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Major Article

Prevalence, risk factors, and outcomes of idle intravenous catheters: An integrative review

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Objective: Complications of intravenous catheters remain a major contributor to health care costs and are a patient safety problem. An intravenous catheter not actively in use—an idle catheter—may increase the risk of infectious and noninfectious complications. We conducted an integrative review of the available literature to evaluate the prevalence, risk factors, and outcomes associated with idle intravenous catheters.

Methods: Searches of multiple computerized databases were conducted to identify studies on idle intravenous catheters. Data on definitions of idle catheter, type of catheter, prevalence, risk factors, and patient outcomes were extracted.

Results: Thirteen studies met inclusion criteria and were included in the review. The location and setting of the studies were diverse, including cross-sectional, retrospective, and prospective, and were conducted in varied geographic locations. The definition of an idle catheter was variable across studies. Although studies varied in terms of line-days or number of catheters placed, the primary definition of idle device was based on number of days or percent of devices left in situ without use. Four studies evaluated patient outcomes associated with idle catheters and found increased risk of infection, intensive care unit admission, and phlebitis.

Conclusions: Idle intravenous catheters are common and are associated with adverse outcomes. Prospective studies incorporating uniform definitions of idle catheters to test interventions to reduce idle catheter use are urgently needed.

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Intravenous catheters (ICs), both peripheral and central, are common in medical practice for both in-hospital care and in ambulatory care settings,¹ with an estimated 150 million peripheral and 5 million central ICs used each year in the United States.^{2–4} Although critical for medical care, ICs increase the risk of local and systemic infectious complications such as bloodstream infections,⁵ endocarditis,⁶ and thrombophlebitis.⁷ Current estimates of attributable mortality and cost due to central IC complications range from

12%–25% and \$35,000–\$56,000 per episode, respectively, leading to an annual cost of patient care due to central line-associated bloodstream infections estimated to be as high as \$2.3 billion in the United States.^{8–10}

Prevention of complications must focus on optimizing use of these devices, such as insertion only when medically necessary and ensuring removal according to recommended guidelines.¹¹ Despite evidence-based recommendations to remove ICs when no longer needed, studies show that ICs often remain in situ unnecessarily and these idle catheters lead to adverse patient consequences.^{12–14} However, the magnitude of this risk is unknown. We undertook an integrative review to examine the prevalence, risk factors, and outcomes of idle ICs.

REVIEW PROCESS

Following recommended guidelines, an integrative review was conducted to evaluate the available literature on this topic.¹⁵ Queries

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Conflicts of Interest: None to report.

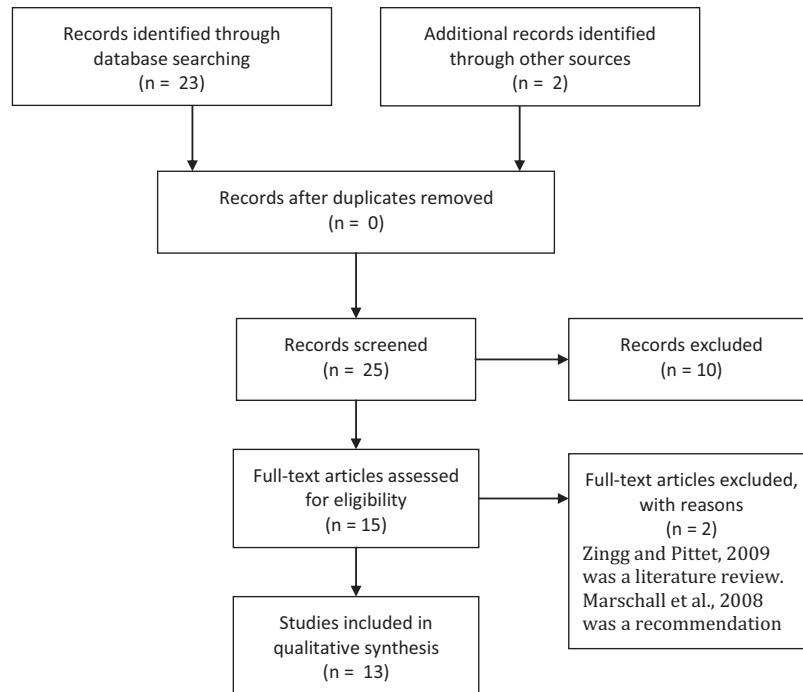


Fig 1. Literature identification procedure.

were carried out using MEDLINE (including PubMed) and EBSCOhost (including Cumulative Index to Nursing and Allied Health Literature) using the following combinations of search terms within titles and abstracts of published articles: *idle* OR *unused* OR *unnecessary* OR *inappropriate* AND *catheter*. The search was conducted March through September 2015. All queries were limited to studies published in English during the past 10 years to focus on the most recent literature, although no restriction on country of research was placed. Reviews, commentaries, editorials, dissertations, single-patient case studies, and abstracts were excluded. Studies that defined the inappropriate use of a catheter as the wrong device without discussion of unused days and those including catheters other than intravascular were excluded from this review. For the identified studies following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Fig 1), we collected information on study characteristics such as the unit of analysis, definition of idle catheter, type of catheter used, risk factors, prevalence, and patient outcomes. Consensus was reached among evaluators to finalize the identified studies for assessment.

RESULTS

Overall study characteristics

As shown in Table 1, we identified 13 studies that met inclusion criteria: 3 retrospective studies,^{13,18,24} 4 prospective studies,^{14,16,20,21} and 6 cross-sectional analyses,^{17,19,22,23,25,26} with a total of 38,940 patients. We also included a qualitative study by Zingg et al²¹ that described interviews with health care workers to assess agreement on indications for IC use. Four of the 13 studies reported use of peripheral ICs,^{13,16,19,26} 4 specified central venous catheters,^{14,21,24,25} 1 study included ICs with unspecified site,¹⁸ and 4 additional studies reported on both peripheral and central ICs.^{17,20,22,23}

Four of the 13 identified studies were conducted in the United States,^{18,20,24,25} whereas others were completed in Australia,^{13,14}

Canada,²² New Zealand,¹⁷ United Kingdom,¹⁶ Spain,²³ Sweden,¹⁹ and Switzerland.²¹ One study included data from 13 countries.²⁶ The study sites varied, including emergency departments,^{16,18,19} medical-surgical ward,²⁰ intensive care units,^{14,22} or entire facilities.^{13,17,21,23–25}

Definition of idle catheter

The definition of an idle catheter was heterogeneous in the reviewed literature (Table 1). Seventy-seven percent^{13,14,16–18,20,21,23–26} of studies defined an idle catheter as a catheter through which no medication or fluid was being administered at the time of evaluation or a catheter was not needed for monitoring of patient hemodynamic status. Other studies used the following criteria for defining an idle catheter: IC left in situ for longer than recommended duration of 72 hours (for peripheral intravenous line),¹⁷ IC not used within 24 hours of insertion,¹⁹ or IC used for medication delivery that could have been combined with an already-existing device.²² The unit of analysis in the studies varied, including number of patients, number of catheters, and catheter-days. All but 3 studies^{21,24,25} evaluated percentage of patients with idle catheters, whereas 2 studies assessed the number of days of idle catheters^{21,25} and 1 assessed both percentage of patients and number of idle days.²⁴

Among studies that focused on central venous catheters only, percentage of patients with idle catheter days was consistently used, whereas among studies that only evaluated peripheral intravenous lines, the common measure was percentage of patients with idle catheters without regard to catheter-days. In studies that included both peripheral and central devices, reported measures varied between number of excess catheters, time left in place beyond 72 hours, and percent of patients with idle devices.

For studies that focused on central venous catheters only, the percentage of patients with IC days was consistently used as the unit of analysis, whereas among studies that evaluated peripheral intravenous lines, a frequently employed measure was percentage of patients with ICs. In studies that included both peripheral and central devices, reported measures varied between number of excess

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