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*Special characteristics of nursing staff scheduling
in intensive care units*

The importance of the improvement of staff scheduling methods in health care has been acknowledged by the Polish Ministry of Health by the *Act in the Matter of Methods for Establishing Minimum Employment Standards for Nurses and Midwives in Health Care Units* of 21 December 1999 (9). Thus, the efforts of many years which aimed at the recognition of the Patient Classification System (PCS) as an optimum method for the determination of the number of medical staff have been legally approved (1, 6, 8, 10, 11).

According to this Act by the Minister of Health, hospital managers are obliged to determine in their own capacity the standards for medical staff scheduling. However, after one-year observation it could be presumed that the method of determination of working time standards based on self-observation of nurses at work, which was applied by the majority of managers, was methodologically incorrect. According to the literature concerning standardization, self-observation is not considered as a reliable method (12). Time-scheduling is recommended as the method of choice (4). The majority of hospitals, however, are not prepared for the time-schedule method in the aspect of its essence, staff and organization.

The series of articles published during the period 1998-2000 presented the method for standardization of the working time which may be applied in national hospitals (2). Nevertheless, not all health care units wanted or were capable of using this method. By using self-observation they strengthen the imperfect organizational state of health care and adopt staff standards which are the resultant of the time of nursing received by a patient, but do not necessarily overlap with the time of nursing a patient should be provided with.

Due to this situation, the following problem questions have been posed: Are there any differences between the time of nursing (provided) in the intensive care ward and the time patients should be offered (model)?

In order to compare both values of the nursing time, patients in intensive care units (ICU) were deliberately selected for the study. ICU patients were mainly unconscious, with multiple organ failure, requiring 24h complex care, application of diagnostic and therapeutic procedures as well as prevention of complications (7). Hence, it is extremely important that this group of patients is provided care according to their actual needs (2, 5).

MATERIAL AND METHODS

Studies were conducted in ICU at one of the clinics in Lublin on the turn of 1999. Observations were carried on daily for a week during 12-hour night and day duties. The research method was an active observation, and time-scheduling technique was applied during which 2,821 measurements of various nursing activities were performed. In order to determine statistical relationships between the provided and model nursing time, u-test was applied for individual fractions.

The study covered 63 patients. The most numerous group were patients with multiple organ failure (19%), condition after appendectomy due to appendicular abscess (15.8%), isolated head injury – intracranial haematoma (15.8%), status post cardiac arrest (7.9%) and chronic cardiopulmonary syndrome (7.9%). This group constituted 66.4% of the people examined. The remaining patients (33.6%) had sepsis, face injury, conditions after fracture of the neck of femur, cholecystectomy, appendix surgical procedures, myasthenia and respiratory failure.

RESULTS

The preliminary period of the study focused on the adjustment of the nursing care criteria to the specificity of patients hospitalized in the ICU. The following 8 parameters were adopted which concerned: state of consciousness, prevention of complications, education and psychological support provided for a patient and the family.

Precise ascribing of the nursing activities registered to a defined criterion as well as the analysis of literature enabled the adoption of the number of categories of care and their detailed description. Finally, three categories of nursing care were adopted, the patients being ascribed these categories according to the accepted criteria.

Conscious patients, with orientation in their surroundings, who were lying in bed, but with whom attempts to tilt to an erect position were undertaken, were ascribed Category I of intensive basic care. Patients in Category I were generally able to locate and define the origin of pain. They required assistance with performing hygienic activities, nutrition and excretion, and usually expressed physiological needs, although they used a bed-pan or receptacle. The basic life parameters (pulse, BP, temperature, diuresis, pO_2 , saturation and ECG) were measured twice a day. Contact with the family was recommended.

Patients with consciousness disorders (confused, excited) or those unconscious were ascribed Category II of highly intensified care. In these patients the reaction to pain stimuli was maintained and the function of life centres was independent. The patients required total assistance in performing hygienic activities and frequent changes of underwear and bed clothes. They were fed by stomach tube, while fluid infusion and parenteral nutrition were periodically applied. Life parameters mentioned in Category I of care were measured every one or four hours. Additional tests were performed. The patient's position was frequently changed. In addition to the activities preventing complications mentioned in Category I of care, secretion from the upper airways was removed by suction through intubation or tracheostomy tubes. Procedures regulating body temperature were applied. Prophylaxis of bedsores was intensified. Great importance was attached to the maintenance of verbal and tactile contact. The family of the patient required information and psychological support.

Category III of critical intensive care covered patients whose life functions were supported by medical equipment, with no reaction to pain stimuli observed, who often required permanent immobilization. Patients required parenteral nutrition and fluid infusion as a supplementation of the diet provided by means of a stomach tube. The patient could not control sphincter muscles and often

fouled himself. Basic life parameters mentioned in Categories I and II were measured every 30 minutes, or even more frequently. Cardiac output, pulmonary capillary wedge pressure, pulmonary arterial pressure as well as CVP were determined and other specialist tests were performed. Failure of at least two organs was noted. The patient continuously received intravenous infusion; blood and blood-related preparations were applied in the treatment. Artificial ventilation and systematic hemodialysis were carried out as well as drainage of the body cavities and ultrafiltration. In these patients complications occurred frequently, therefore preventive activities were intensified. The patient's family received psychological support.

In order to establish mean nursing time in individual categories of care, the time provided by nurses to patients was first calculated, then it was compared with the time which a patient should receive (model).

Category I of care covered patients with respiratory failure, status post appendix surgical procedures, cholecystectomy, fracture of the neck of femur, chronic cardiopulmonary syndrome and multiple organ failure. In this category of care patients with multiple organ failure required the greatest time expenditure, (\bar{x}) 140 min/daily on average. A slightly smaller amount of time was devoted to patients post cholecystectomy – \bar{x} 101 min; chronic cardiopulmonary syndrome – \bar{x} 91 min; and the condition after the fracture of the neck of femur – \bar{x} 88.5 min. A similar nursing time was provided for patients after appendix surgery – \bar{x} 70 min, and respiratory failure – \bar{x} 67.6 min/day/patient.

The differences in the nursing time within Category I resulted from the diagnosis, state of a patient, capability for self-care, the necessary number of repeated activities, engagement of the family in care of a patient. It was calculated that the mean time of the care provided by nurses in ICU in Category I was 94 min/day/patient.

Category II of care covered patients with the following diagnoses: status post cardiac arrest, multiple organ failure, status post appendectomy due to abscess, isolated head injury – intracranial haematoma, sepsis, face injury, and myasthenia. Patients with multiple organ failure showed the greatest demand for nursing care – \bar{x} 166 min, followed by the state post cardiac arrest – \bar{x} 153.4 min, status post appendectomy due to abscess – \bar{x} 124.7 min, isolated head injury – intracranial haematoma – \bar{x} 117 min, myasthenia – \bar{x} 116 min., face injury – \bar{x} 111.4 min, and sepsis – \bar{x} 101.5 min/day/patient.

The following activities were most often performed in patients with Category II of care: measurement of BP, temperature, pO_2 , diuresis minimum every 4 hours. Mucus was removed from the airways, body position was changed, drugs administered by various routes, nutrition carried out parenterally and by a stomach tube, tactile contact was maintained. The mean time of care provided by nurses was 132 min/day/patient.

Patients with the following diagnoses were ascribed Category III of care: sepsis, status post appendectomy due to abscess, cardiac arrest, isolated head injury – intracranial haematoma, chronic cardiovascular syndrome and multiple organ failure. In this category the greatest demand for care was observed among patients with isolated head injury – intracranial haematoma – \bar{x} 169.6 min., status post appendectomy due to abscess – \bar{x} 155.9 min., multiple organ failure – \bar{x} 149.3 min, sepsis – \bar{x} 139 min and chronic cardiopulmonary syndrome – \bar{x} 137 min. The smallest outlay of nursing time was offered to patients with post cardiac arrest – \bar{x} 105.8 min/day/patient. Patients ascribed Category III of care had the most comprehensive therapeutic-nursing programme. The mean time of care provided in Category III was 147 min/day/patient.

Some activities were not performed by nurses, were performed superficially or with a lower frequency, although they resulted from the nursing scheme and were indispensable for an individual patient. Omitting or simplification of the nursing activities or their careless performance negatively affect the nursing process, and contribute to the alteration of the degree of demand for nursing care.

This directly affects the determined direct nursing care standards, which constitute a starting point for staff scheduling. Therefore, in order to determine the actual demand for care among ICU patients, model nursing times were adopted for individual categories. These times were determined based on the nursing care schemes in ICUs adjusted to individual needs of each patient. In case of activities which did not occur but should be performed in a patient, or those which were performed incorrectly, the mean time was quoted after another author (2).

While comparing the times of direct care provided by nurses in ICU in individual categories of care, with the standards of time which a patient should receive (model) statistically significant differences are observed (Tab.1). While comparing the times of the nursing provided with model times in individual categories of care, u-test for fraction was applied for the data presented in Table 1. Thus in: Category I of care: $u = - 5.79$ (***) $p < 0.001$; Category II of care: $u = - 8.5$ (***) $p < 0.001$; Category III of care: $u = - 13.06$ (***) $p < 0.001$; significant differences being noted between provided and model nursing times in individual categories of care. The deficit of the care provided with relation to the actual patients' demand was: in Category I – by 92 min less, in Category II – by 162 min, and in Category III – by 280 min/day/patient.

Table 1. Differences between the provided and model nursing time in individual categories of care

No	Cat. of intensive care	Provided nursing time	Model nursing time
1	Cat. I of intensive basic care	94 min/day/patient	186 min/day/patient
2	Cat. II of intensive intensified care	132 min/day/patient	294 min/day/patient
3	Cat. III of critical intensive care	147 min/day/patient	427 min/day/patient

DISCUSSION

The analysis of the research material indicated two important problems. The determination of nursing staff standards, even by an objective researcher, does not produce a positive effect. This results from the omitting by nurses the activities which should be performed in a patient according to the demand determined. Sometimes selected activities are shortened, or their frequency is insufficient, compared to the needs. The other phenomenon observed is connected with low objectivity of standards which are determined by the self-observation method by the employees participating in the study. Such standards may be altered even more than those determined by the researcher not interested in overestimation of the nursing time.

The implementation and the consequent realization of the nursing standards may be a reaction against the acceptance of standards which are not fully objective. With respect to the method of determination of nursing care time standards, the methodological proposal of the model times should be applied until the quality of this care clearly improves.

CONCLUSIONS

1. Statistically significant differences were observed between the nursing time provided by nurses in the ICU, and the time which the patients should be provided with according to their actual demand for care.

2. Self-observation method adopted for the determination of working time standards for nurses and midwives employed in hospitals evokes doubts with respect to its methodological correctness.

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SUMMARY

The method of determination of working time standards for nursing staff scheduling based on self-observation, which is applied in hospital practice, evokes doubts concerning its methodological correctness. Considering the lack of nursing care standards and not always optimum quality of care, this method may contribute to the preservation of standards which would not guarantee patients' safety. Therefore, studies have been undertaken to find out if there are any differences between the nursing time provided in intensive care units, and the time which patients should be provided with according to their actual demand for care.

The study covered 63 patients in the ICU, for whom the time of performing 2,821 various therapeutic and nursing activities was measured. In order to determine working time standards a more reliable method was applied – an active observation with time-scheduling technique and model times. Patients who differed with respect to the diagnosis, state of health, and period of hospitalization were ascribed three categories of care according to their state of health and the adopted criteria of care.

Statistically significant differences were noted between the nursing time devoted to patients and the time they should be provided with according to their demand for care.

Specyfika planowania obsad pielęgniarskich w oddziałach intensywnej opieki medycznej

Stosowana w praktyce szpitali metoda samofotografii przy wyznaczeniu norm czasu pielęgnowania dla potrzeb planowania obsad kadrowych budzi wątpliwości metodologiczne. Ten sposób określania norm, przy braku standardów opieki pielęgniarskiej i nie najlepszej jej jakości, może przyczynić się do utrwalenia norm, które nie będą gwarantowały bezpieczeństwa chorych. Stąd postanowiono sprawdzić, czy w oddziałach intensywnej opieki medycznej występują różnice między czasem świadczonej pielęgnacji a czasem, który powinien otrzymać pacjent zgodnie z rzeczywistym zapotrzebowaniem na opiekę.

Badaniu poddano 63 chorych OIOM, u których zmierzono czas wykonywania 2821 różnych czynności terapeutycznych i pielęgnacyjnych. Do wyznaczenia norm czasu pracy zastosowano bardziej wiarygodną metodę – obserwacji uczestniczącej z techniką chronometrażu i czasów modelowych. Pacjentów zróżnicowanych pod względem rozpoznania, stanu zdrowia, okresu hospitalizacji, zakwalifikowano do trzech kategorii opieki, wyłonionych ze względu na stan zdrowia/choroby pacjenta i przyjęte kryteria opieki.

Stwierdzono jednoznacznie istnienie różnic istotnych statystycznie między czasem świadczonym chorem a tym, który powinien być im oferowany zgodnie z zapotrzebowaniem na opiekę.