

IMPLEMENTATION OF PATIENT CATEGORIZATION MODEL BASED ON THEIR NEED FOR MEDICAL CARE AS AN INDICATOR OF EFFICIENCY AND EFFECTIVENESS OF NURSING CLINICAL PRACTICE

AMER OVČINA, SEBIJA IZETBEGOVIĆ and ERNELA EMINOVIĆ

Sarajevo University Clinical Center, Sarajevo, Bosnia and Herzegovina

Introduction: Evaluation and categorization of patients enable us to determine the number of hours required for their medical treatment, to calculate the number of required nursing staff, to monitor and evaluate results, and to determine financing of services. Standardized forms are used for appropriate assessment of patient condition and need for medical care. Categorization of patients contains comprehensive data related to patient condition based on 16 risk factors. **Objective of the study:** to determine the number of hospitalized patients categorized in the group of patients in high demand for progressive care; to show care evaluation and treatment outcome of highly categorized patients; and to examine the ratio of medical care providers in relation to the number of highly categorized patients. **Methods:** the study was conducted among patients hospitalized at the Sarajevo University Clinical Center in the period from January 1 to December 31, 2017. The research used standardized nursing documentation, patient categorization forms, monthly evaluation reports and other relevant documentation. The study included 25 organizational units. Analysis of highly categorized patients requiring progressive medical care was conducted in 15 organizational units of the Sarajevo University Clinical Center. In the course of the study, identity and other personal data of patients were protected. This was a retrospective study. **Study results and discussion:** patients were categorized in one of four categories, in accordance with the methodology described. Most of the total of 28097 patients were category 1 patients where self care sufficed (40.7%), while there were 22.4% of patients in category 4, the majority of them hospitalized at the Department of Neurology (n=1300). Based on the number of patients from different categories and the time required for their treatment, we gave an estimate of the number of nurses required for providing quality medical care. Their number was by 50% lower than their actual number. The percentage of cured patients at the Sarajevo University Clinical Center was 75%. **Conclusions:** categorization of patients should have its purpose and final objective directed at strategic planning of human resource in the field of nursing, monitoring the course and outcome of health care processes, and analysis of nursing clinical practice efficiency and effectiveness. Study results showed realistic need for medical care providers at different departments where patients were categorized for progressive care. Analysis of the results confirmed that the percentage of cured patients was higher at departments with a higher number of nurses in respect to their estimated number.

Key words: categorization, patients, nurses, efficiency, effectiveness, outcome

Address for correspondence: Assistant Professor Amer Ovčina, PhD
Sarajevo University Clinical Center
Bolnička 25
71 000 Sarajevo
Bosnia and Herzegovina
Phone: +387 332 97 000
E-mail: amer.ovcina@kcus.ba

INTRODUCTION

The history of patient categorization depending on the amount of care provided dates back to 1863 when Florence Nightingale used an informal classification method reflecting nursing workload. For the most difficult

patients, open units were located closest to the office of the main nurse in order to facilitate their observation. On the other hand, self-care patients were mainly accommodated at the far end of the department, which reflected their reduced dependence on nurses (1).

The primary purpose of categorizing patients is to respond to the changing nature of health care requirements. Categorization does not necessarily mean that patients from the same category are identical but that they are similar to each other by certain characteristics in relation to patients from another category (2).

The patient categorization system enables us to determine the actual need of each individual patient for health care, to quantify that need, and to convert it into the time spent for patient care, and based on the calculation, to determine the exact number of nurses in each department. Such approach allows us to keep distance from the previous decision-making process, which was based on intuition, pressure and previous cases (3,4).

Previous appointment and distribution of nurses relied on the fixed staff and patient ratio (4). The nursing workload surveys were initiated in the 1970s due to the need to determine the severity of the disease and to analyze the costs and effectiveness of the medical intensive care unit. The optimum number of nurses is a prerequisite for a good quality care in intensive care units (5).

Various international organizations emphasized the importance of an optimal number of employees in order to increase patient safety and reduce the number of complications and costs. Increased nursing workload has an impact on burnout syndrome and more frequent requests for relocation or change of career (6).

Measuring health care costs and the use of human resources in the health care system is a demanding task, and the use of resources in the health care system and clinical outcomes are difficult and costly to measure (7).

Increased number of jobs significantly increases operating costs, and limited financial resources are an obstacle for appointing sufficient number of nurses at provided working positions. As a consequence of the said disproportion, personalized therapeutic indexes have been developed for optimal numbering, assessment and allocation of nurses (8). In this regard, the world has developed scoring systems needed for determining the level of the intensive care performed, which can provide useful additional information regarding severity and prognosis of the disease, required number of nurses and their workload (9).

One of the most common is NEMS (the nine equivalents of nursing manpower use score). The NEMS scoring system comprises nine general categories of nursing activities and factors related to patients which influence the nursing workload (9,10).

What is known and actual nowadays are two basic types of system categorization. Abdellah and Levine

Stevenson have defined those types as “a prototype and factor evaluation” (11). The difference between the two is in the actual design of the categorization instrument and objectivity of each type (13).

Evaluation of factors is most often used in practice. Categorization of patients is performed by nurses-technicians at clinical departments (3,13).

Categorization of patients contains overall data on the patient condition reviewed through 16 risk factors: assessment of patient autonomy (hygiene, dressing, feeding and elimination), assessment of patient physical activity (walking, standing, sitting, moving and turning), assessing patient risk of falling, evaluation of patient state of mind, pressure ulcer risk assessment, frequency of vital sign monitoring, assessing patient communication ability, assessing specific procedures in patient health care, evaluation of diagnostic techniques performed, evaluation of therapeutic procedures performed, and intensity of education provided to patient and his/her family (4,13,14).

Based on the patient categorization data and evaluation of the said physical factors, the patient is placed in a particular category depending on his/her needs (13). In this way, the recommended time is obtained for patient care in a particular category during 24 h, as follows:

category 1 – self-care 1-2 h,
category 2 – minimum care 3-5 h,
category 3 – intermediate care 6-9 h, and
category 4 – intensive care 10 and more hours.

In addition, applying this procedure will ensure patient satisfaction with proper distribution and adequate amount of health care provided (13,15).

It has been noted that the lack of patient classification according to their needs for health care results in a number of difficulties regarding evaluation of nursing work and services, estimation in respect of a larger number of nurses, and inadequate funding of nursing services.

Lack of patient categorization leads to an inappropriately long patient hospital stay in intensive care unit, transforming a standard care unit into palliative care unit, inadequate redistribution of nurses, and increase in administrative work.

OBJECTIVES OF THE STUDY

1. To determine the number of hospitalized patients based on health care categorization.
2. To show care evaluation and treatment outcome of highly categorized patients.

3. To examine the ratio of medical care providers in relation to the number of highly categorized patients.

METHODS

The study was conducted among patients hospitalized at the Sarajevo University Clinical Center (SUCC) in the period from January 1 to December 31, 2017. It used standardized nursing documentation, patient categorization forms, monthly evaluation reports, and

other relevant documentation. The study included 25 organizational units. In 15 organizational units of the SUCC, analysis of highly categorized patient needs for progressive health care was performed. During the study, the identity and other personal data of patients were protected. Statistical analysis was descriptive-inferential. Patients were randomly selected and categorized based on a regular variable, prospectively. The number of nurses included in health care and duration of treatment were determined retrospectively, using the available archive. The level of significance was set at $\alpha=0.05$.

RESULTS

Table 1

Overview of patients categorized at the Sarajevo University Clinical Center (total number of different category patients at certain departments (n), relative proportion expressed in percentage and total number of patients Σn)

	Department	Category 1		Category 2		Category 3		Category 4		Total Σn
		n	(%)	n	(%)	n	(%)	n	(%)	
Surgery	Neurosurgery Department	713	(57.8)	0	(0)	94	(7.6)	427	(34.6)	1234
	General and Abdominal Surgery Department	297	(15)	883	(44.6)	594	(30)	206	(10.4)	1980
	Thoracic Surgery Department	505	(90)	0	(0)	28	(5)	28	(5)	561
	Urology Department	426	(44.8)	321	(33.8)	119	(12.5)	84	(8.8)	950
	Pediatric Surgery Department	242	(47.3)	177	(34.6)	91	(17.8)	2	(0.4)	512
	Anesthesia and Resuscitation Department	0	(0)	0	(0)	221	(32.4)	461	(67.6)	682
	Orthopedics and Traumatology Department	0	(0)	396	(22.8)	407	(23.4)	937	(53.9)	1740
	Plastic and Reconstructive Surgery Department	56	(45.9)	29	(23.8)	25	(20.5)	12	(9.8)	122
	Ear, Nose and Throat Department	295	(78.5)	34	(9)	21	(5.6)	26	(6.9)	376
	Eye Disease Department	728	(100)	0	(0)	0	(0)	0	(0)	728
	Cardiovascular Surgery Department	2	(0.2)	3	(0.3)	390	(40.1)	578	(59.4)	973
Internal Medicine	Department of Gastroenterohepatology	124	(15.5)	165	(20.6)	171	(21.3)	341	(42.6)	801
	Lung Disease Department	301	(10.4)	725	(25)	1362	(47)	512	(17.7)	2900
	Department of Cardiovascular Diseases and Rheumatism	130	(5.7)	730	(32.2)	773	(34.1)	633	(27.9)	2266
	Dermatovenereology Department	389	(82.8)	63	(13.4)	0	(0)	18	(3.8)	470
	Infectious Disease Department	441	(58)	45	(5.9)	82	(10.8)	193	(25.4)	761
	Hematology Department	595	(70)	136	(16)	42	(4.9)	77	(9.1)	850
	Physical Medicine and Rehabilitation Department	272	(58.6)	61	(13.1)	74	(15.9)	57	(12.3)	464
	Nuclear Medicine and Endocrinology Department	195	(52)	20	(5.3)	27	(7.2)	133	(35.5)	375
	Oncology Department	472	(25.4)	1139	(61.2)	58	(3.1)	191	(10.3)	1860
Hemodialysis Department	8	(11.8)	15	(22.1)	5	(7.4)	40	(58.8)	68	
Neuropsychiatry	Psychiatry Department	0	(0)	0	(0)	0	(0)	18	(100)	18
	Neurology Department	0	(0)	0	(0)	818	(38.6)	1300	(61.4)	2118
Gynecology and Obstetrics	Gynecology Department	1097	(97.2)	0	(0)	25	(2.2)	7	(0.6)	1129
	Obstetrics Department	4159	(100)	0	(0)	0	(0)	0	(0)	4159
Sarajevo University Clinical Center		11447	(40.7)	4942	(17.6)	5427	(19.3)	6281	(22.4)	28097

Table 2

Number of patients discharged in 2017, number of beds and average duration of treatment at different departments of the Sarajevo University Clinical Center.

	Department	No. of discharged patients		Number of beds		Duration of treatment (days)	Category
		n	(%)	n	(%)	\bar{x}	Mo
Surgery	Neurosurgery Department	1113	(2.5)	42	(2.6)	7.9	1
	General and Abdominal Surgery Department	2497	(5.6)	103	(6.3)	7.5	2
	Thoracic Surgery Department	543	(1.2)	23	(1.4)	10.0	1
	Urology Department	2137	(4.8)	53	(3.2)	4.8	1
	Pediatric Surgery Department	900	(2)	25	(1.5)	3.5	1
	Anesthesia and Resuscitation Department	696	(1.6)	19	(1.2)	58.4	4
	Orthopedics and Traumatology Department	1653	(3.7)	147	(8.9)	18.0	4
	Plastic and Reconstructive Surgery Department	1049	(2.4)	39	(2.4)	4.7	1
	Ear, Nose and Throat Department	716	(1.6)	25	(1.5)	6.3	1
	Eye Disease Department	1329	(3)	52	(3.2)	4.2	1
	Cardiovascular Surgery Department	1084	(2.4)	62	(3.7)	7.1	4
	Maxillofacial Surgery Department ¹	933	(2.1)	26	(1.6)	5.2	
	Emergency Medicine Department ¹	0	(0)	7	(0.4)	.	
Internal Medicine	Department of Gastroenterohepatology	1216	(2.7)	37	(2.3)	6.3	4
	Lung Disease Department	2893	(6.5)	90	(5.5)	7.2	3
	Department of Cardiovascular Diseases and Rheumatism	3549	(8)	115	(7)	8.7	3
	Dermatovenereology Department	489	(1.1)	27	(1.6)	8.1	1
	Infectious Disease Department	1452	(3.3)	80	(4.9)	9.2	1
	Hematology Department	1215	(2.7)	50	(3)	10.4	1
	Physical Medicine and Rehabilitation Department	488	(1.1)	26	(1.6)	19.8	1
	Nuclear Medicine and Endocrinology Department	723	(1.6)	30	(1.8)	7.5	1
	Oncology Department	3453	(7.8)	89	(5.4)	6.9	2
	Hemodialysis Department	64	(0.1)	5	(0.3)	6.7	4
Nephrology Department ¹	695	(1.6)	30	(1.8)	10.8		
Neuropsychiatry	Psychiatry Department	583	(1.3)	77	(4.7)	33.8	4
	Neurology Department	2041	(4.6)	102	(6.2)	12.3	4
Gynecology and Obstetrics	Gynecology Department	1051	(2.4)	34	(2.1)	4.7	1
	Obstetrics Department	4267	(9.6)	69	(4.2)	3.1	1
Child Health	Pediatric Department ¹	2795	(6.3)	47	(2.9)	2.8	
	Pediatric Department ¹	2819	(6.3)	113	(6.9)	13.1	
Sarajevo University Clinical Center		44443	(100)	1644	(100)	10.5	

The table does not contain data from Diagnostic Department with no hospitalized patients; ¹the department was not included in categorization (Table 1)

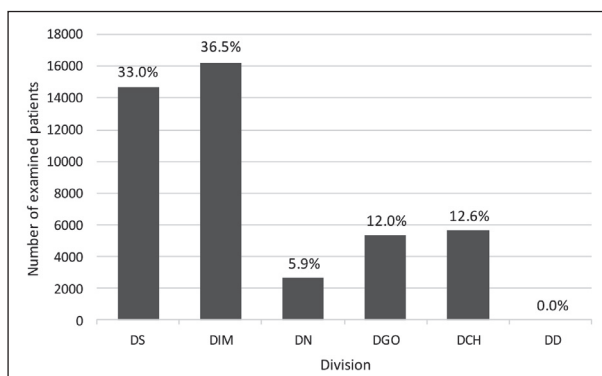


Fig. 1. Number of patients discharged from Surgery (DS), Internal Medicine (DIM), Neuropsychiatry (DN), Gynecology and Obstetrics (DGO) and Child Health (DCH); Diagnostic Department does not have hospitalized patients.

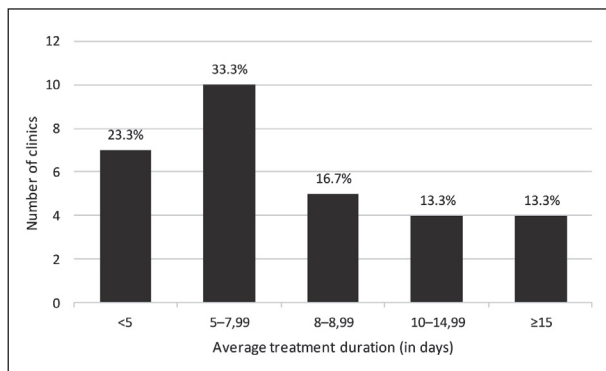


Fig. 2. Number of departments in different groups of patients with mean duration of treatment. Duration of treatment in the majority of departments (10 or 33%) was in the range from 5 to 7.99 days. The longest hospital stay was recorded at the Anesthesia and Resuscitation Department (mean, 58.4 days), which together with other three departments was classified in the group of departments with treatment duration of over 15 days.

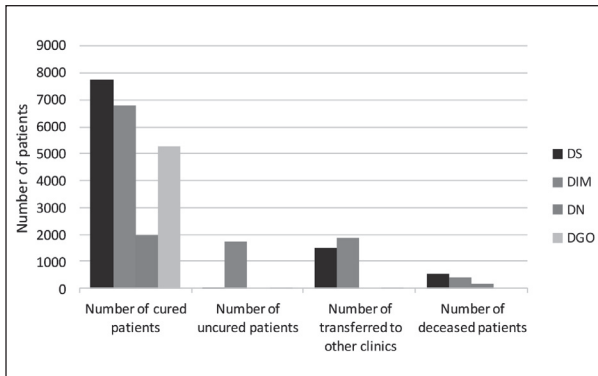


Fig. 3. Number of cured, uncured, transferred and deceased patients from different departments of the Sarajevo University Clinical Center.

Table 2 gives an overview of patients discharged from the SUCC in 2017, based on data provided by the Planning and Analysis Service. Given that the number was obtained from the software for recording the services provided, it could be considered most accurate. On the other hand, Table 1 gives an overview of patients categorized by different clinical staff. The two tables should coincide in total number, but it is not always the case. Discrepancies might occur if a patient hospitalized at a department was not categorized.

Taking into account the categorization presented in Table 1 and data obtained from the literature regarding the time required for treatment of different category patients and duration of their hospital stay (Table 3), it is possible to estimate the optimal number of nurses required at each department of the SUCC.

In order for the estimated number not be affected by the number of uncategorized patients, we decided to use the product of different categories relative share in the total number of categorized patients (Table 1) and actual number of discharged patients (Table 2). Thus, we obtained the number of hospitalized patients belonging to particular category (n_i), which better corresponds to their actual number, as shown in Table 4.

Table 3
Duration of daily care and duration of hospital stay for different category patients

Category	No. of points	Duration of daily care per patient (h), t_i	Duration of patient hospitalization, T_i
1	21	2	5
2	33.5	4	8
3	47	8	10
4	59	12	15

Annual number of particular category patients (n_i) is multiplied by the time required for patient daily care (t_i) and overall duration of hospital stay (T_i).

$$T = \sum_{i=1}^4 n_i t_i T_i$$

The obtained product is summarized in all categories (4 of them) and the result is the overall duration of care required for all patients expressed in hours.

Total working hours of the staff working in shifts does not differ from others. Therefore, the additional calculation may take into account that a nurse or technician works 8 hours a day for 5 days in the week and that during the year they are allowed to vacation and holiday in the minimum duration of 5 weeks. Accordingly, the total number of working hours is calculated as follows:
 $T_{year} = 47 \text{ weeks} \times 5 \text{ days} \times 8 \text{ h} = 1880 \text{ h}$

Thus, the total estimated number of nurses is:

$$N = \frac{T}{T_{year}}$$

Table 4 gives estimated value of the number of nurses and technicians (N), their actual number at different departments of the SUCC (N_o), and relative deviation between the two numbers ($\Delta N/N$).

The study also analyzed to which extent the actual duration of hospitalization corresponded to the literature model.

Table 5 shows actual and estimated average duration of treatment *per* patient, T_o and T , and mutual relative deviation $\Delta T/T$ expressed in percentage.

In order to recognize the impact of the number of nurses on the quality of the service provided, we performed comparison of the cured patient percentage, depending on whether the number of nurses was higher or lower than their estimated number. Figure 4 clearly shows that the mean value of the cured patient percentage is higher at departments with greater number of nurses, both in respect of departments with seriously ill patients and those with smaller number of such patients.

Table 4

Review of corrected number of patients categorized at different departments of the Sarajevo University Clinical Center in accordance with the total number of discharged patients (total number of different category patients hospitalized at various departments n_i , estimated number of nurses/technicians N and actual number of direct care providers N_0 , relative deviation between the two numbers expressed in percentage $\Delta N/N$), as well as the reported percentage of cured patients

	Cat. 1	Cat. 2	Cat. 3	Cat. 4	Estimated no. of nurses		Actual number of nurses providing care		Deviation	Percentage of cured	
	n_1	n_2	n_3	n_4	N	(%)	N_0	(%)	$\Delta N/N$	(%)	
Surgery	Neurosurgery Department ¹	643	0	85	385	44	(3.6)	28	(4.5)	-36%	68%
	General and Abdominal Surgery Department	375	1114	749	260	78	(6.3)	31	(5.0)	-60%	65%
	Thoracic Surgery Department ¹	489	0	27	27	6	(0.5)	12	(1.9)	+89%	95%
	Urology Department	958	722	268	189	47	(3.8)	22	(3.6)	-53%	100%
	Pediatric Surgery Department	425	311	160	4	15	(1.1)	10	(1.6)	-32%	100%
	Anesthesia and Resuscitation Department ¹	0	0	226	470	55	(4.5)	30	(4.8)	-45%	4%
	Orthopedics and Traumatology Department ¹	0	376	387	890	108	(9)	49	(7.9)	-55%	94%
	Plastic and Reconstructive Surgery Department	482	249	215	103	26	(2.1)	13	(2.1)	-50%	91%
	Ear, Nose and Throat Department	562	65	40	50	11	(0.8)	12	(1.9)	+14%	98%
	Eye Disease Department	1329	0	0	0	7	(0.4)	8	(1.3)	+13%	100%
Cardiovascular Surgery Department	1	2	237	352	44	(3.6)	28	(4.5)	-36%	82%	
Internal Medicine	Department of Gastroenterohepatology	188	250	260	518	66	(5.4)	11	(1.8)	-83%	87%
	Lung Disease Department ¹	300	723	1359	511	121	(9.8)	30	(4.8)	-75%	49%
	Department Cardiovascular Diseases and Rheumatism	204	1143	1211	991	167	(14)	32	(5.2)	-81%	76%
	Dermatovenereology Department ¹	405	66	0	19	5	(0.4)	4	(0.6)	-21%	0%
	Infectious Disease Department	841	86	156	368	48	(3.9)	28	(4.5)	-41%	79%
	Hematology Department	851	194	60	110	21	(1.6)	28	(4.5)	+34%	4%
	Physical Medicine and Rehabilitation Department ¹	286	64	78	60	12	(0.9)	16	(2.6)	+37%	94%
	Nuclear Medicine and Endocrinology Department	376	39	52	256	29	(2.4)	13	(2.1)	-56%	89%
	Oncology Department	876	2114	108	355	79	(6.5)	21	(3.4)	-73%	80%
Hemodialysis Department ¹	8	14	5	38	4	(0.3)	48	(7.8)	1075%	100%	
Neuro-psychiatry	Psychiatry Department ¹	0	0	0	583	56	(4.7)	55	(8.9)	-1%	0%
	Neurology Department ¹	0	0	788	1253	153	(13)	48	(7.8)	-69%	92%
Gynecology and Obstetrics	Gynecology Department ¹	1021	0	23	7	7	(0.5)	13	(2.1)	+84%	98%
	Obstetrics Department ¹	4267	0	0	0	23	(1.4)	29	(4.7)	+28%	100%
Sarajevo University Clinical Center		14886	7533	6492	7797	1230	(100)	619	(100)	-50%	75%

¹Department with the share of categorized patients in the total number higher than 95%.

The difference between the estimated and actual number of nurses providing care is significant (Wilcoxon test for paired samples, $p=0.007$).

Table 5
 Mean duration of treatment at different departments of the Sarajevo University Clinical Center T_0 compared to the estimated
 model T

	Department	Treatment duration (days)		Deviation
		T_0	T	$\Delta T/T$
Surgery	Neurosurgery Department	7.9	8.8	-10%
	General and Abdominal Surgery Department	7.5	8.9	-16%
	Thoracic Surgery Department	10.0	5.7	75%
	Urology Department	4.8	7.5	-36%
	Pediatric Surgery Department	3.5	7.0	-50%
	Anesthesia and Resuscitation Department	58.4	13.4	336%
	Orthopedics and Traumatology Department	18.0	12.2	48%
	Plastic and Reconstructive Surgery Department	4.7	7.7	-39%
	Ear, Nose and Throat Department	6.3	6.2	2%
	Eye Disease Department	4.2	5.0	-16%
	Cardiovascular Surgery Department	5.9	13.0	-45%
	Maxillofacial Surgery Department	5.2	.	.
	Emergency Medicine Department	.	.	.
Internal Medicine	Department of Gastroenterohepatology	6.3	10.9	-42%
	Lung Disease Department ¹	7.2	9.9	-27%
	Department of Cardiovascular Diseases and Rheumatism	8.7	10.5	-17%
	Dermatovenereology Department ¹	8.1	5.8	40%
	Infectious Disease Department	9.2	8.3	11%
	Hematology Department	10.4	6.6	58%
	Physical Medicine and Rehabilitation Department ¹	19.8	7.4	168%
	Nuclear Medicine and Endocrinology Department	7.5	9.1	-18%
	Oncology Department	6.9	8	-14%
	Hemodialysis Department ¹	6.7	11.9	-44%
Neuropsychiatry	Psychiatry Department ¹	33.8	15.0	125%
	Neurology Department ¹	12.3	13.1	-6%
Gynecology and Obstetrics	Gynecology Department ¹	4.7	5.2	-10%
	Obstetrics Department ¹	3.1	5.0	-38%
Child Health	Pediatric Department	2.8	.	.
	Pediatric Department	13.1	.	.
Sarajevo University Clinical Center		10.5	8.7	21%

¹Department with the share of categorized patients in the total number higher than 95%.
 The difference between the mean and estimated treatment duration is not significant (Wilcoxon test for paired samples, $p=0.667$).

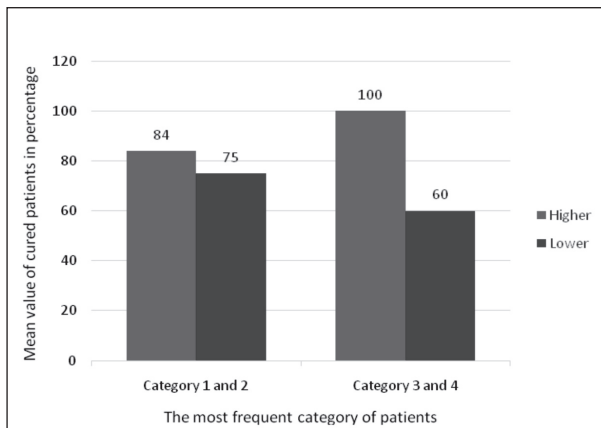


Fig. 4. Comparison of departments where the actual number of nurses in medical care is higher or lower than the estimated one. Departments were classified into two groups: departments with the majority of patients classified in category 1 or 2, and those with the majority of patients classified in category 3 or 4. It is observed that, regardless of the department group, the percentage of cured patients was higher in departments with a higher number of nurses in respect to their estimated number.

DISCUSSION

The study was conducted in 2017 at the SUCC and included implementation and evaluation of categorized patients. Study results showed that patient selection according to health care category had multiple relevance for both the patients and health care providers.

Most of the total of 28097 patients were category 1 patients where self care sufficed (40.7%), while there were 22.4% of patients in category 4. The largest share in the total number of patients hospitalized at various departments and classified in group 4, specifically patients requiring progressive health care, was recorded at the Anesthesia and Resuscitation Department (67.6%), Neurology Department (61.4%), Cardiovascular Surgery Department (59.4%) and Orthopedic and Traumatology Department (53.9%). The number of nurses required for quality care was estimated based on the number of patients from different categories and time needed for their treatment. Their number was by 50% lower than the actual number. The percentage of patients cured at the SUCC was 75%.

The mean duration of hospital stay at the Anesthesiology and Resuscitation Department is 58.4 days, which is by 336% more than the estimated time. The reason is the lack of palliative care department.

The actual planning of nursing is based on the staff workload *per* total number of beds, occupancy of bed capacities in the observed period, but not on clinical condition of patients and number of nursing services provided, etc.

The actual number of nurses at a department does not mean that they are all involved in the process of health care.

A large number of nurses have been allocated to other duties such as theatre nurses, nurses in specialized health care departments, administration, etc. In addition, there is a number of nurses with disabilities engaged in less demanding jobs within the health care process, mainly in administrative jobs.

As evident in a number of surveys, nurses are resentful by the fact that they are not allowed to do what they have chosen as their career and what they have been trained for, i.e. providing health care to hospitalized patients. Given that nurses perform tasks not contained in their job description, it could negatively reflect on the outcome of health care itself (16).

Mary Warstler (1972) recognized and classified patients into categories based on health care needs, with category 4 requiring most time for providing intensive health care, specifically 10 to 14 hours (600-800 minutes) (13).

A study conducted in 2010 in the United States of America (National Center for Biotechnology Information, U. S. National Library of Medicine) included 402 patients of which 216 (54%) were females. The results showed that according to the ASA classification, patients in semi intensive care had a degree of dependence of medical staff between one and three. There was a significant link between dependency level and ASA classification. The study revealed that the semi intensive unit accepted patients with moderate anesthetic risk (17).

In the studies conducted in 2009 and 2010 in hospitals in Austria and The Netherlands (Institute of Nursing Science, Medical University of Graz, Graz, Austria, and Department of Health Services Research, Maastricht University, Caphri, Maastricht, The Netherlands), the majority of patients were males (65.1%) diagnosed with ischemic stroke (71.5%). The results showed that dependence of patients with stroke significantly decreased from their admission to discharge, and from week 5 to week 13 based on CDS measurement. On admission, 23.0% of patients were fully dependent of medical staff, but after 13 weeks that proportion decreased to 1.0%. Patient dependence of health care significantly decreased in all items (18).

A study conducted in 1999 in the United States of America by the American Society of Clinical Oncology included 670 patients with advanced renal cell carcinoma. Five prognostic factors were defined for predicting survival in those patients and for categori-

zing patients into three risk groups. Patients were divided into two groups (6-month survival and >6-month survival). There was good prognosis for two-year survival in 45% of patients, in 17% of patients the prognosis was fifty-fifty, and 3% of patients did not have optimistic prognosis for two-year survival. This study related to categorization of oncologic patients proved that a small number of patients achieved long-term survival and that more efficient therapy was required (19).

A study conducted in 2016 at the Intensive Care Unit of Dubrovnik General Hospital comprising 6 beds showed that 98.6% of patients required intensive care, which involved a higher level of nursing competence. Based on the scoring system, it was concluded that four nurses-technicians working in shifts were required for providing quality health care (20).

A study conducted in 2014 at the Surgical Department of Zadar General Hospital showed that the ratio of the number of nurses-technicians at the Abdominal Surgery Department II and General Surgery was inadequate in the sense that two workers were lacking in order to meet health care requirements at the said department. The results showed that 62% of patients required health care involving higher levels of nursing competence (21).

Comparison of our study with the studies of different authors showed similar results. The main problem in the strategic human resource nursing management is inadequate and arbitrary assessment of the needs for nurses-technicians.

CONCLUSIONS

Our study showed that the majority of patients hospitalized at department within the Surgery Department required progressive health care, including Neurology Department. Although the number of health care providers is lower than their estimated number, the outcome of treatment and health care may be considered successful. Treatment success would significantly improve by the increase of nurses, especially at departments that hospitalize patients requiring progressive health care. The workload of nurses would decrease by transfer of patients requiring permanent care into palliative care centers. The efficiency of nursing clinical practice would significantly improve by appropriate staff redistribution within the institution (nurses-disabled staff, administrative staff, etc.), who could perform tasks outside of health care.

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SAŽETAK

PRIMJENA MODELA KATEGORIZACIJE BOLESNIKA PREMA POTREBAMA ZA ZDRAVSTVENOM SKRBI KAO POKAZATELJ EFIKASNOSTI I EFEKTIVNOSTI SESTRINSKE KLINIČKE PRAKSE

A. OVČINA, S. IZETBEGOVIĆ i E. EMINOVIĆ

Univerzitet u Sarajevu, Klinički bolnički centar Sarajevo, Sarajevo, Bosna i Hercegovina

Uvod: Procjena trijažiranja bolesnika u kategorije omogućava nam utvrditi broj sati potrebnih za zdravstvenu skrb bolesnika, proračun potrebnog sestrinskog osoblja, praćenje i evaluiranje ishoda i financiranje usluga. Za odgovarajuću procjenu stanja bolesnika i potreba za zdravstvenom skrbi koriste se standardizirani obrasci. Kategorizacija bolesnika sadrži sveobuhvatne podatke o stanju bolesnika sagledanom u 16 čimbenika rizika u zdravstvenoj njezi. **Cilj rada:** Utvrditi broj hospitaliziranih bolesnika kategoriziranih visokom ocjenom za progresivnu zdravstvenu skrb; prikazati evaluaciju zdravstvene skrbi i ishod liječenja visoko kategoriziranih bolesnika; ispitati omjer izvršitelja zdravstvene skrbi u odnosu na broj visoko kategoriziranih bolesnika. **Metode:** Istraživanje je provedeno među hospitaliziranim bolesnicima u Kliničkom centru Sveučilišta u Sarajevu od 1. siječnja do 31. prosinca 2017. godine. Za istraživanje je korištena standardizirana sestrinska dokumentacija, obrasci kategorizacije bolesnika, mjesečna izvješća i druga relevantna dokumentacija. Istraživanje je provedeno u 25 organizacijskih jedinica ustanove. Analizirani su visoko kategorizirani bolesnici za potrebe progresivne zdravstvene skrbi u 15 organizacijskih jedinica Kliničkoga centra Sveučilišta u Sarajevu. Za vrijeme provođenja istraživanja identitet i drugi osobni podatci o bolesnicima bili su zaštićeni. Istraživanje je retrospektivno. **Rezultati i rasprava:** Bolesnici su svrstani u jednu od četiri kategorije sukladno metodi opisanoj u radu. Od 28.097 bolesnika najviše ih je bilo 1. kategorije za koje je samoskrb dovoljna (40,7%), dok je bolesnika 4. kategorije bilo 22,4%, od čega najviše u Neurološkoj klinici (1300). Na osnovi broja bolesnika različitih kategorija i vremena koje je potrebno za njihovo liječenje procijenjen je broj medicinskih sestara neophodan za kvalitetnu skrb. Njihov broj je za 50% manji od stvarnog broja zaposlenih. Postotak izliječenih bolesnika u Kliničkom centru Univerziteta u Sarajevu je 75%. **Zaključci:** Razvrstavanje bolesnika u kategorije trebalo bi imati svoju svrhu i konačan cilj usmjeren na strateško planiranje ljudskih resursa u području sestrinstva, praćenje tijeka i ishoda procesa zdravstvene skrbi te analizu učinkovitosti i sposobnosti sestrinske kliničke prakse. Rezultati istraživanja pokazali su stvarne potrebe za izvršiteljima zdravstvene skrbi na odjelima klinika gdje su bolesnici kategorizirani ocjenom za progresivnu skrb. Analizom rezultata je potvrđeno da je postotak izliječenosti veći na klinikama koje imaju broj sestara veći u odnosu na procijenjeni.

Ključne riječi: kategorizacija, bolesnici, medicinske sestre, efikasnost, efektivnost, ishod