MEDICAL UNIVERSITY OF SOUTH CAROLINA
VALUE INSTITUTE
Evidence-Based Practice Brief
Peripheral IV Dwell Time and Infection Rates

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ASK THE QUESTION

Question: In hospitalized patients with peripheral IVs, does routine removal and/or increased nursing assessment of the line after 5 days of insertion decrease infection rates compared with removal of the line only when clinical indicated?

SEARCH FOR EVIDENCE

Databases: PubMed, Scopus

PubMed search strategy: ("Catheterization, Peripheral"[Mesh] OR "peripheral IV" OR "peripheral intravenous" OR PIV OR "peripheral lines") AND infection AND (replacement OR "time factors"[Mesh] OR time OR timing OR duration OR days OR removal OR "clinically indicated")

Filters: Humans, English, Published last 10 years

CRITICALLY ANALYZE THE EVIDENCE

Ho and Cheung (2012) proposed evidence-based recommendations on timing for replacing peripheral intravenous catheters to prevent related complications which states:

- To prevent CRBIS, phlebitis, blockages, infiltration and local infections, peripheral intravenous catheters do not need to be routinely replaced. **Level of Evidence: High**
- The clinically indicated replacement of intravenous peripheral catheters is safe for patients. **Level of Evidence: High**
- The clinically indicated replacement of intravenous peripheral catheters can reduce the financial burden on organizations. **Level of Evidence: High**

They also suggest use of the following algorithm for the replacement of peripheral IV catheters:
There were five articles found addressing infection rates for routine (typically at 72-96 hours after placement) versus clinically indicated removal of peripheral IVs (PIVs). Two of the articles (Morrison & Holt, 2015; Webster et al., 2015) were systematic reviews, both of which supported the use of clinically indicated removal. A meta-analysis of 7 RCTs by Webster et al. (2015) found no statistically significant differences in the catheter-related bloodstream infection or phlebitis rates when PIVs were removed only when the line was clinically indicated. The authors estimated that removing PIVs only when clinically indicated saves approximately 7.00 Australian dollars ($5.36 USD) in cannulation costs. Similarly, a systematic review by Morrison & Holt (2015) concluded that the replacing PIV catheters every 72-96 hours does not decrease the incidence of phlebitis or infection compared to clinically indicated removal in adult patients.

The three remaining articles include an RCT (Xu et al. 2017) and two prospective observational studies (Palese et al., 2011; Tan et al., 2017). Xu et al. (2017) randomized 1198 patients in 10 internal medicine and 10 surgery wards at a hospital in China to receive either PIV routine removal every 72-96 hours or PIV removal only when clinically indicated. There were no statistically significant differences in the incidence of phlebitis, catheter occlusion, infiltration, and accidental removal between the two groups. Palese et al. (2011) explored the factors behind nurse decision-making to leave a PIV in place for more than 96 hours at 7 hospitals in Italy. They found that 61.7% of PIV catheters observed in the study remained in place for more than 96 hours, with the most common factor influencing that decision (52.3%) being the nurse’s experience of PIV management (e.g., never experienced complications, nurse’s lack of capability with PIV insertion). Finally, Tan et al., (2017) evaluated PIV management decisions in 100 adult patients at a single hospital in Singapore. They found that 50% of all catheters removed by the 2nd day in situ, however none were removed due to phlebitis or catheter-related blood stream infection.

<table>
<thead>
<tr>
<th>Author/Date/ Journal</th>
<th>Purpose of Study</th>
<th>Study Design</th>
<th>Sample &amp; Setting</th>
<th>Outcomes</th>
<th>Design Limitations</th>
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</thead>
<tbody>
<tr>
<td>Morrison &amp; Holt, 2015, Worldviews on Evidence-Based Nursing</td>
<td>To determine if replacing peripheral intravenous catheters only when clinically indicated compared to every 72–96 hr increases the adult patient’s risk for infection or phlebitis</td>
<td>Systematic review (qualitative only)</td>
<td>4 RCTs &amp; 2 meta-analyses</td>
<td>The current practice of replacing peripheral intravenous catheters every 72–96 hr does not decrease the incidence of phlebitis or infection when compared to replacing catheters when clinically indicated in the adult population</td>
<td>Study Limitations = None Systematic Review Review did not address focused clinical question Search was not detailed or exhaustive Quality of the studies was not appraised or studies were of low quality Methods and/or results were inconsistent across studies</td>
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<tr>
<td>Webster et al., 2015, Cochrane Database of Systematic Reviews</td>
<td>To assess the effects of removing peripheral IV catheters when clinically indicated compared with removing and re-siting the catheter routinely</td>
<td>Systematic review &amp; meta-analysis</td>
<td>7 RCTs (4895 patients) - Catheter-related bloodstream infection (CRBSI) assessed in 5 RCTs (4806 patients) Phlebitis = presence of 2 or more of the following: pain, warmth, erythema, swelling, or a</td>
<td>There was no significant difference in the CRBSI rate (clinically-indicated 1/2365; routine change 2/2441) -RR 0.61 (95% CI 0.08-4.68, p=0.64) There was no difference in phlebitis rates (clinically-indicated 186/2365; 3-day change 166/2441)</td>
<td>Study Limitations = None Systematic Review Review did not address focused clinical question Search was not detailed or exhaustive Quality of the studies was not appraised or studies were of low quality Methods and/or results were inconsistent across studies</td>
</tr>
<tr>
<td>Study</td>
<td>Title</td>
<td>Study Design</td>
<td>Sample Size</td>
<td>Methods</td>
<td>Findings</td>
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<tr>
<td>Xu et al., 2017, International Journal of Nursing Practice</td>
<td>To investigate the safety of clinically indicated peripheral intravenous catheters (PIVC) replacement intervals</td>
<td>RCT - cluster randomized</td>
<td>1198 patients in 10 internal medicine and 10 surgery wards at a single hospital in China - experimental (clinical indications only): n=553 - control (routinely every 72-96 hours): n=645</td>
<td>There were no catheter-related bloodstream infections or local infections in either group There were no statistically significant differences in the incidence of phlebitis, catheter occlusion, infiltration, and accidental removal</td>
<td>Study Limitations = None</td>
</tr>
<tr>
<td>Palese et al., 2011, Journal of Infusion Nursing</td>
<td>To explore the factors behind a nurse’s decision to leave a peripheral IV (PIV) in place for more than 96 hours</td>
<td>Prospective observational</td>
<td>269 adult patients with PIVs in 7 hospitals in Northern Italy - direct observation at bedside 2 times per day (research staff n=13) - nurse interviews - protocol based on HICPAC 2002 guidelines recommending replacement of PIV within 72-96 hours</td>
<td>166 (61.7%) PIV catheters were left more than 96 hours Catheters that remained less than 96 hours were removed for occlusion (5.8%), phlebitis (3.9%), and extravasations (2.0%), and because patients needed no further infusions (88.3%)</td>
<td>Study Limitations = None</td>
</tr>
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</table>

Publication Bias (e.g. pharmaceutical company sponsors study on effectiveness of drug) | Increase Quality Rating if: Large effect (When the relative risk of association between two factors is large or very large) Plausible confounders (When plausible residual confounding is directly impacting the magnitude of effect) Level of evidence for studies as a whole: High Moderate Low Very Low | | | | |
| Tan et al., 2017, Journal of Clinical Nursing | To evaluate current practices in managing peripheral venous catheters through catheter lifespan, reasons for removal and identifying potential predictors of catheter complications | Prospective observational study | 100 adult patients (mean 68.4 yo) selected by systematic sampling over 2 weeks in 28 general wards at a single hospital in Singapore. Eligible: IV medication and/or therapy for > 4 days, PIV upper limbs only, no transfer or discharge in the next 24 hours. Followed until PIV was removed. -hospital policy of routine replacement every 3 days. Complications assessed: ‘plug out’, infiltration, swollen, occlusion, pulled out by patient, bruising, pain, hematoma, phlebitis. Phlebitis assessed using Pearson Phlebitis Scale. | Median catheter lifespan was 2.0 days (IQR = 2.0) with some catheters lasting up to 9 days. - 50% of all catheters removed by the 2nd day in situ with 67.6% removed due to catheter-related complications -none removed as a result of phlebitis or catheter-related blood stream infection. 13.4% of catheters kept in situ longer than the hospital policy recommendation. | Study Limitations = None 
Non-Experimental/Observational Studies (case-control, cohort, cross sectional, longitudinal, descriptive, epidemiologic, case study/series, survey) 
- Insufficient sample size 
- Sample not representative of patients in the population as a whole 
- Variables (confounders, exposures, predictors) were not described and accounted for 
- Outcome criteria not objective or were not applied in blind fashion 
- Insufficient follow-up, if applicable 
- For prognostic study, sample not defined at common point in course of disease/condition 
- For diagnostic study, gold standard not applied to all patients 
- For diagnostic study, no independent, blind comparison between index test and gold standard |
REFERENCES


Appendix A: GRADE criteria for rating a body of evidence on an intervention
Developed by the GRADE Working Group

Grades and interpretations:
<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>High</td>
<td>Further research is very unlikely to change our confidence in the estimate of effect.</td>
</tr>
<tr>
<td>Moderate</td>
<td>Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.</td>
</tr>
<tr>
<td>Low</td>
<td>Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.</td>
</tr>
<tr>
<td>Very low</td>
<td>Any estimate of effect is very uncertain.</td>
</tr>
</tbody>
</table>

Type of evidence and starting level
<table>
<thead>
<tr>
<th>Evidence Type</th>
<th>Starting Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomized trial</td>
<td>high</td>
</tr>
<tr>
<td>Observational study</td>
<td>low</td>
</tr>
<tr>
<td>Any other evidence</td>
<td>very low</td>
</tr>
</tbody>
</table>

Criteria for increasing or decreasing level

**Reductions**
- Study quality has serious (–1) or very serious (–2) problems
- Important inconsistency in evidence (–1)
- Directness is somewhat (–1) or seriously (–2) uncertain
- Sparse or imprecise data (–1)
- Reporting bias highly probable (–1)

**Increases**
- Evidence of association† strong (+1) or very strong (+2)
- Dose-response gradient evident (+1)
- All plausible confounders would reduce the effect (+1)

†Strong association defined as significant relative risk (RR 2-5 or 0.5-0.2) based on consistent evidence from two or more studies with no plausible confounders;
Very strong association defined as significant relative risk (RR >5 or <0.2) based on direct evidence with no threats to validity