Protected Clinical Indication of Peripheral Intravenous Lines: Successful Implementation

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Abstract

Background: *A large, urban community hospital developed an insertion bundle to support the safe implementation of a policy of extended dwell time (clinical indication) for inpatient peripheral intravenous lines (PIVs).*

Methods: *Internal evaluation of practices through direct observations as well as evidence-based guidelines and historic data on PIV-related bloodstream infections helped drive the bundle elements. A surveillance plan was in place to continue measurement of these outcomes during the postimplementation period.*

Results: *At 12 months following implementation, the organization documented a 37% reduction (*$P = .03$*) in primary bacteremias (combining PIV and central line-associated bloodstream [CLABSI] infections) and a 19% percent reduction in PIV bloodstream infections. CLABSI rates were also reviewed, as 20% of CLABSI were noted to also have peripheral access present during the year prior to implementation. CLABSI standardized infection ratios for the publicly reported intensive care units decreased from 1.3 to 0.32 (*$P = .02$*). In addition, intravenous line start kit use decreased 48% during the year following bundle implementation.*

Conclusions: *Careful planning and development of an education bundle and an insertion bundle in a community hospital setting allowed for longer dwell times and a trend of decreased bloodstream infections.*

Keywords: *bacteremia, bloodstream infection, clinical indication, infection prevention and control, peripheral IV, prevention bundle*

Background

In February 2014, a community hospital located in northwest Indiana with 625+ beds launched a policy update on peripheral lines to extend the permissible dwell time from 72 to 96 hours to clinical indication for replacement. Infection control and nursing staff members collaborated closely to develop a policy and insertion bundle as well as an education bundle to support the goal of allowing extended dwell without increasing the risk of bloodstream infection.

The opportunity to address peripheral intravenous lines (PIVs) was identified based on internal infection control data. The 2011 versions of the Centers for Disease Control and Prevention Guidelines for the Prevention of Intravascular Device Associated Infections[1] and the Infusion Nurses Society Standards of Practice[2] served as the main sources to guide this change, as did both Cochrane reviews on the topic[3,4] and a review of existing literature performed by the authors. The hospital had 11 years of surveillance data regarding PIV-associated bloodstream infections to serve as baseline data and provide information regarding risk reduction opportunities. A cluster of primary bacteremias occurred on a unit of the hospital during the preimplementation phase. This highlighted additional prevention opportunities within the organization regarding PIV risk reduction.[5] Unlike many of the hospitals mentioned in the literature, our hospital does not have a vascular access team responsible for inserting and maintaining peripheral lines, so consideration of applicability to the bedside staff was imperative.

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The potential benefits of a switch from routine intravenous line restarts to those based on clinical indication are numerous, beyond our initial intent of improving the risk of bloodstream infection by implementing a protected clinical indication approach. Therefore, our bundle centered on reducing the unnecessary needle sticks associated with a 72-96 hour restart policy. Others have described cost savings in materials as well as staff time after implementing such a policy.[6] We also saw an opportunity for improvement in patient satisfaction by reducing the number of intravenous line restarts based solely on elapsed time.

Care and maintenance issues were addressed before implementation of the extended dwell time. Use of alcohol-impregnated caps had been added to policies for both central and peripheral lines 2 years prior.[7] Audits identified other opportunities for improvement, including dressing adherence and blood traces found in the bifurcation of the hubs. Staff members expressed difficulty with using the negative pressure caps. Infection control surveillance data were consistent with the literature findings identifying *Staphylococcus aureus* as a frequent pathogen[8] as well as emergency departments as targeted focus opportunities.[9]

Methods

Infection control and nursing staff members collaborated with key stakeholders throughout the organization to identify any concerns or possible barriers to implementation of this policy change. Members of the materials management team collaborated in developing an intravenous line start kit that met the goal of allowing safe extension of dwell time by providing products that address concerns regarding safe insertion and maintenance of a protected, intact dressing. This team also assisted in procuring catheters and related components that allow reduced manipulation and add-on devices as well as enhance safety (Table).

Preparation for the launch took approximately 6 months, during which time the organization reviewed existing professional standards and literature as well as internal policies and conducted practice audits to further refine implementation strategies.[1-13] PIV insertions were observed, staff huddles took place in case of the occurrence of infections, and patients with PIVs were rounded on by members of the infection control team, a nurse educator, and unit champions. Rounds included observations of dressing integrity and the presence of blood in connectors before the new policy was implemented. Follow-up monitoring included monitoring of appropriate product use for the new catheter, chlorhexidine gluconate sponge dressings, and securement dressings.

An education bundle was developed in conjunction with vendors of products included in the intravenous line start kit. Its purpose was to help staff members become confident and competent in implementing the changes made to the products being used. Intravenous line basics training for bedside staff was also provided leading up to the changes. Patient care leadership received education in advance of the policy launch to help reinforce the "why" behind the changes so they would be champions for staff as questions arose.

During the implementation, vendor clinicians assisted with product-specific training to bedside staff on every shift on each campus. Before the launch, continuing education intravenous line basics classes were offered that focused on insertion technique and site selection considerations. Additionally, during the early stages of policy development, we had an extensive practice audit conducted as a gap analysis between practice, policy, and evidence to further identify areas for improvement.

Our hospital is composed of 2 hospital facilities located 8 miles apart that operate under a single provider number. Implementation was launched first at 1 site and the following month at the other site to allow an intensive education presence for all staff throughout the hospital, on all shifts. The same process of collaborative rounding by content experts on the products being introduced took place at each campus. Follow-up monitoring for compliance and addressing questions continued postimplementation by hospital staff as well as vendor clinicians and representatives.

Bloodstream infection surveillance is conducted at our hospital following the Centers for Disease Control and Prevention National Healthcare Safety Network protocols. Bloodstream infections meeting the Laboratory Confirmed Bloodstream Infection event definitions were reviewed to determine which line types were present in the days before the infection. Those infections with only peripheral access were categorized as PIV-associated bloodstream infections using all the same attribution requirements that are in place for central line-associated bloodstream infections (CLABSIs) within the protocol.[11]

The medical staff and board of directors of our hospital are responsible for approving all infection control surveillance at the institution. The approval process takes place on an annual basis. The data reported are within the scope of this approval and did not require additional formal approval by an institutional review board.

Throughout the weeks and months following the policy change, members of the infection control team monitored any occurrence of bloodstream infection involving patients with peripheral access, as had been done at our institution for more than 10 years. Each infection was assessed to identify whether the policy of allowing extended dwell time was causing harm, or whether there were identified gaps in compliance with the expected policy elements that could represent continued needs for education or compliance monitoring. Each opportunity was addressed with the involved departments for clarification of any concerns and a review of the findings.

At the 12-month point (February 2014-January 2015), a statistical analysis was conducted to assess the influence of the policy outcomes. At 18 months, a further review of the process findings was undertaken to assess whether the policy actually resulted in practice changes at the bedside.

Results

Infection control surveillance data for primary bacteremia, which includes bacteremia with central lines as well as peripheral lines, showed a 37% ($P = .03$) reduction from 0.052 out of 100 patient-days to 0.033 out of 100 patient-days. When data were reviewed involving only peripheral lines (a smaller

Table. **Components of the Protected Clinical Indication Bundle**

Bundle item	Reason
Chlorhexidine gluconate skin prep	Adequate skin disinfection on clean skin
Sterile gloves	Centers for Disease Control and Prevention and Infusion Nurses Society both indicate sterile gloves for repalpation after skin prep. Direct observation preimplementation indicated an opportunity to enhance compliance
Intravenous catheter with integrated extension set	Reduces add-on sets and manipulation, consistent with Infusion Nurses Society standards. Also, integrated extension set avoids the need to perform additional dressing change before 7 d to meet tubing change policy
Chlorhexidine gluconate-impregnated sponge dressing	Indicated to reduce bloodstream infections, skin infection, and skin colonization. With extended dwell, apply same standard used for central lines
Securement dressing	With ability to allow catheter to dwell until clinical reason for removal, securement was identified as a strong element in preventing catheter pistoning within the vein
Alcohol disinfection caps	Provide intraluminal protection and help decrease variation in technique for disinfection of needleless connectors

subset), a 19% reduction was achieved from 0.0150 out of 100 patient-days to 0.0121 out of 100 patient-days. Standardized infection ratios for CLABSI in the intensive care units of the hospital (which at the time were the only units reportable to the Center for Medicare and Medicaid Services as well as the state health department) also showed substantial improvements, moving from 30% above what was predicted to 68% fewer infections than predicted. This 75% reduction was statistically significant ($P = .02$). CLABSI data were also included in this analysis of success because up to 50% of CLABSI patients have been identified as having multiple lines in place at the time of their infection. Additionally, the increasing awareness of skin preparation, importance of dressing integrity, and aseptic technique that were included in education surrounding peripheral lines could also potentially influence care of central lines incidentally. Materials management team supply-related data were also reviewed specific to intravenous line start kits. When normalized by patient days, the hospital realized a 48% reduction in start kits during the time period encompassing the 12 months following bundle launch.

After the bloodstream infection analysis following the first 12 months was completed and deemed indicative of a safe adoption of the protected clinical indication, an evaluation to assess the success of the policy in actually extending dwell time beyond 96 hours was undertaken. We wanted to confirm that the policy had been successfully incorporated into practice change at the bedside, as suggested by the decrease in intravenous line start kit use. A sample of 364 admitted patients on a day 18 months following the policy change was reviewed. All PIVs present during that admission were evaluated to assess average dwell time. Based on those findings it was determined that 35% (n = 129) of the PIVs placed were remaining in situ for 5 days or longer. Furthermore, average dwell time in this sample was calculated to be 4.2 days, which is consistent with the findings of Rickard et al.[6]

Discussion

In 2011 the Infusion Nurses Society standards were updated to remove time-based site rotation and instead support clinical indication for peripheral lines,[2,14] and the Centers for Disease Control and Prevention guidelines were revised in a manner the makes extended dwell permissible[1]; however, neither group gave clear guidance for organizations on how to proceed. The existing literature presented reason for caution when considering allowing intravenous lines to remain beyond 96 hours, as did our hospital's internal surveillance data on these devices. Using an evidence-based approach to synthesize the available information and develop an approach that allowed adoption of the latest standards while taking proactive steps to mitigate risk proved to be a successful strategy.

After achieving our main objective of fewer restarts and no increased bloodstream infection risk we continue to refine our internal practices. Ongoing, directly observed insertion competencies starting with the emergency department have been completed. Sterile glove use (currently included in our start kits) at the right time for the right reason is being emphasized. Suggestions for future improvement include ongoing dialogue with radiology and emergency department staff members regarding antecubital starts as a remaining opportunity for potentially greater improvements. In accordance with the 2016 Infusion Nurses Society standards[14] we are also further restricting the number of intravenous line insertion attempts and the inclusion of midline catheters in our array of devices.

Possible limitations of our study include the lack of continuous surveillance for other vascular access indicators such as phlebitis, occlusion, and infiltration. The use of surveillance definitions may also overrepresent the incidence of infections because there is no definitive link to the device required in the Centers for Disease Control and Prevention protocols.

Conclusions

Careful planning, development of a prevention bundle, and education coupled with ongoing surveillance and feedback allowed successful implementation of a clinical indication policy in our large community hospital. Many changes in products were made as part of the launch in response to specific concerns identified through direct observation of patient care practices and analysis of existing process as well as outcome data. Our success was measured not only with increased dwell time, but also by a trend of decreased bloodstream infections.

Disclosures

The authors have no conflicts of interest to disclose.

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