International Journal of Nursing Studies 52 (2015) 1678–1685

Contents lists available at ScienceDirect

International Journal of Nursing Studies

journal homepage: www.elsevier.com/ijns

Nursing and midwifery practice for maintenance of vascular access device patency. A cross-sectional survey

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ARTICLE INFO

Article history:
Received 17 September 2014
Received in revised form 1 July 2015
Accepted 3 July 2015

Keywords:
Flushing
Midwifery practice
Nursing practice
Patency
Survey
Vascular access device

ABSTRACT

Background: Up to 85% of hospital in-patients will require some form of vascular access device to deliver essential fluids, drug therapy, nutrition and blood products, or facilitate sampling. The failure rate of these devices is unacceptably high, with 20–69% of peripheral intravenous catheters and 15–66% of central venous catheters failing due to occlusion, depending on the device, setting and population. A range of strategies have been developed to maintain device patency, including intermittent flushing. However, there is limited evidence informing flushing practice and little is known about the current flushing practices.

Objective: The aim of the study was to improve our understanding of current flushing practices for vascular access devices through a survey of practice.

Method: A cross-sectional survey of nurses and midwives working in the State of Queensland, Australia was conducted using a 25-item electronic survey that was distributed via the local union membership database.

Results: A total of 1178 surveys were completed and analysed, with $n = 1068$ reporting peripheral device flushing and $n = 584$ reporting central device flushing. The majority of respondents were registered nurses (55%) caring for adult patients (63%). A large proportion of respondents (72% for peripheral, 742/1028; 80% for central, 451/566) were aware of their facility's policy for vascular access device flushing. Most nurses reported using sodium chloride 0.9% for flushing both peripheral (96%, 987/1028) and central devices (75%, 423/566). Some concentration of heparin saline was used by 25% of those flushing central devices. A 10-mL syringe was used by most respondents for flushing; however, 24% of respondents used smaller syringes in the peripheral device group. Use of prefilled syringes (either commercially prepared sterile or prefilled in the workplace) was limited to 10% and 11% respectively for each group. The frequency of flushing varied widely, with the most common response being pro re nata (23% peripheral and 21% central), or 6 hourly (23% peripheral and 22% central). Approximately half of respondents stated that there was no medical order or documentation for either peripheral or central device flushing.

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http://dx.doi.org/10.1016/j.ijnurstu.2015.07.001

Conclusions: Flushing practices for vascular access device flushing appear to vary widely. Specific areas of practice that warrant further investigation include questions about the efficacy of heparin for central device flushing, increasing adherence to the recommended 10 mL diameter syringe use, increased use of prefilled flush syringes, identifying and standardising optimal volumes and frequency of flushing, and improving documentation of flush orders and administration.

What is already known about the topic?

- Approximately 85% of all hospitalised patients will require some form of intravenous therapy.
- Vascular access device occlusion ranges from 15 to 69% depending on device and setting, with associated costs to the patient, organisation and healthcare system.
- There is a paucity of research and a high degree of practice variation in the maintenance of peripheral and central venous device patency, including the role of flushing to prevent complications.

What this paper adds

- The results of this study have clarified nursing and midwifery practice related to vascular access device flushing.
- The results further highlight the inconsistencies in flushing practice and the need for evidence in this area.
- The results have laid the foundation for an informed protocol development for future intervention and randomised controlled trial work in vascular access device patency and flushing practice.

1. Introduction and background

Venous access via peripheral and central venous catheters is frequently used in hospital care to administer fluids, drugs, blood and nutrition, and to withdraw blood for testing, among other purposes. These devices may need to be left in place for days or even weeks; but they are associated with complications that can be mechanical or infectious. Mechanical complications include occlusion, thrombosis, dislodgement, infiltration, leakage, phlebitis and scar formation. Infectious complications include bacterial or fungal sepsis. Thrombosis or phlebitis at the catheter site can act as a focus for nosocomial infection that is associated with extended admission time, additional costs and increased mortality (Maki et al., 2006; Maki and Ringer, 1991; Mermel et al., 2009).

Each year, approximately 450,000 individuals are admitted to Queensland public hospitals (Australian Bureau of Statistics, 2013). The majority require intravenous catheterisation for the administration of medications or fluid. Based upon this, it is estimated that 150,000 will need a peripheral intravenous catheter in place for more than three days (Tuffaha et al., 2014). A survey from 2003 stated the proportion of central venous catheter use is approximately 29% of the general hospital population, rising up to 80% for patients in critical care settings (Climo et al., 2003). There have been a range of strategies to prevent or reduce intravenous catheter related complications. These include: optimising patency through continuous infusion or intermittent flushes with either normal saline, heparin, antibiotic and/or ethanol locks (Goode et al., 1991; Peterson and Kirchhoff, 1991; Randolph et al., 1998); less frequent catheter and infusion set changes (Bregenzer et al., 1998; Cornely et al., 2002; Homer and Holmes, 1998; Rickard et al., 2012; White, 2001); placement of in-line filters (Chee and Tan, 2002; Roberts et al., 1994); and designated intravenous therapy teams (da Silva et al., 2010; Wenzel and Edmond, 2006). Despite these interventions, catheter failure before the end of treatment is all too common. The failure rate of peripheral intravenous catheters due to occlusion is 20–69% (Bolton, 2010; Rickard et al., 2010, 2012; Royer, 2003). The failure rate of central venous catheters due to occlusion ranges from 15% to 66%, depending on the device, setting and population (Baskin et al., 2009; Raad et al., 2002, 2003; Timsit et al., 2011a). Repeated catheter insertions due to failed catheters require multiple penetrations of the skin barrier, increase patient discomfort and staff time, and predispose patients to infection from skin commensals. Such infections can be life threatening in the acute and critically ill (Maki et al., 2006; Mermel et al., 2009; Raad et al., 2007). Therefore, methods that can prolong the duration of viability of both peripheral and central venous catheters hold significant benefit for patient outcomes and the quality of organisational care delivered.

The USA's Centers for Disease Control (CDC) and the UK's EPIC3 Guidelines for preventing healthcare associated infections (HCAIs) only briefly address the issue of vascular access device patency, and when they do it is in relation to central venous catheters not peripheral intravenous catheters. The Catheter Related Bloodstream Infection (CRBSI) rate in central venous catheters in the USA is approximately 3% (Maki et al., 2006) whereas central venous catheter failure rates due to occlusion or thrombosis range from 15 to 66% (Baskin et al., 2009; Raad et al., 2003, 2002; Timsit et al., 2011a). CRBSI rates in peripheral intravenous catheters are extremely low (0.1% Maki et al., 2006). On the other hand, peripheral intravenous catheter failure rates due to dislodgement, occlusion, infiltration or phlebitis sit at 26% in Australia (Rickard et al., 2012), 38% in Spain (Chico-Padron et al., 2011) and 53% in the USA (Bausone-Gazda et al., 2010). Leading professional Associations include some guidelines for maintaining vascular