sampling of 10 distal sites) is conducted once a year for these facilities rather than twice a year which is required for transplant and post-transplant centers. Clinical screening involves the testing of at least 10 patients with HCA pneumonia for *Legionella* using urinary antigen testing. Not all acute care facilities and CLCs meet the criteria for clinical screening as not all facilities routinely identify patients with HCA pneumonia or treat 10 HCA pneumonia patients per year. For those facilities, environmental testing is the only available option.

If the facility-designated threshold level for action is exceeded while conducting environmental testing, the ICC must institute an Action Plan to reduce *Legionella* in the water. If an HCA pneumonia patient is found to be positive for LD, the ICC must review the case to assess if there is epidemiologically-linked disease.

B. VHA Directive 2009-009, Domestic Hot Water Temperature Limits for *Legionella* Prevention and Scald Control

[19] Allen JG, Myatt TA, MacIntosh DL, et al. Assessing risk of health care-associated Legionnaires' disease from environmental sampling: the limits of using a strict percent positivity approach. Am J Infect Control. 2012;40:917-21.
[20] VHA Directive 2008-010 recommends a 30% level but allows facilities to identify a lower local threshold level.

Rapid growth of *Legionella* is enhanced when water temperatures are between 25°C and 45°C (77°F and 113°F respectively). Therefore, maintaining water temperatures outside the optimal range for amplification can be an important control measure. However, the growth of organisms is only inhibited at water temperatures greater than 50°C (122°F). At higher temperatures, *Legionella* is killed at an increasing rate in a shorter time frame. With a constant water temperature of 50°C (122°F), it may take 80-124 minutes to destroy 90% of a *L. pneumophila* population, but only 2 minutes at temperatures of 60ºC (140°F). Above 70°C (158°F), the pathogen is killed almost instantly.[21]

Unfortunately, the higher water temperatures required to inactivate and kill *Legionella* fall within the range of scalding temperatures, particularly for patients with compromised skin integrity. The risk of scalding increases significantly when water temperatures are 47°C (117°F).[22] Full thickness burns may occur in adults after 3 minutes exposure to 52°C (125°F) water and after 5 seconds exposure to 60°(140°F) water. The time frame for burns in children is shorter (for this example, 2 minutes and 3 seconds respectively).[23]

VHA Directive 2009-009 is the most recent iteration of the VHA's policy to prevent *Legionella* proliferation by controlling water temperature without causing scalding or burn injuries. The directive requires facilities to have a written plan that considers the risk of *Legionella*, the risk of scalding related to its patient population, and the particular characteristics of its water distribution system when determining hot water limits. Water temperature checks at various sites in the hot water distribution system must be performed routinely to verify that temperatures are in accordance with facility policy.

C. Remedial Actions

In the Action Plan that is implemented to reduce *Legionella* in the facility's water distribution system, the ICC may propose remediation such as thermal eradication,[24] hyperchlorination,[25] copper-silver ionization,[26] use of chlorine dioxide[27] or point of use filters. While copper-silver ionization and chlorine dioxide can be used for ongoing mitigation, the effects of thermal eradication and hyperchlorination cannot be indefinitely

[21] Bartram J, Chartier Y, Lee JV, Pond K, Surman-Lee S, eds. *Legionella* and the prevention of legionellosis. Geneva: World Health Organization, 2007.
[22] VHA Directive 2009-009.
[23] CEOSH. *Directives Requirements.* Accessed May 18, 2013.
[24] VHA Directives 2008-010 and 2009-009. Thermal eradication (superheat and flush) requires temporarily increasing water temperatures to 71-77°C (160-170°F) and flushing for 30 minutes. Extreme caution must be taken to protect end users during the superheating process. *Legionella* may be detectable within 1 - 3 months of treatment.
[25] VHA Directives 2008-010 and 2009-009. Hyperchlorination involves increasing chlorine levels to maintain a higher than usual level of chlorine in the water (2 mg/L) for at least 2 hours. The system must be flushed thoroughly after the process. *Legionella* is only temporarily eradicated .
[26] U.S. Environmental Protection Agency. *Legionella: Drinking Water Health Advisory 2001.* www.epa.gov. Accessed May 17, 2013. Copper-silver ionization involves the installation of a commercial system that requires routine monitoring of its components, copper and silver levels, and proper circulation of the water throughout the distribution system.
[27] Lin YE, Stout JE, Yu VL. Controlling *Legionella* in hospital drinking water: an evidence-based review of disinfection methods. Infect Control Hosp Epidemiol. 2011;32:166-73. Chlorine dioxide is a gas that is introduced into the water locally.

maintained; *Legionella* may reappear within weeks or months of these temporary treatments. Point of use filters are suitable for focal eradication but not typically used for systemic disinfection.

To decrease exposure to potentially contaminated aerosolized water, VHA issued a prohibition in November 2012 against the use of indoor, open decorative water features in VHA facilities unless factory-sealed.[28] In an additional attempt to reduce droplet inhalation, some facilities have removed faucet aerators from showerheads located where patients with a higher risk for LD are housed.[29]

D. Evaluating Implementation of VHA Directive 2008-010

In 2009, the VHA Infectious Diseases Program Office (IDPO) conducted a comprehensive survey to assess implementation of VHA Directive 2008-010. Although 86 percent of facilities reported "correct implementation" of guidance for environmental risk assessments, only 29 percent reported adherence to guidance for clinical risk assessments.[30] To provide additional guidance to assist facilities with implementation of the 2008 Prevention of *Legionella* Disease directive, the IDPO disseminated an Information Sheet in January 2011.

The information sheet clarified a few key components of the directive. Given that the status of the facility may change over time (for example, an acute care facility could begin to care for a greater number of post-transplant patients or vice versa), the facility must evaluate its status each year and modify its annual evaluation plan accordingly. Similarly, the local water utility company may alter its disinfection method (for example, terminate the use of monochloramine) which could require a change in the Risk Assessment selection.

The IDPO Information Sheet also provided guidance related to the clinical screening risk assessment selection. Facilities that do not screen for HCA pneumonia or do not typically identify 10 HCA pneumonia cases in the one-year time frame do not meet the criteria for selecting that option and should elect the environmental water testing risk assessment option.

Scope and Methodology

In response to VA and Congressional requests that OIG evaluate VHA's actions to prevent LD in all facilities, OHI developed an extensive, broad-based questionnaire to

[28] VHA National Leadership Council. Executive Decision Memo: Indoor decorative water features in VHA healthcare facilities. December 26, 2012.
[29] Tablan, OE, Anderson LJ, Besser R, Bridges, C, Hajjeh, R. Guidelines for preventing health-care-associated pneumonia, 2003. Recommendations of CDC and the Healthcare Infection Control Practices. www.cdc.gov. Accessed 6.2.2013.

[30] VHA Infectious Diseases Program Office. Report on Implementation of VHA Directive 2008-010 (Prevention of *Legionella* Disease) by VHA Facilities, and Associated Risk Assessment Findings and Actions, June 2011.

ascertain current practice. The questionnaire was revised after review by infectious disease and public health experts and sent to each Veterans Integrated Service Network and VA Medical Center Director. For VA healthcare systems (VAHCS) or medical centers that consist of two or more campuses or divisions, we requested that a separate questionnaire be completed for each campus or division. We also requested that a questionnaire be completed for each CLC not physically housed within an acute care facility (stand-alone CLC).[31] We did not include VA Community Based Outpatient Clinics, ambulatory care centers or other facilities providing care to outpatients only, or Mental Health Residential Rehabilitation Treatment Programs (formerly known as domiciliaries) in our data collection requests.

All responses were submitted online via a questionnaire web link. We also requested a copy of each facility's annual LD evaluation plan, policies governing hot water temperatures, and patient information for veterans diagnosed with LD during FY12. The total number of VAHCSs and medical centers who were asked to and completed the questionnaire was 132[32]. However, VAHCSs and medical centers with multiple campuses/divisions, and CLCs not physically housed within acute care facilities were required to submit individual responses; therefore, the number of completed questionnaires totaled 182.

We reviewed all submitted documents along with the facilities' responses to the questionnaire. When necessary, we contacted designated liaisons and conferred with infectious disease experts to clarify ambiguous points or issues.

Besides the FY12 patient information we requested from the participating facilities, we independently identified inpatient veteran patients diagnosed with LD in FY12 by ICD-9-CM code.[33] We compared the information from the two data sources and compiled a list of patients that met our timeframe and diagnosis criteria. We reviewed all relevant patient records and confirmed the diagnosis of LD, evaluated antibiotic use, and determined patient outcome.

VHA has designated 14 facilities as transplants centers. However, two of the 14 VHA-designated facilities have not yet instituted a transplant program and did not care for more than 5 post-transplant patients in the 3 months after surgery. For the purposes of this review, we considered them to be acute care centers.

We conducted the inspection in accordance with *Quality Standards for Inspection and Evaluation* published by the Council of the Inspectors General on Integrity and Efficiency.

[31] See VHA Directive 2008-010.
[32] In addition to medical centers without an inpatient unit, one healthcare system was excluded because its patients were housed at a Department of Defense facility during FY 12.
[33] ICD-9-CM (International Classification of Diseases – Ninth Revision – Clinical Modification) is a system of assigning codes to diagnoses and procedures associated with hospital utilization in the United States. The ICD-9-CM code for Legionnaires' Disease is 482.84.

Results

Issue 1: Compliance with VHA Directives/Executive Decision Memorandum

A. Directive 2008-010, Prevention of *Legionella* Disease

Written Plan and Annual Appraisal

Each inpatient facility governed by VHA Directive 2008-010 must have a written plan for the evaluation of LD prevention. The plan is defined as a "document that calls for an annual appraisal of the considerations and activities a facility needs to implement to prevent HCA LD"[34], and most plans must include a Risk Assessment (see below) to determine if mitigation is necessary. The directive further states that documentation of the annual evaluation and risk assessment must be recorded in the Infection Control Committee (ICC) or equivalent meeting minutes. We equated the "annual appraisal" reference in the directive's definition of a written LD plan with the "annual evaluation" report that must be recorded in meeting minutes.

We requested that facilities submit their current annual evaluation plan along with their responses to the LD questionnaire. Facilities submitted a variety of documents to comply with this request. A majority of facilities submitted their local policy or medical center memorandum (MCM) on Prevention of *Legionella* Disease.[35] Generally, the local policies adopted the directive language with little modification and did not clearly indicate whether their facility had a history of HCA LD, whether the facility had cared for greater than 5 patients within the first 3 months of transplantation, or whether the local utility company added monochloramine to the facility's water source.

While we considered the local policies or MCMs to be equivalent to a written plan, VHA policies and MCMs, are generally in effect for three years after issuance while the LD evaluation plan requires an annual review. The dates of the submitted local policies or MCMs ranged from 2009-2013 and did not contain elements of an annual appraisal or evaluation. We therefore determined that these local policies did not meet the annual appraisal component of the directive requirement and requested additional documents that would show evidence of an annual review.

After reviewing documents submitted in response to both requests, we determined that all facilities submitted written plans addressing actions that should be taken to prevent LD. However, we did not find evidence of the annual appraisal requirement for FY12 in 33 of 182 responding facilities.

[34] Directive 2008-010.

[35] Other facilities submitted a document(s) that had been presented to leadership or the ICC or equivalent outlining a review of the written plan currently in place, actions taken during FY12, and recommended actions for FY13. We determined that these documents included elements of an annual evaluation.

Risk Assessment/Action Plan

A risk assessment is a "component of the plan that calls for the collection of environmental or clinical samples to determine if action to eradicate *Legionella* in the water distribution system is necessary."[36] Facilities without a history of epidemiologically-linked HCA LD that must complete a routine risk assessment are the following: transplant/immediate post-transplant centers, and acute care facilities and CLC without monochloramine. Facilities *with* a history of epidemiologically-linked HCA LD need to complete an Action Plan.

Facilities with a History of Epidemiologically-Linked HCA LD

Sixteen (including 3 campuses of one VAHCS and 2 campuses of a second VAHCS) of the 182 responding facilities acknowledged a history of epidemiologically-linked HCA LD. All four classifications of facilities are represented in this category: 3 transplant centers, 4 immediate post-transplant centers, 8 acute care facilities, and 1 CLC. These facilities need to complete an Action Plan that includes environmental testing. For transplant center and immediate post-transplant center with positive environmental testing, clinical screening must be performed. The FY12 Action Plan selection(s) of these facilities and their compliance with VHA Directive 2008-010 guidance are tabulated below (see Table 1).

Table 1
Facilities with A History of Epidemiologically-Linked HCA LD:
FY12 Action Plan Components and Results

Action Plan Components Selected by Facility	Number of Facilities	Appropriately Conducted Environmental Testing	Appropriately Conducted Clinical Screening	Appropriately Followed Directive Guidance
Clinical Screening	2	0	1	0[37]/2
Environmental Testing	10	4	NA	4/10
Both	4	4	0	3[38]/4
Total Number of Facilities that Followed Directive Guidance				7/16

[36] VHA Directive 2008-010.
[37] Facilities with a history of epidemiologically-linked HCA LD must conduct environmental testing to monitor the mitigation protocol. Although one of the two facilities appropriately conducted clinical screening, both failed to conduct appropriate environmental testing to monitor mitigation.
[38] One of the four facilities was a transplant center which had positive environmental testing but did not conduct clinical screening per Directive guidance.

Transplant/Immediate Post-transplant Centers without a History of Epidemiologically-linked HCA LD

Of the remaining 166 responding facilities without a history of epidemiologically-linked HCA LD, twenty identified their facilities as VHA-designated transplant centers or immediate post-transplant centers. Transplant and immediate post-transplant centers must implement biannual environmental testing. A total of 10 or more distal sites must be tested on each occasion. The FY12 Risk Assessment selection of these facilities and their compliance with VHA Directive 2008-010 are tabulated below (see Table 2).

Table 2
Transplant and Immediate Post-transplant Centers
without A History of HCA LD:
FY12 Risk Assessment Selection and Results

Risk Assessment Selection	Number of Facilities	Appropriately Conducted Environmental Testing	Appropriately Conducted Clinical Screening	Compliant with Directive Guidance
Environmental	10	7	NA	7/10
Both	8	5	0	5/8
None	2	NA	NA	0/2
Total Number of Facilities Compliant with Directive Guidance				12/20

Acute Care Facilities and CLCs with Monochloramine without a History of HCA LD

Acute care facilities and CLC with monochloramine in their water that do not have a history of epidemiologically-linked HCA LD are not required to perform a risk assessment. We determined that 54 of the remaining 146 responding facilities met these criteria. However, facilities in this category must routinely verify proper functioning of the monochloramine treatment system. We found that 13 of the 54 responding facilities (24 percent) did not routinely confirm that the monochloramine was properly functioning.[39]

Additionally, at those facilities with monochloramine that are not required to conduct a risk assessment, clinicians are advised to maintain a high degree of suspicion of LD. We considered the ordering of urinary antigen testing and/or clinical cultures an indicator of a clinician's level of suspicion for LD. We found that, at 3 of the 54

[39] Two facilities and one water utility company reported a 30 day break in monochloramine use; interruption of monochloramine disinfection may require additional or supplemental facility action to protect their water supply.

responding facilities with monochloramine that were not required to conduct a risk assessment, no testing for LD was ordered.[40]

Acute Care Facilities and CLCs without Monochloramine or a History of HCA LD

Acute care facilities and CLCs without monochloramine or a history of HCA LD must conduct a risk assessment annually. The risk assessment selections of the remaining 92 acute care facilities and CLCs without monochloramine who submitted responses are tabulated below (see Table 3).

Table 3
Acute Care Facilities and CLCs without Monochloramine or A History of HCA LD: FY12 Risk Assessment Selection and Results

Risk Assessment Selection	Number of Facilities	Appropriately Conducted Environmental Testing	Appropriately Conducted Clinical Screening	Compliant with Directive Guidance
Clinical	22	1[41]	6	7/22
Environmental	47	42	NA	42/47
Both	15	13	1	13[42]/15
None	8	NA	NA	0/8
Total Number of Facilities Compliant with Directive Guidance				62/92

In summary, we found that 81 of the 128 responding facilities (63 percent) required to conduct an action plan or risk assessment completed them as outlined by VHA Directive 2008-010.

Ongoing Mitigation

For routine prevention of *Legionella* in the water distribution system, the Centers for Disease Control and Prevention (CDC) recommends maintaining hot water temperatures as mandated by state law. If state law allows temperatures outside 105-120°F for hospitals or 95-110°F for nursing home facilities (below optimal temperatures for controlling *Legionella* amplification), CDC recommends either periodic increases to >150°F or chlorination with flush. CDC guidelines further states: "No recommendation

[40] For this determination, we excluded responding facilities that are campuses, divisions or stand-alone CLCs who reported no testing results because their results were combined with another campus, division or acute care facility.
[41] One facility selected clinical only but in reality, conducted environmental testing.
[42] The one facility that successfully completed the clinical screening was included in the facilities that successfully completed the environmental testing.

is offered for treating water in the facility's distribution system with chlorine dioxide, heavy-metal ions (e.g., copper or silver), monochloramines, ozone, or UV light…" and considers the use of these additional mitigation measures to be an unresolved issue.[43]

Approximately one-third of VHA facilities have opted to employ one or more ongoing mitigation efforts in addition to maintaining hot water temperatures at allowable levels. The ongoing mitigation methods in use in the VHA system in FY12 are tabulated below. Because some facilities use multiple mitigation methods, they are included in more than one category; therefore, the total number of facilities using ongoing mitigation cannot be calculated by adding the numbers in this table.

Table 4
Ongoing Mitigation Methods Reported in FY12
Excluding Water Utility Treatments

Type	Number of Facilities
Chlorine Dioxide	
Chlorine dioxide	8
Chlorine dioxide + other mitigation	3
Total Number of Facilities Using Chlorine Dioxide	11
Copper-silver Ionization	
Copper-silver ionization	10
Copper-silver ionization + other mitigation	5
Total Number of Facilities Using Copper-silver Ionization	15
Point-of-use Filters	
Point-of-use filters	1
Point-of-use filters + other mitigation	7
Total Number of Facilities Using Point-of-use Filters	8
Routine Hyperchlorination	
Routine hyperchlorination	3
Routine hyperchlorination + other mitigation	7
Total Number of Facilities Using Routine Hyperchlorination	10
Routine Thermal Eradication	
Routine thermal eradication	6
Routine thermal eradication +other mitigation	7
Total Number of Facilities Using Routine Thermal Eradication	13
Other	
Oxidized Chlorine	1
Sodium Hypochlorite	4
Total Number of Facilities Using Other	5

[43] Sehulster LM, Chinn RYW. Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR. June, 6, 2003.

Reporting Requirements

VHA Directive 2008-010 identifies specific items that must be reported to the ICC annually. Laboratory personnel must report the number of urinary antigen tests and clinical cultures ordered, number of persons with positive results, and the results of any environment testing. Staff from facility management/engineering departments must provide a report on water system maintenance and monitoring as well as any mitigation actions taken. The summaries of these reports must be recorded in the ICC (or equivalent) meeting minutes.

We requested and reviewed relevant FY11 and FY12 ICC minutes from the 182 responding facilities. In 53 of 182 responding facilities, we found no documentation of report summaries to the ICC (or equivalent) as required by the directive.[44] Additionally, we found 15 incidences of absent or incorrect reporting of the number of positive LD test results to the ICC. During follow-up contacts, we learned that some facilities had misinterpreted the reporting requirement to the ICC or equivalent to apply to patients with HCA LD rather than all patients with positive results. Submitted responses showed discrepancies between number of positive test results and number of patients reported to the ICC.

B. VHA Directive 2009-090, Domestic Hot Water Temperature Limits for *Legionella* Prevention and Scald Control

Of the 182 responding facilities, 171[45] submitted a hot water temperature policy that established maximum temperature limits at distal sites, frequency of temperature checks, and use of anti-scalding measures. The frequency of temperature checks ranged from continuous (computerized monitoring) to daily, monthly, quarterly and annually.

C. Executive Decision Memorandum

VHA's Under Secretary for Health signed an Executive Decision Memorandum on November 26, 2012, that banned indoor, open decorative water features in VHA facilities due to a concern that transmission of LD could occur despite routine maintenance. We found that all VHA facilities had complied with this Memorandum.

Issue 2: Diagnostic Testing and Patient Outcomes: An Indicator of Risk

A. Diagnostic Testing

Our questionnaire was directed to all campuses and divisions of VAHCS and medical centers as well as CLCs not physically located within an acute care facility for a total of

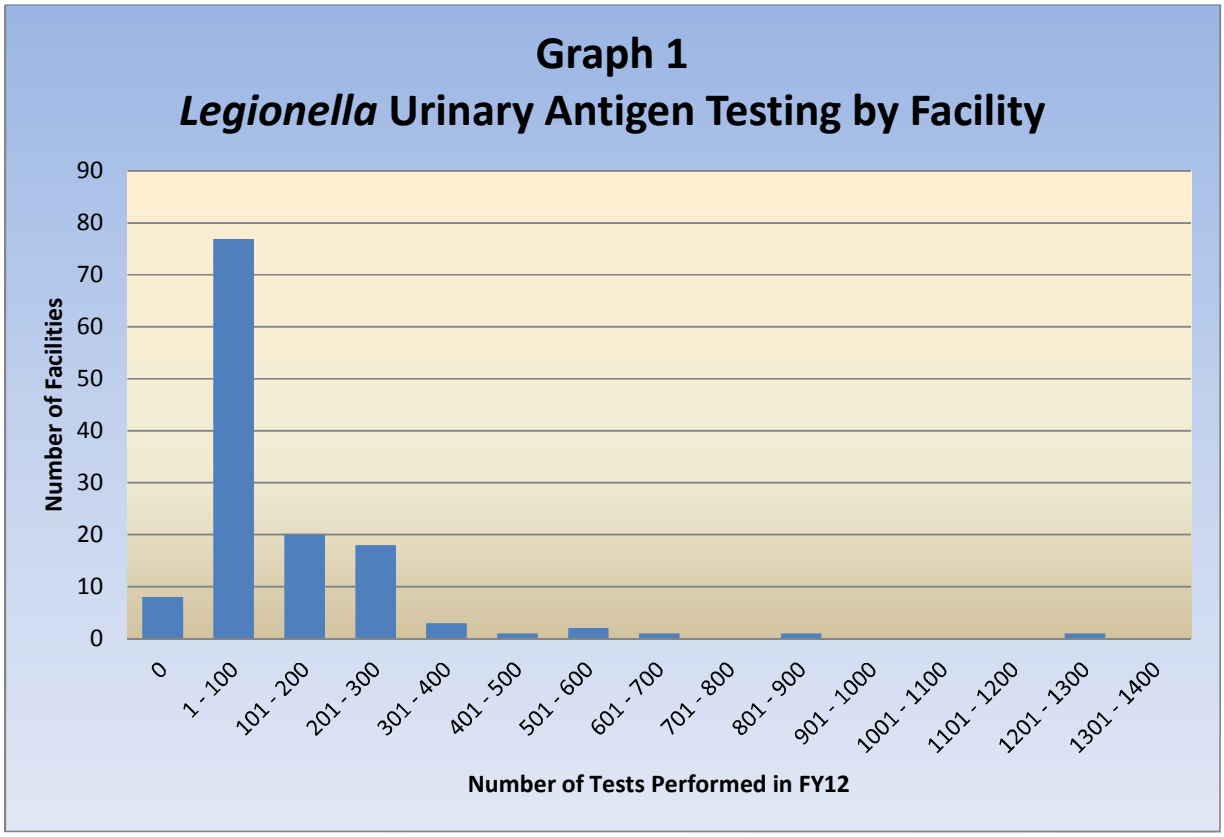
[44] When necessary, we reviewed parent facility documents for their associated campuses, divisions or stand-alone CLCs' reports.
[45] When necessary, we reviewed VAHCS or medical center policies that would include geographically separated campuses or buildings.

182 responding facilities. However, diagnostic testing results are reported through the VAHCS or medical center, not the individual campus, division, or stand-alone CLC. Therefore, analysis of testing results and patient data, is based on the number of participating VAHCS and medical centers (132) rather than the total number of responding facilities (182).

Urinary Antigen Testing

LD cannot generally be distinguished from pneumonia caused by other agents based on clinical or radiographic evidence. The diagnosis may be confirmed by detection of specific antigens in the urine, culturing of respiratory secretions or tissues, or a fourfold rise of antibody titer in the blood over time. The urinary antigen test, which detects *Legionella pneumophila* serogroup 1, has become the most frequent test used for diagnosis of the disease.[46]

We found that in FY12, clinicians in VHA facilities ordered 15,169 urinary antigen tests. The distribution of urinary antigen testing by facility is illustrated below in Graph 1.



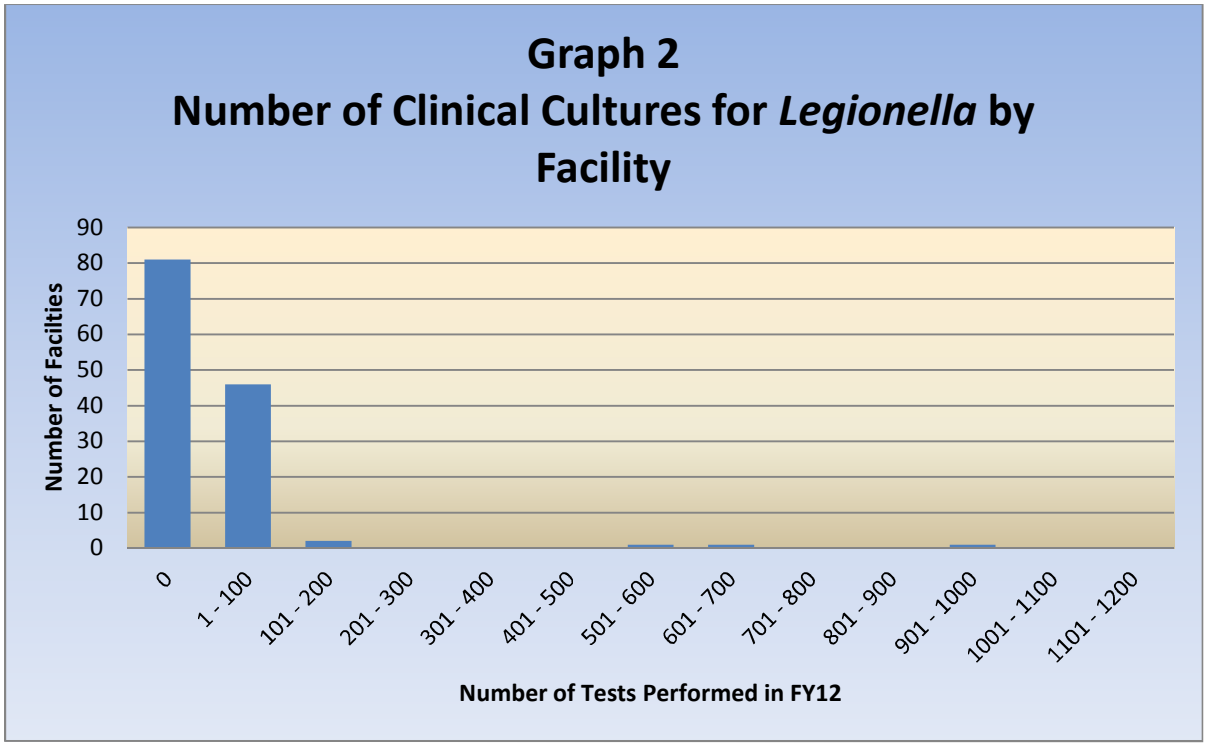
[46] Tablan, OE, Anderson LJ, Besser R, Bridges, C, Hajjeh, R. Guidelines for preventing health-care-associated pneumonia, 2003. Recommendations of CDC and the Healthcare Infection Control Practices. www.cdc.gov. Accessed 6.8.2013.

Clinical Cultures (Respiratory Tract/Tissue Specimens)

While urinary antigen testing only identifies *Legionella pneumophila* serogroup 1, respiratory specimen cultures allow identification of other *Legionella* species and serogroups.[47] Additionally, collecting clinical cultures allows for epidemiological matching when *Legionella* bacteria are also found in environmental samples.[48]

Obstacles to obtaining a usable respiratory tract specimen limit the usefulness of this method of testing. The patient may be unable to produce an appropriate sputum specimen which often requires forceful expiration. Early treatment with antibiotics may destroy a sufficient number of *Legionella* to make it impossible to identify the pathogen. Although respiratory tissue specimens can be collected through more invasive procedures, the risks may outweigh the benefits. Even when adequate specimens are obtained, *Legionella* is difficult to culture. VHA Directive 2008-010 requires respiratory secretion cultures for all transplant patients with HCA pneumonia when environmental sampling is positive for non-*Legionella pneumophila* serogroup 1.

We found that in FY12, clinicians in VHA facilities ordered 3,091 respiratory clinical cultures for *Legionella.* The distribution of respiratory clinical cultures for *Legionella* by facility is illustrated below in Graph 2.



[47] Tablan et al.
[48] Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Disease Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Inf Dis. 2007;44:S27-72.

B. Patient Data

The 132 VAHCS and medical centers identified 112 patients diagnosed with LD in FY12. We independently identified 173 VA patients diagnosed with LD in FY12 by ICD-9-CM code (482.84). We determined that 89 of the 173 patients we identified did not have an acute episode of LD in FY12[49] or received treatment for LD outside of the VA system. We excluded these 89 patients from consideration. Therefore, the list of 173 VA patients we originally identified was reduced to 84 patients.

We combined the 84 patients with the 112 patients identified by the VAHCS and medical centers. Because these two groups contained 71 patients in common, the combined group consisted of 125 unique patients. We reviewed the medical care of these 125 patients. An additional 13 patients were excluded from the combined group: 8 patients were excluded because they were not diagnosed with LD in FY12; 1 was excluded because his/her LD test was a false positive result; 1 had completed treatment for LD at a non-VA hospital and was transferred to the VA for management of a pressure ulcer; 3 were treated as outpatients only and therefore excluded. The remaining 112 patients[50] received treatment for LD as inpatients at VA hospitals.

The vast majority of the 112 patients presented to VA hospitals with signs and symptoms of pneumonia and according to facility responses to our questionnaire, did not acquire it as a result of their VHA hospitalization, i.e., the pneumonia was community-acquired pneumonia (108), not hospital-acquired (4).

We noted that in most cases, clinicians ordered empiric antibiotics effective for treating *Legionella* prior to learning the results of clinical laboratory testing. In only 5 cases did we find that patients were not on antibiotics effective against *Legionella* prior to their diagnosis. In the other 107 cases, either patients were on antibiotics for LD prior to their diagnosis or had been diagnosed prior to admission and were on appropriate antibiotics at the time of admission or transfer. We found that antibiotics were adjusted after confirmation of the diagnosis to optimize treatment.

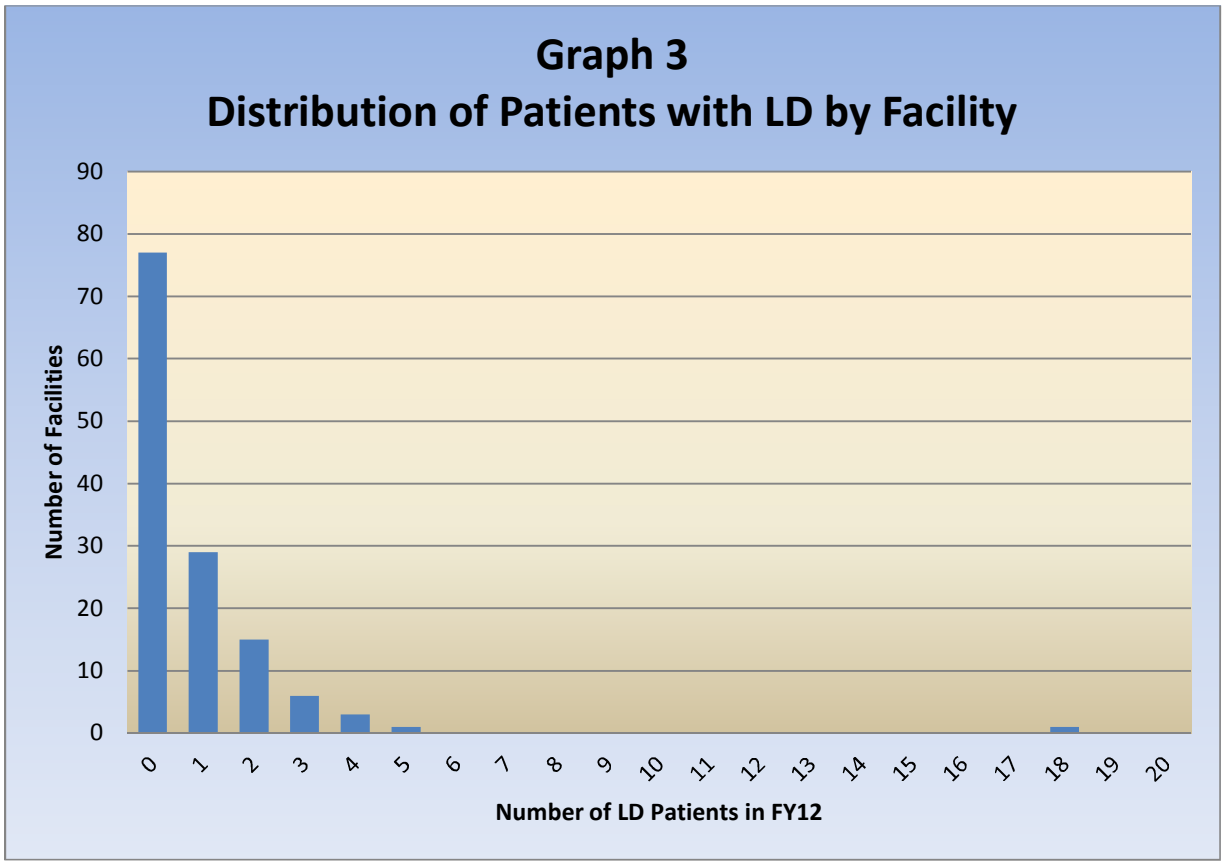
We also observed that in our cohort of 112 patients, only two had undergone transplants while 25 were either on immunosuppressive medications or immunosuppressed by end-stage cancer or HIV with abnormal CD4 counts.

Five of the 112 patients reviewed expired within 30 days of the LD diagnosis. Besides the LD diagnosis, each patient had multiple chronic diseases which likely decreased resistance to LD. Two had metastatic lung cancer; one had a spinal cord injury, a severe blood clotting disorder amputation of two limbs, chronic obstructive pulmonary disease, and a recent history of smoking; another was a 78 year old with chronic

[49] These patients had a past history for LD or were suspected of having LD but had testing that did not confirm the diagnosis.
[50] Coincidentally, the number of patients in the final list was identical to the number of patients identified by the facilities, but the patients were not the same.

obstructive pulmonary disease and chronic kidney disease; and the last one had insulin dependent diabetes and chronic kidney disease.

We used ICD-9-CM codes specific for bacterial pneumonia to determine that 8,024 veterans were admitted to a VA hospital with bacterial pneumonia in FY12. However, other codes may be assigned that do not specifically identify the cause of the pneumonia. These non-specific codes could include large numbers of patients with bacterial pneumonias. Using both the specific and non-specific codes for bacterial pneumonia, we found that 36, 242 patients with any type of bacterial pneumonia were admitted to VA hospitals in FY12.[51] The 112 inpatients with confirmed LD, the majority of which were community-acquired, represent a small portion of inpatients diagnosed with bacterial pneumonia in FY12. The distribution of patients with LD by facility is illustrated below.



[51] Bacterial pneumonia was defined as having one of the following ICD-9-CM codes: 481, 482.xx, 483.x, 484.3, and 484.5. The following codes are used to classify patients with pneumonia and do not require that the cause of the pneumonia be specified: 484.8, 485, and 486.

Issue 3. Progress in Mitigating Risk of LD in VHA Facilities

The discovery of legionellosis as a disease entity has been relatively recent. Despite advances in our knowledge of the pathogen since its original outbreak in 1976, a single, effective, and proven method of control and eradication of *Legionella* in water distribution systems is not yet available. Rather, attempts to prevent the transmission of LD are currently recommended to occur at as many points as possible along the chain of transmission.[52]

Interference with optimal conditions for *Legionella* growth includes controlling the ranges of water temperature, pH, available LD nutrients, droplet formation, and system cleanliness. Altering the water piping system to remove areas, such as dead legs, where *Legionella* can grow may also reduce risk.

Should *Legionella* thrive despite water control methods, exposure to water containing *Legionella* is not, in itself, enough to cause disease. The *Legionella* species must be one that causes disease and be numerous enough to overwhelm a person's immune system.[53] The risk of developing disease after exposure also depends on the exposed person's health status. According to guidelines co-authored by the Infectious Diseases Society of America and the American Thoracic Society, "Persons with severe immunosuppression from organ transplantation or chronic underlying illnesses (e.g., hematologic malignancy or end-stage renal disease) are at markedly increased risk for legionellosis. Persons with diabetes mellitus, chronic lung disease, or non-hematologic malignancy; those who smoke cigarettes; and the elderly are at moderately increased risk."[54]

Like other healthcare institutions, VHA facilities are sites where persons with lowered immunity come in contact with large, complex water distribution systems. To reduce the risk of transmission of LD to its patients, VHA has issued directives that address control of *Legionella* in its water supply and how to determine whether *Legionella* is present in the water and causing disease. If *Legionella* is identified, VHA allows the facility, with its knowledge of the local water supply, patients, and other unique circumstances, to devise and implement an Action Plan specific to these factors that will reduce *Legionella* in its water supply.

As IDPO noted in its 2009 evaluation of Directive 2008-010, implementation of the directive has been variable. Our review of facility practices shows a similar variability in compliance with the Prevention of *Legionella* Disease directive. However, the low number of patients with confirmed LD pneumonia in FY12, in relation to the number of

[52] ASHRAE Technology Council. *Position Document on Legionellosis*. Approved, June 25, 1998; Reaffirmed January 25, 2012.
[53] ASHRAE Technology Council. *Position Document on Legionellosis*. Approved, June 25, 1998; Reaffirmed January 25, 2012.
[54] Lionel A. Mandell, Richard G. Wunderink, Antonio Anzueto, John G. Bartlett,G. Douglas Campbell, Nathan C. Dean,Scott F. Dowell, Thomas M. File, Jr. Daniel M. Musher, Michael S. Niederman,Antonio Torres, and Cynthia G. Whitney. Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults. Clinical Infectious Diseases 2007; 44:S27–72.

patients admitted to VHA facilities with bacterial pneumonia, suggests an overall low risk of contracting or dying from LD in a VHA facility.

CDC last published guidelines addressing LD in 2003.[55] No large-scale studies researching the effectiveness of different control methods have produced results that warrant revision of current guidelines.

Conclusions

VHA has issued two directives: Prevention of *Legionella* Disease (2008-010) and Domestic Hot Water Temperature Limits for *Legionella* Prevention and Scald Control (2009-090). When a 2009 evaluation of VHA Directive 2008-010 revealed variability with its implementation, additional guidance was disseminated in the form of an information sheet that provided clarification of specific problem areas. Our review of facility practices showed a similar variability in compliance with the Prevention of *Legionella* Disease directive.

We found that facilities did not consistently document their annual evaluation for risk related to LD; conduct a risk assessment appropriate to their status; evaluate proper functioning of municipal monochloramine treatment on a routine basis; and/or accurately document LD testing results to the ICC or equivalent. During the course of our review, we learned that VHA is currently revising Directive 2008-010 and Directive 2009-009.

In the records reviewed for this study, we found a much larger number of immunosuppressed patients unrelated to transplantation than in patients who had undergone organ transplantation. While we did not have data to calculate the relative risk for transplant patients versus those with reduced immune function, the large number of immunosuppressed individuals among those treated for LD suggests that, although VHA prevention measures would not prevent community-acquired cases, VHA should examine risk factors other than transplant status when revising the current Directives. Immunosuppression is only one of several conditions that place patients at increased risk for contracting *Legionella,* so an alternative risk stratification methodology may be more effective in preventing *Legionella*.

We considered the lack of documentation in the submitted ICC meeting minutes to be an indicator of a low level of interdepartmental communication regarding test results and the risk of LD at the local facility. We found little evidence of collaborative decision-making among the different departments. Because management of *Legionella* and other waterborne diseases requires an interdisciplinary effort among clinicians, laboratory personnel, engineers, and others, a committee that provides structure for these interactions would allow improved communication among the different

[55] Sehulster LM, Chinn RYW. Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR. June, 6, 2003.

departments. A national-level committee would be able to provide overarching assistance for setting policy and offer expert assistance to local facilities when issues related to waterborne diseases arise.

Recommendations

1. We recommended that the Under Secretary for Health address the reported compliance issues when revising the current Prevention of *Legionella* Disease directive.

2. We recommended that the Under Secretary for Health provide a plan that simplifies implementation of the directive, and that provides guidance, education, and monitoring of the implementation of the revised Prevention of *Legionella* Disease directive when issued.

3. We recommended that the Under Secretary for Health consider re-evaluation of the current stratification plan that identifies risk of Legionnaires' disease based on transplant status.

4. We recommended that the Under Secretary for Health institute a national-level water safety committee that will provide expert and technical assistance for collaborative decision-making at the local level in the control and prevention of waterborne disease.

Appendix A

Under Secretary for Health Comments

Department of Veterans Affairs **Memorandum**

Date: July 22, 2013

From: Under Secretary for Health (10)

Subject: OIG Healthcare Inspection Draft Report, Prevention of Legionnaires' Disease in VHA Facilities (Project No. 2013-01189-HI-0362) (VAIG7376736)

To: Assistant Inspector General for Healthcare Inspections (54)

1. I have reviewed the draft report and concur with the report's recommendations. Attached is the Veterans Health Administration's corrective action plan for the report's recommendations.

2. Thank you for the opportunity to review the draft report. If you have any questions, please contact Karen Rasmussen, Acting Director, Management Review Service (10AR) at (202) 462-6643.

//original signed//

Robert A. Petzel, M.D.

Attachment

Under Secretary for Health Comments to Office of Inspector General's Report

The following comments are submitted in response to the recommendations in the Office of Inspector General's report:

OIG Recommendations

Recommendation 1. We recommended that the Under Secretary for Health address the reported compliance issues when revising the current Prevention of *Legionella* Disease directive.

Concur

Target date for completion: June 27, 2014

Facility response: VHA concurs with revising the current policy on Prevention of *Legionella* Disease to address the reported compliance issues. Currently, the Director of VHA National Infectious Diseases Service (NIDS) and the Deputy Director of VHA Office of Capital Asset Management, Engineering, and Support (OCAMES) are co-chairing a multidisciplinary *Legionella* Expert Work Group. Membership consists of representatives from infectious diseases, infection prevention and control, healthcare engineering, construction and facilities management, public health, occupational safety and health, pathology and laboratory medicine, the Office of the Medical Inspector, and medical center leadership. This workgroup is currently reviewing VHA's *Legionella* prevention policies, scientific literature, and clinical evidence to inform new policy development or revisions to current policy. This workgroup will consider policy standards for addressing reported compliance issues when proposing revisions to current policy or as part of new policy, whichever is more appropriate.

Completion of this action will be when the draft revised policy is submitted to the Office of Regulatory and Administrative Affairs (10B4), at which time the draft document will have received concurrence by VA Office of General Counsel and the document will undergo final formatting in preparation for concurrence by the Under Secretary for Health.

Recommendation 2. We recommended that the Under Secretary for Health provide a plan that simplifies implementation of the directive, and that provides guidance, education, and monitoring of the implementation of the revised Prevention of *Legionella* Disease directive when issued.

Concur

Target date for completion: June 27, 2014

Facility response: VHA concurs with providing an implementation plan for revised policy that will simplify implementation of the directive, provide guidance and education, and monitoring for implementation of the revised Prevention of *Legionella* Disease directive once published.

The National Infectious Diseases Service (NIDS) submitted educational requests for two meetings to discuss the revised Prevention of *Legionella* Disease directive.

- The **"Water Safety in Healthcare"** workshop serves as the national kickoff for a focused effort in VHA to prioritize water safety in the healthcare setting.
- The **"Implementation of Updated Prevention of Legionella Directive"** train-the-trainer workshop provides implementation strategies for the Directive. Workshop participants will work on creating local plans in accordance with the revised directive for *Legionella* risk analysis, building water distribution assessment, and engineering controls for the prevention of healthcare-associated Legionnaires' disease.
- The request for approval of the **"Water Safety in Healthcare"** workshop and the **"Implementation of Updated Prevention of Legionella Directive"** train-the-trainer workshop are pending. If approved in Fiscal Year 2013, VHA expects to conduct the workshops during Fiscal Year 2014.

Additional educational efforts include teleconferences with the Networks and VHA Medical Centers to provide education and guidance on the revised *Legionella* prevention policy.

In order to monitor implementation with, and provide guidance and education on, the revised Prevention of *Legionella* Disease directive, NIDS and OCAMES will be working together to establish a VHA Central Office Water Safety Work Group. See response to Recommendation 4 for additional information.

Completion of this action plan will be:

- documentation of either VHA approval or refusal of one or both of the proposed workshops; and
- evidence that teleconferences with Networks and Medical Centers have been conducted; and
- minutes from VHA Central Office Water Safety Work Group meetings or evidence of outcomes related to this work group's collaborative efforts related to monitoring implementation, and providing guidance and education on the revised directive
- The implementation plan containing elements established in the recommendation.

Recommendation 3. We recommended that the Under Secretary for Health consider re-evaluation of the current stratification plan that identifies risk of Legionnaires' disease based on transplant status.

Concur

Target date for completion: November 31, 2013

Facility response: VHA concurs with re-evaluating current algorithms defined in VHA Directive 2008-010 that stratify risk of Legionnaires' disease (LD) based on transplant status.

Risk stratification algorithms in current VHA policy were based on assumptions and recommendations in the Department of Veterans Affairs Office of Inspector General (OIG) 2007 Report, "Assessment of Legionnaire's Disease Risk in Veterans Health Administration Facilities" (Report No. 07-00029-151). The Report stratified transplant centers with no explicit LD prevention plan in place as being higher risk; OIG recommended written plans at such facilities. This risk stratification aligns with CDC's 2003 guidance on prevention of healthcare-associated LD. CDC's guidance differentiates prevention measures for facilities that perform hematopoietic stem-cell and/or solid organ transplants from those facilities that do not. Accordingly, VHA Directive 2008-010 used transplant center status (or facilities managed a number of patients in the post-transplant surgery period) as a main factor in risk stratification. Notably, CDC has not updated its guidelines for prevention of healthcare-associated pneumonia since 2003.

The *Legionella* Expert Work Group (refer to Recommendation 1) is currently reviewing VHA's *Legionella* prevention policies, scientific literature, and clinical evidence to inform new policy development or revisions to current policy. This workgroup will consider re-evaluation of the current stratification plan that identifies risk of LD based on transplant status.

Completion of this action will be when the *Legionella* Expert Work Group provides recommendations regarding re-evaluation of the risk stratification algorithms to the policy drafting group or the Deputy Under Secretary for Health for Policy and Services (10P4).

Recommendation 4. We recommended that the Under Secretary for Health institute a national-level water safety committee that will provide expert and technical assistance for collaborative decision-making at the local level in the control and prevention of waterborne disease.

Concur

Target date for completion: June 27, 2014

Facility response: VHA concurs that a VHA Central Office Water Safety Work Group (termed "committee" in the recommendation) be established to provide expert and technical assistance to VHA Medical Centers for the control and prevention of waterborne diseases.

The Director, VHA National Infectious Diseases Service (NIDS) and the Deputy Director, VHA Office of Capital Asset Management, Engineering, and Support (OCAMES) currently chair a *Legionella* Expert Work Group (refer to recommendation 1). Over the past several months, NIDS and OCAMES have established a collaborative working relationship with respect to *Legionella* prevention and control. The Water Safety Work Group will provide expert and technical assistance for collaborative decision-making at the local level in the control and prevention of waterborne disease.

This action plan is complete upon documentation of the following:

1. The approved and signed charge for the central office Water Safety Work Group; and
2. Minutes from at least three meetings where the Water Safety Work Group has addressed the elements of this recommendation.

APPENDIX B: Table and Graph Data

Table 1: Facilities with a History of Epidemiologically-Linked HCA LD [56]

Compliant with Directive Guidance for Environmental/Clinical Testing Related to FY12 Action Plans

Aleda E. Lutz VAMC, Saginaw, MI
Albany VAMC
Bay Pines VA HCS
VA Greater Los Angeles HCS
VA Maine Healthcare System
VA Salt Lake City HCS
VA Western New York HCS, Buffalo, NY

Non-Compliant with Directive Guidance for Environmental/Clinical Testing Related to FY12 Action Plans

Canandaigua VAMC
Central Texas Veterans HCS, Olin E Teague Veterans' Center, Temple, TX
Sioux Falls VAMC,
VA Palo Alto HCS, Menlo Park, CA
VA Palo Alto HCS, Palo Alto, CA
VA Pittsburgh HCS, H. John Heinz III Progressive Care Center, Pittsburgh, PA
VA Pittsburgh HCS, Highland Drive Division, Pittsburgh, PA
VA Pittsburgh HCS, University Drive Division, Pittsburgh, PA
VA Puget Sound HCS

Table 2. Transplant/Immediate Post-Transplant Facilities without a History of Epidemiologically-Linked HCA LD

Compliant with Directive when FY12 Risk Assessment Conducted

G.V. (Sonny) Montgomery VAMC, Jackson, MS
Louis Stokes VAMC, Cleveland, OH
Minneapolis VAMC
Portland VAMC, Vancouver, WA
Robert J. Dole VA Medical and Regional Office Center, Wichita, KS
South Texas Veterans HCS, San Antonio, TX
Tennessee Valley HCS, Alvin C. York, Murfreesboro, TN
Tennessee Valley HCS, Nashville, TN

[56] Facilities appearing more than once had to submit separate plans per Directive 2008-010.

VA Connecticut HCS, West Haven Campus, West Haven, CT
VA Loma Linda HCS, Loma Linda, CA
VA Palo Alto HCS, Livermore, CA
William S. Middleton Memorial Veterans Hospital, Madison, WI

Non-compliant with Directive when FY12 Risk Assessment Conducted

Asheville VAMC
Birmingham VAMC
Hunter Holmes McGuire VAMC, Richmond, VA
Iowa City VAMC
Memphis VAMC
Michael E. DeBakey VAMC, Houston, TX
Portland VAMC, Portland, OR
St. Louis VAMC, John Cochran Division

Table 3. Acute Care Facilities and CLCs without Monochloramine and without a History of Epidemiologically-Linked HCA LD

Compliant with Directive when FY12 Risk Assessment Conducted

Alexandria VAMC, Pineville, LA
Amarillo VA HCS
Baltimore VA Rehabilitation and Extended Care Center
Bath VAMC (CLC)
Captain James A. Lovell Federal Health Care Center, North Chicago, IL[57]
Captain James A. Lovell Federal Health Care Center, North Chicago, IL
Captain James A. Lovell Federal Health Care Center, North Chicago, IL
Captain James A. Lovell Federal Health Care Center, North Chicago, IL
Central Alabama Veterans HCS, East Campus, Tuskegee, AL
Cheyenne VA Medical
Chillicothe VAMC
Cincinnati VAMC (Acute Care)
Cincinnati VAMC (CLC)
Coatesville VAMC
Dayton VAMC (Acute Care)
Dayton VAMC (CLC)
Edward Hines Jr. VA Hospital (Acute Care)
Edward Hines Jr. VA Hospital (CLC)

[57] See footnote 56.

Erie VAMC
Huntington VAMC
Jack C. Montgomery VAMC, Muskogee, OK
James J. Peters VAMC, Bronx, NY
Jesse Brown VAMC
John D. Dingell VAMC, Detroit, MI
Kerrville VAMC
Martinsburg VAMC
Mountain Home VAMC (Acute Care)
Mountain Home VAMC, Mountain Home (CLC)
New Mexico VA HCS
Northern Arizona VA HCS, Prescott, AZ
Northport VAMC
Orlando VAMC
Oscar G. Johnson VAMC, Iron Mountain, MI
Phoenix VA HCS
Sheridan VAMC
Syracuse VAMC
Tomah VAMC (Acute Care)
Tomah VAMC (CLC)
Tuscaloosa VAMC
VA Boston HCS, Brockton Campus
VA Central Western Massachusetts Healthcare System, Leeds, MA
VA Greater Los Angeles HCS
VA Greater Los Angeles HCS
VA Gulf Coast Veterans HCS, Biloxi, MS
VA Hudson Valley HCS, Castle Point Campus, Castle Point, NY
VA Hudson Valley HCS, Franklin Delano Roosevelt, Montrose, NY
VA Maryland HCS, Baltimore, MD
VA Maryland HCS, Perry Point VAMC, Perry Point, MD
VA Northern California HCS, Mather, CA
VA Northern Indiana HCS, Marion, IN
VA NY Harbor HCS, Brooklyn Campus
VA NY Harbor HCS, Manhattan Campus
VA NY Harbor HCS, St. Albans Community Living Center, Jamaica, NY
VA Roseburg HCS (Acute Care)
VA Roseburg HCS (CLC)
VA Western New York HCS, Batavia, NY
Veterans HCS of the Ozarks, Fayetteville, AR
W.G. (Bill) Hefner VAMC, Salisbury, NC

West Palm Beach VAMC
West Texas VA HCS, Big Spring, TX
Wilkes-Barre VAMC
Wilmington VAMC

Non-compliant with Directive when FY12 Risk Assessment Conducted

Asheville VAMC
Atlanta VAMC
Bath VAMC (Acute Care)
Battle Creek VAMC, Battle Creek, MI
Beckley VAMC
Boise VAMC
C. Arkansas Veterans HCS, Eugene J. Towbin Healthcare Ctr., N. Little Rock, AR
C. Arkansas Veterans HCS, John L. McClellan Memorial Veterans Hospital, Little Rock, AR
Carl Vinson VAMC, Dublin, GA
Central Alabama Veterans HCS, West Campus, Montgomery, AL
Charlie Norwood VAMC, Augusta, GA
Charlie Norwood VAMC, Uptown Division, Augusta, GA
John J. Pershing VAMC, Poplar Bluff, MO
Louis A. Johnson VAMC, Clarksburg, WV
Providence VAMC
Southern Arizona VA HCS, Tucson, AZ
Spokane VAMC
VA Black Hills HCS - Hot Springs Campus, Hot Springs, SD
VA Black Hills HCS - Fort Meade Campus, Fort Meade, SD
VA Central California HCS, Fresno, CA (Acute Care)
VA Central California HCS, Fresno, CA (CLC)
VA Central Iowa HCS (Acute Care)
VA Central Iowa HCS (CLC)
VA Montana HCS, Fort Harrison, MT
VA Montana HCS, Miles City, MT
VA New Jersey HCS, East Orange Campus
VA Sierra Nevada HCS
Washington DC VAMC
West Palm Beach VAMC
White River Junction VAMC

Graph 1: Legionella Urinary Antigen Testing in FY12 Reported By Medical Centers and Health Care Systems

Medical Centers and Health Care Systems Performing No Legionella Urinary Antigen Testing

Central Alabama Veterans HCS
John J. Pershing VAMC
Manchester VAMC
San Francisco VAMC
Sheridan VAMC
St. Cloud VAMC
VA Central Western Massachusetts Healthcare System
West Texas VA HCS

Medical Centers and Health Care Systems Performing 1 - 100 Legionella Urinary Antigen Tests

Aleda E. Lutz VAMC
Alexandria VAMC
Amarillo VA HCS
Asheville VAMC
Atlanta VAMC
Bath VAMC
Battle Creek VAMC
Bay Pines VA HCS
Beckley VAMC
Birmingham VAMC
Butler VAMC
Canandaigua VAMC
Captain James A. Lovell Federal Health Care Center
Carl Vinson VAMC
Charlie Norwood VAMC
Cheyenne VA Medical
Chillicothe VAMC
Clement J. Zablocki VAMC
Coatesville VAMC
Dayton VAMC
Edith Nourse Rogers Memorial Veterans Hospital
Erie VAMC
Fargo VAMC
Fayetteville VAMC
G.V. (Sonny) Montgomery VAMC
Grand Junction VAMC
Hampton VAMC
Hunter Holmes McGuire VAMC

Huntington VAMC
Jack C. Montgomery VAMC
James E. Van Zandt VAMC
Kansas City VAMC
Lebanon VAMC
Louis A. Johnson VAMC
Marion VAMC
Martinsburg VAMC
New Mexico VA HCS
Northern Arizona VA HCS
Orlando VAMC
Oscar G. Johnson VAMC
Overton Brooks VAMC
Philadelphia VAMC
Phoenix VA HCS
Ralph H. Johnson VAMC
Robert J. Dole VA Medical and Regional Office Center
Salem VAMC
Southern Arizona VA HCS
Spokane VAMC
St. Louis VAMC
Syracuse VAMC
Tennessee Valley HCS
Tomah VAMC
Tuscaloosa VAMC
VA Black Hills HCS
VA Caribbean HCS
VA Eastern Colorado HCS
VA Eastern Kansas HCS, Colmery-O'Neil VAMC
VA Greater Los Angeles HCS
VA Gulf Coast Veterans HCS
VA Hudson Valley HCS
VA Loma Linda HCS
VA Maine Healthcare System - Togus VAMC
VA Montana HCS
VA Nebraska Western Iowa HCS
VA North Texas HCS
VA Northern California HCS
VA Northern Indiana HCS
VA Pacific Islands HCS
VA Roseburg HCS
VA Sierra Nevada HCS
Veterans HCS of the Ozarks

W.G. (Bill) Hefner VAMC
West Palm Beach VAMC
White River Junction VAMC
Wilkes-Barre VAMC
Wilmington VAMC
Wm. Jennings Bryan Dorn VAMC

Medical Centers and Health Care Systems Performing 101-200 Legionella Urinary Antigen Tests

Cincinnati VAMC
Edward Hines Jr. VA Hospital
Harry S. Truman Memorial
Iowa City VAMC
James J. Peters VAMC
Jesse Brown VAMC
John D. Dingell VAMC
Lexington VAMC
Miami VA HCS
NF/SGVHS, Malcom Randall VAMC
Providence VAMC
VA Ann Arbor HCS
VA Boston HCS
VA Central California HCS
VA Connecticut HCS
VA Long Beach HCS
VA Maryland HCS
VA Palo Alto HCS
VA Puget Sound HCS
VA San Diego HCS

Medical Centers and Health Care Systems Performing 201-300 Legionella Urinary Antigen Tests

Albany VAMC, Samuel S. Stratton
Boise VAMC
Louis Stokes VAMC
Memphis VAMC
Minneapolis VAMC
Northport VAMC
Oklahoma City VAMC
Portland VAMC
Richard L. Roudebush VAMC

Sioux Falls VAMC
South Texas Veterans HCS
VA Central Iowa HCS
VA Illiana HCS
VA New Jersey HCS
VA NY Harbor HCS
VA Salt Lake City HCS
Washington DC VAMC
William S. Middleton Memorial Veterans Hospital

Medical Centers and Health Care Systems Performing 301 - 400 Legionella Urinary Antigen Tests

C. Arkansas Veterans HCS, John L. McClellan Memorial Veterans Hospital
Central Texas Veterans HCS, Olin E Teague Veterans' Center
Durham VAMC

Medical Centers and Health Care Systems Performing 401 - 500 Legionella Urinary Antigen Tests

Mountain Home VAMC

Medical Centers and Health Care Systems Performing 501 - 600 Legionella Urinary Antigen Tests

Louisville VAMC
VA Western New York HCS

Medical Centers and Health Care Systems Performing 601 - 700 Legionella Urinary Antigen Tests

Michael E. DeBakey VAMC

Medical Centers and Health Care Systems Performing 801 - 900 Legionella Urinary Antigen Tests

James A. Haley Veterans' Hospital

Medical Centers and Health Care Systems Performing 1201 - 1300 Legionella Urinary Antigen Tests

VA Pittsburgh HCS

Graph 2: Respiratory Clinical Culture in FY 12 Reported By Medical Center and Health Care System

Medical Centers and Health Care Systems that Performed No Respiratory Clinical Cultures for LD

Aleda E. Lutz VAMC
Amarillo VA HCS
Atlanta VAMC
Bath VAMC
Bay Pines VA HCS
Beckley VAMC
Boise VAMC
Butler VAMC
C. Arkansas Veterans HCS, John L. McClellan Memorial Veterans Hospital
Canandaigua VAMC
Captain James A. Lovell Federal Health Care Center
Carl Vinson VAMC
Central Alabama Veterans HCS
Central Texas Veterans HCS, Olin E Teague Veterans' Center
Charlie Norwood VAMC
Cheyenne VA Medical
Chillicothe VAMC
Coatesville VAMC
Dayton VAMC
Fargo VAMC
Fayetteville VAMC
G.V. (Sonny) Montgomery VAMC
Grand Junction VAMC
Hampton VAMC
Hunter Holmes McGuire VAMC
Iowa City VAMC
Jack C. Montgomery VAMC
James E. Van Zandt VAMC
James J. Peters VAMC
John J. Pershing VAMC
Lebanon VAMC
Louis A. Johnson VAMC
Louis Stokes VAMC
Louisville VAMC
Manchester VAMC
Marion VAMC
Martinsburg VAMC

Miami VA HCS
Michael E. DeBakey VAMC
New Mexico VA HCS
Northern Arizona VA HCS
Northport VAMC
Orlando VAMC
Overton Brooks VAMC
Philadelphia VAMC
Richard L. Roudebush VAMC
Robert J. Dole VA Medical and Regional Office Center
San Francisco VAMC
Sheridan VAMC
Spokane VAMC
St. Cloud VAMC
Tennessee Valley HCS
Tomah VAMC
Tuscaloosa VAMC
VA Ann Arbor HCS
VA Black Hills HCS
VA Boston HCS
VA Central California HCS
VA Central Iowa HCS
VA Central Western Massachusetts Healthcare System
VA Eastern Colorado HCS
VA Eastern Kansas HCS, Colmery-O'Neil VAMC
VA Greater Los Angeles HCS
VA Gulf Coast Veterans HCS
VA Hudson Valley HCS
VA Illiana HCS
VA Loma Linda HCS
VA Maine Healthcare System - Togus VAMC
VA Montana HCS
VA New Jersey HCS
VA North Texas HCS
VA Northern California HCS
VA Northern Indiana HCS
VA NY Harbor HCS
VA Pacific Islands HCS
VA Roseburg HCS
VA Sierra Nevada HCS
W.G. (Bill) Hefner VAMC
Washington DC VAMC
West Texas VA HCS

Wilkes-Barre VAMC

Medical Centers and Health Care Systems that Performed 1 - 100 Respiratory Clinical Cultures for LD

Albany VAMC, Samuel S. Stratton
Alexandria VAMC
Asheville VAMC
Battle Creek VAMC
Birmingham VAMC
Cincinnati VAMC
Clement J. Zablocki VAMC
Durham VAMC
Edith Nourse Rogers Memorial Veterans Hospital
Edward Hines Jr. VA Hospital
Erie VAMC
Harry S. Truman Memorial
Huntington VAMC
James A. Haley Veterans' Hospital
Jesse Brown VAMC
John D. Dingell VAMC
Kansas City VAMC
Lexington VAMC
Memphis VAMC
Minneapolis VAMC
Mountain Home VAMC
NF/SGVHS, Malcom Randall VAMC
Oklahoma City VAMC
Oscar G. Johnson VAMC
Phoenix VA HCS
Portland VAMC
Providence VAMC
Ralph H. Johnson VAMC
Salem VAMC
Sioux Falls VAMC
South Texas Veterans HCS
Syracuse VAMC
VA Caribbean HCS
VA Connecticut HCS
VA Long Beach HCS
VA Maryland HCS
VA Nebraska Western Iowa HCS
VA Palo Alto HCS
VA Salt Lake City HCS

VA San Diego HCS
VA Western New York HCS
Veterans HCS of the Ozarks
West Palm Beach VAMC
White River Junction VAMC
Wilmington VAMC
Wm. Jennings Bryan Dorn VAMC

Medical Centers and Health Care Systems that Performed 101 - 200 Respiratory Clinical Cultures for LD

VA Puget Sound HCS
William S. Middleton Memorial Veterans Hospital

Medical Centers and Health Care Systems that Performed 501 - 600 Respiratory Clinical Cultures for LD

St. Louis VAMC

Medical Centers and Health Care Systems that Performed 601 - 700 Respiratory Clinical Cultures for LD

Southern Arizona VA HCS

Medical Centers and Health Care Systems that Performed 901 - 1000 Respiratory Clinical Cultures for LD

VA Pittsburgh HCS

Graph 3: Medical Centers and Health Care Systems With Patients Diagnosed with LD in FY12

Medical Centers and Health Care Systems With One Patient Diagnosed with LD

Atlanta VAMC
Bay Pines VA HCS
Boise VAMC
Charlie Norwood VAMC, Augusta, GA
Cincinnati VAMC
Huntington VAMC
James E. Van Zandt VAMC, Altoona, PA
Jesse Brown VAMC

Kansas City VAMC
Lexington VAMC, Cooper Drive Division, Lexington, KY
Louis A. Johnson VAMC, Clarksburg, WV
Louisville VAMC
Martinsburg VAMC
Memphis VAMC
New Mexico VA HCS
NF/SGVHS, Malcom Randall VAMC, Gainesville, FL
Oklahoma City VAMC
Phoenix VA HCS
South Texas Veterans HCS, San Antonio, TX
VA Ann Arbor HCS
VA Eastern Colorado HCS, Denver, CO
VA Hudson Valley HCS, Castle Point Campus, Castle Point, NY
VA Nebraska Western Iowa HCS, Omaha, NE
VA North Texas HCS, Dallas, TX
VA Roseburg HCS, Roseburg, OR
VA Salt Lake City HCS, Salt Lake City, UT
VA Western New York HCS, Buffalo, NY
William S. Middleton Memorial Veterans Hospital, Madison, WI
Wm. Jennings Bryan Dorn VAMC, Columbia, SC

Medical Centers and Health Care Systems With Two Patients Diagnosed with LD

Asheville VAMC
Central Texas Veterans HCS, Olin E Teague Veterans' Center, Temple, TX
Clement J. Zablocki VAMC, Milwaukee, WI
Durham VAMC
Hunter Holmes McGuire VAMC, Richmond, VA
Jack C. Montgomery VAMC, Muskogee, OK
James J. Peters VAMC, Bronx, NY
Lebanon VAMC
Mountain Home VAMC
VA Boston HCS, West Roxbury Campus
VA Central California HCS, Fresno, CA
VA Connecticut HCS, West Haven Campus
VA Gulf Coast Veterans HCS, Biloxi, MS
VA Northern California HCS, Mather, CA
West Palm Beach VAMC

Medical Centers and Health Care Systems With Three Patients Diagnosed with LD

Edward Hines Jr. VA Hospital,

Louis Stokes VAMC, Cleveland, OH
Tennessee Valley HCS, Nashville, TN
VA Maryland HCS
VA San Diego HCS
Wilmington VAMC

Medical Centers and Health Care Systems With Four Patients Diagnosed with LD

John D. Dingell VAMC, Detroit, MI
Minneapolis VAMC
VA NY Harbor HCS, New York, NY

Medical Centers and Health Care Systems With Five Patients Diagnosed with LD

Washington DC VAMC

Medical Centers and Health Care Systems With Eighteen Patients Diagnosed with LD

VA Pittsburgh HCS

Appendix C

OIG Contact and Staff Acknowledgments

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Appendix D

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House Committee on Oversight and Government Reform
National Veterans Service Organizations
Government Accountability Office
Office of Management and Budget

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