Construction of a Training System for SCU Nurses who Began to Support Endovascular Treatment for Acute Ischemic Stroke

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Purpose: In recent years, shortening the time from onset to recanalization has been shown to markedly affect the outcome of acute ischemic stroke. In our hospital, in order to shorten the time to recanalization at night hours with staff shortage, stroke care unit (SCU) nurses supported the outpatient clinic nurses during endovascular treatment from preparation to introduction. We hereby report the contents and results of the training we conducted toward the SCU staff.

Materials and Methods: The following methods were used to educate 12 SCU nurses with the knowledge and skills necessary to provide support in acute-phase cerebral endovascular treatment: 1) training in the catheterization laboratory, 2) manual production for acute-phase recanalization therapy, 3) simulation training, and 4) production of a digital video disc (DVD) as an audiovisual teaching material. The effects of these methods were evaluated using a questionnaire.

Results: By the end of the training, 11 of the 12 SCU nurses were able to perform the procedures of cerebral endovascular treatment from preparation to introduction. Results of the questionnaire showed that these educational methods reduced SCU nurses’ anxiety, and the knowledge provided by these methods could be utilized in clinical setting. Following the given training methods, the time from the patient’s arrival at the hospital to acupuncture could be reduced by 22 minutes.

Conclusion: The nurses were able to acquire the knowledge and skills necessary to participate in acute-phase cerebral endovascular treatment by gaining experience through training in the catheterization laboratory, simulation training, and repeated image training using the manual and DVD. As a result, their anxiety decreased and the nurses became able to participate in the actual operation. The results suggest the usefulness of these educational methods.

Keywords: acute-phase cerebral endovascular treatment, education

Introduction

Concerning acute-phase recanalization therapy, recent studies suggest the effectiveness of endovascular mechanical thrombectomy compared to intravenous thrombolysis with alteplase alone.1) The time to recanalization is the most important prognostic factor.2) In particular, shortening the time from arrival at the hospital to puncture (door to puncture: D to P) requires a team effort. In order to reduce the D to P time in acute-phase recanalization during night hours when staff is short, in 2015, we decided that stroke care unit (SCU) nurses should participate in endovascular surgery along with emergency care nurses. We constructed a training system so that SCU nurses can assist endovascular surgery without feeling anxious. We hereby report its contents and effects.

Materials and Methods

We took the following methods to train 12 SCU nurses without any experience in endovascular surgery, to assist the procedure accurately with less anxiety: Daytime training in the catheterization laboratory, Production of a manual regarding acute-phase recanalization therapy,
Simulation training,
Production of a digital video disc (DVD) material showing the process from preparation to introduction,
A questionnaire after the training.

Daytime catheterization training
Under the instruction of catheterization laboratory nurses (outpatient clinic and operating room nurses), SCU nurses practiced procedures from preparation to assistance in scheduled angiography and endovascular treatment for 3 months from June 2015. In the training, instructions were given regarding preoperative preparation such as laying out instruments, their names and storage places, warming of the operating table, timing of verbal communication with the patient, ways to cooperate with physicians and radiologists, and how to record the operation. Each nurse took the training three times. At the first training, the nurses would observe preparation and procedures. At the second training, nurses would perform procedures following instructions. By the third training, they will become able to support procedures independently.

Manual production for acute-phase recanalization therapy
A manual was produced with caution to the following under the guidance of catheterization laboratory nurses (Fig. 1).
Photos were used so that the names and storage places of articles can be known at a glance. Procedures were written in order so the nurses can prepare by simply following the manual. The manual was placed at the SCU nurse station so the SCU staff can read anytime and take it to the catheterization laboratory at the time of emergency.

Simulation training
The SCU nurses who completed the daytime catheterization training were divided into two groups, and received simulation training under the instruction of catheterization laboratory nurses for 90 minutes after work. In the catheterization laboratory, the SCU nurses performed procedures from preparation to assistance in cerebral endovascular surgery using actual articles. The training instructors played the roles of a patient and surgeon under the scenario where the patient underwent nighttime acute-phase
recanalization therapy. The SCU nurses receiving the training played the role of both direct and indirect assistant nurses. The training included procedures such as ways to dress the surgeon with a sterile gown, confirming the placement of surgical articles in order to handle the requested articles smoothly, and ways to handle sterilized articles to the surgeon using the clean technique. In addition, the nurses practiced recording while observing the flow of the operation and communicating with the patient at the appropriate timing while receiving instructions. After the training, the instructors provided feedback, clarified each nurse’s problems, and gave instructions.

Production of a DVD as an audiovisual teaching material

For nurses who have missed the training as they were transferred to the SCU after the simulation training and SCU nurses who only have few opportunities to participate in cerebral endovascular surgery, we produced a 15-minute DVD that can be viewed over and over again so they would not forget the acquired procedures and techniques.

The DVD contained scenes where procedures were simulated on a model patient with the instructor’s explanation and regarding the following contents:

The SCU staff is informed that a patient requiring nighttime emergency acute-phase revascularization has arrived, and SCU nurses are requested to participate in emergency cerebral endovascular surgery.

Surgical article preparation in the catheterization laboratory (such as layout of the articles of the angiography set, placement of the A line and its assistance, and preparation of the angiography table).

The types of catheter used for cerebrovascular surgery and the names and placement of these surgical articles.

A questionnaire

To evaluate the effects of the training, a questionnaire was performed on the effects of the following educational methods: daytime catheterization training, manual production for acute-phase recanalization therapy, simulation training, and the production of a DVD as a teaching material. For the educational methods, the following questions were asked: A. “Did this educational method reduce your anxiety toward cerebral endovascular surgery?” and B. “Could the knowledge or skills provided by this method be utilized in the clinical setting?” The answer choices for question A were “Anxiety was reduced,” “Unchanged,” and “Anxiety was increased,” and those for question B were “could be utilized,” “produced no change,” and “could not be utilized.” The answers were simply totaled and analyzed for analysis. The results were rounded off to the nearest whole number.

While methods were used, a system to incorporate SCU nurses in the emergency outpatient system for a reduction in the time until acute-phase recanalization was constructed in cooperation with the emergency outpatient unit, and SCU nurses received education using methods. In the daytime catheterization training, nurses were asked to orally tell the on-clot time (time when the catheter reached the target lesion) and recanalization time as recording items to the surgeon to allow staff members to smoothly record these times.

In addition, we decided that a nurse in the acute care in the same ward as that of the SCU may enter the SCU for help while the SCU nurses are working in the catheterization laboratory. For this, time for nursing handover is necessary. Therefore, the head nurse was requested to make contact with the SCU leader nurse in the early stage when there is a possibility of acute-phase recanalization therapy. Thus, in the DVD and simulation training, nurses were instructed to perform handover to an acute care unit nurse before moving to the catheterization laboratory.

Results

The questionnaire response rate was 100%. The questionnaire showed that anxiety was reduced by “manual production,” “simulation training,” and “production of a DVD teaching material” in many staff nurses, but was unchanged or increased by the “daytime catheterization training” by approximately 50% and 30%, respectively (Fig. 2). Answers to the question asking whether knowledge or skills provided using each educational method could be utilized in the clinical setting, “could be utilized” was selected by all nurses for “simulation training” by 70%–80% for
“manual production” and “production of a DVD teaching material,” but only 50% for “daytime catheterization training” (Fig. 3).

In the first “simulation training,” many SCU nurses’ understanding of the names and placement of articles were inadequate. Therefore, when the instructor playing the role of a surgeon gave instructions, they could not move smoothly. As a countermeasure, information on the placement of the articles was added to the manual for acute-phase recanalization therapy, which previously only showed photos of the articles used. In the second “simulation training” that was performed after these changes have been made in the manual, the flow of simulation was smooth, and the instructors were able to give instructions regarding verbal communication with the patient and how to cope with acute changes in the patient.

Concerning the frequency of the use of the DVD teaching material, nurses who had sometimes experience participating in endovascular operations only watched it once, but most nurses answered that they “read the manual during hours such as breaks on the night shifts” and have watched it two to three times on average. Nurses who transferred to this SCU and could not attend the simulation training also described that they could form an image of their role in nighttime emergency cerebral endovascular surgery by watching the DVD.

After daytime catheterization training, manual production for acute-phase recanalization therapy, simulation training, and DVD production, 11 of the 12 SCU nurses became able to perform procedures during endovascular surgery from preparation to introduction.

Before this training system, the mean D to P time was 86 minutes between July 2014 and May 2015, but was shortened to 64 minutes between June 2015 and March 2016 after implementing this system, showing a 22-minute reduction.

### Discussion

To reduce the D to P time in acute-phase vascular reconstruction during the night where staff is short, SCU nurses began to support endovascular surgery from preparation to assistance. However, when they provide support in acute-phase vascular reconstruction, anxiety about learning the actual process is the greatest psychological burden under the circumstances of being in a race against time. The results of the questionnaire showed that the present training system reduced this anxiety for most nurses, suggesting its efficiency for overcoming this problem.

In “simulation-based education,” one can learn a focused item through experiencing nursing in reproduced situation of the clinical setting, reflecting the experience and by integrating professional knowledge, skills, and attitude. This is an effective method to improve an individual’s practical ability since what should be performed becomes clear. The questionnaire in this study also showed that knowledge and skills learned in simulation training could be utilized in the clinical setting.

“Catheterization training” did not reduce anxiety for some nurses. This may because SCU nurses attended their first catheterization training with no experience and inadequate background knowledge of endovascular surgery causing their anxiety to increase due to the atmosphere of the site. However, this “catheterization training” was performed as the preliminary stage for “simulation training.” Since the questionnaire showed that all nurses considered “simulation training” to be valuable, “catheterization training” may also have been useful as the preliminary stage for “simulation training.”

“Manual production” and “DVD production” enabled repeated image training. For SCU nurses lacking experience, both the manual and DVD clips may have been useful tools to compensate for the lack of experience. In addition, for nurses transferred to the SCU who could not attend the training, these may have been effective methods to support self-learning.

“Daytime catheterization training” and simulation training mimicking the actual clinical practice and repeated image training using the “manual” and “DVD” have markedly reduced the initially observed vague anxiety toward cerebral endovascular surgery.

When tension increases in the catheterization laboratory, nurses often have difficulty in maintaining their composure and cannot exhibit their usual ability. In addition, nurses engaging in interventional radiology (IVR) are required to not only be equipped with knowledge and skills, but to provide the patients with mental support to
cope with their physical pain especially under local anesthesia. Therefore, it is necessary to improve the training system and develop even more effective methods, so, when assisting in cerebral endovascular surgery, the SCU nurses can accurately perform procedures without anxiety.

**Conclusion**

When ward nurses participated in cerebral endovascular treatment requiring quick correspondence, “manual production,” “DVD teaching material production,” and “simulation training” were useful for training in simulated clinical situations and repeated image training. As a result, necessary techniques, knowledge, and coping methods were clarified, which may have resulted in the acquisition of knowledge and skills, and the reduction of anxiety.

**Disclosure Statement**

The first author and co-authors have no conflicts of interest.

**References**

