

# PATIENT OUTCOMES AND HOSPITAL NURSES' WORKLOAD: A CROSS-SECTIONAL OBSERVATIONAL STUDY IN SLOVENIAN HOSPITALS USING THE RN4CAST SURVEY

## IZIDI ZDRAVLJENJA PACIENTOV IN DELOVNA OBREMENTEV MEDICINSKIH SESTER V BOLNIŠNICAH: PRESEČNA OPAZOVALNA RAZISKAVA RN4CAST V SLOVENSkih BOLNIŠNICAH

Brigita SKELA-SAVIČ<sup>1\*</sup>, Tit ALBREHT<sup>2</sup>, Walter SERMEUS<sup>3</sup>, Bojana LOBE<sup>4</sup>, Mateja BAHUN<sup>1</sup>, Simon DELLO<sup>3</sup>

<sup>1</sup> Angela Boškin Faculty of Health Care, Spodnji Plavž 3, 4270 Jesenice, Slovenia

<sup>2</sup> National Institut of Public Health Slovenia, Trubarjeva 2, 1000 Ljubljana, Slovenia

<sup>3</sup> Leuven Institute for Healthcare Policy, University of Leuven, Kapucijnenvoer 35 blok d - bus 7001, 3000 Leuven, Belgium

<sup>4</sup> Faculty of Social Sciences, University of Ljubljana, Topniška ulica 31, 1000 Ljubljana, Slovenia

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### ABSTRACT

#### Keywords:

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**Introduction:** Higher nursing workload increases the odds of patient deaths, as the work environment has a significant effect on patient outcomes. The aim of the study was to explore the relation between patient outcomes and nurses' working conditions in hospitals.

**Methods:** Administrative data on discharges of surgical patients for the year 2019 in eight general hospitals and two university medical centres in Slovenia were collected to determine in-hospital mortality within 30 days of admission. The RN4CAST survey questionnaire was used to gather data from nurses in these hospitals, with 1,010 nurses participating. Data was collected at the beginning of 2020. The number of nurses per shift and the nurse-to-patient ratio per shift were calculated. Univariate, bivariate and multivariate statistical methods were used to analyse the data.

**Results:** The 30-day in-hospital mortality for surgical patients was 1.00% in the hospitals sampled and ranged from 0.27% to 1.62%. The odds ratio for staffing suggests that each increase of one patient per RN is associated with a 6% increase in the likelihood of a patient dying within 30 days of admission. The mean patient-to-RN ratio was 15.56 (SD=2.50) and varied from 10.29 to 19.39. Four of the 13 tasks checked were not performed on patients during the last shift.

**Conclusion:** The results are not encouraging, with an extremely critical shortage of RNs and thus a high RN workload. The number of patients per RN is the highest in Europe and also higher than in some non-European countries, and represents an extreme risk to the quality of nursing and healthcare as a whole. The recommendation for acute non-emergency internal medicine and surgery departments is four patients per RN per shift.

### IZVLEČEK

#### Ključne besede:

delovne razmere  
zaposlovanje  
medicinske sestre  
smrti bolnikov  
umrljivost  
delovno okolje  
dodiplomski študij  
nedokončane naloge  
kakovost  
menedžment

**Uvod:** Večje delovne obremenitve medicinskih sester povečujejo verjetnost smrti pacientov. Delovno okolje medicinskih sester pomembno vpliva na izide zdravljenja. Namen raziskave je bil pojasniti povezavo med izidi zdravljenja pacientov in delovnimi razmerami medicinskih sester v bolnišnicah.

**Metode:** Zbrani so bili administrativni podatki o odpustu kirurških pacientov iz leta 2019 v osmih splošnih bolnišnicah in dveh univerzitetnih kliničnih centrih v Sloveniji, da bi ugotovili bolnišnično umrljivost v 30 dneh po sprejemu. Za zajem podatkov pri medicinskih sestrah v istih bolnišnicah je bil uporabljen vprašalnik raziskave RN4CAST. Sodelovalo je 1.010 medicinskih sester. Ti podatki so bili zbrani v začetku leta 2020. Izračunana sta bila število zaposlenih medicinskih sester v delovni izmeni ter razmerje med številom pacientov in številom medicinskih sester v delovni izmeni. Za analizo podatkov so bile uporabljene univariatne, bivariatne in multivariatne statistične metode.

**Rezultati:** Tridesetdnevna bolnišnična umrljivost kirurških pacientov je bila v vzorčenih bolnišnicah 1,00-odstotna in je znašala od 0,27 do 1,62 %. Razmerje možnosti za osebje kaže, da je vsako povečanje za enega pacienta na diplomirano medicinsko sestro povezano s 6-odstotnim povečanjem verjetnosti, da bo pacient umrl v 30 dneh po sprejemu. Povprečno razmerje pacientov na eno diplomirano medicinsko sestro je bilo 15,56 (SD = 2,50) in se je gibalo med 10,29 in 19,39. Štiri od trinajstih preverjenih nalog pri pacientu v zadnji izmeni niso bile opravljene.

**Zaključek:** Rezultati niso spodbudni, saj je pomanjkanje diplomiranih medicinskih sester izjemno kritično. Izpostavljena je njihova velika obremenitev. Število pacientov na eno diplomirano medicinsko sestro je najvišje v evropskih državah in širše ter predstavlja izjemno tveganje za kakovost zdravstvene nege in zdravstvene oskrbe kot celote v Sloveniji. Priporočilo za akutne internistične in kirurške oddelke, brez obravnav na intenzivni negi, je štiri paciente na eno diplomirano medicinsko sestro v delovni izmeni.

\*Corresponding author: Tel. +386 4 5869 360; E-mail: [bskelasavic@fzab.si](mailto:bskelasavic@fzab.si)

## 1 INTRODUCTION

The Nurse Forecasting (RN4CAST) study in Europe aims to simulate scenarios to illustrate what happens to the quality of patient care and nursing outcomes when different aspects of the nursing (RNs) workforce (nurse-to-patient ratio, nurse education, nurse skill mix, nursing work environment) are changed. Unfortunately, Slovenia was not included in the launch of the European Commission study in twelve European countries in the period 2010-2011.

### 1.1 Background

Research has consistently shown that higher nursing workloads increase the odds of patient deaths. In hospital settings where RNs provide care to a greater number of patients per shift, where their work environment is unsupportive and managers do not respond to RNs' concerns, patients have poor health outcomes and RNs report greater burnout, job dissatisfaction, and intent to leave (1 - 4). When nurses care for fewer patients at a time, they are able to spend more time at each patient's bedside, and as a result patients are less likely to experience an adverse outcome, the length of stay is shorter, and there are cost savings for the hospital (5). Griffiths (6) states that staff shortages can lead to a proportion of nurses abandoning the provision of services, which is a direct indicator of inadequate staffing levels in nursing, as has been shown in international studies (7).

Longitudinal findings revealed an association between increased proportions of bachelor of science RNs (BSN) and improvements in patient outcomes; higher proportions of BSNs were associated with lower odds of 30-day inpatient surgical mortality (1, 6, 8). The BSN educational pathway (four-year study programme) is recommended for at least 80% of the BSN workforce (8 - 11). Higher hospital proportions of BSN nurses, regardless of educational pathway, are associated with lower odds of 30-day inpatient surgical mortality (5, 9).

Schlak et al. (3) found that the work environment had a significant effect on patient outcomes, as a change in the work environment from poor to mixed or mixed to good was associated with a 14% drop in the odds of 30-day in-hospital mortality. Addressing staffing without improving the practice environment would be ineffective (12), because better staffing and practice environments are associated with improved patient outcomes (1, 3, 8, 13 - 15). The cumulative evidence suggests that interventions to improve hospital work environments and patient-to-nurse staffing ratios may be key to addressing quality, safety, and nurse workforce concerns (4), and staffing is a key variable for patient mortality within 30 days of admission, readmission, and hospitalisation time (15).

### 1.2 Situation in Slovenia

Slovenia faces a major shortage of RNs, with only 30% of RNs in the nursing workforce group, a far cry from recommendations noted above - 80% of nurses with a bachelor of science in nursing (BSN) (9, 11). The title of nurse (RN) describes anyone meeting the European Union (EU) definition of a trained and licensed nurse according to Directive 2013/55/EU (16). In Slovenia, this corresponds to having an undergraduate three-year professional bachelor's degree in nursing, level six of the European Qualifications Framework (EQF). The education level of healthcare assistants (HCAs) is four years of secondary school for healthcare technicians, level four of the EQF. For years, health policymakers on Slovenia have been neglecting the need to increase the number of nurses with a minimum of a professional bachelor's degree in clinical settings and educate them to a four-year bachelor of science in nursing (BSN). Most European Union countries have switched from a three-year professional nursing degree to a four-year science degree because students' workloads were too high and the three-year professional degree is too short to deliver the competences set out in the 2013 update of the Directive (16).

### 1.3 The aims

The first aim of our study is to explore the relation between patient outcomes and nurses' working conditions in hospitals. The second is to describe nurses' workloads and place them in an international context.

## 2 METHODS

### 2.1 Design and setting

For this observational study with a cross-sectional design, administrative discharge data on surgical patients for the year 2019 was collected in all acute care hospitals in Slovenia. Nurses in all general hospitals (n=10) and university clinical centres (n=2) were invited to participate in a survey to estimate nurse staffing. Eight general hospitals and two university clinical centres participated in the survey (n=10). Nurses in participating hospitals providing direct patient care on surgical and medical inpatient units (n=2813) were invited to participate in the survey between February and March 2020.

### 2.2 Sample of nurses

The overall response rate for the nurse survey was 35.90% and varied across hospitals, ranging from 21.97% to 85.71%. Respondents included 848 (83.96%) women and 160 (15.84%) men, while the average age was 37.02 (SD=10.65) years. The average length of employment in nursing was 15.34 years (SD=11.12). Almost all the respondents (96.2%) were employed full time. On average, 35.65% (n=403) of nursing care providers had completed an undergraduate

professional bachelor's programme, which varied from 23.68% to 48.76%, depending on the hospital (Table 2); on average 59.9% (605) were HCAs.

### 2.3 Instruments for nurses

The RN4CAST survey instrument comprises a core battery of extensively validated instruments and questions (17). In this article, we will present data on nurse staffing levels and education, and a description of recent changes in hospitals (duration of shift, aspects of responsibility for patients, roles in nursing care, number of RNs and HCAs on the ward, performance of various tasks, and tasks they should have completed and did not). The possible answers to each question are described in the results. The last part of the instrument includes demographic data. Using the same approach as in RN4CAST (18), forward and backward translations of the survey instrument were conducted independently by two qualified translators.

### 2.4 Patient outcome variables

Patient data was provided by the National Institute of Public Health in Slovenia to analyse the links between patient outcomes and nurses' working conditions. The primary outcome of interest is in-hospital mortality within 30 days of admission. Primary and secondary diagnoses were coded using the tenth version of the International Classification of Diseases (19). When modelling mortality, only patients with a primary diagnosis in ICD-10 blocks S (Injury), M (Disease of musculoskeletal system), K (Disease of digestive system), I (Disease of circulatory system), and C (Malignant neoplasm) were included. The analysis included surgical patients aged 18 years or older with a hospital stay of at least two days or more, and for whom complete data was available for comorbidities, discharge status, and other variables used for risk adjustment. Risk adjustment variables at the individual patient level include patient age, gender, admission type (emergency or elective), and the Charlson Comorbidity index (20, 21).

### 2.5 Ethical approval

Permission to conduct the study was obtained from the National Medical Ethics Committee (No. 0120-488/2019/6, January 7, 2020), and all actions were carried out in accordance with relevant guidelines and regulations (22). The participants gave their written informed consent to participate in the study and permission to use the data collected at the national level for professional and scientific purposes. The informed consent to publish in scientific journals (online, open-access) was also obtained from the study participants.

### 2.6 Statistical analysis

Nurse staffing was calculated by averaging the patient-to-nurse ratios - as reported by each nurse - for the hospital

level. The patient-to-nurse ratio at the individual nurse level was calculated by dividing the number patients by the number of nurses with an undergraduate professional bachelor's degree present on the ward on their most recent shift. A low ratio reflects a more favourable staffing situation. The association between nurse staffing, nurse education and 30-day in-hospital mortality is estimated before and after adjusting for hospital characteristics and risk-adjustment for individual patient characteristics. Using a generalised linear model, individual patient outcomes were modelled using a combination of both hospital and patient characteristics. This approach allowed us to take the hierarchical structure of the data (i.e. patients nested within hospitals) into account. Descriptive and bivariate statistics were used to analyse the data obtained from the nurses using the instrument. Analyses were conducted using SAS version 9.4 for Windows and SPSS version 20.0.

## 3 RESULTS

### 3.1 Patient outcomes

The mean age of patients sampled was 59.62 years (SD=17.25), all other patient characteristics are provided in Table 1. Of the 36,037 patients included, 18,768 were men (52.08 %) and 17,269 (47.92 %) were women, and 29.64% had a primary diagnosis in ICD10-block M, while only 6.53% had a primary diagnosis in ICD10-block C. The most common comorbidities were diabetes without complication, congestive heart failure, and malignancy (Table 1).

**Table 1.** Patient characteristics (n=36,037) in the included hospitals.

	Number
<b>Men</b>	18,768 (52.08)
<b>Emergency admissions</b>	10,682 (29.64)
<b>Inpatient deaths within 30 days of admission</b>	359 (1.00)
<b>Categories</b>	
Injury - S	9,842 (27.31)
Disease of musculoskeletal system - M	10,680 (29.64)
Disease of digestive system - K	10,322 (28.64)
Disease of circulatory system - I	2,841 (7.88)
Malignant neoplasm - C	2,352 (6.53)
<b>Comorbidities</b>	
Myocardial infarction	437 (1.21)
Congestive heart failure	978 (2.71)
Peripheral vascular disease	517 (1.43)
Cerebrovascular disease	483 (1.34)
Dementia	387 (1.07)
Chronic pulmonary disease	667 (1.85)
Rheumatic disease	151 (0.42)
Peptic ulcer disease	50 (0.14)
Mild liver disease	230 (0.64)
Diabetes without chronic complication	1 866 (5.18)
Diabetes with chronic complication	199 (0.55)
Hemiplegia or paraplegia	82 (0.23)
Renal disease	473 (1.31)
Malignancy	677 (1.88)
Moderate or severe liver disease	44 (0.12)
Metastatic solid tumour	591 (1.64)
AIDS/HIV	0 (0)

Mortality data was obtained for 36,037 patients; the number of discharges varied across hospitals (Table 2). The 30-day in-hospital mortality for surgical patients was 1.00% in the hospitals sampled and ranged from 0.27% to 1.62%.

**Table 2.** Number of deaths and discharges per hospital, overall (%) of RNs and patient-to-RN ratio.

Hospital	Deaths / Discharges (%)	RNs (%)	Patient-to-RN ratio (M)
AC	26 / 2,440 (1.05)	42.22	15.7179
AH	9 / 1,082 (0.82)	32.25	17.1000
BK	28 / 3,079 (0.90)	29.26	17.5083
BU	40 / 4,076 (0.97)	48.76	14.0615
DQ	13 / 1,817 (0.71)	33.33	15.6152
EA	107 / 10,680 (0.99)	46.18	10.2855
EF	12 / 2,672 (0.45)	29.16	14.3178
FH	5 / 1,844 (0.27)	28.94	19.3851
FZ	102 / 6,193 (1.62)	42.64	17.1487
HG	17 / 1,795 (0.94)	23.68	14.4306
<b>Total</b>	<b>359 / 3,6037 (1.00)</b>	<b>35.65</b>	<b>15.56</b>

Table 3 shows the effect of nurse staffing and nurse education on 30 day in-hospital mortality, both unadjusted and adjusted for potential confounders. In the unadjusted model, only nurse education is significantly associated with mortality. After considering the severity of patients' illness, patient characteristics, and hospital characteristics (bedside), only nurse staffing was significantly associated with mortality in the adjusted model (Table 3). The odds ratio for staffing suggests that each increase of one patient per RN is associated with a 6% increase in the likelihood of a patient dying within 30-days of admission.

### 3.2 Nurses' workloads on recent shift

The mean number of patients per inpatient ward during the last work shift of the respondents was 25.17 (SD=14,390). The mean patient-to-RN ratio was 15.56 (SD=2.50) and varied from 10.29 to 19.39 (Table 2). One HCA was responsible for an average of 8.62 (SD=5.675) patients. The difference between RNs and HCAs is significant, with the latter significantly less burdened than the former ( $p<0.001$ ).

The mean number of RNs per ward during the most recent work shift was 2.06 (SD=1.412), compared to 3.60 HCAs (SD=2.800) ( $p<0.001$ ).

The self-assessed number of patients for whom respondents were directly responsible during the last shift was 17.42

(SD=11.84); RNs' assessment was significantly higher at 19.09 (SD=14.42) compared to HCAs' assessment at 16.38 (SD=9.64) ( $p<0.001$ ). A total of 55.4% respondents reported their direct responsibility for patients did not differ from the usual level, while 31.1% felt they were less burdened than usual.

The mean duration of the most recent shift was 9.42 hours (SD=5.518), with no significant differences between RNs and HCAs.

An average of 8.85 (SD=7.555) patients for whom the respondents were responsible during the last shift needed assistance with all activities of daily living and 5.40 (SD=5.923) needed monitoring for an hour or less or healthcare interventions. RNs were significantly more burdened in patients' daily living activities ( $M=9.55$ ,  $SD=8.83$ ,  $p=0.023$ ) compared to HCAs ( $M=8.41$ ,  $SD=6.57$ ), with no differences in monitoring the patients between the two nursing groups ( $p=919$ ).

A total of 54.9% ( $n=523$ ) respondents estimated they provided most care to the patients themselves, 31.3% ( $n=298$ ) supervised other providers in addition to providing direct nursing care, 11.1% ( $n=106$ ) responded that they were involved in the direct work (dressing wounds, administering medication) in a minor way, with most of the direct nursing care being provided by others. The difference is significant in the category of supervision of

**Table 3.** Adjusted and unadjusted odds ratios showing the effects of nurse staffing and nurse education on 30 day in-hospital mortality.

		Unadjusted model OR 95% CI	p-value	Adjusted model OR 95% CI	p-value
Model - all together	Staffing	1.008 (0.932-1.090)	0.838	1.059 (1.011-1.110)	<b>0.016</b>
	Education	1.024 (1.002-1.046)	<b>0.032</b>	1.011 (0.984-1.039)	0.436

the nursing care provided, as RNs (46.6%, n=179) ( $p<0.001$ ) act as both providers and as those responsible for the nursing care provided in the nursing team, in contrast to HCAs (21%, n=119).

Table 4 shows the frequency of the different tasks during the last work shift. RNs are typically more likely to answer the telephone, perform routine blood draws, handle patient discharge tasks, and obtain supplies or equipment. HCAs typically answer the telephone, take care of food service, clean patient rooms and equipment, perform non-nursing care, transport non-threatened patients, obtain supplies or equipment, and perform other services (Table 4).

The respondents were asked which tasks they should have performed during their last shift but did not due to lack of time (Table 5). The tasks that stood out the most were ensuring comfort and engaging in conversation with patients, educating patients and family, appropriate

supervision of patients, care planning, etc. On average, four of the planned tasks were not performed during the most recent shift. More detailed results are shown in Table 5.

#### 4 DISCUSSION

The results reported in this study are not encouraging for patient outcomes in Slovenia, nor for other countries in Europe and elsewhere where there is an extremely critical shortage of RNs, and thus a high RN workload. In Slovenia, the number of patients per RN is the highest in Europe (24) and also higher than in some non-European countries (15), and represents an extreme risk to the quality of nursing and healthcare as a whole, as is evident from our study. The recommendation for acute non-emergency internal medicine and surgery departments is four patients per RN per shift (23), but in our study this workload was found

Table 4. Frequency of different tasks during the most recent work shift and differences in educational level.

Items	n	Never %	Sometimes %	Often %	RN Often %	HCA Often %	Education p
Delivering and retrieving food trays	993	17.1	23.1	58.2	32.9	76.7	<0.001
Performing non-nursing care	987	6.1	49.4	44.4	40.5	46.8	0.114
Arranging discharge referrals and transportation (including to long-term care)	992	32.9	30.3	36.8	51	27.4	<0.001
Routine phlebotomy/blood draw for tests	983	48.9	13.4	37.5	76.1	11.1	<0.001
Transporting of patients within hospital	986	22.9	37.1	39.8	32.6	44.7	<0.001
Cleaning patient rooms and equipment	991	16.3	36.3	47.2	28.3	59.9	<0.001
Filling in for non-nursing services not available on off-hours	976	25.5	49.1	25.4	20.3	29	<0.001
Obtaining supplies or equipment	989	12.8	40.8	46.3	49.6	44.1	0.308
Answering phones, clerical duties	998	2.0	15.2	82.6	89	78.4	<0.001

Table 5. Tasks respondents should have performed during their last shift but did not due to lack of time.

Item	n	% (min - max)	Impact of education (p bold - lower presence in group RNs)
Comfort and talk with patients	1000	588/1,009 (58.3) [41.9 - 72.7]	0.060
Educating patients and family	1001	563/1,008 (55.9) [32.3 - 61.9]	0.067
Adequate patient surveillance	1001	362/1,010 (35.8) [22.6 - 47.4]	<b>0.006</b>
Developing or updating nursing care plans or care pathways	1000	362/1,010 (35.8) [22.6 - 53.3]	< <b>0.001</b>
Frequent changing of patient position	1001	322/1,010 (31.9) [19.7 - 49.1]	0.043
Oral hygiene	1001	317/1,009 (31.4) [21.1 - 54.4]	0.501
Adequately document nursing care	1001	294/1,010 (29.1) [15.8 - 42.9]	<b>0.006</b>
Planning care	1001	272/1,010 (26.9) [9.7 - 50.0]	< <b>0.001</b>
Skin care	1001	275/1,010 (23.2) [7.9 - 40.9]	0.614
Prepare patients and families for discharge	1001	221/1,010 (21.9) [6.45 - 28.6]	<b>0.015</b>
Administer medications on time	1001	175/1,009 (17.3) [3.2 - 28.6]	0.937
Treatments and procedures	1001	138/1,010 (13.7) [6.6 - 21.4]	0.174
Pain management	1001	105/1,010 (10.4) [2.6 - 19.1]	0.088
Composite score		Mean=3.9 (SD=0.7) Min=2.7 - Max=5.1	

to be 15.6 patients per RN on average. An additional increase in the number of patients per RN translates into an average 6% increase in the risk of death within 30 days of admission for each added patient in the participating hospitals. Many studies have shown that increasing nurses' workload increases the likelihood of a patient dying within 30 days of admission, as summarised by Aiken et al. (21) in a recent article. They found that those patients admitted to hospitals with 18 patients per nurse had a 41% higher probability of dying, compared to those admitted to hospitals with eight patients per nurse. The differences in patient mortality between the hospitals in our study are substantial and are related to differences in the level of nurse employment. The findings related to the effect of nurse staffing in the Slovenian study reported here are comparable to the findings of the seminal work by Linda Aiken et al. (1, 8, 13, 15, 24).

In our study, only just over a third of nursing staff have a higher educational qualification that is in line with the minimum European guidelines for nursing education (16). The number of RNs is not in line with the international recommendations (11, 23) followed by most European countries (25), i.e. the transformation of three-year higher professional education programmes into four-year university degree programmes. Healthcare personnel educated at secondary school level (HCAs) account for as much as two-thirds of the total workforce, which is one of the worst ratios in Europe (13, 24, 25) and elsewhere (9, 15). With regard to RNs, many countries have found that better outcomes were obtained when RNs were educated to BSN level or above (1, 15, 24, 25). We did not find this to be the case in our study, as there was no difference within the group of Slovenian RNs as the vast majority have a three-year undergraduate professional degree, and the number of those with a higher degree (professional master's level) in the RN population is too small to have an effect on patient outcomes in our study, whereas most of the countries included in the RN4CAST study did see this impact (1, 8, 9, 15, 24). This is because these countries have changed their educational systems, and the groups educated under the reformed programmes are sufficiently large. In Slovenia, there have been no changes to the length of study since 1996. A meta-analysis showed that patients who receive care from a nurse with a BSN degree or higher had a 5% lower odds of 30-day mortality. BSN preparation or higher was also associated with decreasing failure-to-rescue by 6%, and was also significant in the meta-analysis (26).

An important finding of the current study is that the ratio of RNs to HCAs varies by hospital, which suggests that the observed proportion of RNs is also related to the staffing policy of each hospital, with the lowest proportion of RNs being 23.7% and the highest 48.9%. The workload of one RN during a shift thus varies between 10.3 and 19.4 patients,

while HCAs are significantly less burdened, as there are always more HCAs than RNs on a shift. Aiken et al. (13) concluded that substituting one nurse assistant (HCA) for a professional nurse (RN) for every 25 patients is associated with a 21% increase in the odds of dying, and each 10% reduction in the proportion of professional nurses is associated with an 11% increase in the odds of death.

According to the RNs' self-assessment, they provided direct nursing care to more than half of the patients assigned on their most recent shift. A third rated their last shift as less stressful compared to their average workload. For both occupational groups, the average working hours are an hour and a half longer than the norm. The workload resulting from direct patient work is also high, with more than half the patients needing assistance with all activities of daily living, and over a third needing monitoring or other healthcare interventions every hour. More than half of the respondents performed all patient activities themselves, while one third performed patient activities and were responsible for supervising other providers - these were typically RNs who are responsible for the nursing care provided in a nursing team. Content analysis of the work and its frequency showed that the focus is on professional tasks that fall within the RNs' remit, hence the heavy workload. It is also evident that both RNs and HCAs are doing jobs and tasks that could be done by less skilled support staff or staff covering administrative tasks and less professional operational tasks of the hospital ward, such as delivering food and materials, answering the telephone, clerical work, cleaning the bed unit, and other non-nursing jobs. The proportion of tasks that should have been done for the patient but were not is high, and is the highest in the group of European countries that have used the RN4CAST survey (7). Top of the tasks left undone is engaging in conversation with and educating patients and their relatives, and this service is not accessible to more than half of patients. Also omitted for one third of patients is the prescribed patient monitoring, updating patient work plans, changing the patient's position, and oral hygiene. The fewest undone tasks are in the area of pain therapy and the completion of diagnostic and therapeutic programmes. The hierarchy of abandonment reported here is comparable to that found in other European research (7, 27). Chaboyer (27) found similar patterns of nursing care left undone across a cross-section of European hospitals, suggesting that nurses develop informal task hierarchies to facilitate important patient-care decisions. The composite score in that study was 3.6 (SD=1.2), in ours it was also 3.6 (SD=0.7). Given this result, the inadequacy of staffing in the participating hospitals can be confirmed by the nursing care left undone in the other research. Researchers state that this figure is the most direct indicator of the adequacy of nursing staffing levels (6).

In existing research, the need to improve working conditions has been shown to be an important factor in the retention of nurses, as improving the work environment remains a solution for hospitals looking to reduce nurse burnout and improve patient outcomes (3).

#### 4.1 Guidelines for health management and health policy

The findings call for the unification of staffing norms in Slovenian hospitals and the consideration of the fact that the staffing policies of developed countries aim for an 80% share of BSN-educated nurses in the nursing workforce (11). Our findings support promoting multiple BSN educational pathways to reach the Institute of Medicine recommendation (8, 9). It has been shown that reducing the nursing skill mix by adding nursing associates and other categories of assistive nursing personnel without professional nursing qualifications may contribute to preventable deaths, erode the quality and safety of hospital care, and contribute to shortages of hospital nurses (13).

It is important to adopt staffing norms that will increase the number of BSN staff by 50% over the next decade. There is also an urgent need to reorganise the work and tasks at the level of the hospital ward and hospital so that non-nursing work and tasks, particularly those performed by RNs, are delegated to non-healthcare staff involved in helping the hospital ward run and performing administrative tasks.

There is also a need to reform the nursing curricula and expand the nursing curriculum by one year to reach the BSN level. Employers should take the approach of sending HCAs to obtain higher nursing education in order to improve the ratio of HCAs to RNs as soon as possible, thereby also improving the input of nursing skills and the patient-to-RN ratio.

The results of this study have important implications for the management of Slovenian hospitals and for health policy. The long-known fact that Slovenia has the lowest proportion of adequately educated RNs according to the European Directive has been confirmed by our study. The consequences of the policy of overloading existing RNs are also related to patient mortality within 30 days of hospital admission in our study, which should be a clear message to health policymakers and healthcare managers that the long-standing limitation on the recruitment of RNs has negative consequences. Slovenia is the worst performing country for RNs in the EU. RNs are the most overworked and are also forced to omit the care that patients should receive - and here, too, the result is the worst in the EU. Economic analyses have shown that work-related complications have negative effects beyond making it difficult to recruit an adequate number of nurses and enabling them to develop their careers. Griffiths et al.

(28) clearly show that staffing plans with higher baseline staff levels are highly cost effective. It is therefore high time to regard the recruitment, training and performance of nurses as an investment and not as a cost. Mandatory training in working with staff should be introduced for the appointment of health managers at macro and meso levels. Only educated managers and leaders can properly address the problems of providing an appropriate and supportive working environment in nursing, an issue which has been described by other authors in our cultural context (29-31).

## 5 CONCLUSION

The results reported here are not encouraging, with an extremely critical shortage of RNs and thus a high RN workload, as the number of patients per RN is the highest of all the European countries and many beyond the continent, representing an extreme risk to the quality of nursing and healthcare as a whole. The recommendation for acute non-emergency internal medicine and surgery departments is four patients per RN per shift. In retrospect, we have arrived at this situation in Slovenian hospitals by looking at the health system only from the perspective of physicians, but no health system can be effective unless all the health workers and allied health professionals involved are considered.

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## CONFLICTS OF INTEREST

The authors report no conflicts of interest. The manuscript has not been published and is not under consideration for publication elsewhere.

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## ETHICAL APPROVAL

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