Variables influencing intravenous catheter insertion difficulty and failure: An analysis of 339 intravenous catheter insertions

Ann F. Jacobson, PhD, RN, and Elizabeth H. Winslow, PhD, RN, FAAN, Kent, Ohio, and Dallas, Texas

BACKGROUND: Inserting an intravenous catheter (IV) is one of the most frequently performed invasive procedures by nurses. Little research has been conducted on ways to reduce the difficulty and failure, and enhance the ease and success, of IV insertion. We conducted this study to determine variables associated with IV insertion difficulty, failure, and success, and to learn special techniques nurses use to facilitate IV insertion.

METHODS: Data were collected on 339 IV insertions in hospitalized patients by 34 registered nurses. The data included information about the nurse (eg, age, education, and self-rated IV insertion skill); the patient (eg, age and race); the IV (eg, site, gauge, and type); and the IV insertion, (eg, duration and difficulty). Data were analyzed to determine the effects of these variables on IV insertion outcome. In addition, nurses were asked to describe special techniques they used to facilitate IV insertion.

RESULTS: A total of 77% of the IV insertions were successful. Nurses who were older, had more years of experience, were certified in a specialty, and rated themselves higher in insertion skill had significantly more successful insertions than their younger and less-experienced and less-skilled counterparts ($P < .001$). Successful IV insertions were significantly faster (mean 32 seconds) than unsuccessful ones (mean 66 seconds) ($P < .001$), and were rated as significantly less difficult ($P < .001$). Failed IV insertions were associated with higher degrees of difficulty arising from vein variables, such as vein rolled or vein was resistant to puncture, and patient variables, such as tough or dark skin and patient movement. The nurses described a wide variety of techniques to facilitate insertion success. The most frequently mentioned were getting self and patient in a comfortable position, using mechanical stimulation such as tapping the vein, and stabilizing the vein.

CONCLUSION: Approximately one fourth of the 339 IV insertions in this study were unsuccessful. Repeated insertion attempts are painful and costly. This study identified nurse, patient, and IV variables associated with IV insertion success and failure. Future research is needed to confirm and expand these findings and to develop interventions to improve IV insertion skills and outcomes. (Heart Lung® 2005; 34:345–59.)