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MANAGING HUMAN RESOURCES IN NURSING: THE RELATIONSHIP OF NURSES' WORKING TIME AND PATIENTS' INDEPENDENCE LEVEL

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Abstract. A skilled, competent, and motivated nursing workforce is crucial for a well-functioning health care system. Nurses' professional activities done on a regular basis, their workload, and occupancy are related to the patient's health status, dependence level and care needs. Therefore, managing human resources in nursing by effectively distributing nurses' working time and monitoring their workload for safe and high quality care, managers should rely on the severity of patients' health status and their independence level.

In this article the results on how nurses' working time depends on patients' independence are provided. The research was carried out at a regional hospital, in departments of medical profile. The time-and-motion study was implemented with 72 observations made in total, which amounted to 777.2 hours of nursing time. A questionnaire was used to assess the level of patients' independence by assessing the four activities of the patient's daily living. The results revealed that the largest amount of nurses' working time, i.e. almost half of a day shift, was spent on direct patient care by administrating medication use and performing various nursing procedures. Nurses would spend almost half of the time for direct patient care on completely dependent patients, while one third would be spent on dependent patients. The relative number of nurses' contacts with a patient is directly proportional to patient's level of independence; a strong or fairly strong linear relationship was established between the level of patients' independence and the relative amount of nurses' working time.

Keywords: nursing human resource management, nurses' working time, workload management, patients' classification systems, patient's independence level.

JEL Classification: I10, M12, M54.

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Introduction

The vitality and prosperity of a nation depends on its citizens' health. The fundamental goal of health care sector is added value for patients (Čiarnienė, Vienažindienė, & Vojtovic, 2017). Nurses compound the largest group of the human resources in health, but according to Ulep (2018), significant nursing shortagies expected in the near future. Proper management of human resources in nursing, learning orientation strategy, innovativeness (Ejdys, 2015) and regulation of nurses' workload is extremely important for safe and high quality person-oriented care as well as for justification of nursing resources: their rational size, composition, intensity of nursing care, and distribution.

During the last two decades since the restoration of Lithuania's independence in the 1990s, many significant changes related to the development of nursing profession, together with unfavorable demographic changes in nursing human resources and migration. Such transformations improved level of nurses' competences, expanded scope of practice and caused changes in nurses' daily work profile.

In dynamic and increasingly complex health care environment, nurses are facing barriers performing clinical duties in timely and impeccable manner. Often nurses report that they no longer have time to provide the direct care to patients and the extent of missed care, or care left undone, is constantly increasing. Such practice makes it difficult for nurses to understand the meaning and value of their work, reduces professional autonomy and motivation, and decreases involvement in work and job satisfaction. All those negative factors result nurses' work related stress, burnout and the intent to leave the profession (Amendolair, 2012; Fouka et al., 2013; Goldsworthy, 2016; Timmins, Parissopoulos, Plakas, & Fouka, 2017; Martin & Warshawsky, 2017; Virkstis, Herleth, & Langr, 2018).

A large and increasing number of studies have reported a relationship between low nurse staffing level and adverse outcomes of care. It is important that nurses' human resources in health care system are properly managed and effectively used in care process, utilizing nurses' competences precisely for the activities and duties they are trained to do, which corresponds with their education level and clinical experience (Duffeld, Garder, & Catling-Paull, 2008; Karabatsou et al., 2016). The results of nurses' work have an impact not only on the satisfaction of patients and nurses themselves, but they also affect the organizational results of health care institution (e.g. cost-effectiveness), outcomes of patient care (Aiken et al., 2012; Cadmus & Wisniewska, 2013; Recio-Saucedo et al., 2015) and social aspects (Lachowska, 2017). The number of nurses, for example, is associated with omitted or delayed nursing care, complications, more frequent cases of death in hospitals (Kalisch, Landstrom, & Hinshaw, 2009; Shu, Ismail, Ong, & Kang, 2010; Ausserhofer et al., 2014; European Federation of Nurses Associations, 2012; Craker et al., 2017) and is identified as one of the main determinants of quality of nursing care (Guidance on safe nursing staffing in the UK, 2010).

Baernholdt, Cox, and Scully (2010) emphasized the lack of research on the impact that nursing workload has on patient safety, and the lack of standardized workload measurement tools and software that would combine clinical data with administrative systems and allow to calculate the nurses' workload and analyze its impact on safe patient care.

Without evidence on nurses' work activities and the use of their working time, nurse managers cannot accurately define the need for a number of nurses or properly manage and

distribute nursing resources (Smith, 2009; Bray et al., 2010; Sermeus et al., 2011). When nursing care tasks are not monitored and updated, the changes in nursing practice and organization can not be adequately recognized (Perroca & Ek, 2007), and it is difficult to reconcile the patients' needs with the number of nursing staff (Fasoli & Haddock, 2010).

Various classifications and methodologies have been developed and tested over the past few decades in order to assess complex nursing activities, identify patient care needs and manage nurses' workload (Fasoli & Haddock, 2010; Webster, Davies, Stankiewicz, & Fleming, 2011). However, it is difficult to accurately calculate the optimal nurse to patient ratio, because of the specific nature of nursing work that is not always visible, the analysis of nurses' activities does not fully reveal the multiplicity of tasks, the required skills and time. This is because nurses carry out activities at a different pace, depending on their own excellence, number of patients, their health status and the level of independence, and, finally, peculiarities and culture of how nursing work is organized and managed at a certain department also matter.

While developing nursing science, nursing researchers most often investigate the issues of clinical nursing, patient's quality of life and educational aspects of nursing. However, there is a lack of scientific research that focuses on characterizing nurses' professional activities, analyses workload, and assesses how busy the nurses are on a regular basis, taking into account the patient's capacities. This article provides interdisciplinary approach when knowledge on clinical nursing and human resources management are synergized for solving scientific problem of the relationship of nurses' workload and patient's level of independence. In Lithuania, such studies, to our knowledge, have not been carried out until now and the data on this matter is scarce.

The purpose of this research was to investigate the relationship of workload and time allocation for nurses' daily care activities and patient's independence level.

Research methods: analysis and synthesis of scientific literature, survey, direct time-and-motion study.

The paper consists of three main parts: theoretical background, research methodology and research findings. Theoretical background covers analysis of patients' classification system and description of nurses' work activities and workload. Research methodology is based on time-and-motion study. Research findings section provides results of empirical study on the relationship of nurses' working time expenditure and patients' independence level.

1. Theoretical background

1.1. Patient classification systems

The nursing profession uses dozens of nursing classification systems that describe the aspects of nursing practice. The goal of the nursing community to standardize professional terminology and divide it into classifications similar to those existing in medicine was observed in the 1860s, when F. Nightingale emphasized the need for nursing documentation and uniform concepts in nursing.

The patient classification system in everyday practice is used to reconcile staff resources with patient's needs. In general, various patient classification systems in health care allow

patients to be grouped according to nursing and medical diagnoses, nursing intensity, treatment and care interventions, diagnosis related groups, or demographic factors (Patrician, Loan, McCarthy, Brosch, & Davey, 2010; Porter-O'Grady & Malloch, 2016).

Patient classification systems began to be developed around 1960s in order to combine the existing nursing resources with the nursing needs of patients (Fasoli & Haddock, 2010; Porter-O'Grady & Malloch, 2016). According to Malloch and Conovaloff (1999), the development of these systems encompassed three generations: before 1970s, they helped to calculate the nurse to patient ratio and identify differences between different fields of nursing; in the 1980s, these systems were related to environmental changes (e.g., assessment and coding of patient's condition related to diagnosis, the use of technology and informatics); in 1990s, attempts were made to calculate nurses' workload on the basis of shift work and the introduction of skill-mix (Perroca & Ek, 2007).

At the end of 1960s, nurses' workload was measured at the Vaasa Hospital in Gothenburg, Sweden (Perroca & Ek, 2007). In the middle of 1970s, the aim was to identify and demonstrate nursing interventions that showed the quality of care provided to patients. A new workload allocation system was introduced, according to which patients were grouped into nursing categories. Connor and Johns Hopkins Operation Group are considered to be the first experts when it comes to calculating the number of nursing staff and categorization of patients, back in the 1960s. Connor's patient classification system used factors related to nursing problems, in order for the patient classification system to be based on aspects of direct patient care (Fasoli & Haddock, 2010). Subsequent studies relied on this work, and the criteria for patient classification systems were rather consistent: patients' ability to take care of themselves, patients' characteristic, disease severity, specific nursing and care needs, staff competence and skill levels, geographical location of a hospital and its status.

The North American Nursing Diagnosis Association (NANDA) has developed and published: 1986 – Nursing Diagnosis Taxonomy I and II; 1992 – Nursing Intervention Classification (NIC); 1997 – Nursing Outcomes Classification (NOC). They were followed by extended editions, based on scientific evidence of how classifications are applied in practice (NANDA International, n.d.).

Group of Representatives from European Nursing Organizations of International Council of Nurses introduced the International Classification for Nursing Practice (ICNP®): 1996 – Alpha version and 1999 – Beta version. The classification sought to bring nurses from different countries and cultures together, promote the progress of both nurses and nursing and to influence health policies. This classification is regarded as a vocabulary of nursing phenomena (aspects of nursing), actions and outcomes. Nursing phenomena are classified according to their interactions with the environment and human beings; nursing diagnosis consists of symptoms and corresponds to one of the nursing phenomena (International Council of Nurses [ICN], 2017).

In assessing patients' needs, many factors need to be taken into account, for example: patient's age (children receive more intense care than adults, elderly patients receive more complex care), health status, intensity of care, peculiarities of a specific department, preparation and professionalism of staff (Ampt, Westbrook, Creswick, & Mallock, 2007). Over a decade ago, a group of hospitals in Finland, Norway and Iceland approved and since then successfully use the RAFAELA patient classification system. The system, which aims to

uphold staffing levels in accordance with patients' care needs, consists of three parts: The Oulu Patient Classification instrument; registration of available nursing resources; and the Professional Assessment of Optimal Nursing Care Intensity Level method, as an alternative to classical time studies. This system provides information on patients need for individual care and creates an opportunity to analyze the quality of nursing processes, resource use and costs (Fagerstrom, Lonning, & Andersen, 2014). Six patient care areas (planning and coordination of nursing care; status of health; nutrition and medication; hygiene and excretion; activity, sleep and rest; treatment after outpatient visits and emotional support) are evaluated, and so are 4 levels of care intensity: 1 – low need for nursing; 2 – average need for nursing; 3 – high need for nursing; 4 – completely or almost totally dependent patient. According to the levels of nursing intensity, individual nursing units determine the need for care for each patient and for all patients in the department: from the minimum need of care to the intensive care.

Fasoli and Haddock (2010), having analyzed the studies conducted from 1983 to 2010 in relation to patient classification systems and systems regarding the intensity of treatment and workload management, identified drawbacks of patient classification systems, such as difficulties in measuring workload, inadequate definitions of nursing care, insufficient testing of patient classification systems, and the continuing need to identify criteria and outcomes related to nursing care. Undoubtedly, nursing terminology is not finite it can change; as nursing science develops, the terminology of nursing practice is being expanded as well.

1.2. Grouping of nurses' work activities and their workload

Nurses' work activities and workload intensity go together, since an activity that a nurse can perform over a set period of time depends on the workload intensity. Both nursing skills and the physical and mental health status of patients have an impact on this. Accomplishment of nursing tasks is important for nurses and gives positive work-related emotions (Kalisch, Tschanen, & Hyunhwa, 2011). According to Allen (2004), nursing activities can be grouped into: coordination of multiple factors, patients' perviousness, implementation of standards, managing other people's work, eliminating interruptions at work, administering information, filling in the documentation and monitoring priorities and resources. According to Squires (2004), nursing activities are classified into: autonomy, care provision, administration of cultural aspects, information administration, leadership, psychology management and relationship management.

However, many other researchers (O'Brien et al., 2002) group all nursing activities into two large groups: direct care and indirect care. Direct care includes all activities that are performed in the presence of a patient and with a patient. Indirect care is recognized as an activity that is not directly related to the patient but is intended for the patient. Desjardins, Cardinal, Belzile, and McCusker (2008) distinguished four main categories:

1. Direct patient care.
2. Indirect patient care.
3. Actions unrelated to nursing.
4. Personal affairs.

According to other authors, the time spent on direct nursing activities was found to be between 30% and 55%. On average, nurses would spend 37% of their working time at a bedside (Upenieks, Kotlerman, Akhavan, Esser, & Ngo, 2007). Reliable information on nursing needs and nursing outcomes is essential for nursing resources and nurses' workload management. When assessing the effectiveness of nursing, amongst other factors, it is important to determine how much of nurse's working time is spent on patient care and on other activities that are merely related to nursing. Ideally nursing should be provided according to a model where nurses use their working time to do the nursing tasks that have the greatest direct impact on patients' recovery (Fasoli & Haddock, 2010). However, if highly qualified nurses working at health care institutions will carry out the work that can be done by less qualified people, this can have a negative impact on the quality of nursing care as well as reduce job satisfaction, diminish nurses' autonomy and encourage nurse turnover.

The health care system is changing, as medical diagnostic methods and methods of treatment are improving, the application of technology is rapidly expanding, human resources are changing and the number of elderly patients in need of continuous complex nursing care is increasing. Historically, the demand for healthcare professionals was calculated for a certain number of people (for example, the number of physicians and nurses per 1000 inhabitants) and that would determine the distribution of workload. Later it was calculated according to the type of the health care institution and the services that it provided.

Each workplace, when it comes to nurses, is a system of certain functions and measures necessary for their fulfilment. All nursing tasks are based on authority and responsibility. In addition, different responsibilities require different permissions. Tools for measuring nursing care intensity, which can be used to classify patients according to their health condition and identify the need to develop skills, labor force and the number of nurses, were identified in the middle of 1990s. One tool for measuring intensity, created by the AUKUH (Association of UK University Hospitals) and the University of Leeds, was tested and validated in several healthcare organizations (Smith, 2009).

A specific number of staff members based on a variant level of patients' independence was the goal of many classification systems. Possibly the best way to solve this complex problem is to monitor the patient's level of independence and the nurses' workload as well as to analyze the nursing activities so that the most appropriate members of the health care team would provide the necessary care (Harrison, 2004).

The purpose of each personal health care institution is to provide affordable, high quality, secure services. In order to ensure patient safety and to minimize the risk, an adequate number of medical and helping staff must work in the institution. In order to ensure a high quality nursing care for patients, the evaluation of nurses' workload and the relationship between nurse-doctor, or nurse-patient, nurse-helping staff is currently especially important in the whole world and in Europe. The impact of staff shortages on the security of provided services and their availability has been proven. The basic principle of nursing staff planning, that is the number of specialists at workplaces, depends on the autonomy of these specialists, i.e. how many and what individual decisions they are allowed to make (Guidance on safe nursing staffing in the UK, 2010).

Europe does not have single human resources planning policy, generally accepted workload standards or guidelines when it comes to personal health care. In most cases, the decisions are based on recommendations and guidelines offered by national or European professional associations and organizations. In Lithuania, five decrees of the Ministry of Health of the Republic of Lithuania regulate the workload of doctors, nurses and other staff at the national level by providing: nursing and supportive treatment services in hospitals and units; nursing services at the patient's home; palliative care services; newborn intensive care services; resuscitation and intensive care for children and adults. All other areas of nursing practice rely on not obligatory recommendations for nurse-patients ratio and human resource management policy of individual health care institution.

2. Research methodology

The research was performed in three departments of medical profile (internal medicine, neurology, nursing and supportive treatment) in one of district hospital of Lithuania. The duration of activities performed by nurses was registered in seconds on a computer using a digital tool for specialists. A direct activity performed by a nurse was observed alongside the patient, with the results being registered in a computer and notes. 72 observations were made in total, which amounted to 777.2 hours of nursing time. 1264 patients participated in the research. Table 1 presents the detailed statistics of observations according to department and shift.

Table 1. Statistics of observations

Unit	Day shift		Night shift		Weekends and holidays: day shift		Weekends and holidays: night shift		In total	
	No. of obser.	No. of patients	No. of obser.	No. of patients	No. of obser.	No. of patients	No.of obser.	No. of patients	No. of obser.	No. of patients
Internal medicine	11	174	5	100	3	66	4	86	23	430
Neurology	13	168	7	90	2	31	2	26	24	316
Nursing and supportive treatment	12	238	6	132	4	82	3	71	25	518
In total:	36	580	18	322	9	179	9	183	72	1264

Activities performed by nurses were divided into four categories:

1. Direct care is an activity that requires direct contact with the patient.
2. Indirect care is an activity that is directly related to the patient, but direct contact is not compulsory.
3. Activities related to the work of the whole department that do not involve taking care of the patient.
4. Personal activities are designed to meet the personal needs of a specialist.

These categories are divided into groups of activities and activities are divided into actions. Patient independence is evaluated by a questionnaire composed of four daily living activities: 1) Cleaning and getting dressed; 2) Movement; 3) Eating and drinking; 4) Excretion. Each activity is evaluated from 1 to 4. A patient who has got 4 points is considered as independent, 4–7 points – partly dependent, 8–11 points – dependent, more than 11 points – completely dependent. Linear correlation analysis methods are used to determine the interface of quantitative characteristics. To determine the interdependence of variables, Pearson correlation coefficient is calculated.

3. Research findings

Analysis on medical profile nurses' management of their working time

Summarizing the distribution of nurses' working time by categories of care in a day shift, it was found that in all three units of medical profile, nurses would mainly perform tasks in the category of direct patient care (from 46% to 50%) with one quarter (25%) of working time being allocated to the category of tasks related to the whole department. During the night shifts in Department of Internal medicine and Nursing and supportive treatment, nurses would spend most of their working time on the category of direct care (up to 44%). Most of the working time at night in the Department of Neurology was spent on nurses' personal activities (50%).

In the category of indirect care, the majority of nurses' working time would be spent on documentation management (12%).

During the night shift in all three departments, the nurses would spend most of their time (from 38% to 49.2%) on personal activities. In the category of direct care, the biggest amount of nurses' working time (from 12% to 15%) was spent for the administration of medications.

Having examined nurses' working time while performing activities belonging to care categories and groups of activities per day, it was found that in day shifts from 8 am till 4 pm the maximum time spent on the direct care category (from 30% to 72%) (the only time when nurses would devote most of their time to personal activities is midday). The largest amount of nursing time in daytime hours (weekends and holidays) was spent on nursing work in the category of direct care (from 40% to 78%).

During night shift, from 4 pm to 1 am and from 5 am until 8 am, the largest amount of time was also spent on tasks of direct patient care. During weekends and holidays, nurses would be busier than on a regular day and night shift and carry out 48% of works related to direct patient care.

Assessing the independence level of patients in medical departments

The age of patients. It was noticed that 22% of patients in the Department of Internal Medicine were between 76 and 80 years of age. 20% of patients in the Department of Neurology were 66–76 years of age, and 18% of those in the Department of Nursing and Supportive Care were 66–90 years of age. In departments of Neurology and Internal Medicine, the number of younger patients (41–51 years of age) was fairly identical (10%).

The independence level of patients in medical departments. Having analyzed patients' level of independence, it was found that in the Department of Internal Medicine, the majority

of patients were independent (57.4%) and only 5.9% were partly dependent and completely dependent. In the Department of Neurology, too, most of the patients were independent (55.3%); 17.5% and 15.5% were partly dependent and completely dependent respectively. The number of dependent patients dominated in regards to the Department of Nursing and Supportive Care (41%); 25.5% and 25.9% of all the patients were partly dependent and completely respectively (Table 2).

Table 2. Analysis of patients' level of independence in medical departments, %

Department	Independent	Partly dependent	Dependent	Completely dependent
Department of Neurology	55.3	17.5	11.7	15.5
Department of Nursing and Supportive Treatment	7.6	25.5	41.0	25.9
Department of Internal Medicine	57.4	22.4	14.3	5.9

Summarizing the findings when it comes to patients' independence level, it can be said that more independent patients are treated in the Departments of Internal Medicine and Neurology. However, the Department of Nursing and Supportive Care was dominated by dependent and completely dependent patients who need nurses' help when washing themselves up, dressing up, moving, eating and drinking, and eliminating.

Analysis of medical profile nurses' working time spent on direct care in relation to patients' level of independence

The relationship between nurses' working time and patients' independence has been evaluated on the basis of the time that the nurses spend providing direct care, as this is the only category that is directly related to the patient (nursing "at a bedside"). The relationship between how busy the nurses are and patient's independence level was determined. Table 3 shows nurses' working time spent on direct care taking into account the level of patient's independence.

Table 3. Nurses' working time spent on direct care taking into account the level of patients' independence, %

Department	Working time based on the level of patient's independence, %			
	Independent	Partly dependent	Dependent	Completely dependent
Department of Internal Medicine	12	19	23	46
Department of Neurology	13	20	26	41
Department of Nursing and Supportive Treatment	17	16	19	48

The results show that during both shifts (day and night), the nurses assigned nearly half of the time spent on direct care (41–48%) for the care of completely dependent patients. 16–20% of time was spent taking care of the patients who are partly dependent; 19–26% of time spend on direct care was spent on dependent patients, and the least amount of time spent on direct care was needed by independent patients (12–17%).

Analysis of medical profile nurses' activities in direct care category in relation to patients' level of independence

By analyzing the results of the study, we can assess the number and duration of nursing activities related to direct care category for one patient of varying independence in a shift, and the duration of one activity for one patient of varying independence. During a shift, nurses working in a Department of Internal Medicine performed the most (46%) nursing activities for a completely dependent patient, 22% – for a dependent patient, 19% – for a partly dependent patient, 13% – for a completely independent patient. In a Department of Neurology, nurses performed 39% of nursing activities for a completely dependent patient, 30% – for a dependent patient, 18% – for a partly dependent patient and 13% – for a completely independent patient. In a Department of Nursing and Supportive treatment, nurses performed 50% of nursing activities for a completely dependent patient, 20% – for a dependent patient, 14% – for a party dependent patient, 16% – for a completely independent patient.

Table 4 shows the relative duration of nursing activities (duration of actions for a specific level of patient's independence / total duration of actions spent on nursing care of all the patients) for one patient of varying independence level during a shift.

Table 4. Relative duration of nursing activities (duration of nursing tasks for a specific level of patient's independence / total duration of time spent on nursing care of all the patients) for a patient of varying independence level, %

Department	Relative duration of nursing activities for a patient of varying independence level, %			
	Independent	Partly dependent	Dependent	Completely dependent
Department of Internal Medicine	11	18	28	43
Department of Neurology	11	18	28	43
Department of Nursing and Supportive Treatment	16	15	18	51

As seen in Table 4, during a shift the duration of nurses' actions is the longest (43–51%) when patient is completely dependent, 18–28% of the duration of nursing actions was dedicated to a dependent patient, 15–18% – to a partly dependent patient and 11–16% of nursing actions was done for an independent patient.

Summarizing the amount of nursing activities related to direct patient care performed by nurses working in medical department, time management and the usage of time spent on

nursing activities, the relationship between the amount of nursing actions and their duration are proved: the less independent the patient is, the more nursing actions the nurses have to perform and the longer it takes to do it.

The relationship of nurses working time spent for direct patient care and patient's level of independence

The results have shown that in three separate medical departments and the overall medical profile of patient care at the hospital, the **relative number of contacts made by nurses**, which is calculated by dividing the number of patient-nurse contacts related to direct care by the number of patients in each category of independence, was directly **proportional to the patient's level of independence**. In regards to the three medical departments and the whole medical profile of patient care, there exists a strong ($r > 0.7$) or a sufficiently strong ($r > 0.4$) linear relationship between the level of patients' independence and the relative amount of working time spent by nurses for direct care, i.e. as the patient's dependence increases (from completely independent to completely dependent) the number of nursing contacts increases, too. Having analyzed the relationship by departments, the strongest positive correlation was found in the Department of Neurology ($r = 0.9722$). This correlation is also strong in the Department of Internal Medicine ($r = 0.882$) and sufficiently strong ($r = 0.6837$) in the Department of Nursing and Supportive Treatment. Figure 1 presents strong linear relationship between the amount of direct nursing care, based on the relative number of nurse-patient contacts, and patients' level of independence in a medical profile of hospital units.

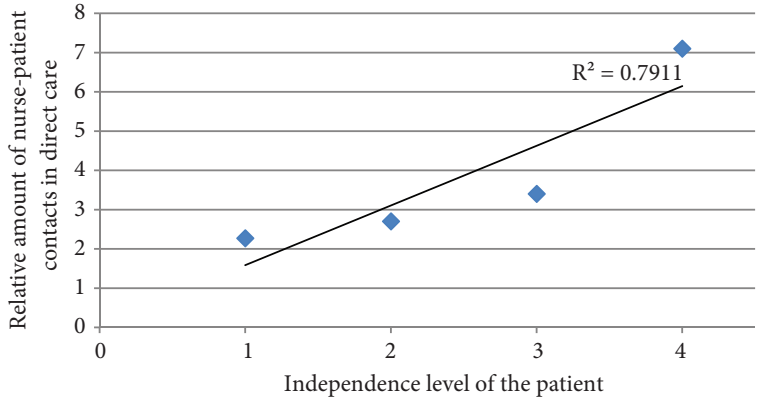

Figure 1. The relationship between the amount of direct nursing care, based on the relative number of nurse-patient contacts and patients' level of independence in medical units of a hospital

Similarly, the results have shown that in three separate departments of medical profile and the overall medical profile at the hospital, the **relative duration of contacts made by nurses,** which is calculated by dividing the duration of patient-nurse contacts related to direct care (in seconds) by the number of patients in each category of independence, was directly **proportional to the patient's level of independence.** In regards to the three departments and the whole medical profile, there exists a strong ($r > 0.7$) or a sufficiently strong ($r > 0.4$) linear relationship between the level of patients' independence and the relative amount of working time spent by nurses for direct care, i.e. as the patient's dependence increases (from

completely independent to completely dependent), the duration of nursing contacts in direct care increases as well. Figure 2 presents the strong relationship (r = 0.7822) between the amount of time spend to direct nursing care, based on the relative duration of nurse-patient contacts per 100 patients, and patients' level of independence in a medical units of a hospital.

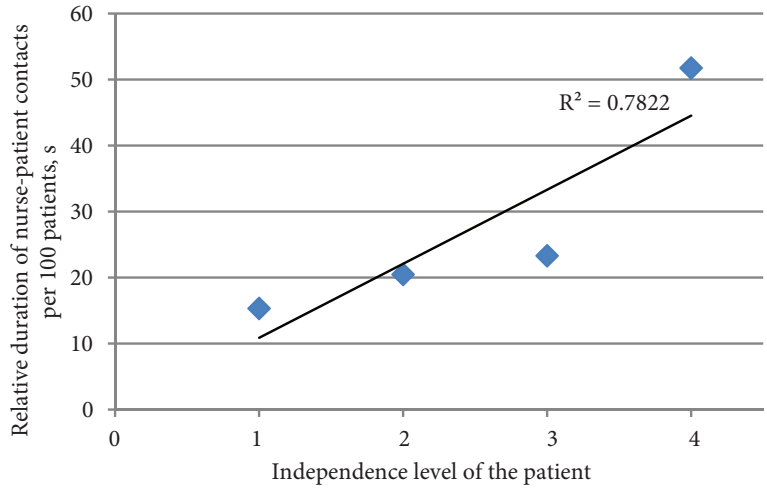

Figure 2. The relationship between the amount of time spent to direct nursing care, based on the relative duration of nurse-patient contacts (per 100 patients) and patients' level of independence in medical units of a hospital

Assessment of nurse-patient ratio according to the level of patients' independence in medical units

Having assessed the relationship between the current fixed number of patients per nurse per shift and the patient-to-patient ratio according to the level of patients' independence, the proportions become apparent, i.e. if, for example, the nurse, working in the Department of Neurology, takes care of 14 independent patients during the day shift, then the total time spent on these patients is equal to that spent on 3.66 completely dependent patients. One completely dependent patient in the Department of Neurology is equivalent to 3.83 independent patients. Or, if the nurse, working during the day and night shift in the Department of Internal Medicine, takes care of 11 independent patients, then the total time spent on these patients is equal to the time spent on 2.45 dependent patients. One completely dependent patient in this department is equivalent to 4.48 independent patients. In Nursing and Care department the nurse regularly takes care of 15 independent patients during the day shift and the total time spent on these patients is equal to that spent on 4.63 completely dependent patients. The ratio of completely dependent patient and independent patient in Nursing and Care department is 1:3.23. Similarly, the ratios of patients with other levels of independence and, in accordance to that, the number of patients per nurse per shift may be determined.

The research has shown a nurse-patient ratio in regards to a different level of patients' independence in departments of medical profile. Thus, in all three medical departments, as the level of patient's independence decreases (from independent to completely dependent), so respectively does the number of patients per nurse per shift.

Conclusions

The results of theoretical analysis of nurses work activities and workload revealed the importance of nursing human resource management. Nurses work activities and their workload highly depend on patient needs and their independence. Research provides interdisciplinary approach when knowledge on clinical nursing and human resources management are synergized for solving scientific problem of the relationship of nurses' workload and patient's level of independence.

The results of empirical research disclosed that maximum amount of working time for nurses working in a medical profile, i.e. almost half of time of a day shift is dedicated to direct patient care, usually administering medications and performing various nursing procedures; the least amount of nurses' working time, i.e. slightly more than a tenth, is dedicated to indirect patient care, usually communicating with patients' relatives and managing documentation. During the night shift, the nurses working in therapeutic profile spend most of the time on direct patient care and administration of medication. It can be stated that results on working time spent on various nursing activities more or less confirm ideas and results that have been indicated in research works conducted by Harrison (2004), Upenieks et al. (2007), Fasoli and Haddock (2010).

Two fifths of all the patients treated in departments of therapeutic profile were independent and almost a half was partly dependent patients. The major part of independent patients was treated at the Department of Internal Medicine, where they accounted for more than a half of all the patients; the level of patients' independence was the lowest in Department of Nursing and Supportive Treatment, i.e. half of the patients were dependent and completely dependent.

The research revealed that nurses' working time spent on nursing activities strongly and sufficiently strongly depends on patients' independence, i.e. the relative number of nurse contacts in direct patient care and the relative duration of those contacts depends on the capacity of the patient to perform the activities of daily living. As the level of patient's independence decreases and they become more dependent (from independent to completely dependent), the number of contacts made by a nurse increases and they become longer.

The research has shown a nurse-patient ratio in regards to different level of patient independence. From managerial point of view, seeking safe and high quality person-oriented patient care and effective use of nursing human resources, it is important to monitor the patient's level of independence and allocate, and distribute nursing human resources according to this. Achieved results and conclusions can be interesting for other researchers in the field and can also be used by health care organizations for solving the problem of the relationship between patient's level of independence and nurses' workload.

Limitation of this research is that it was conducted just in one regional hospital. In order to get deeper knowledge, the future research could be expanded to other health care settings and other types of nursing service (university hospital, primary care, long-term nursing care, surgery profile, and etc.).

Author contributions

Ramunė Čiarnienė developed the concept of the article, drafted the manuscript and contributed to its improvement. Roberta Suprikienė collected the data, conducted data analysis and produced the results. Rūta Čiutienė developed the concept of the article and contributed to the improvement of the manuscript. Asta Daunorienė interpreted study results and contributed to the improvement of the manuscript. Olga Riklikienė created study design, revised the manuscript critically for important intellectual content and improvements. All listed authors are in agreement with the final content of the manuscript.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Aiken, L. H., Sermeus, W., Van den Heede, K., Sloane, D. M., Busse, R., McKee, M., Bruyneel, L., Rafferty, A. M., Griffiths, P., Moreno-Casbas, M. T., Tishelman, C., Scott, A., Brzostek, T., Kinnunen, J., Schwendimann, R., Heinen, M., Zikos, D., Sjetne, I. S., Smith, H. L., & Kutney-Lee, A. (2012). Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in Europe and the United States. *British Medical Journal*, *344*. https://doi.org/10.1136/bmj.e1717

Allen, D. (2004). Re-reading nursing and re-writing practice: towards an empirically based reformulation of the nursing mandate. *Nursing Inquiry*, *11*, 271-283. https://doi.org/10.1111/j.1440-1800.2004.00234.x

Amendolair, D. (2012). Caring behaviors and job satisfaction. *JONA*, *42*, 34-39. http://doi.org/10.1097/NNA.0b013e31823c18af

Ampt, A., Westbrook, J., Creswick, N., & Mallock, N. (2007). A comparison of self–reported and observational work sampling techniques for measuring time in nursing tasks. *Journal of Health Services Research & Policy*, *12*(1), 18-24. http://doi.org/10.1258/135581907779497576

Ausserhofer, D., Zander, B., Busse, R., Schubert, M., De Geest, S., Rafferty, A. M., Ball, J., Scott, A., Kinnunen, J., Heinen, M., Strømseng Sjetne, I., Moreno-Casbas, T., Kózka, M., Lindqvist, R., Diomidous, M., Bruyneel, L., Sermeus, W., Aiken, L. H., & Schwendimann, R. (2014). Prevalence, patterns and predictors of nursing care left undone in European hospitals: results from the multicountry cross-sectional RN4CAST study. *BMJ Quality and Safety*, *23*(2), 126-135. http://doi.org/10.1136/bmjqs-2013-002318

Baernholdt, M., Cox, K., & Scully, K. (2010). Using clinical data to capture nurse workload: implications for staffing and safety. *Computers, Informatics, Nursing*, *28*(4), 229-234. http://doi.org/10.1097/NCN.0b013e3181e1e57d

Bray, K., Wren, I., Baldwin, A., St Ledger, U., Gibson, V., Goodman, S., & Walsh, D. (2010). Standards for nurse staffing in critical care units determined by: the British Association of Critical Care Nurses, The Critical Care Networks National Nurse Leads, Royal College of Nursing Critical Care and In-flight Forum. *Nursing in Critical Care*, *15*(3), 109-111. http://doi.org/10.1111/j.1478-5153.2010.00392.x

Cadmus, E., & Wisniewska, E. K. (2013). Measuring first-line nurse manager work: instrument: development and testing. *Journal of Nursing Administration*, *43*(12), 673-679. http://doi.org/10.1097/NNA.0000000000000010

Craker, N. C., Myers, R. A., Eid, J., Parikh, P., McCarthy, M. C., Zink, K., & Parikh, P. J. (2017). Nursing interruptions in a trauma intensive care unit: a prospective observational study. *Journal of Nursing Administration*, *47*(4), 205-211. http://doi.org/10.1097/NNA.0000000000000466

Čiarnienė, R., Vienažindienė, M., & Vojtovic, S. (2017). Process improvement for value creation: a case of health care organization. *Inzinerine Ekonomika-Engineering Economics*, *28*(1), 79-87. http://doi.org/10.5755/j01.ee.28.1.16601

Desjardins, F., Cardinal, L., Belzile, E., & McCusker, J. (2008). Reorganizing nursing work on surgical units: a time-and-motion study. *Nursing Leadership*, *21*(3), 26-38. https://doi.org/10.12927/cjnl.2008.20057

Duffeld, C., Garder, G., & Catling-Paull, C. (2008). Nursing work and the use of nursing time. *Journal of Clinical Nursing*, *1*, 3269-3274. http://doi.org/10.1111/j.1365-2702.2008.02637.x

Ejdys, J. (2015). Innovativeness of residential care services in Poland in the context of strategic orientation. *Procedia – Social and Behavioral Sciences*, *213*, 746-752. https://doi.org/10.1016/j.sbspro.2015.11.461

European Federation of Nurses Associations. (2012, January). *Caring in crisis: the impact of the financial crisis on nurses and nursing. A comparative overview of 34 European countries*. Retrieved from http://www.efnweb.be/wp-content/uploads/2012/05/EFN-Report-on-the-Impact-of-the-Financial-Crisis-on-Nurses-and-Nursing-January-20122.pdf

Fagerstrom, L., Lonning, K., & Andersen, M. H. (2014). The RAFAELA system: a workforce planning tool for nurse staffing and human resource management. *Nursing Management*, *21*(2), 30-36. https://doi.org/10.7748/nm2014.04.21.2.30.e1199

Fasoli, D. R., & Haddock, K. S. (2011). Results of an integrative review of patient classification systems. *Annual Review of Nursing Research*, *28*, 295-316. https://doi.org/10.1891/0739-6686.28.295

Fouka, G., Plakas, S., Papageorgiou, D., Mantzorou, M., Kalemikerakis, I., & Vardaki, Z. (2013). The increase in illegal private duty nurses in public Greek hospitals. *Journal of Nursing Management*, *21*(4), 633-637. https://doi.org/10.1111/j.1365-2834.2012.01409.x

Goldsworthy, S. (2016). Deteriorating work environments for critical care nurses: How urgent is this issue and what can be done? *Nursing in Critical Care*, *21*(1), 6-7. https://doi.org/10.1111/nicc.12233

Harrison, J. (2004). Addressing increasing patient acuity and nursing workload. *Journal of Nursing Management*, *4*(11), 20-26. https://doi.org/10.7748/nm2004.07.11.4.20.c1984

International Council of Nurses. (2017). *International Classification for Nursing Practice* (ICNP®). Retrieved from http://www.icn.ch/what-we-do/international-classification-for-nursing-practice-icnpr/

Kalisch, B. J., Landstrom, G. L., & Hinshaw, A. S. (2009). Missed nursing care: a concept analysis. *Journal of Advanced Nursing*, *65*(7), 1509-1517. https://doi.org/10.1111/j.1365-2648.2009.05027.x

Kalisch, B., Tschanen, D., & Hyunhwa, L. (2011). Does missed nursing care predict job satisfaction? *Journal Health Management*, *56*(2), 117-131.

Karabatsou, D., Tsironi, M., Tsigou, E., Boutzouka, E., Katsoulas, T., & Baltopoulos, G. (2016). Variable cost of ICU care, a micro-costing analysis. *Intensive & Critical Care Nursing*, *35*, 66-73. https://doi.org/10.1016/j.iccn.2016.01.001

Lachowska, A. (2017). Efficiency of public and non-public primary health care providers in Poland. *Engineering Management in Production and Services*, *9*(2), 57-63. https://doi.org/10.1515/emj-2017-0014

Malloch, K., & Conovaloff, A. (1999). Patient classification systems, Part 1: The third generation. *Journal of Nursing Administration*, 29(7/8), 49-56. https://doi.org/10.1097/00005110-199907000-00013

Martin, E., & Warshawsky, N. (2017). Guiding principles for creating value and meaning for the next generation of nurse leaders. *Journal of Nursing Administration*, *47*(9), 418-420. https://doi.org/10.1097/NNA.0000000000000507

NANDA International. (n.d.). *Defining the knowledge of nursing*. Retrieved from http://www.nanda.org/

O'Brien, A. J., Abas, M., Christensen, J., Nicholis, P., Le Prou, T., Hekau, A., & Vanderpyl, J. (2002). *Nursing workload measurement in acute mental health inpatient units. A report for the mental health research and development strategy.* Auckland: Health Research Council of New Zealand. Retrieved from http://www.hrc/govt.nz/MHR&D

Patrician, P. A., Loan, L., McCarthy, M., Brosch, L. R., & Davey, K. S. (2010). Towards evidence-based management creating an informative database of nursing-sensitive indicators. *Journal of Nursing Scholarship*, *42*(4), 358-366. https://doi.org/10.1111/j.1547-5069.2010.01364.x

Perroca, M. N., & Ek, A. C. (2007). Utilization of patient classification systems in Swedish hospitals and the level of satisfaction among nursing staff. *Journal of Nursing Management*, *15*, 472-480. https://doi.org/10.1111/j.1365-2834.2007.00732.x

Porter-O'Grady, T., & Malloch, K. (2016). *Leadership in nursing practice: changing the landscape of health care*. Burlington, Massachusetts: Jones & Bartlett Learning.

Recio-Saucedo, A., Pope, C., Dall'Ora, C., Griffiths, P., Jones, J., Crouch, R., & Drennan, J. (2015). Safe staffing for nursing in emergency departments: evidence review. *Emergency Medicine Journal*, *32*(11), 888-894. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/

Sermeus, W., Aiken, L. H., Van den Heede, K., Rafferty, A. M., Griffiths, P., Moreno-Casbas, M. T., Busse, R., Lindqvist, R., Scott, A. P., Bruyneel, L., Brzostek, T., Kinnunen, J., Schubert, M., Schoonhoven, L., & Zikos, D. (2011). Nurse forecasting in Europe (RN4CAST): Rationale, design and methodology. *BioMed Central Nursing*, *10*(6), 1-9. https://doi.org/10.1186/1472-6955-10-6

Shu, Y. H., Ismail, N., Ong, L. C., & Kang, J. (2010). Determining nurse staffing needs: the workload intensity measurement system. *Journal of Nursing Management*, *18*, 44-53. https://doi.org/10.1111/j.1365-2834.2009.01045.x

Smith, J. (2009). How to keep score of acuity and dependency. *Journal of Nursing Management*, *8*(16), 14-19. https://doi.org/10.7748/nm2009.12.16.8.14.c7392

Squires, A. (2004). A dimensional analysis of role enactment of acute care nurses. *Journal of Nursing Scholarship*, *26*, 272-278. https://doi.org/10.1111/j.1547-5069.2004.04049.x

Timmins, F., Parissopoulos, S., Plakas, S., & Fouka, G. (2017). Economic recession in Greece and effects on quality nursing care. *Journal of Nursing Management*, *25*, 163-166. https://doi.org/10.1111/jonm.12477

Ulep, K. (2018). The nurse leader's pivotal role in retaining millennial nurses. *Journal of Nursing Administration*, *48*(12), 604-608. https://doi.org/10.1097/NNA.0000000000000689

Upenieks, V. V., Kotlerman, J., Akhavan, J., Esser, J., & Ngo, M. J. (2007). Assessing nursing staffing rations: variability in workload intensity. *Policy, Politics,* & *Nursing Practice*, *8*(1), 7-19. https://doi.org/10.1177/1527154407300999

Virkstis, K., Herleth, A., & Langr, M. (2018). Cracks in the foundation of the care environment undermine nurse resilience. *Journal of Nursing Administration*, *48*(12), 597-599. https://doi.org/10.1097/NNA.0000000000000687

Webster, J., Davies, H., Stankiewicz, M., & Fleming, L. C. (2011). Estimating the time involved in managing the "unoccupied bed": a time and motion study. *Nursing Economics*, *29*(6), 317-322.

Why nurse staffing matters. (2010). *In Guidance on safe nursing staffing in the UK* (pp. 14-19). Policy Unit, Royal College of Nursing. Retrieved from http://www.weds.wales.nhs.uk/sitesplus/documents/1076/rcn%20safe%20staffing%20levels.pdf