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Simple Quality Improvement Interventions Reduce Unnecessary Intravascular Device Dwell Time

To the Editor—Intravascular devices (IVD) are a vital part of medical care. IVD-associated infections are an important cause of iatrogenic morbidity in inpatients. IVD-related bloodstream infections (BSI) prolong hospital stay and increase costs.[1] IVD-related phlebitis is also a significant problem.[2] The risk of IVD-associated complications correlates with IVD dwell time.[1] The Centers for Disease Control recommends prompt removal of nonessential IVDs to reduce the rate of IVD-related BSI (category IA recommendation).[3]

Parenti et al[4] showed that quality improvement programs could reduce the unnecessary use of IVDs. We identified the leaving of IVDs in situ unnecessarily as a significant quality issue at Auckland City Hospital. We therefore developed low-cost interventions intended to reduce unnecessary IVD dwell time, and we assessed their effectiveness.

The interventions were implemented on the 4 internal medicine wards at Auckland City Hospital, a 700-bed tertiary hospital. The first intervention was a sticker placed in every patient's clinical notes each morning. This required the medical team to indicate whether IVDs were required or should be removed, and this also required the nursing staff to contact the medical team if no indication was made. The second intervention was the daily distribution of an educational pamphlet (designed to be printed on the daily menu sheet) to every patient. This pamphlet showed a photograph of a peripheral IVD and explained the usefulness of these devices and their potential to cause infection. It requested that patients with an IVD in situ ask their doctors and nurses whether it was still required.

Baseline data were gathered for 14 consecutive days beginning 7 weeks prior to the implementation of the interventions. The interventions were implemented on 14 consecutive days, during which the same types of data were collected. Each patient was assessed daily, and the number and type of IVDs in situ were recorded. Each patient assessed was counted as a patient-day. If an IVD was present in the patient, this was counted as an IVD-day. If a patient had more than 1 IVD, each device was counted as 1 IVD-day.

Each IVD-day was defined at the time of review as "necessary" or "unnecessary" according to strict prespecified criteria. An IVD was deemed necessary if the patient was receiving appropriate intravenous antibiotic therapy; was receiving other intravenous medications or hydration; had an unstable condition, such as seizures or gastrointestinal bleeding, or was undergoing cardiac monitoring; or had a procedure requiring vascular access planned within the following 24 hours. If a patient had more than 1 IVD in situ, each IVD-day required a separate indication to be defined as "necessary." Because these interventions were being assessed as a quality improvement exercise, approval by the institutional review board was not considered to be required.[5] The project was approved by the head of the Department of Internal Medicine and by the charge nurses of the wards involved.

The results during the baseline and intervention periods are shown in the Table. A statistically significant reduction in the number of both total IVD-days and unnecessary IVD-days occurred during the intervention period. The percentage of patient−days on which an unnecessary IVD was in use during the intervention period was reduced by 7.8% (from 20.4% to 12.6%; $P < .001$). Therefore, for every 13 patient-days of intervention, 1 unnecessary IVD-day was avoided.

We have shown that the introduction of 2 low-cost interventions can significantly reduce the number of unnecessary IVD-days. This would be expected to result in a reduction in the incidence of IVD-related complications, including BSI. Infection control measures such as these are also increasingly important because of the emergence of antimicrobial resistance among nosocomial pathogens.

A recent meta-analysis showed the risk of IVD-related BSI associated with use of peripheral short lines (which accounted for more than 95% of the IVDs in our internal medicine wards) was 0.5 cases per 1,000 IVD-days.[1] Thus, 1 IVD-related BSI would be prevented per 26,000 patient-days, with our interventions. The estimated cost of the interventions was US$0.10 per patient-day, which is equivalent to $2,600 per IVD-related BSI prevented. This compares favorably with the

TABLE. Characteristics of Intravascular Device (IVD) Use During the Baseline and Intervention Periods

Variable	Baseline period	Intervention period	P[a]
No. of patient-days	1,148	1,153	
Patient characteristics			
Male sex	478 (41.6)	490 (42.5)	.67
Age in years, mean	71.0	70.3	.27
Total no. of IVD-days	625	506	<.001
No. of necessary IVD-days (% of patient-days)	391 (34.1)	361 (31.3)	.31
No. of unnecessary IVD-days (% of patient-days)	234 (20.4)	145 (12.6)	<.001

Note. Data are no. (%) of patients unless otherwise indicated. If a patient had more than 1 IVD, an IVD-day was counted for each device. For definitions of "necessary" and "unnecessary," see the text.

[a] The Fisher exact test (2-tailed) was used for categorical data and the Student t test for the comparison of mean ages.

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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-