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The Effect of Intravenous Infiltration Management Program for Hospitalized Children

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Purpose This study aimed to identify the effect of IV infiltration management program among hospitalized children.

Design and Methods: This was a quasi-experimental study with history comparison group design with 2,894 catheters inserted during 3 months comparison phase and 3,651 catheters inserted during 4 months experimental phase. The intervention was composed of seven activities including applying poster, documentation of catheter insertion, parents education, making infiltration report, assessment of vein condition before inserting catheter, appropriate site selection, and documentation of catheter insertion, and assessment of peripheral catheter insertion site every shift. Data were analyzed using of X2-test, Fisher's exact test.

Results: The infiltration incidence rate was 0.9% for experimental group and 4.4% for comparison group, which was significantly different (x2 = 80.42, $p < .001$). The catheter maintenance period ($p = .035$) and infiltration state ($p = .039$) were significantly different among participants with infiltration between comparison and experimental groups.

Conclusions: IV Infiltration management program was founded to be effective in reducing the IV infiltration incidence rate and increasing early detection of IV infiltration.

Practice Implications: Considering the effect of IV Infiltration management program, we recommend that this infiltration management program would be widely used in the clinical settings.

INTRAVENOUS (IV) INFUSION is a process often performed on hospitalized patients (Flippo & Lee, 2011; Kagel & Rayan, 2003; Walter & Pitter, 2009). This technique is an effective method for the administration of some drugs, and is also used for delivery of drugs to pediatric patients with absorption defects due to diarrhea, dehydration, or peripheral blood vessel collapse. This method is also used for pediatric patients who need to maintain a high blood drug concentration, being infected with strains of bacteria with a high resistance to antibiotics and therefore must receive medications through IV insertion for a certain period, and require continuous pain relief.

Peripheral IV insertion is a basic nursing technique, but it is also a complex and technically difficult procedure that needs to be performed successfully within a limited time (Thomas, 2007). IV insertion is particularly difficult in children who have thin and weak blood vessels, and move continuously due to the pain associated with insertion (McCullen & Pieper, 2006). According to a previous study, the success rates of peripheral IV insertion performed on pediatric patients were 42.8% for the first trial, 39.7% for the second trial, 37.5% for the third trial, and 38.8% for the fourth trial (Peterson, Phillips, Truemper, & Agrawal, 2012). According to a prospective study on patients in the

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emergency room with an average age of 53 years, a success rate of 79% for first insertion was observed along with a total success rate of 98.6% (Sebbane et al., 2013). These results indicate that the first trial success rate of peripheral IV insertion for pediatric patients is very low compared to that of adults, and the patients consequently become more vulnerable to IV infiltration and extravasation (hereafter IV infiltration) (Fang, Fang, & Chung, 2011; Sung & Kim, 2007). IV infiltration causes inconvenience or delay in treatment due to re-insertion into the vein, and may also result in the need for surgery due to tissue damage (Talbot & Rogers, 2011; Willsey & Peterfreund, 1997) or cause permanent damage in pediatric patients (Clifton-Koeppel, 2006). Therefore, primary prevention of IV infiltration in the early stage is extremely important. An effort to minimize damage by noticing injury at an early stage is also needed.

Although the hospital also made efforts to prevent IV infiltration among pediatric patients with the use of posters, education of guardians, and IV infiltration monitoring, the IV infiltration rate has not been decreased. Therefore, we have developed and implemented an IV infiltration management program by establishing a professional team for prevention and effective management of IV infiltration in hospitalized pediatric patients. This management program includes IV infiltration prevention practices that have not been previously enforced in order to reduce the additional occurrence of IV infiltration in this hospital.

The aim of this study was to evaluate the effectiveness of a new IV infiltration management program by comparing the occurrence rate of IV infiltration and characteristics of pediatric patients with IV infiltration before and after application of the program.

Methods

Research Design

This was a synchronized quasi-experimental study using a historical control to analyze the rate of IV infiltration by application of an infiltration and extravasation management program for patients in a children's hospital, and to identify the characteristics of pediatric patients with IV infiltration.

Study Participants

The participants in this study were children or teenagers 0 to 19 years old who received peripheral IV insertions when hospitalized from August 1, 2011 to February 29, 2012 at a children's hospital with 126 beds located in Yangsan city, Korea. Patients who were hospitalized from August 1 to October 31, 2011 formed the comparison group in this study and did not participate in the IV infiltration management program, representing a total of 2,894 cases of IV insertion. Pediatric patients who were hospitalized from November 1, 2011 to February 29, 2012 formed the experimental group which received care under the IV infiltration management program, with a total of 3,651 cases of IV insertion.

Intervention

The Comparison Group

The comparison group received the routine usual care for preventing IV infiltration. The specific care was as follows:

1. Posters on how to prevent IV infiltration were displayed on the wall(s) of all patient rooms.
2. After IV catheter insertion, the nurses recorded the date and time of IV catheterization, the size of IV catheter, and the name of the practitioner at the site of IV insertion.
3. After IV catheter insertion, the nurses educated the patients' guardians by providing leaflets on how to prevent IV infiltration. The guardians were asked to touch the site of IV insertion, remember the feeling, and make frequent observations to alert the nurses when any abnormalities developed.
4. When IV infiltration occurred, nurses were supposed to immediately stop the infusion, and assess the IV infiltration site, and document this on an 'IV infiltration record' including demographics, IV infusion related characteristics (e.g., duration, site, size of IV catheterization, and type of drug injected), and IV infiltration related characteristics (e.g., stage and size of skin damage).

The Experimental Group: The IV Infiltration Management Program

The 'IV infiltration management program' was applied to the experimental group. This program was developed by the research team composed of one pediatric nursing team leader, three pediatric head nurses, and one nursing professor. They reviewed articles and guidelines related to the IV infiltration prevention and management of peripheral intravenous infusion (Doellman et al., 2009; Earhart & McMahon, 2011; European Oncology Nursing Society (EONS), 2007; Hadaway, 2007; Infusion Nurses Society, 2006; Ingram & Lavery, 2005). Because some of recommendations from the IV infiltration prevention guidelines had already been implemented, the team selected other recommendations which had not been included in the original IV infiltration prevention programs. The additional recommendations were as follows:

1. Prior to IV catheter insertion, the nurse assessed the condition of the patients' blood vessel and selected the best vein for peripheral administration. Small size and poor condition of veins were one of the factors contributing to the risk of infiltration (Doellman et al., 2009). Then, he/she decided whether he/she could perform IV catheterization by himself/herself or referred to the IV insertion team. When insertion failed twice, the nurse was supposed to refer to the IV insertion team to complete the task. In the first step, there was no formal assessment tool. The nurse simply