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Peripheral IV Stabilization and the Rate of Complications in Children: An Exploratory Study[1,2]

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Peripheral intravascular catheter insertion is the most common invasive procedure performed on the hospitalized child with a significant potential for complications. This study compared complication rates between a standard aseptic taping technique and a commercially-available adhesive anchoring device in 80 hospitalized children ages 2–17 years. Eighteen (18) participants (22.5%) experienced a complication with occlusion being the most common (n = 8) followed by infiltration (n = 4), leaking (n = 3), and dislodgement (n = 2). There were no differences in complication rates or types between the two groups. This study provides evidence that a stabilization device may not be necessary in short-duration PIVs in children.

THE INSERTION OF a peripheral intravascular (PIV) access device is one of the most common invasive procedures performed on hospitalized children. However, the placement of a PIV access device increases the risk for the development of phlebitis, infection, infiltration, and extravasation. Children are particularly vulnerable to these PIV-induced complications. In one surveillance report, neonates were impacted by these complications at nearly twice the rate of adults, particularly in critical care areas (O'Grady et al., 2011). In other studies, PIV complications were reported at rates as high as 28% in children (Garland et al., 1992; Pettit, 2003) compared to 8.5% in adults (Flippo & Lee, 2011) leading to prolonged hospitalization, increased medical costs, higher mortality, and greater morbidity in both groups (McCullen & Pieper, 2006; Pearson, 1996; White, 2001).

The cause of PIV complications has most often been attributed to bacterial colonization and unintended catheter movement. Inadequate hand hygiene, lack of aseptic technique, and prolonged indwell time, maintained at 72 hours and beyond, has been consistently associated with increased incidence of phlebitis and infection (Powell, Tarnow, & Perucca, 2008; Tripathi, Kaushik, & Singh, 2008). In one study, over 50% of children experienced infiltration or phlebitis after 96 hours of PIV placement (Tripathi et al., 2008). In addition, small veins, the inability to verbalize or localize discomfort, underdeveloped immunity, and uncontrolled movement are developmental characteristics of young children contributing to the loss of PIV patency and the subsequent onset of complications (Cornely, Berthe, Pauls, & Waldschmidt, 2002; Doellman et al., 2009; Lee et al., 2009; Maki & Ringer, 1991; McCullen & Pieper, 2006).

Since the 1990s, there has been growing interest in the use of commercially-available adhesive devices to stabilize PIV catheters in adults. In most studies, complication rates were reduced dramatically compared to stabilization using tape, gauze, or sutures (Moureau & Iannucci, 2003; Royer, 2003; Runyan et al., 2011; Schears, 2006; Sheppard, LeDesma,

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Morris, & O'Connor, 1999; Wood, 1997; Wood & Bowe-Geddes, 1997; Yamamoto et al., 2002) with few exceptions (Bausone-Gazda, Lefaiver, & Walters, 2010). Additionally, Flippo and Lee (2011) evaluated the clinical effectiveness of the Sorbaview SHIELD, a sterile adhesive, with a particular interest in cost reduction. The authors reported a change in practice from StatLock to the new Sorbaview SHIELD and a direct cost savings of $120,000/year. Yet even with this change, unscheduled restarts reached 8.5% due to dislodgement, leaking, occlusion, or infiltration, well above the goal of <5% recommended by the Infusion Nurses Society (2006).

More recently, research on adhesive anchoring devices have been conducted in the pediatric population with mixed results. Pondinas (2008) determined no difference in the longevity of the PIV catheter compared to securement with a sterile transparent dressing, however, there was a statistically significant reduction in complications with the children in which the stabilization device was used. Heltz (2009) found complication rates were higher in PIVs for children where StatLock was used alone (43%) compared to a control group (35%) and those with a combination of House UltraDressing and StatLock (15%). Also, the StatLock Pediatric device was rated as difficult to use by almost half of the nurses, especially for "small" children and those less than 8 years of age (Heltz, 2009).

In 2011, the Infusion Nurses Society recommended sufficient stabilization of PIV catheters, with preference given to manufactured adhesive anchoring devices (Infusion Nurses Society, 2011). In the same year, guidelines published in the *American Journal of Infection Control* also recommended sutureless securement devices to reduce the risk of infection with intravascular catheters (O'Grady et al., 2011). This standard was based on suggestive evidence for effectiveness comparing sutures to StatLock in PICC lines in adults (Yamamoto et al., 2002). The universality of this recommendation, however, has not been established in either adults or children, and the routine use of such devices has not yet permeated nursing practice. The purpose of this study was to explore PIV securement and stabilization and the resulting PIV complications by comparing a standard sterile transparent dressing and the StatLock securement device in children (StatLock® IV Select Pediatric Stabilization Device, Venetec International Inc./Bard Access Systems, Salt Lake City, Utah).

Method

The study was conducted at a 489-bed midwestern regional medical center with a 20-bed pediatric unit. The sample location was selected due to accessibility of children in the desired age range and access to children who required PIV insertion. Participants were enrolled if the following conditions were met: a PIV catheter placement was needed, the child was between 2–17 years of age, and the parent/guardian consented to participation. Participants admitted to the pediatric unit with a PIV already in place were excluded from the study as well as those with a known adhesive allergy or those with a PIV insertion angle, such as the antecubital or scalp veins, that were not conducive to the use of the StatLock Pediatric stabilization device. Also, children under 2 years of age were excluded due to the challenges of securing the StatLock stabilization device to small surface areas of their extremities. Thirty-seven (37) participants were required in each of the taping method and StatLock stabilization device groups based on power = .80, 2-tailed test with alpha = .05 assuming a 19.005% predicted difference in complication rates between the two groups (Kraemer & Thiemann, 1987). This was a conservative estimate as similar studies reported complication rate reductions in excess of 30% (Royer, 2003).

Training on human subject and study procedures commenced for nursing staff and research assistants using a training video, return demonstration, and an instructional poster placed centrally on the pediatric unit. Parents/Guardians and patients were approached directly by the staff nurses in conjunction with the principal investigators or trained co-investigators to inquire about interest in study participation and to determine eligibility. Following the consent and assent process, children were placed into the intervention or control group by alternating eligible participants (the first eligible participant was placed in the control group; the second was in the intervention group, etc.). A study packet was placed on the nurses' station with instructions on the study protocol, consent and assent forms, and data collection sheets. Data were collected between July 2010 and August 2012. The study was approved by the facility's institutional review board.

In the control group, each PIV was inserted and maintained in accordance with the pediatric unit policies and procedures utilizing a 3 M Tegaderm™ IV 1610, an arm

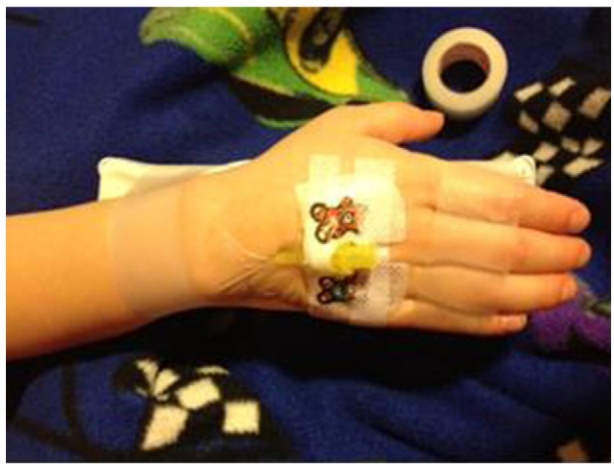

Figure 1 Method for securing with a sterile transparent dressing and tape.