estimated cost of management of an IVD-related BSI, which is between $4,000 and $56,000.[1] A large study using Centers for Disease Control definitions of phlebitis reported a rate of 104 cases per 1,000 IVD-days.[6] On the basis of this rate, 1 episode of phlebitis would be prevented per 125 patient-days with our interventions.

The strength of the interventions we describe lies in the fact that they target doctors, nurses, and patients. Potentially, only 1 of these 3 groups needs to heed the intervention to avoid an unnecessary IVD-day. The interventions also increase general awareness about IVDs and their complications, which may reduce the number of unnecessary IVD-days over and above the direct effect of the interventions. Patients are a frequently neglected group when preventive interventions are considered, but we chose to target them for the following reasons: they have a vested interest in the outcome of the intervention, the novelty value of a patient-directed intervention does not wear off as readily as that of interventions directed at staff, patients are less likely than staff to be overburdened by alternative priorities, and this approach encourages patients to actively participate in their care. The Centers for Disease Control also recommends patient education regarding the reporting of new IVD-related symptoms[3] (category II recommendation).

The simple, low-cost quality improvement interventions that we describe are effective in reducing unnecessary IVD dwell time. Long-term implementation of these interventions should reduce complications, such as IVD-related BSI and phlebitis, improving the quality of healthcare provision. The importance of infection control interventions such as these will only increase as increasing antimicrobial resistance reduces the number of treatment options.

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Legionella Colonization of the Respiratory Tract in Patients Without Nosocomial Exposure

To the Editor—Environmental and clinical data from half of the hospitals in Italy's Piemonte region show that, over the past 5 years, extensive efforts to control and prevent legionellosis have drastically reduced the circulation of *Legionella* in hospital environments but have not significantly lowered the incidence of pneumonia.[1] Indeed, in hospitals where strict pneumonia surveillance is carried out, cases of legionellosis continue to be reported, in spite of the low risk of environmental exposure to the pathogen. In our area, as elsewhere, the cases diagnosed are chiefly among patients immunocompromised by disease or drugs. Pneumonia caused by *Legionella* has been seen to develop in hospitalized patients after a mean length of stay of 26 days,[1] even in highly protected wards (ie, wards with filters fitted to water outlets). This finding has led to the hypothesis that *Legionella* colonizes the respiratory tract prior to hospitalization and increases in pathogenicity as the host's immune system is progressively impaired. Evidence supporting this hypothesis comes from reports of pneumonia cases in which no correlation has been demonstrated between the genetic patterns of the strain isolated from the patient and that isolated from the environment; in such cases, transmission is thought to occur by aspiration from the colonized oropharynx during endotracheal intubation or assisted ventilation.[2,3]

The finding of *Legionella* in patients with no sign of pneumonia could confirm the hypothesis of colonization prior to hospitalization and might also explain those cases of nosocomial legionellosis for which no epidemiological correlation with environmental contamination can be established. Moreover, epidemiological data from surveillance reports have signalled an increase in the incidence of community-acquired pneumonia—partly due to greater awareness of the problem among family physicians—and the persistence of a consid-

erable percentage of nonclassifiable cases. These data suggest a somewhat active circulation of *Legionella,* with patients being colonized by the pathogen before admission to the hospital. Pneumonia would therefore be the result of activation of the bacterium caused by the patient's clinical condition, rather than the result of infection from contaminated hospital water.

The main aim of this study was to test the hypothesis that *Legionella* colonizes the respiratory tract prior to hospitalization. To this end, we searched for the bacterium in respiratory samples from subjects undergoing diagnostic procedures for noninfectious disease. A second aim was to develop and validate a polymerase chain reaction (PCR) assay for the detection of *L. pneumophila* DNA in respiratory specimens.

Our study was carried out in collaboration with the Healthcare Management and Division of Pulmonary Disease of San Giovanni Battista Hospital, Turin. Every year, approximately 400 outpatients are referred to the unit for bronchoscopic respiratory sampling (exfoliative lung biopsy, brushing or washing for sampling, excisional biopsy). One hundred consecutive bronchoalveolar lavage (BAL) samples were analyzed. Outpatients with clinical and/or radiological signs of pneumonia and/or respiratory infection were excluded from the study.

Demographic data and the reason for sampling were recorded. Culture and PCR were performed. Briefly, the sample was concentrated and then inoculated into culture medium containing L-cysteine (BCYE alpha medium, Oxoid) and into selective medium (MWY medium, Oxoid). Nucleic acid detection by PCR was performed with 2 oligonucleotides designed to amplify a 600-bp region highly specific to *Legionella* 16S rRNA.[4]

The most reliable method of DNA extraction from patients' specimens was assessed by comparing different extraction methods by use of phenol-chloroform, boiling, and the QIAamp DNA Mini Kit (Quiagen) on BAL samples to which serial dilutions of *Legionella* cells (10^4, 10^3, 10^2, and 10 cells) were added. An appropriate internal control was constructed by cloning into pGEM-T-easy vector (Promega) a heterologous genomic DNA fragment of approximately 1,000 bp amplified in low stringency conditions from *Dictyostelium discoideum* genomic DNA with the same primers used for the *Legionella* rRNA.[5] Samples that yielded no DNA both by the internal control and by target fragment amplification were further analyzed in different amplification conditions to minimize the interference of inhibiting contaminants in the samples.

The QIAamp DNA Mini Kit produced the best results in terms of DNA extract yield, speed, and ease of performance. Preliminary tests on the artificial samples showed that the PCR method for detecting *Legionella* in the respiratory sample was able to detect 10 bacterial cells.

A total of 67 samples were obtained from male subjects and 33 from female subjects; 60% of the subjects were aged from 60 to 80 years, and the mean age was 64 years (SD, 14 years). In the majority of subjects, the reason for undergoing the diagnostic procedure was suspected neoplasia. No *Legionella* colonies were isolated from any of the cultured samples. The nucleic acid test also did not detect *Legionella.* Although this study was conducted on elderly subjects with suspected respiratory ailments that required specific diagnostic determinations, it failed to demonstrate respiratory tract colonization by *Legionella.* Given the low incidence of legionellosis in Italy (15 cases per million population), studies of a larger number of samples will be needed.

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