

Influence of Different Climates on the Replacement Time of Peripheral Intravenous Catheters: A Meta-Analysis

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Background: The newly conducted meta-analysis of the Cochrane database of systematic reviews has indicated that, compared to routine three-day replacement, clinically indicated replacement of peripheral intravenous catheters does not significantly increase the incidence of phlebitis. However, the literature included in that analysis did not compare subgroups of different climates.

Purpose: To explore the influence of different climates on the replacement time of peripheral intravenous catheters, through a systematic review and meta-analysis.

Methods: This systematic review and meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, and the methodology followed the Cochrane handbook. Six English and Chinese databases: Airiti Library, CINAHL, Cochrane Library, ProQuest, PubMed/MEDLINE, and the Index of the Taiwan Periodical Literature System were searched. For the search of the literature published prior to October 2017, keywords including "peripheral intravenous catheter" and "replacement, indwell" were used. Adults and randomized controlled trials or controlled clinical trials were included. A total of nine articles met the criteria. The literature quality was assessed according to the Cochrane risk of bias 2.0 tool, and the RevMan 5.3.5 software was used for the analysis of the different climate subgroups.

Results: The meta-analysis of the climate subgroups indicated that there was no significant difference in the incidences of phlebitis ($p = .21, .31, .15$, respectively), local infection ($p = 1.00, 1.00, .30$, respectively), bloodstream infection ($p = .71, 1.00, .63$, respectively), and catheter occlusion ($p = 1.00, .69, .12$, respectively) in the three climatic subgroups, between the clinically indicated replacement group and the routine three-day replacement group. Clinically indicated replacement can significantly reduce the medical material costs (five RCTs, 4,747 participants, $MD = -6.26$ AUD \cong 151.43 new Taiwan dollars, 95% CI = [-7.06, -5.47], $p < .00001$) and nursing time (two RCTs, 3,424 participants, $MD = -2.97$ mins, 95% CI = [-3.65, -2.29], $p < .00001$) of peripheral intravenous catheter insertion.

Conclusions/Implications for Practice: In areas with a warm, humid tropical/subtropical island

climate, such as Taiwan, clinically indicated intravenous catheter replacement can be considered if each shift change and random assessment shows no symptoms of infection in the insertion sites.

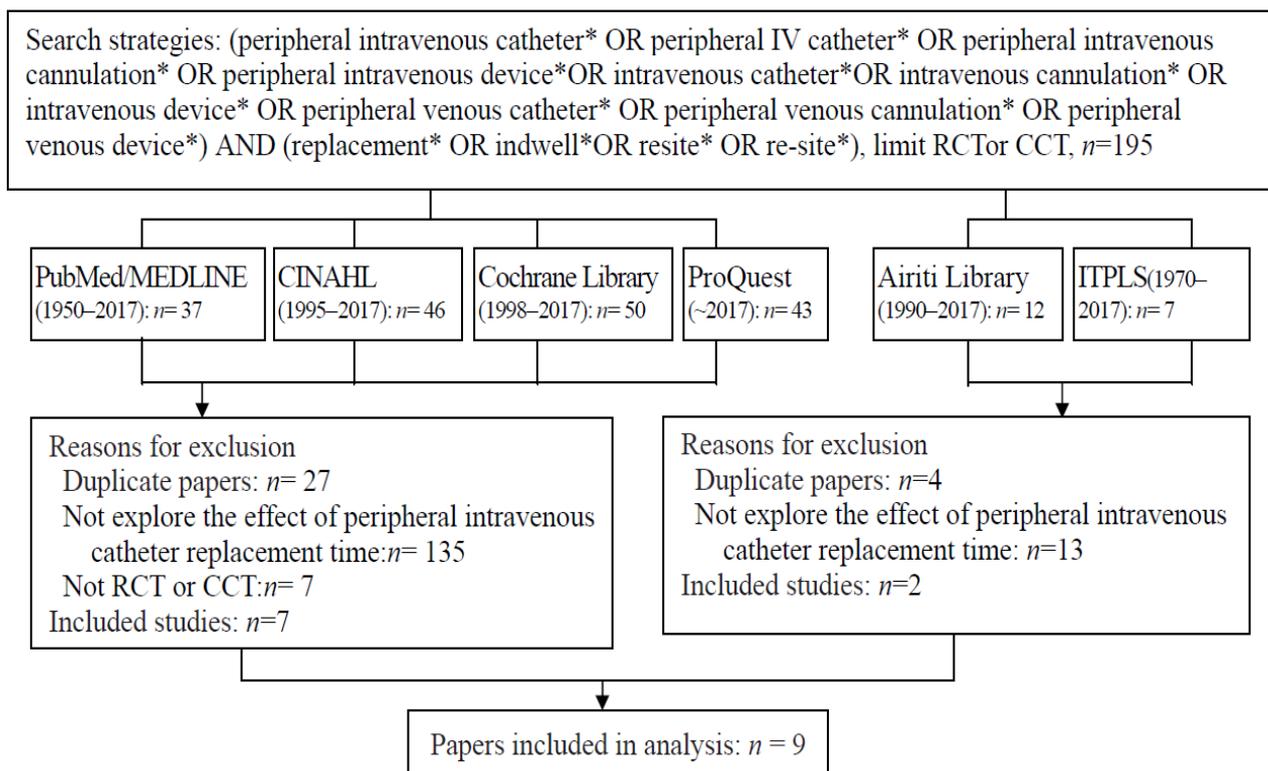


Figure 1. Flow chart used to identify and select studies for systematic review.

| Study | Random sequence generation (selection bias) | Allocation concealment (selection bias) | Blinding of participants and personnel (performance bias) | Blinding of outcome assessment (detection bias) | Incomplete outcome data (attrition bias) | Selective reporting (reporting bias) | Other bias |
|-----------------------|---|---|---|---|--|--------------------------------------|------------|
| Chen et al., 2015 | + | ? | - | - | + | + | + |
| Rickard et al., 2010 | + | + | - | - | + | + | + |
| Rickard et al., 2012 | + | + | - | - | + | + | + |
| Tuffaha et al., 2014 | + | + | - | - | + | + | + |
| Van Donk et al., 2009 | + | + | - | - | + | + | + |
| Wang & Kuo, 2014 | + | - | - | - | + | + | + |
| Webster et al., 2007 | + | + | - | - | + | + | + |
| Webster et al., 2008 | + | + | - | - | + | + | + |
| Xu et al., 2017 | + | ? | - | - | + | + | + |

Figure 2. Risk of bias identified in the included studies.

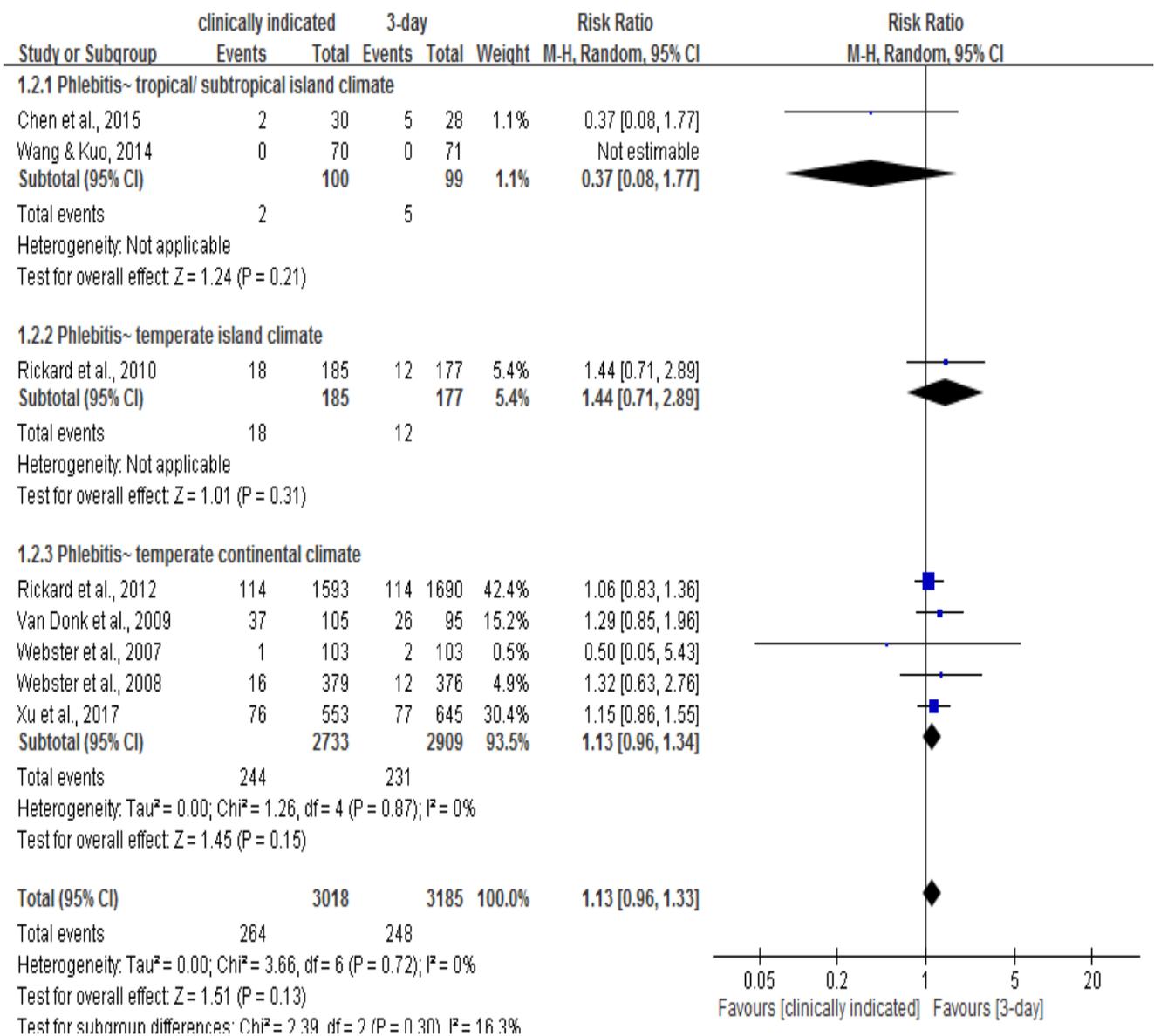


Figure 3. Forest plot of phlebitis.

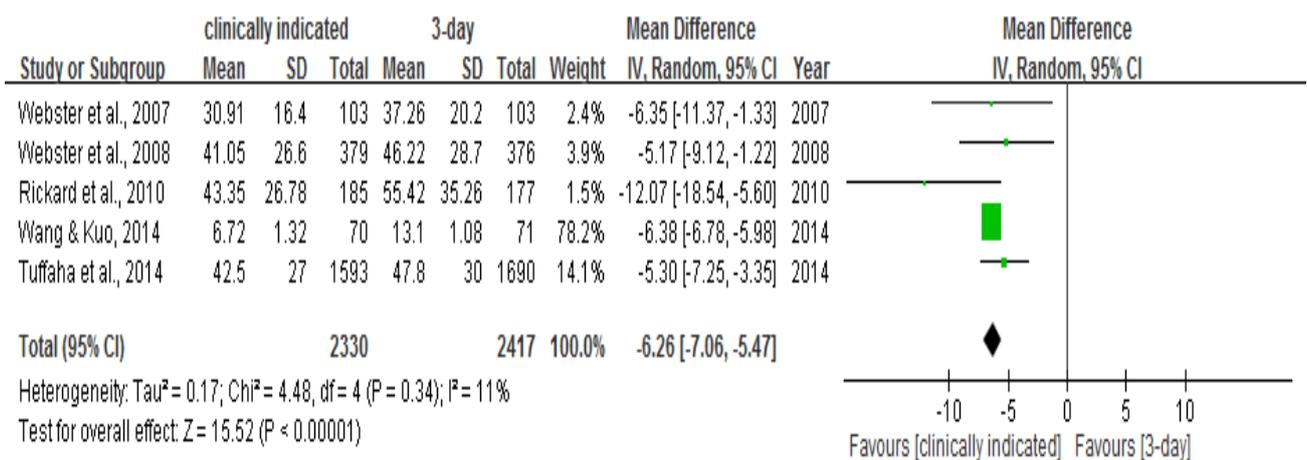


Figure 4. Forest plot of medical material costs.