

Title page:

Title: Paediatric ICU nurses' knowledge and practices to prevent central venous access device infections: implications for clinicians

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Background of the study:

Paediatric intensive care unit (ICU) nurses are responsible for the management of children vulnerable to developing healthcare-associated infections, specifically central venous access device (CVAD)-associated infections. CVAD-associated infections have been demonstrated to reduce to zero with the adherence to best practice guidelines and interventions (Pronovost, 2008, Han et al., 2010, Berenholtz et al., 2004).

Why this study was conducted (aims):

This study aimed to examine paediatric ICU nurses knowledge and paediatric ICU practices, to prevent CVAD-associated infections, in comparison to best practice guidelines.

Study methods:

A cross-sectional, descriptive study was undertaken between 2010 and 2011 throughout all tertiary-level paediatric ICUs Australia and New Zealand. A questionnaire of CVAD-associated infection prevention knowledge was completed by paediatric ICU nurses, and a survey of practice was completed by representative nursing managers and researchers. The questionnaire was developed using a previously validated adult ten-item questionnaire (Labeau et al., 2009, Labeau et al., 2008), with modifications to ensure applicability to paediatrics, using the Centers for Disease Control and Prevention (CDC) Guidelines for the Prevention of Intravascular Catheter-Related Infections (O'Grady et al., 2002, O'Grady et al., 2011). The survey of practice was developed using the CDC Guidelines (O'Grady et al., 2002).

Study results:

All Australian and New Zealand paediatric ICUs participated in the survey of practice ($n=8$) and 253 paediatric ICU nurses completed the questionnaire (response rate 34%).

The knowledge questionnaire mean total score was 5.5 out of a possible ten (SD = 1.4; range: 1-9). There was significant variation of total scores between paediatric ICU sites (range: 4.8–6.0; 7 df; $p = 0.01$). Questions of knowledge which were frequently incorrectly answered were surrounding maximum sterile barrier precautions for the insertion of CVADs and the correct concentration of chlorhexidine gluconate for the disinfection of the insertion site and routine dressing changes.

There was mixed application of CDC guidelines in the survey of practice of paediatric ICUs. Positive applications included the practice of prompt removal of CVADs when no longer essential and 2% chlorhexidine gluconate for antiseptics of the insertion site. Some paediatric ICUs reported 'sometimes' or 'mostly' routinely changing CVAD even if there is no suspicion of CVAD-associated infection and never using sutureless securement devices; which is contrary to CDC guidelines for best practice.

Implications for clinicians:

This study has demonstrated that a gap remains between best practice guidelines and nurses' knowledge and practice in the prevention of CVAD-associated infection. The prevention of CVAD-associated infection via the implementation of readily available guidelines should be an important goal for healthcare professionals.

While the prevention of CVAD-associated infection in the paediatric ICU depends on many factors, some are associated with discretionary decisions made by healthcare professionals (Ramritu et al., 2008). Personal education and professional development is the responsibility of all clinicians.

Process-improvement strategies are available within critical care to facilitate the translation of evidence-based guidelines to the bedside. These knowledge translation strategies include the use of catheter-care bundles, checklists and standardised insertion trolleys (Institute for Healthcare Improvement, 2011, McPeake et al., 2012). These strategies have been demonstrated to significantly reduce the rate of CVAD-associated infections, resulting in improved health outcomes for patients and significant cost savings (Helder et al., 2013, Sacks et al., 2014, Kim et al., 2011).

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