Targeted Training to Reduce Blood Reflux in Peripheral Intravenous Catheters: An Experience Sharing Postprint

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Abstract

Objective To reduce the incidence of blood reflux in indwelling needles through targeted training using quality control circles. Methods By employing quality control circles to precisely analyze the causes of blood reflux, identify main factors, formulate corresponding solutions and implement them, the incidence of blood reflux in indwelling needles was reduced. Results Through precise targeted training, the blood reflux rate of indwelling needles decreased from the initial 54% to 9%, achieving the expected goal. Following implementation, indwelling needle operations became more refined and standardized. Conclusion By utilizing quality control circles to explore root causes and identify precise issues for targeted training, nurses' professional competence was enhanced, shifting the focus from 'good puncture technique' to 'good indwelling quality', thereby reducing the incidence of blood reflux in indwelling needles and increasing infusion safety.

Full Text

Experience Sharing of "Targeted" Training to Reduce the Incidence of Blood Return in Indwelling Needles

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Abstract

Objective: To reduce the incidence of blood return in venous indwelling needles through "targeted" training using a Quality Control Circle (QCC) approach. **Methods:** A QCC was employed to precisely analyze the causes of blood return,

identify primary factors, develop corresponding solutions, and implement them. **Results:** Through precise "targeted" training, the blood return rate decreased from the initial % to %, achieving the expected goal. Following implementation, indwelling needle operations became more refined and standardized. **Conclusion:** Utilizing QCC to explore root causes and implement "targeted" training for precise problems improved nurses' professional competence, shifting the focus from "good puncture technique" to "good indwelling quality," thereby reducing blood return incidence and enhancing infusion safety.

Keywords: "targeted"training; Quality Control Circle; indwelling needle; blood return rate

Introduction

Venous indwelling needles are widely used as an infusion tool in clinical practice. Research has shown that their use improves nursing efficiency, reduces vascular damage and psychological distress from repeated punctures, and shortens infusion time, offering numerous benefits. However, although indwelling needle insertion is considered a simple invasive procedure, operators often neglect procedural standardization, patient safety, and risks of potential complications. In our department, a summary of indwelling needle issues among hospitalized patients revealed a blood return incidence rate of %. To effectively reduce this rate, we established a QCC in 2023 with the theme of reducing indwelling needle blood return through "targeted" training. This activity has achieved effective results, which we now report.

1. Materials and Methods

1.1 QCC Formation

All nurses in the department voluntarily enrolled as circle members. The team consisted of one circle leader, one counselor, and one deputy leader. Circle activities ran from 2023 to 2024. Based on common peripheral indwelling needle issues—including extravasation, blood return, shortened indwelling time, frequent dressing changes, bleeding and redness at puncture sites, improper placement of infusion stickers, and puncture failure—members scored seven potential topics according to relevance, specificity, measurability, achievability, feasibility, urgency, and circle capability using a 5-point scale (highest 5 points, lowest 1 point). The topic of reducing indwelling needle blood return received the highest score and was selected as the activity theme.

1.2 Data Collection and Problem Analysis

Data were collected from hospitalized patients using indwelling needles in 2023, with cases identified, among which cases exhibited blood return. Through literature review and clinical observation, we identified potential causes and created

a checklist. We found that nurse-related factors accounted for cases, patient-related factors for cases, and other causes for cases. By creating a Pareto chart based on the 80/20 principle, we determined that nurse-related factors constituted the primary improvement focus.

1.3 Target Setting

Using the target value formula: Target Value = Pre-improvement Rate - Improvement Value. Based on circle member voting, the circle capability for this theme was set at %. The target value was calculated accordingly, establishing an improvement amplitude of %.

1.4 Root Cause Analysis

Through brainstorming sessions, circle members analyzed nurse-related causes and created a fishbone diagram to identify true causes. Analysis across four dimensions—personnel, materials, mechanisms, and methods—identified the following true causes: incorrect sealing technique, improper dressing molding, inappropriate insertion site selection, failure to elevate the platform after sealing, and improper vascular clamp positioning.

2. "Targeted" Training

2.1 Department-Level Skills Training

The department' s intravenous therapy team leader organized nurses to watch instructional videos on indwelling needle operation and conducted hands-on demonstrations using models. Training focused on operation details addressing the identified true causes. Sealing technique is a critical component of venous indwelling needle application. Proper technique ensures the catheter remains filled with sealant solution without medication residue, maintaining catheter function and protecting blood vessels. When sealing technique was incorrect, we emphasized "positive pressure sealing." For improper dressing molding, we stressed the "pinch-smooth-press" three-step procedure. For failure to elevate the platform and improper clamp positioning, we emphasized "U-shaped tubing above puncture site, clamp at catheter root." For inappropriate insertion sites, we stressed "forearm first"preference. For patients with poor vascular conditions, we utilized infrared vascular imaging devices to identify optimal forearm vessels. These portable visualization devices increase puncture success rates and solve difficult infusion problems with minimal environmental constraints. Training was conducted in small groups with team leaders supervising practice, with particular attention to nurses with less than 3 years of experience to ensure all staff mastered the theoretical knowledge. For difficult cases, the hospital' s intravenous therapy team was consulted for advanced instruction.

2.2 Assessment and Reinforcement

The department' s intravenous therapy team leader created written examinations on indwelling needle knowledge. Frequently missed questions were explained during morning meetings, with department head nurses summarizing key points to reinforce learning. Small-group competitions were held to assess operational details, with outstanding groups receiving public recognition. Errors were documented and communicated to individuals. Department head nurses conducted spot checks, photographing operational deficiencies for group discussion and 警示. After remedial practice, the hospital' s intravenous therapy team performed re-assessment. Problems were meticulously documented to ensure strict adherence to operational details.

2.3 Hierarchical Theoretical Training

Hospital-level intravenous therapy experts lectured on "intravenous therapy and safety management" for all nursing staff. Department-level head nurses organized 科室-specific learning sessions on key content, using questioning to reinforce important concepts. Group-level intravenous therapy team leaders conducted stratified training for nurses at different experience levels.

3. Review and Summary

Following one month of training, department intravenous therapy team members re-collected data on indwelling needle blood return. In April 2024, among hospitalized patients using indwelling needles, cases of blood return occurred, yielding a blood return rate of %. The target achievement rate was calculated at %, with a progress rate of %. Through this "targeted" training, the indwelling needle blood return rate decreased significantly.

However, blood return still occurred in clinical practice. We established a comprehensive "targeted" specialized training mechanism for staff with the highest blood return incidence based on scheduling records. Nurses with the most frequent blood return cases received one-on-one training from the department' s intravenous therapy team leader, focusing on correcting operational errors. Re-assessment continued until performance passed and blood return rates decreased, then moving to the next staff member for continuous improvement. Motivational reminders such as "Do your best, avoid being last!" were posted on medication carts or in treatment rooms to reinforce standardized operation and safe intravenous practice.

Discussion

Indwelling venous catheterization is a common clinical procedure. Blood return in the catheter poses thrombosis risk, increasing catheter blockage and phlebitis incidence, thereby shortening catheter dwell time. Patients observing blood return in their indwelling needle experience anxiety and fear, severely affecting

dwell time and treatment efficacy. Additionally, improper puncture can cause nerve injury, creating unnecessary suffering.

QCC activities motivated team members to identify causes of blood return, create fishbone diagrams to determine primary factors, and implement "targeted" specialized training for each influencing factor through layered training and assessment. This approach refined management, addressed weak links in previous peripheral venous catheter care, and continuously improved, optimized, and standardized catheter insertion and maintenance procedures to minimize individual capability dependency and reduce execution deviation.

Through "targeted" training on standardized operational details—including correct dressing molding techniques, appropriate site selection, and proper sealing methods—we reduced indwelling needle blood return rates, decreased blockage probability, and extended dressing durability after fixation, thereby reducing medical costs.

This "targeted" training not only improved nursing quality and professional knowledge but also enhanced participants' intangible capabilities including motivation, responsibility, communication, cooperation, and team cohesion, laying a solid foundation for implementing high-quality nursing services and improving patient satisfaction.

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Note: Figure translations are in progress. See original paper for figures.