Demand for Nursing Care for Patients in Intensive Care Units in Southeast Poland

By Mariusz Wysokiński, RN, MN, PhD, Anna Ksykiewicz-Dorota, RN, MN, PhD, and Wiesław Fidecki, RN, MN, PhD

Background The Therapeutic Intervention Scoring System is widely used in both Western Europe and the United States to assess the level of patients’ need for nursing care. Poland currently has 3 types of intensive care according to a territorial division of the country and the scope of medical treatment offered: powiat, voivodeship, and clinical.

Objective To determine the need for nursing care for patients in the 3 types of intensive care units in southeastern Poland.

Methods The investigation was conducted at 6 intensive care units in southeastern Poland in 2005 and 2006. Two units were randomly selected from each type of intensive care unit. A total of 155 patients from the units were categorized according to scores on the Therapeutic Intervention Scoring System 28.

Results Among the 3 types of units, patients varied significantly with respect to age, length of hospitalization, and scores on the Therapeutic Intervention Scoring System 28. Nevertheless, demand for nursing care during night and day shifts was similar in all 3 types. On the basis of the patients’ scores, all 3 types of units provided appropriate staffing levels necessary to meet the demands for nursing care. Most patients required category III level of care.

Conclusion Need or demand for nursing care in intensive care units in Poland varies according to the type of intensive care unit and can be determined on the basis of scores on the Therapeutic Intervention Scoring System 28. (American Journal of Critical Care. 2010;19:149-155)
Successively tested in the United States and Western Europe, the Therapeutic Intervention Scoring System (TISS) is widely used to assess the acuity of a patient’s condition, choose an optimal treatment location, assess employment norms, specify an optimal number of nurses, and assess nurses’ workload in anesthesia and intensive care units (ICUs). The TISS was first used in 1974 and was systematically modified throughout the following years; the current version is the TISS-28 scale. Padilha et al11 confirmed a high correlation between versions of the scale. The TISS-28 consists of 7 criteria associated with therapeutic interventions4,13: basic actions, respiratory therapy, circulatory therapy, therapy supporting excretory functions of the kidneys, monitoring of the central nervous system, treatment of metabolic disorders, and other intervention activities. Each criterion includes the classification of actions to which it refers.

In Poland, the National Health Fund14 (ie, the health service payer) developed a register for all nurses’ activities that are classified into individual criteria of the TISS-28 scale. Each criterion is ascribed an appropriate number of points, from 5 to 1. Most advanced criteria (ie, treatments administered to patients whose status is critical) are ascribed 5 points; routine criteria are ascribed 1 point. The number of points a patient scores is the basis for classifying the patient into an appropriate category:

- Category I: less than 14 points
- Category II: 14 to 19 points
- Category III: 20 to 39 points
- Category IV: 40 points or more

On the basis of a patient’s category, the number of ICU nurses necessary to provide optimal nursing care can be established.13 One nurse is required to provide care to 1 category IV patient, 2 category III patients, 4 category II patients, and more than 4 category I patients.10

According to the TISS scale, a well-trained nurse taking care of a patient who requires intensive therapy may score 40 to 50 points during his or her shift, or, from a different perspective, a score of 1 point requires 10 to 20 minutes of care.4,7,10 In Poland, on average, 1 nurse is able to score 55 points during a single 12-hour shift. Data collection is easy with the TISS-28 because completing the scale requires less than 5 minutes per patient per day.13 Nevertheless, a patient’s condition should be assessed every 24 hours at the same time each day (eg, at 8 AM). However, in some investigations,9,20 because of frequent changes in the intensity of nursing care, the TISS-28 was used to assess patients during each 8-hour shift.

**ICUs in Poland**

ICUs in Poland typically provide a wide range of services. The network of Polish hospitals is divided into 3 reference levels. Level 1 (poviat) hospitals provide health care services in 4 basic specialties—internal diseases, general surgery, obstetrics and gynecology, and pediatrics—and in anesthesiology and intensive care. Level 2 (voivodeship) hospitals provide health care services in the 4 basic medical specialties, anesthesiology and intensive care, and at least 4 of the following specialties: cardiology, neurology, dermatology, problem pregnancies and neonatology, ophthalmology, laryngology, casualty surgery, urology, neurosurgery, pediatric surgery, and oncological surgery. Level 3 (clinical) hospitals are clinical teaching hospitals of medical universities or state universities engaged in teaching and research and development units subordinate to the Minister of Health. These hospitals may provide services in areas larger than a single voivodeship, and the research and development units may provide services nationwide. This division corresponds to the administrative division of Poland; currently we have 16 voivodeships and 279 pivots.

Level 3 hospitals are typically situated in cities with medical universities that provide student training. Level 2 hospitals are typically situated in present

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or former voivodeship cities. Other ICUs (ie, level 1 hospitals) most often provide services in areas corresponding to poviat. Our investigation involved hospitals in southeastern Poland: Lubelskie, Podkarpackie, and Świętożyskie voivodeships. The area has 2 level 3 hospitals, 29 level 2 hospitals, and 62 level 1 hospitals.\(^{21}\)

Currently, according to Kübler,\(^{22}\) 3 types of ICUs can be singled out on the basis of hospitals’ division into the 3 reference types. Type 1 (poviat) ICUs provide basic procedures within the scope of intensive care; they are situated in level 1 hospitals. Type 2 (voivodeship) ICUs provide more advanced and costly procedures to a wider area than do type 1 units; these ICUs are situated in level 2 voivodeship hospitals. Type 3 (clinical) ICUs treat patients who mostly require advanced procedures; these units are in level 3 clinical hospitals.

The differences in the scope of care provided by the different types of ICUs may be associated with differences in the needs or demand for nursing care of patients in the different types of ICUs. So far, the existence of such a phenomenon has not been confirmed, and the range of potential differences in demand for nursing care in the different types of ICUs has not been assessed. The study we describe here is based on research we pioneered in Poland. Previously, other investigators\(^{23,24}\) used the TISS-28 scale to assess workload of nurses who work in such ICUs.

**Purpose of the Study**

The main purpose of our study was to determine the need or demand for nursing care on the basis of scores on the TISS-28 for patients hospitalized in the 3 types of ICUs. Specific questions were as follows:

1. Are there any statistically significant differences with respect to patients’ age and length of stay in the different types of ICUs?
2. What is the need for nursing care on the basis of scores on the TISS-28 for patients in the 3 types of ICUs?
3. What is the need for nursing care on the basis of scores on the TISS-28 during day and night shifts in the 3 types of ICUs?
4. What should the nurse to patient ratio be in the different types of ICUs according to the demand for nursing care?

**Methods**

The study had 3 parts: (1) review of literature on the TISS-28 and use of the scale in the United States, Western Europe, and Poland; (2) a pilot study to validate the practicality of the scale in Polish ICUs; and (3) the investigation per se, which was conducted from September 2005 to September 2006 at 6 ICUs. The research was performed after obtaining permission from the ethical committees of the respective hospitals.

**ICUs**

Two ICUs were selected from each type of ICU in southeastern Poland. The 2 clinical ICUs were units from the only 2 level 3 clinical hospitals in the area: Independent Public Clinical Hospitals No. 1 and No. 4 in Lublin. The other 4 ICUs for the study were randomly selected from level 2 and level 1 hospitals. The Voivodeship Specialist Hospital of Cardinal Stefan Wyszyński in Lublin and the Podkarpackie Voivodeship Hospital of Jan Paweł II in Krosno represented type 2 voivodeship ICUs. Type 1 (poviat) ICUs were located in the Healthcare Unit in Ostrowiec Świętokrzyskie and the Independent Public Healthcare Unit in Łuków. The total number of ICU beds was 35.

Nurses employed in these ICUs worked in 2 shifts, 12 hours per shift. Such a model is used by the majority of Polish hospitals. The Polish health care system does not differentiate between different categories of nursing staff (eg, nurse’s aide, nurse assistant). Polish anesthesiology and intensive care nurses can broaden their knowledge by taking a qualification course and specialization courses. According to a 1996 study,\(^{25}\) a total of 53.3% of the nurses employed in anesthesiology units and in ICUs had graduated from a qualification course, and 21.9% had a specialization in anesthesiology nursing and intensive care.

**Data Collection and Analysis**

Patients were categorized according to their scores on the TISS-28. Scores were obtained once in 24 hours on randomly selected days of the week. Statistica 6.0 (Statsoft, Tulsa, Oklahoma) was used for data analysis. The Mann-Whitney test was used for comparisons of groups composed of different numbers. Medians and Kruskal-Wallis tests were used to compare more than 2 groups of results. The investigation allowed for a statistical error of 5%. Basic statistical measures were calculated for quantitative measurable features (eg, age, length of stay): arithmetic mean, standard deviation, median, and minimum and maximum values.
Results

Characteristics of the Sample

A total of 155 patients were involved in the study: 114 men (73.5%) and 41 women (26.5%). Patients’ age ranged from 17 to 88 years (mean, 55.5 years). Most patients were in the age brackets from 50 to 59 years (n = 38; 24.5%) and 60 to 69 years (n = 36; 23.2%). Two patients (1.3%) were less than 19 years old. Most of the patients had had surgeries.

In type 3 (clinical) ICUs, 31 patients (38%) were 41 to 60 years old and another 31 (38%) were more than 60 years old (Table 1); the mean age was 53.58 years (SD, 16.01). In type 2 (voivodeship) ICUs, 27 patients (60%) were more than 60 years old; the mean age was 55.28 years (SD, 21.44). In type 1 (poviat) ICUs, 15 patients (54%) were 41 to 60 years old. However, none of the patients in type 1 units was less than 40 years old; the mean age was 61.32 years (SD, 8.77), the highest in the 3 types of ICUs. The differences between patients’ ages in the 3 types of ICUs were significant ($\chi^2 = 21.4; P < .001$).

ICU Length of Stay

Most patients (n = 82; 52.9%) were hospitalized for 1 to 10 days. This tendency was observed in all ICUs involved in the study. Mean length of stay was 25.03 days (range, 1-190 days). Most patients in all categories were hospitalized for fewer than 30 days: 58 of 82 patients (71%) in type 3 ICUs, 36 of 45 (80%) in type 2 units, and 28 (100%) in type 1 units. In the type 3 ICUs, other patients either stayed longer than 60 days (n = 13; 16%) or their stay ranged from 31 to 60 days (n = 11; 13%). In type 2 ICUs, 5 patients (11%) stayed 31 to 60 days and 4 (9%) stayed more than 60 days. Mean length of stay was 33.58 days (SD, 47.47) in type 3 ICUs, 20.31 days (SD, 20.60) in type 2 units, and 7.30 days (SD, 7.03) in type 1 units. Clearly, the higher the hospital level, the lower was the percentage of patients who stayed less than 30 days. The differences between the types of ICUs in length of stay were significant ($\chi^2 = 11; P = .03$).

TISS-28 Scores

For the entire sample, the mean TISS-28 score was 38.64. By type of ICU, mean scores were 39.63 (SD, 12.27) for patients in type 3 ICUs, 37.17 (SD, 9.54) for patients in type 2 ICUs, and 39.32 (SD, 7.67) for patients in type 1 units. Thus, need or demand for nursing care was similar in patients in type 3 and type 1 units. Differences in TISS-28 scores among the 3 types of ICUs were significant according to the results of the Kruskal-Wallis test ($H = 133.57; P < .001$; Table 2).

By shift, the overall mean TISS-28 score was 39.02 points (SD, 9.86) for day shifts and 38.04 points (SD, 15.01) for night shifts. According to the Mann-Whitney test, differences in mean TISS-28 scores between day and night shifts in specific types of ICUs were not significant.

Table 3 gives the patients’ categories of care based on TISS-28 scores, according to the type of ICU. Most patients in the study in all types of ICUs were categorized as level III and required a ratio of 1 nurse to 2 patients. Level III care was required by 15 patients (54%) in type 1 (poviat) ICUs, 34 patients (76%) in type 2 (voivodeship) ICUs, and

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Relationship between patients’ age and type of intensive care unit$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>Clinical</td>
</tr>
<tr>
<td>&lt;40</td>
<td>20 (24)</td>
</tr>
<tr>
<td>41-60</td>
<td>31 (38)</td>
</tr>
<tr>
<td>&gt;60</td>
<td>31 (38)</td>
</tr>
<tr>
<td>Total</td>
<td>82 (100)</td>
</tr>
</tbody>
</table>

$^a$ Values are number (%) of patients. $\chi^2 = 21.4; P < .001$.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Patients’ scores on the Therapeutic Intervention Scoring System 28, according to type of intensive care unit$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of unit</td>
<td>No. of patients</td>
</tr>
<tr>
<td>Poviat</td>
<td>28</td>
</tr>
<tr>
<td>Voivodeship</td>
<td>45</td>
</tr>
<tr>
<td>Clinical</td>
<td>82</td>
</tr>
</tbody>
</table>

$^a$ Differences significant according to Kruskal-Wallis test: $H = 133.57; P < .001$. 

Table 3

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
<th>25 percentile</th>
<th>75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poviat</td>
<td>28</td>
<td>39.32</td>
<td>37</td>
<td>7.67</td>
<td>23</td>
<td>59</td>
<td>35.5</td>
</tr>
<tr>
<td>Voivodeship</td>
<td>45</td>
<td>37.17</td>
<td>37</td>
<td>9.54</td>
<td>22</td>
<td>59</td>
<td>34</td>
</tr>
<tr>
<td>Clinical</td>
<td>82</td>
<td>39.63</td>
<td>39</td>
<td>12.27</td>
<td>18</td>
<td>59</td>
<td>27</td>
</tr>
</tbody>
</table>
have access to more modern treatments and diagnostic methods.

Patients’ age and length of stay in the 3 types of ICUs in southeastern Poland differed significantly. The overall mean TISS-28 score in our study was 38.64 points. Patients in ICUs of foreign health systems had lower TISS-28 scores; mean scores ranged from 22 to 32 points.1 1,29,30,32-35 Our results and those of other researchers indicate that nurses’ workload is similar in ICUs irrespective of the type of shift. Patients’ need or demand for nursing care during day shifts was 39.02 according to the TISS-28 scale and 38.04 during night shifts. These values are higher than those presented by other Polish investigators,23 who reported TISS scores of 31.8 and 31.4 points during day shifts and 28.3 and 30.1 points during night shifts. Our scores may have been higher because patients’ demand for nursing care during night shifts was a continuation of activities performed during day shifts (eg, monitoring parameters, observation, bedsore preventive measures). Researchers26 in Finland obtained different results; the intensity of nurses’ activities in their study was higher at night, perhaps because the number of nursing staff during night shifts is typically smaller than the number during day shifts.

In our study, differences in mean TISS-28 scores in the 3 types of ICUs were significant. These results may have occurred because type 1 ICUs provide a basic range of services connected with early postsurgical care, a characteristic that may also influence the length of stay.

Although we found a significant difference between patients’ TISS-28 scores in the 3 types of ICUs, we found no need to change the nurse to patient ratio. According to the TISS-28 scores, patients required care at the nurse to patient ratio of 1 to 2; that is, 1 ICU nurse should provide care to 2 patients during the nurse’s shift. This finding

45 patients (55%) in type 3 (clinical) ICUs. According to the median test, differences between care categories in the 3 types of ICUs were not significant.

### Discussion

Because this study was the first on need or demand for nursing care based on TISS-28 scores in Polish ICUs, our results cannot be compared with those of other researchers who investigated the same range of problems. ICUs in Western European health care systems are often divided into 2 types: postsurgical and nonsurgical or general and specialist.20 The division of Swiss ICUs is similar to that of Polish units: university teaching hospitals, central referral hospitals, community hospitals, and private for-profit hospitals.27 ICUs are specific organizational units in health care delivery; their special character stems from treatment and nursing methods and from the characteristics of ICU patients (eg, age, length of stay).

The mean age of patients hospitalized in ICUs in Western European countries ranges from 52 to 63.7 years.26,28-32 The mean age of patients hospitalized in type 2 and 3 ICUs in Poland was similar to the lower value of 52, whereas the mean age of patients in type 1 ICUs (61.32 years) was similar to the higher value.

Length of stay is another characteristic of ICUs. In Western Europe and the United States, mean ICU length of stay is 1 to 78 days.26,28,30-32 The greatest mean ICU length of stay in the hospitals in our study, nearly 34 days, occurred in type 3 ICUs, ones where advanced and complicated procedures are performed. Mean ICU length of stay was 20 days in type 2 (voivodeship) hospitals and no more than 8 days in type 1 (poviat) hospitals, where basic procedures are performed. This phenomenon may occur because patients in type 1 ICUs usually are patients who have had surgery and are promptly referred to their original units unless complications occur. However, complicated cases are referred to voivodeship (type 2) or clinical (type 3) hospitals, which

<table>
<thead>
<tr>
<th>No. of patients (N = 155)</th>
<th>Type of unit</th>
<th>Category of care⁸</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>II</td>
</tr>
<tr>
<td>28</td>
<td>Poviat</td>
<td>0 (0)</td>
</tr>
<tr>
<td>45</td>
<td>Voivodeship</td>
<td>0 (0)</td>
</tr>
<tr>
<td>82</td>
<td>Clinical</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1 (0.6)</td>
</tr>
</tbody>
</table>

⁸ Values are number (%) of patients. Determined on the basis of patients’ mean scores on the Therapeutic Intervention Scoring System 28.
may have occurred because the TISS-28 scale is based on therapeutic interventions associated with the development stage of an illness, and many nursing activities are not included. Such activities can be required because of the acuity of a patient’s condition and can be both time-consuming and repetitive (eg, changes of bedding and bedside preventive measures). In Polish nursing practice, such activities also include measures associated with maintaining patency of peripheral catheters (inserting, rinsing, and removing), providing nourishment (feeding a patient, inserting and removing a gastroscopy probe), assisting with excretory functions (removing a catheter, giving a patent an enema), maintaining physical fitness (rehabilitation exercises), and assessing patients’ clinical status. These activities are associated with Polish nurses’ primary vocational roles and are not determined by accessibility of complicated treatment and diagnostic procedures. Scores on the TISS-28 do not fully reflect activities such as indirect nursing time, organizational tasks, or work breaks.4,5,12,26,34 TISS-28 scores also do not reflect activities within the scope of teaching/managing, encouraging/supporting, or being present in patients’ rooms, all of which are provided in Polish ICUs.37 Thus, the scores reflect only a fraction of such activities, which can account for 32% of a nurse’s time.12,26 Our results are similar to indices used and recommended by foreign ICUs.34,42

The results of our assessment of patients’ need or demand for nursing care in 3 types of ICUs in southeastern Poland should be treated as introductory conclusions and should form the basis for nationwide investigations to specify differences in patients’ need or demand for nursing care. Rules and regulations for the provision of funding could be developed on the basis of our study, and our findings could be used to draft norms governing numbers of nurses in Polish ICUs.41 Staffing in ICUs is becoming a serious problem for the Polish health care system. Shortages in nursing staff are becoming more obvious and widespread because nursing is attracting fewer students, and experienced nurses are migrating to countries that offer better salaries.

Conclusions

Patients’ age and ICU length of stay differed significantly in the 3 types of ICUs. Most patients in the study were more than 41 years old. In most instances the ICU length of stay was less than 30 days. According to TISS-28 scores, patients’ need or demand for nursing care was higher for type 1 and type 3 ICUs than for type 2 ICUs. The demand during day and night shifts was similar in all 3 types of ICUs. Most patients in the study in all types of ICUs were classified as category III patients who require a staffing ratio of 1 nurse to 2 patients.

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FINANCIAL DISCLOSURES

None reported.

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