

## CHAPTER V

### THE MANOEUVRE

The purpose of this chapter is to discuss the process which was used to develop a tool for evaluating the quality of mechanical ventilator care delivered by nursing personnel in the intensive care units at Maharaj Nakorn Chiang Mai Hospital. The general plan for the study consists of an initial observation of the nursing activities while nursing personnel are providing care for patients with mechanical ventilation and, at a later period, the use of questionnaire to assess their demographic background and specific knowledge, focusing only on the problematic procedures. An observational checklist (or criterion standard) prepared specially for the study serves as a tool of measurement for the initial observation phase.

The first part of the study took place in 5 intensive care units of Maharaj Nakorn Chiang Mai Hospital during the period of March 18, 1991 to December 20, 1991. There were an investigator and one helper to gather the data. The investigator was responsible for the overall management of the study.

#### Organization of Intensive Care Units

A short description of the organization and physical structure of Maharaj Nakorn Chiang Mai Hospital may be helpful in

understanding the study process used as the study settings are intensive care units of the medical, surgical and pediatric nursing departments of the hospital. The medical nursing department consists of 6 general wards, an intensive care unit, a coronary care unit and a dialysis unit. The surgical nursing department consists of 6 general wards, 6 orthopedics wards, 2 intensive care units, 2 intermediate care units and a burn unit. The pediatric nursing department consists of 4 general wards, 2 intensive care units and 5 nurseries. So, the intensive care units involved in this study are: the Surgical Intensive Care unit (ICU-S), the Neurosurgical Intensive Care unit (ICU-N), the Medical Intensive Care unit (ICU-M), the Pediatric Intensive Care unit (ICU-P) and the Pediatric Acute Care unit (ACU-P). All, but the last, of these intensive care units are located in different wings of the second floor of the main building. The Pediatric Acute Care unit is on the sixth floor of the same building.

The intensive care units of Maharaj Nakorn Chiang Mai Hospital offer a fixed number of permanent beds; 9, 9, 8, 8, and 6 beds are available in the ICU-S, ICU-M, ICU-N, ICU-P and ACU-P, respectively. At any given time, the maximal number of patients admitted in each ward will generally be the same as the number of bed available. An exception is the ICU-N which will provide temporary bed(s); as many as 16 patients had been cared for during certain festivals.

Critically ill patients may be admitted right from the emergency room, operating room and various out patient departments

(OPD) or they may be transferred from general wards.

The routine work of nursing personnel in all intensive care units are quite similar. Nursing personnel work as total care providers at a ratio of 1 - 2 patients/nurse in 4 units; in the ICU-N nurses were not assigned specific patients to care for. There is a one-year rotating program to orientate new graduates or new employees at the level of nurse and practical nurse. After completing the orientation, the nursing personnel can choose their permanent working place according to their own needs and available quota of each ward.

All of the intensive care units is staffed 24 hours a day. Daily work hour is divided into 3 shifts: the day shift (8.00 am-4.00 pm), the evening shift (4.00 pm-12.00 pm) and the night shift (12.00 pm-8.00 am). While the head nurse of any ward will work only during the day shift of regular official days as the nursing incharge, other nurses will be rotated among 3 shifts. Therefore, all nursing personnel, except of course the head nurses, in these wards are likely to be randomly distributed. During the evening shift and night shift of official days and during all 3 shifts of holidays, the most senior nurse in that shift takes the responsibility of the nurse incharge of the ward. Critically ill patients, especially those with mechanical ventilation, are usually cared for by both nurses and practical nurses.

#### Measurement Framework

Since this is a measurement of clinical process, the

criterion reference framework is used to determine to what extent a nurse knows or can do in relation to a fixed performance standard. The criteria for caring of patients with mechanical ventilator were selected from the CDC guidelines, the mechanical ventilator care guidelines of Maharaj Nakorn Chiang Mai Hospital and related literature (Stromborg, 1988). In order to cover a wide range of the nursing practices and to be of particular relevance to mechanical ventilator care, 10 procedures were included in the study.

### Type of Measurement

Two separate devices were used: an observational checklist and a questionnaire. The checklist was designed for the use of the investigator and a helper to keep track of the actual steps performed by the nursing personnel during the observation phase. On the other hand, the questionnaire was for the nursing personnel to answer by themselves at the end of the observation period. It is used to assess the demographic data and specific knowledge concerning mechanical ventilator care.

1. Observational Checklist. The set of checklists was prepared for each of 10 nursing procedures. In a checklist, individual steps required for the completion of the procedures were expressed in behavioral terms. For each step, the observer (or rater) was allowed only 1 decision out of 4 choices; that is, whether a particular behavior did in fact occur correctly, or incorrectly, or whether the behavior was omitted by the nurse

during an episode, or whether it was not possible to decide one way or the other as that particular result has already occurred without the nursing intervention. A total of 149 items was originally prepared for these 10 procedures (Appendix). Each procedure contained from 7 - 38 items; the procedure of initiation of mechanical ventilator care being the most itemized.

For any item within a procedure, the quality score is calculated by dividing the number of correct episodes with the sum of correct episodes, incorrect episodes and omitted episodes. The result is then expressed as a percentage that ranges from 0-100. For example, if a particular step (or item) was observed for a total of 10 times with a result of 7 correct episodes, 0 incorrect episode, 2 omitted episodes and 1 non-applicable episode, the quality score would be  $7/9$  or 77.8%. This score reflects the overall quality of nursing care delivered to a group of patients with mechanical ventilation by a group of nursing personnels in all 5 intensive care units during a 9-month period.

2. Questionnaire. At the end of observational period, the questionnaire was constructed to contain items identical to those in the observational checklist, but selecting only the procedures with poor performance. In addition, specific directions are available to aid in the answering of each question. It is easily understood by the nursing staffs.

The resulting questionnaire, a knowledge testing device, was used to help differentiate whether the item with poor quality score resulted from the lack of specific knowledge or from an

inappropriate response. From these results we can make specific suggestion(s).

### Ethical Consideration

Since this study is aimed at the evaluation of nursing activities which constitute normal parts of the nursing process in this educational institution and since nursing personnel need to be blind in order to diminish the Hawthorn effect, the consent from participants should not be needed in the observation period. On the other hand, the knowledge assessment period involves the collection and storage of important personal informations, such as name, address, other demographic data including the quality score of nursing practice. If the result is in a negative direction, it might adversely affect those particular subject(s) of study. So all information of the study is kept as confidential in order to protect human rights.

### Quality of Measuring Tool

Since the measurement is one of the most important part of this kind of study. Amlborn (1976) stated that someone learning archery must first learn to hit the center of the target, and then to do this consistently. This is analogous to the difference between two characteristics of a measurement: validity and reliability.

1. Content Validity. Most validation studies started with content validity, which refers to how adequately the sampling of

question reflects the aims of study. Each health measurement represents a sampling of questions from a larger number that could have been chosen. At the beginning of this study, after reviewing related literature, the investigator listed all possible procedures which are needed in the caring of patients with mechanical ventilation and compiled the nursing activities according to those procedures. She then tried to select those procedures that are known, from appropriately rigorous studies, to affect the patients' clinical outcome. She also adopted some indicator conditions that are believed either to evoke clinical actions known to result in more good than harm when correctly applied or to evoke clinical actions known to result in more harm than good, as suggested by McMaster INCLIN (1984).

In the next step, experts in the field of mechanical ventilation were asked to assign weights to the behavioral task steps (or items) in each of the procedures as recommended by Stalker, Kornblith, Lewis and Parker (1986). The weights assigned by this panel were the basis for creating the observational checklist and the questionnaire. The weight scale was divided into three levels: critical, important and less important. Critical items were assigned when experts considered that this item should be performed correctly for 100% of the times. Important and less important items were assigned when experts expected that they should be performed correctly at least 90% and 80% of the times, respectively. Only the items of which the weights assigned by at least 4 out of 6 experts agreed were used in the actual

observation. Among a total of 149 items in the original checklist, the weights assigned by 6 experts were concordant in only 138 items. Among the latter, 19 items, 111 items and 8 items were rated as critical, important and less important, respectively.

The weights assigned to each task step reflected the opinion of a minimum of 4 and a maximum of 6 experts. Concordance of the experts' opinion also serves as an indicator for selecting items to assess knowledge with the use of questionnaire. Any task step that the nursing personnel, as a group, performed correctly at the level which is below a minimal requirement as suggested by at least 4 out of 6 experts would be our focus to assess knowledge.

As suggested by McDowell and Newell (1987), a further common procedure to establish content validity is to ask experts to comment on the clarity and completeness of the checklist. For this study, the content validity was established by 6 experts who were dealing directly in mechanical ventilator care. These experts reviewed the observational checklist for mechanical ventilator care and suggested a number of changes.

2. Reliability. Another characteristics that an instrument must possess is the reliability. Reliability can be conceptualized in terms of stability, equivalence or internal consistency of measurement with the instrument (Stromborg, 1988). Because one of the greatest problems in quality monitoring is that of observer reliability, two forms of observer reliability testing, the intrarater reliability and the interrater reliability, had been used.



2.1 Intrarater reliability. In order to determine the stability of the observational checklist, the consistency with which one observer assigned score for one nurse by using the same instrument on 2 different occasions (the test- retest method) was used. The intra-class correlation as calculated from the score at time one and time two with the methods of Streiner and Norman (1989) and Rucha et al.(1989) was 8.7.

2.2 Interrater reliability. To ensure the interrater reliability a study was conducted that tested two observers, the investigator and one of trained observer, as they watch an event simultaneously by using the same instrument and score the episode independently. The intra-class correlation among the two observers as calculated with the methods of Streiner Norman (1989) and Rucha et al.(1989) was 8.5.

As the score of 0.7 or greater is considered as achieving reliability, these two results indicated that both intrarater and interrater reliability do exist for the observational checklist.

3. Pilot Study. Before collecting data, a pilot study was conducted in the Trauma Ward and Emergency Ward. These two units are similar to the intensive care units with regards to the provision of mechanical ventilator care.

### Data Collection

This part of the study were devided into two periods: the observational period and the knowledge testing period. The plan for study include observation of the nursing activities while

nursing staffs are providing care for their patients without knowing that they have been observed (Rucha et al., 1989). A minimum of 16 observations was made for each item.

1. Observational period. Data collection by using the observational checklist was done mostly by the investigator. The nursing personnel in intensive care units were observed during different periods of time, depending on the nature and the occurrence of these procedures. Nursing personnel were blind to diminish the Hawthorn effect.

The procedures were divided into two types: common procedures and rare procedures. Continuing mechanical ventilator care, endotracheal tube care, cuff care, suctioning of trachea represent common procedures. Rare procedures are endotracheal intubation, initiation of mechanical ventilator, tracheostomy inner canular care, blood gas sampling from arterial line, weaning from ventilator and extubation.

In order to observe the common procedures, the investigator made a rotation every week to each of 5 intensive care units. The sequence of this rotation was fixed and the starting unit was picked by using random sampling technique. The observational period was between 7 a.m. - 10 p.m. Monday through Friday. During the period of observation, the investigator participated and/or helped the subjects all through their activities.

For observing rare procedures, the investigator made round to the intensive care units early in the morning before starting her usual work and in the evening just before leaving in order to

evaluate the general situations of the unit, the general conditions of all patients and to take a quick look at patient's charts. This measure allowed her to predict the occurrence of rare procedures. For example, endotracheal intubation is an emergency situation and time limiting procedure. Most of the cases that we could obtain were the ones who had been extubated and needed to be reintubated. Studying of the patients' clinical signs and symptoms including the arterial blood gas results allowed us to predict the procedure and the investigator would made herself available for observation.

In order to predict the initiation of mechanical ventilator care, the investigator would note, during the morning round, the capacity of each unit to receive new patient, the number of patient who would be able to be transfered out, the number of vacant bed, the number of patient who will be tranfered in and the diagnosis, severity and requirements of those patients. Since a physician who wants to transfer the patient to ICU has to make a reservation for the bed and provide the indications for admitting patients into ICU together with an approximate transfer time, these information would assist the investigator in observing it.

Tracheostomy inner cannula care is also counted as a rare procedure because not every patient who requires ventilators need to have a tracheostomy tube. So, the investigator would try to observe the number of tracheostomy in all 5 wards in the morning round. The result from a pilot study and her own experience suggest that this procedure is usually performed around 1 p.m.- 3 p.m. in the day shift and at 8 p.m.- 10 p.m. in the evening shift.

If several tracheostomee patients were admitted in different intensive care units, the pattern of care in each unit was taken into account. Most of the time, the ICU-S would start first, followed by the ICU-N and ICU-P. In the ACU-P, none of the patient requires a tracheostomy tube. For the ICU-M, this care is under the responsibility of personnel from the Chest Division of the Department of Internal Medicine. As the nursing personnel of the ICU-M only change the inner tube, it is not possible to observe this care in ICU-M.

The weaning from ventilator and extubation require that patients are stable and the spontaneous ventilatory parameters indicated that the patients would be able to breath by themselves. Most of the physicians would try to wean or extubate in the early morning so that they could evaluate the patient for a whole day. During the evening round, the investigator may be able to predict the weaning and extubation for the next morning. Knowing the working pattern of doctors in various specialties greatly assists the investigator in catching rare events.

A priority was established such that a rare procedure would be observed when both a rare procedure and a common procedure were to happen at the same time in a unit. If 2 rare procedures were expected to occur simultaneously, the number of previous observations would be an indicator for the investigator to select the less common one.

In addition, a special attempt was made of using a record book for 2 long procedures: initiation of ventilator care and

continuing mechanical ventilator care. Being recorded in this book was the information about the patient, instead of the nursing personnel being observed, such as patient's name, type & mode of ventilator used, tidal volume, level of consciousness of patient, etc. All of these data were obtained from the chart and by observing nursing personnel during their work. This attempt should increase the reliability of data obtained because it would appear as if the investigator was concentrating on the patients rather than on the nursing personnel themselves. This measure also insured that the nursing personnel could not readily identify the small set of specific activities being observed and try to modify their behavior to earn more favorable rating.

It should be noted that the Nursing Service manager had provided a panel discussion on the prevention of respiratory tract infection for all nursing personnels on June 19-20, 1991. This educational activity concentrated mostly on the suctioning technique and on preventive measures for controlling respiratory tract infection in the hospital. Since it could affect the result of this study, the investigator had to finish those parts of the observation that could be affected before the educational program started.

2. Knowledge Assessment. In the second period of the study, a set questionnaires was constructed from the items in the observational checklist and it was employed to assess demographic background and specific knowledge of the personnels.

After finishing the observation, all data were analyzed by

using descriptive statistics and the level of performance for each item was expressed in percentage. The items of which nursing personnel did not perform up to the level expected by at least 4 experts were then identified. A set of questionnaires was next constructed in parallel to the observational checklist, but focusing only on the weakpoints or the problematic parts. Since the content validity of the same items in the observational checklist had been previously established by experts, the remaining part to test for in the questionnaire was the reliability.

Pretest of the questionnaire was done in the intermediate care units. With regards to mechanical ventilation care, the facilities within the intermediate care units are quite similar to the intensive care units.

In order to get accurate data, informal verbal and written information was given to responders in an appropriate manner so that the nursing personnel could readily understand the specific questions in the questionnaires. According to the convenience of the responders, most of the questionnaires were given in the ward; the responders answered the questions at their own convenience.

#### Data Processing and Analysis

The data were transformed into code and it was summarized in percentage. The data analysis was accomplished by using descriptive statistics with a 95% confidence interval in the DBASE III and SPSS/PC program. The multiple logistic regression was used

to calculate the association between knowledge and practice (Lee, 1980).

The knowledge assessment was done only once for each nursing personnel, but some of them had been observed for 2-11 times. In such a case, the latest performance was used to calculate the correlation with knowledge.