Department of Veterans Affairs
Office of Inspector General

Assessment of Legionnaire's Disease Risk in Veterans Health Administration Inpatient Facilities

Report No. 07-00029-151 **June 20, 2007**

VA Office of Inspector General
Washington, DC 20420

To Report Suspected Wrongdoing in VA Programs and Operations
Call the OIG Hotline – (800) 488-8244

Executive Summary

The Veterans Health Administration (VHA) has taken a number of steps to reduce the risk of Legionnaire's Disease (LD) in its hospitals, but little information is available regarding current environmental conditions, prevention strategies, and clinical practices in hospitals across the VA system. The Office of Inspector General, Office of Healthcare Inspections, therefore conducted a survey of VHA's inpatient facilities to characterize risks to patients at individual facilities and suggest where prevention strategies might best be focused.

We obtained detailed information from 159 acute-care and extended-care inpatient facilities. Nine facilities reported being a site for bone marrow or solid organ transplantation, and five of these had no explicit plan for LD prevention. One hundred and forty-five of the facilities reported obtaining water from municipal sources, 30 of which use disinfection systems believed to confer decreased risk of LD. Twenty-five facilities reported that they conduct routine periodic environmental surveillance and 12 have specific disinfection systems in place. Eighteen acute-care facilities reported no recent diagnostic testing of patients and could be categorized as being at relatively increased risk. We concluded that a prioritized approach to amelioration of LD risk at a system level is possible.

We recommended that the Under Secretary for Health take the required actions to ensure that inpatient facilities where transplants are performed have a written plan which addresses the prevention of Legionnaire's Disease and that all inpatient facilities periodically assess local risk for Legionnaire's Disease using specific guidelines developed by VHA experts.

DEPARTMENT OF VETERANS AFFAIRS
Office of Inspector General
Washington, DC 20420

TO: Under Secretary for Health, Department of Veterans Affairs (10)

SUBJECT: Assessment of Legionnaire's Disease Risk in Veterans Health Administration Inpatient Facilities

Introduction

Purpose

The Veterans Health Administration (VHA) has taken a number of steps to reduce the risk of Legionnaire's Disease (LD) in its hospitals, achieving a significant decline in cases between fiscal years (FY) 1992 and 1999.[1] However, little information is available regarding current environmental conditions, prevention strategies, and clinical practices in hospitals across the VA system. Because the degree of risk to patients may vary considerably, the Office of Inspector General (OIG), Office of Healthcare Inspections (OHI), conducted a survey of inpatient facilities. The purposes of this review were to characterize risks to patients at individual facilities and suggest where prevention strategies might best be focused.

Background

LD has been the subject of numerous media reports since 1976, when it was responsible for 34 deaths among delegates to an American Legion convention in Philadelphia.[2] Because LD is both preventable and treatable and because outbreaks are often described in hospitals and nursing homes, LD is relevant to the VHA and its inpatient facilities.

[1] Kelly AA, Danko LH, Kralovic SM, Simbartl LA, Roselle GA. Legionella in the veterans healthcare system: report of an eight-year survey. *Epidemiol Infect*. 2003;131:835-9.

[2] Stout JE, Yu VL. Legionellosis. *N Engl J Med*. 1997;337:682-687. Examples of recent media attention include reports of an outbreak in a Toronto nursing home (*Washington Post*, October 6, 2005), and reports of several outbreaks in hospitals and nursing homes in New York (*New York Times*, July 19, 2005; Associated Press, August 31, 2006) and in Texas (*San Antonio Express-News*, June 26, 2006).

LD accounts for approximately five percent of community-acquired pneumonia, but is much more frequent in hospitalized patients.[3] Among Intensive Care Unit (ICU) patients with pneumonia, it is second only to *S. pneumoniae* as an etiologic agent. *Legionella*, the genus of the group of organisms which cause LD, colonizes hot water distribution systems in many medical facilities, but it is by no means ubiquitous.[4,5] Factors that enhance colonization include warm temperatures (25–42°C), stagnation, scale and sediment, and the presence of other commensal organisms. VA hospitals where municipal water is treated with monochloramine seem to have a significantly reduced incidence of LD.[6]

For the prevention of hospital-associated LD, routine culturing of the hot water supply has been advocated by investigators in Pittsburgh.[7] However, this approach has not been favored by the Healthcare Infection Control Practices Advisory Committee of the Centers for Disease Control and Prevention, which advocates clinical laboratory surveillance. Routine environmental cultures are considered an "unresolved issue" but are suggested as an option for institutions with transplant programs.[8] Unfortunately, LD is difficult to distinguish from pneumonias of other etiologies[9] and less intensive clinical testing may be appropriate in hospitals with a water supply known to be free of *Legionella*.

If LD prevention is to depend on the identification of cases through clinical testing, medical treatment facilities should be able to demonstrate that clinicians routinely test for LD in patients with pneumonia. In VA hospitals, however, preliminary data suggest a wide range in the use of the most common test for LD (urinary antigen), with numerous facilities testing very infrequently.[10]

Although routine environmental sampling has been adopted in several states,[11] five European countries, and in Taiwan, there is little consensus about the utility of this

[3] Pedro-Botet ML, Yu VL. Epidemiology and pathogenesis of Legionella infection. In: *Up-To-Date*, Rose, BD (Ed), *Up-To-Date*, Waltham, MA, 2004.

[4] Goetz AM, Stout JE, Jacobs SL, Fisher MA, Ponzer RE, Drenning S, Yu VL. Nosocomial Legionnaires' disease discovered in community hospitals following cultures of the water system: seek and ye shall find. *Am J Infect Control.* 1998 Feb;26(1):8-11.

[5] Stout, JE, et al. Endemic Legionellosis uncovered in a prospective study of hospital acquired Legionnaires' disease: value of environmental monitoring. Abstract No. 22187. 31st Annual Meeting of the Association for Professionals in Infection Control, 2004; Phoenix, AZ.

[6] Heffelfinger JD, et al. Risk of hospital-acquired Legionnaire's Disease in cities using monochloramine versus other water disinfectants. *Infect Control Hosp Epidemiol*. 2003;24:569-74.

[7] Yu VL. Resolving the controversy on environmental cultures for *Legionella*: a modest proposal. *Infect Control Hosp Epidemiol*. 1998;19:893-897.

[8] Tabian OC, et al; Healthcare Infection Control Practices Advisory Committee. Guidelines for Preventing Healthcare-Associated Pneumonia, 2003. *MMWR*. 53(RR03):1-36 (March 26, 2004).

9 Edeltsein PH, Cianciotta NP. Legionella. In: Mandell GL, et al., Eds. *Principles and Practice of Infectious Diseases*, 6th Ed. Philadelphia: Elsevier Churchill Livingstone, 2005:2716.

[10] Data on file, Office of Healthcare Inspections, VA Office of Inspector General, 2005.

[11] State of Maryland Department of Health and Mental Hygiene. Report of the Maryland Scientific Working Group to Study Legionella in Water Systems in Healthcare Institutions, June 14, 2000.

approach in general settings in the United States. Much greater agreement exists in favor of sampling in facilities housing severely immunocompromised persons.[12]

For eradication in situations where *Legionella* has been isolated, many approaches have been described, but only copper-silver ionization has been rigorously evaluated.[13] Chlorine dioxide, ultraviolet light, and point-of-use filters also seem to be effective but have not been carefully studied.[14,15] Other methods, particularly super-heating and hyper-chlorination, provide only temporary disinfection, are ineffective, or are associated with health risks and unacceptable corrosive damage to water systems.

Scope and Methodology

Identification of Facilities and Facility Characteristics

We identified inpatient treatment facilities from VHA's Master Treatment File. We incorporated both acute care and extended care facilities (including nursing homes and inpatient rehabilitation facilities), but excluded domiciliaries. For the purpose of this review, geographically discrete facilities were analyzed separately irrespective of administrative designation. For example, an acute care hospital with a nursing home on the same campus was evaluated as a single unit, while facilities in different locations were analyzed separately. Type of care provided by facilities was derived from VHA program officials and gleaned from facility web sites. The number of active operating beds at each facility as of December 31, 2006, was obtained from managers at each of VHA's 21 Veterans Integrated Service Networks. Facility teaching status was based on membership in the Association of American Medical Colleges' Council of Teaching Hospitals and Health Systems (COTH),[16] and characterization as urban or rural was derived from U.S. census data[17] and the VA Office of Policy and Planning.[18]

Survey Design and Administration

After review of the medical literature relevant to prevention of healthcare-associated LD and consultation with experts, we developed an internet-based questionnaire to be completed by facility infection control practitioners, engineers, and laboratory staff. We

[12] Edeltsein PH, Cianciotta NP. Legionella. In: Mandell GL, et al., Eds. *Principles and Practice of Infectious Diseases*, 6th Ed. Philadelphia: Elsevier Churchill Livingstone, 2005:2711-2724.
[13] Stout JE, Yu VL. Experiences of the first 16 hospitals using copper-silver ionization for Legionella control: implications for the evaluation of other disinfection modalities. Infect Control Hosp Epidemiol. 2003;24:563-8.
[14] Craven DE. Progress in the battle against nosocomial Legionnaire's disease: shedding light on shades of gray. *Infect Control Hosp Epidemiol*. 2003;24:560-2.
[15] Sheffer PJ, Stout JE, Wagener MM, Muder RR. Efficacy of new point-of-use water filter for preventing exposure to Legionella and waterborne bacteria. *Am J Infect Control*. 2005 Jun;33(5 Suppl 1):S20-5
[16] http://www.aamc.org/members/coth.
[17] http://factfinder.census.gov. "Download Center," Census Summary File 1, Table P2 (Urban & Rural).
[18] vaww.pssg.med.va.gov. (Note that this is an internal VA website not publicly available.)

modified the questionnaire after discussions with VHA's consultant for Infectious Diseases and pilot testing at two sites.

Risk Stratification

Based on available literature, we made several *a priori* assumptions. We assumed that facilities at highest risk for hospital-acquired LD would be those with transplantation programs but no explicit plan for LD prevention. We also assumed that facilities at lower risk would have one or more of the following characteristics: periodic surveillance cultures of potable water, evidence to suggest routine clinical diagnostic testing, and potable water from a municipal system which employs treatment with monochloramine. Since extended care facilities routinely transfer patients with pneumonia to acute care hospitals, we considered minimal clinical testing to be an indication of increased risk only for acute care facilities.

This review was conducted in accordance with *Quality Standards for Inspections* published by the President's Council on Integrity and Efficiency.

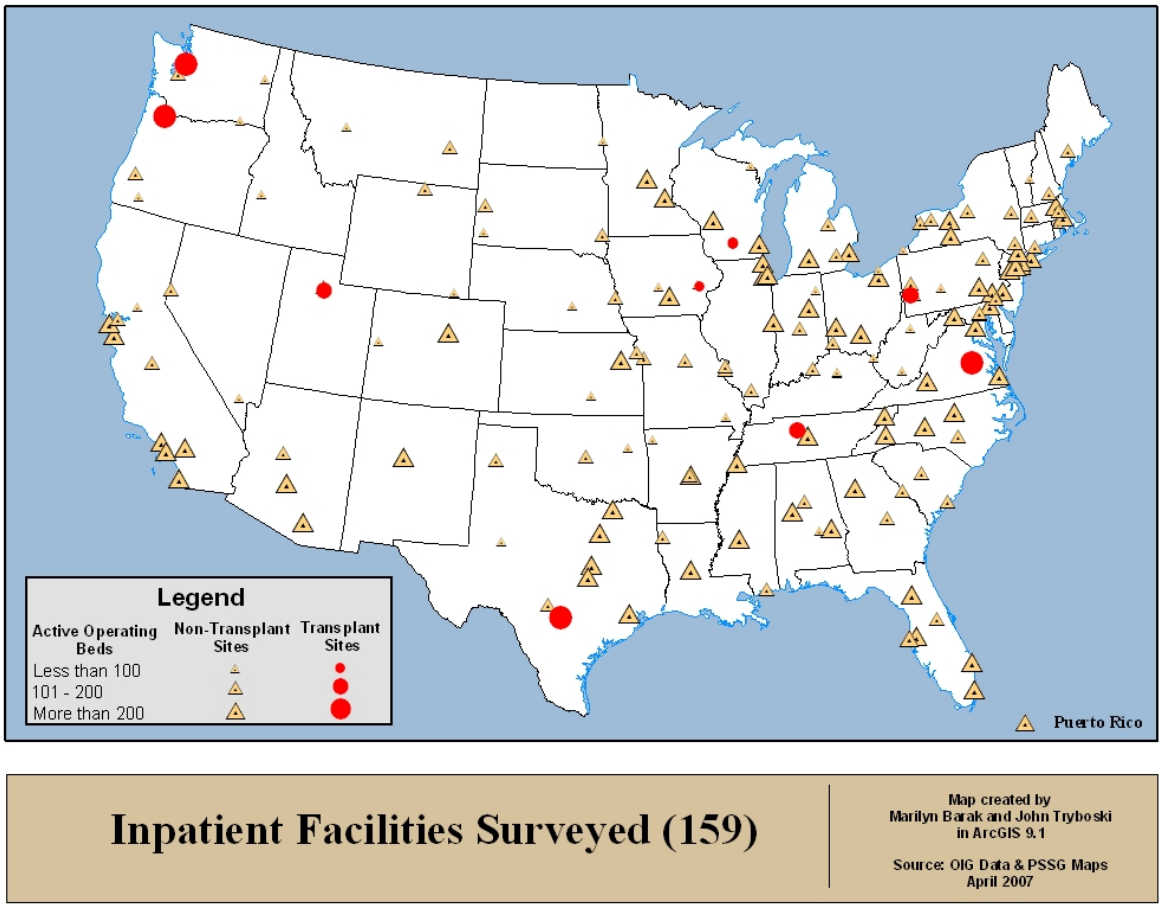
Findings

Responses were received from all facilities from which they were requested. After completion of survey administration, we discovered that several facilities had been inadvertently omitted – one teaching facility with acute and extended care components, and seven extended care facilities. Characteristics of responding facilities are outlined in Table 1.

Facility Characteristics	Number (percent)
Distinct Facilities Surveyed	
Total	159 (100)
Acute Care only	34 (21)
Extended Care only	34 (21)
Acute and Extended care	91 (57)
Number of Active Operating Beds	
<100	33 (21)
100–200	54 (34)
>200	72 (45)
Locale	
Rural	32 (20)
Teaching Status	
Teaching (COTH)	77 (48)
Source of Potable Water	
Municipal	145 (91)
Well or Other	14 (9)
Treatment of municipal water	
Chlorine	115 (79)
Monochloramine	30 (21)

Table 1. Characteristics of 159 surveyed facilities.

Nine hospitals reported being a site for bone marrow or solid organ transplantation. Most (145) of the facilities reported obtaining water from municipal systems, and of these 30 use water treated with monochloramine. Five cases of hospital-acquired LD were reported from three facilities in FY 2006. The figure depicts the geographic distribution of facilities described in this report.



Nine facilities provided evidence of an explicit plan for routinely testing pneumonia patients for LD, and 69 indicated that their clinicians requested urinary antigen testing for *Legionella* fewer than 10 times in FY 2006 (see Table 2). At the same time, 25 facilities reported that they conduct routine periodic environmental surveillance for *Legionella*, 12 have specific disinfection systems in place, and almost all facilities have urinary antigen testing available without prior approval.

Prevention Practices	Number (percent)
Facility Measures	
Routine periodic potable water cultures	25 (16)
Specific Legionella-specific disinfection system	12 (8)
Clinical Practices	
Urinary antigen testing available without prior approval	150 (94)
Clinical testing results available within 24 hours	48 (30)
Ten or more urinary antigen tests performed in FY 2006	90 (57)
Protocol for routinely testing patients with pneumonia for LD	9 (6)

Table 2. Legionnaire's Disease Prevention Practices.

We found that five of VHA's nine hospitals which manage acute transplant patients lacked an explicit plan for LD prevention (Table 3). Further, none of these five facilities routinely test potable water for Legionella, and none derives water from a municipal system which uses monochloramine. Fortunately, these facilities all provide clinical testing without prior approval and at each there is evidence that clinicians regularly test patients for LD.

Twenty medical facilities in our survey perform periodic environmental surveillance and show evidence that their clinicians routinely test patients for LD. In addition, 8 of these facilities have specific disinfection systems in place. As a group these facilities comprise a system-wide resource for best practices.

As anticipated, most facilities (134, 84 percent) were found to have characteristics placing them at an intermediate degree of risk for hospital-acquired LD. Within this large group; however, it is possible to discriminate smaller numbers of facilities which might warrant relatively more or less attention. In particular, 18 acute care hospitals reported no clinic testing in FY 2006 and do not have water supplies which would place them at relatively low risk. These facilities may therefore be considered at somewhat increased risk and probably warrant focused risk mitigation efforts. On the other hand, an additional 18 facilities (both acute and extended care) have both monochloramine-treated municipal water and clinicians who order clinical testing for LD on a regular basis. These latter facilities may be considered to be at lower risk.

Legionnaire's Disease Risk Stratification	Number (percent)
Higher Risk Facilities Transplant centers with no explicit plan addressing LD prevention	5 (3)
Intermediate Risk Facilities Acute care facilities without monochloramine-treated water and which reported no clinical testing for LD (probably higher risk) …. 18 (11) Facilities with monochloramine-treated water and clinicians testing more frequently for LD (probably lower risk) …. 18 (11)	134 (84)
Lower Risk Facilities Facilities performing periodic environmental surveillance and whose clinicians tested more frequently for LD	20 (13)

Table 3. Legionnaire's Disease Risk at 159 Surveyed VHA Facilities.

Conclusion

A relatively uncommon illness overall, Legionnaire's Disease is an important cause of pneumonia among compromised hospitalized patients. Because outbreaks have been linked to colonization of hospital water and because risk of disease can be reduced with established amelioration methods, health care systems are compelled to determine at which facilities focused interventions are warranted.

A carefully implemented program of periodic sampling of potable water is probably the most accurate way to evaluate risk to patients, but this approach remains controversial. In particular, despite recent evidence demonstrating the utility of surveillance cultures, uncertainty persists and no standard-setting organization has endorsed them. Nevertheless, the predictable occurrence of hospital-acquired infection and the large population of vulnerable hospitalized veterans warrant a strategic plan. Fortunately, an assessment of patient characteristics, clinician practice behavior, and the nature of hospital water supplies suggest that resources can be directed at a limited number of facilities with high-risk characteristics.

Our review reveals a wide range of practices and of estimated risk, and several findings merit emphasis.

- Five teaching facilities where transplants are performed had no explicit plan for LD prevention, and none conduct routine environmental surveillance.
- Twenty facilities demonstrated management and clinical practice characteristics which could offer lessons for the feasibility of system-wide implementation.
- Although most facilities were predictably considered to be at an intermediate level of risk, within this group a relatively small number (22 percent) could be categorized as being at relatively lower or higher risk. A prioritized approach to amelioration of risk at a system level is therefore possible.

Recommendations

Recommendation 1. We recommend that the Under Secretary of Health take the required actions to ensure that inpatient facilities where bone marrow or organ transplants are performed have a written plan which addresses the prevention of Legionnaire's Disease.

Recommendation 2. We recommend that the Under Secretary of Health take the required actions to ensure that all inpatient facilities periodically assess local risk for LD using specific guidelines developed by VHA experts.

Comments

The Acting Under Secretary for Health agreed with the findings and recommendations and provided acceptable improvement plans. (See Appendix A, pages 10–13, for the full text of comments.) We will follow up on the planned actions until they are completed.

(original signed by:)
JOHN D. DAIGH, JR., M.D.
Assistant Inspector General for
Healthcare Inspections

Appendix A

Under Secretary for Health Comments

Department of Veterans Affairs **Memorandum**

Date: May 25, 2007

From: Acting Under Secretary for Health, Department of Veterans Affairs (10)

Subject: Assessment of Legionnaire's Disease Risk in VHA Inpatient Facilities, Project No.: 2007-00029-HI-0010, (WebCIMS 379169)

To: Assistant Inspector General for Healthcare Inspections (54)

1. I have reviewed the draft report and I concur with the recommendations. I appreciate your acknowledgement that VA has taken a number of steps to reduce the risk of Legionnaire's Disease (LD) in our inpatient facilities. This assessment will help to further prevent the risk of LD in our facilities.

2. Although your evaluation appears to be primarily based on the web-based survey of VHA medical facilities, rather than in-depth analysis, your assessment emphasizes the importance of prevention measures at higher risk inpatient facilities, where bone marrow or organ transplants are performed. The Office of Patient Care Services will convene a work group within VHA to develop a written plan, guidance and prevention strategies for such facilities. In addition, the work group's guidance will include scientific and clinical evidence, and recommendations that will aid each facility in establishing a process for periodic risk assessment and prevention of Legionella. Periodic assessments will help to maintain information on existing environmental conditions concerning LD in VA facilities.

3. Thank you for the opportunity to review the report. If you have any questions, please contact Margaret M. Seleski, Director, Management Review Service (10B5) at (202) 565-7638.

Michael J. Kussman, MD, MS, MACP

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

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

OIG Recommendations

We recommend that the Under Secretary for Health, Department of Veterans Affairs, take the required actions to ensure that:

Recommendation 1. Inpatient facilities where bone marrow or organ transplants are performed have a written plan which addresses the prevention of LD.

Concur **Target Completion Date:** October 30, 2007

The Infectious Diseases Program Office of Patient Care Services will convene a work group to develop guidance regarding Legionella. The work group will consist of representatives from the Office of the Deputy Under Secretary for Health for Operations and Management and the Office of Public Health and Environmental Hazards, VHA field experts, and field transplant units. As the transplant recipient population may have a higher risk of acquisition of Legionella infection, a component of this process will be to ensure that a written plan which addresses the prevention of Legionella infection will be generated at inpatient facilities where bone marrow and solid organ transplants are performed. This expert work group will convene by June 30, 2007, with a draft Directive submitted for concurrence by August 31, 2007. We anticipate that the concurrence process will be completed by September 30, 2007, with subsequent anticipation that facilities where bone marrow and solid organ transplantation are performed will be given 30 days from publication to review the document(s) and incorporate appropriate components into a written plan.

Recommendation 2. All inpatient facilities periodically assess local risk for LD using specific guidelines developed by VHA experts.

Concur **Target Completion Date:** November 30, 2007

The expert work group referred to in response to recommendation 1 will develop recommendations and written guidance that will include scientific and clinical evidence that can be used by each facility for establishing their own process for periodic risk assessment and prevention of Legionella. The guidance to be developed will allow each facility to best determine how those risk assessments should be conducted based on the facility's unique patient population and physical plant. The expert work group will complete their recommendations and proposed guidance no later than September 30, 2007, with the understanding that each facility will be expected to complete their first Legionella risk assessments within 60 days of the publication of the guidance.

Appendix B

OIG Contact and Staff Acknowledgments

OIG Contact	Karen Moore, Associate Director Dallas Office of Healthcare Inspections (214) 253-3332
Acknowledgments	Jerome E. Herbers, Jr., M.D., Associate Director Medical Consultation and Review Marilyn Barak Shirley Carlile Linda DeLong Marnette Dhooghe Gilbert Melendez Rayda Nadal

Appendix C

Report Distribution

VA Distribution

Office of the Secretary
Veterans Health Administration
Assistant Secretaries
General Counsel
Under Secretary for Health, Department of Veterans Affairs (10)

Non-VA Distribution

House Committee on Veterans' Affairs
House Appropriations Subcommittee on Military Construction and Veterans Affairs
House Committee on Oversight and Government Reform
Senate Committee on Veterans' Affairs
Senate Appropriations Subcommittee on Military Construction and Veterans Affairs
Senate Committee on Homeland Security and Governmental Affairs
National Veterans Service Organizations
Government Accountability Office
Office of Management and Budget

This report is available at http://www.va.gov/oig/publications/reports-list.asp