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Major Article

Plastic in patient study: Prospective audit of adherence to peripheral intravenous cannula monitoring and documentation guidelines, with the aim of reducing future rates of intravenous cannula-related complications

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Background: Peripheral intravenous cannula (PIVC) insertion is a universal intervention for inpatients and is associated with multiple complications. Effective, simple, reproducible interventions specific to PIVC complication prevention are few and often extrapolated from central venous catheter complication prevention strategies. The objective of this study is to improve compliance with documentation and monitoring PIVC guidelines in the medical ward of a secondary care center.

Methods: This study is a prospective run-in audit of adherence to PIVC documentation and monitoring guidelines between the dates of August 30-November 14, 2014, with data recollection from December 25, 2014-January 30, 2015, after intervention implementation. Three interventions were implemented. The Plastic in Patient (PIP) strip is a dedicated column on the journey board, identifying inpatients with PIVCs, prompting assessment of indication at daily multidisciplinary meetings. PIP row is a prompt in the medical admission proforma to review PIVC indication. PIP poster is a visual cue on PIVC trolleys highlighting PIVC management practices.

Results: Baseline demographics were similar in the pre- and postintervention groups. Documentation significantly improved in the postintervention group (36.4 vs 50%, $P = .025$). Early identification of nonindicated PIVCs improved in the postintervention group (88.8% vs 97.1%, $P = .018$) and a trend toward a reduced PIVC-related early phlebitis rate (3.7% vs 0, $P = .08$).

Conclusions: Simple, cost-effective interventions result in improvements in adherence to practice guidelines. Our results suggest a trend toward reduction in phlebitis rates.

It is estimated that up to 80% of hospitalized patients will require intravenous therapy at some point during their inpatient stay.[1] There are 200 million peripheral intravenous cannula (PIVC) used annually in the United States alone.[1,2] Most are inserted to administer intravenous fluids or medications; occasionally PIVCs are inserted in anticipation of requiring access in the near future. However, some PIVC insertions have no clear indication. A recent study of almost 1,000 patients in general medical beds identified idle PIVCs (ie, cannula not used for 48 hours or with no prophylactic indication) in 33% of patients.[1] Given that PIVCs are associated with several complications, including mechanical obstruction without signs of inflammation at the insertion site; phlebitis (a recognized risk factor for PIVC-related bloodstream infection [PIVC-RBSI][3]) as indicated by the presence of redness, swelling, palpable venous cord, tenderness, or pain; and PIVC-RBSI, which implies the patient's blood cultures yield the same organisms as the culture of the PIVC site, or a positive blood culture result returns without an alternative source for septicemia,[4,5] we should seek to minimize the incidence of idle PIVCs. PIVC-RBSI, the most serious morbidity associated with PIVC use, is the end result of either direct contamination at time of insertion or migration of skin organisms from the insertion site.[6]

Despite the use of modern low-irritant plastics,[7] the reported rate of phlebitis varies between 2.3% and 60%. PIVC-RBSI[8] occurs in approximately 0.1% of PIVC insertions or 0.5 per 1,000 PIVC days.[2]

Staphylococcus aureus bacteremias (SABs) are commonly associated with PIVC use and are associated with substantial mortality, morbidity, and health care–related costs. Many SABs occurring as

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a result of PIVC-RBSI are preventable.[9] Appreciating the risks associated with PIVCs, advisory groups around the world have generated policies with the aim of reducing complications attributable to PIVCs, without exposing health care staff to burdensome workloads or increasing costs.

GUIDELINES

Current guidelines in Western Australia (WA) recommend routine replacement of PIVCs every 48-72 hours, while the Centers for Disease Control and Prevention (CDC) guidelines recommend replacement every 72-96 hours.[6,10] Despite a growing body of evidence supporting an alternative approach wherein PIVCs are removed only when an indication to do so arises, this practice is limited to the treatment of pediatric patients in WA.[2,6,11] Our intention is not to imply doubt in the veracity of these studies, but rather to seek to improve monitoring and to reduce idle PIVC rates.

Current policy at our institution mandates the following: aseptic nontouch technique (ANTT) during PIVC insertion, surveillance using the vascular access score (VAS), and documentation and removal of all PIVCs at 72 hours.[12]

There are some important differences in the WA guidelines compared with the CDC guidelines. First, the CDC recommends the use of a simple aseptic technique, whereas in WA, ANTT is required, training for which is facilitated through a mandatory ANTT educational module and PIVC insertion packs. Second, VASs are documented once per shift in WA, whereas in the United States, the VAS is not used, but the ongoing indication for vascular access is assessed daily. Both the WA guidelines and CDC guidelines recommend a routine replacement strategy, but the CDC guideline allows the use of a single PIVC for up to 96 hours. Finally, postremoval surveillance and management procedures are well defined in WA guidelines, requesting swabs, blood cultures if febrile, and medical review,[6,12] whereas the CDC guidelines do not specify postremoval surveillance and management of complications.

DEFINING AN INSTITUTIONAL PROBLEM

During regular quality assurance monitoring, we identified a number of PIVC-associated adverse events, including PIVC-RBSI and SABs. Further small, unpublished hospital-based audits highlighted poor adherence to the documentation policy; for instance, one audit revealed that half of PIVC dressings were not dated or signed.

In view of these results, we embarked on the Plastic in Patient (PIP) Study: a prospective audit of PIVC use with the aim of reducing rates of PIVC-related sepsis. We aimed to assess current adherence to WA guidelines and to implement cost-neutral changes that would result in improved compliance on reaudit. It was anticipated that the event rate would be too low to demonstrate significant reductions in PIVC-related complications.

METHODS

Preintervention

A 2-part prospective audit was designed (Fig 1) to collect data regarding insertion, indication, and documentation of PIVCs sited in patients admitted to the general medical ward before and after the proposed interventions. It was not feasible to collect postremoval surveillance data from the current PIVC documentation charts. The only inclusion criterion was the presence of a PIVC in a patient admitted to the general medical ward. The only exclusion criterion was the absence of PIVC throughout the entire admission to the general ward. Therefore, patients who had their PIVCs removed before coming to the medical ward were excluded unless another PIVC was inserted later in their stay.

We reviewed general medical ward inpatients with PIVCs daily from August 30-November 12, 2014. We collected data pertaining to PIVC insertion; site, date, indication, and documentation on dressing label; medical or emergency department (ED) admission; inpatient notes; and nursing care plan.

It was deliberately planned that the information would be collected once a day at different times in an attempt to control bias related to shift changes and staff completing documentation retrospectively. Care was taken not to alert medical staff that information was being collected. A single senior registrar, well versed on the VAS,[12] reviewed each PIVC event during the run-in and follow-up audit.

Prior to data collection, we agreed the surveying registrar would be ethically mandated to report any observed PIVC with a VAS ≥2 given our policy requires removal at this stage, regardless of whether this would influence our results. However, we did not encounter a VAS ≥2 during this study.

Intervention

Following the run-in audit, a multidisciplinary working group was convened to discuss possible interventions, with emphasis on remaining cost-neutral, avoidance of adding to the paperwork burden faced by staff, and sustainability. The interventions are illustrated in Figure 2 and subsequently detailed.

PIP poster

An A4-sized, laminated, colorful poster was affixed to every intravenous access trolley in the general medical ward and the ED, which served as a visual prompt to remind staff to remove unnecessary PIVCs, use ANTT during insertion, and document the procedure properly.

PIP strip

A dedicated column on the patient journey board in the medical board was created. Here the coordinating nurse, in liaison with all of the ward nurses, would identify all patients who had a PIVC in

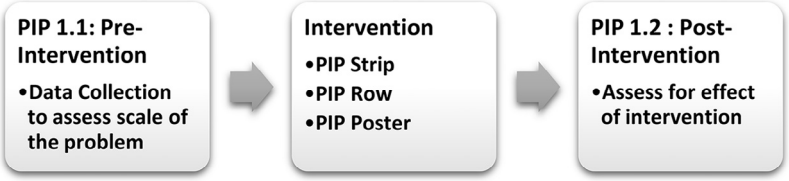

Fig 1. Plastic in patient (PIP) Study design.