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Health workforce forecast in the university hospital: evidence from Lithuania

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Abstract

Background The increasing shortage of staff in healthcare facilities worldwide calls for a human resource planning strategy in order to ensure safe, timely and patient-centred care. The purpose of this paper is to provide an analysis and supply and demand projections of nurses, midwives, and radiographers within the labor market of the largest university hospital in the Baltic States by 2030.

Methods The staff supply was calculated on the intake and outflow of persons in the labour market annually for various factors. Projections for the demand of nurses, midwives, and radiographers took into account the different needs of the population, categorized by gender and age, for the services offered within the institution.

Results The analysis highlights significant projected shortages in the supply of nurses and radiographers by 2030, while the supply of midwives is expected to meet the demand. The projected supply of nurses in 2030 will be lower than in 2021. Projected nurses demand in 2025 according medium scenario - shortage of 59 nurses, on prospective scenario - of 331 nurses. In 2030 according medium scenario - shortage of 173 nurses on prospective - of 772 nurses. The projected supply of radiographers in 2030 will be higher than in 2021. Projected radiographers demand in prospective scenario which is the most likely in 2025 - shortage of 26 and in 2030 - shortage of 52 radiographers. The projected supply of midwives in 2030 will be higher than in 2021. The variables influencing the increase in the demand for midwives did not exceed the projected supply in the institution, indicating a balanced supply-demand scenario for midwives.

Conclusions Due to the rising demand for nurse and radiographer services from the aging population, the predicted supply of nurses and radiographers will be insufficient. To ensure the projected demand for nurses in the medium and prospective scenarios, the nurses recruited each year should increase up to 38% in the medium scenario and 69% in the prospective scenario from 2022. In the prospective demand scenario, the recruitment of radiographers should increase three-fold and the recruitment of midwives should be reduced by 30%.

Keywords Human resources, Supply, Demand forecast, Nurse, Midwife, Radiographer

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Background

Workforce planning in the health sector is important for the sustainability of the healthcare system as it ensures timely, appropriate and safe services [1, 2]. According to the World Health Organisation (WHO), healthcare workforce planning is a comprehensive strategy [1]. It is a complex task to ensure the balance and consistency of health care service providers and individuals who need the healthcare service [3, 4]. The healthcare workforce projection is a part of the workforce planning and it is very useful to project the healthcare workforce in every part of the world [5, 6]. For all countries to reach Sustainable Development Goal 3 on health and well-being, WHO estimates that the world will need an additional 9 million nurses and midwives by the year 2030 [7]. A decade ago, the World Health Report 2006 raised concerns about inadequate staffing levels, describing the global shortage at the time as a “crisis.” The global nursing shortage is widely recognized as a critical issue in healthcare [5]. This shortage encompasses a range of healthcare professionals, including doctors, nurses, midwives, and other specialized healthcare providers [5, 8, 9]. An aging nursing workforce means that the number of nurses will decline significantly. Future workforce planning and development must be informed by accurate and reliable statistics to plan for an aging nursing workforce [10]. Planning the need for nurses is complicated by the lack of accurate data on the distribution of nurse activity between direct and indirect patient care functions. Solutions should involve a multifaceted approach, including educational expansion, improving working conditions, better compensation, and strategic use of technology [6, 8, 11]. In Lithuania, as in the rest of the world, an aging nursing workforce alongside an aging population indicates that the nursing profession will experience significant reductions in its workforce [1, 2, 4, 12]. According to the data of the Center for Strategic Analysis of the Government of Lithuania, the predicted shortage of nurses and midwives in 2028 will be 7.4 thousand and 102 of radiographers in 2030 [12, 13]. This nurses, midwives and radiographers forecast study was conducted in the largest university hospital in the Lithuania and even Baltic States with the 2249 hospital beds, provides care according to the highest standards of evidence-based clinical practice. The hospital has 39 departments devoted to all medical and surgical specialties, including cardiovascular surgery, neurosurgery, and organ transplant surgery and provides a wide range of diagnostic imaging services as well. The annual number of outpatient consultations is increasing every year. In recent years there were more than 1.2 million visits and 94 thousand hospital admissions. In 2023, the hospital core operating income exceed 259 million euro, marking a 20% increase compared to the previous year [14].

Research context

In Lithuania, in 2019, there were 17% fewer computed tomography (CT) scans per 1,000 inhabitants, 18% fewer magnetic resonance imaging (MRI) scans, and 4 times fewer positron emission tomography (PET) scans per 1,000 inhabitants, compared to the average in OECD countries [15]. In 2019, the nurse-to-doctor ratio in Lithuania was 1.7, which is 53% lower than the OECD average of 2.6 in 2019 [15, 16]. The number of nurses per 1,000 inhabitants in Lithuania is on a downward trend and decreased by 1.3% in 2020 compared to 2019, from 7.7 to 7.63 per 1,000 inhabitants respectively. In 2019, the number of midwives per 10,000 inhabitants in Lithuania was 3.2, while the average for countries in the European region was 4.6 midwives per 10,000 inhabitants [5].

New technologies, particularly information technology and artificial intelligence, can also be expected to generate demand for new jobs and new skills in the health and social care sector while reducing the importance of some tasks [17]. According to the WHO, Lithuania has one of the highest mortality rates from cardiovascular diseases in Europe. Projections indicate that due to the aging population, the incidence rates of cancer are expected to rise, and cardiovascular diseases will continue to have a high prevalence. These projections are based on demographic trends and current health data [18]. Eurostat statistics show that Lithuania’s birth rate is lower than that of many Nordic and Western European countries and future birth rate is expected to remain low [19].

These data suggest that the demand for the services of nurses and radiographers in Lithuania will increase over the next decade, while the demand for midwifery services will remain stable and will be similar to what it was in 2017–2019.

Forecasting of the supply and demand for health workforce in the largest university hospital in Lithuania and the Baltic region by 2030 may be influenced by the expected more efficient use of healthcare technologies and growth in numbers of their use in order to approach the OECD average [20], by the low ratio of nurses to doctors [21], and by the number of nurses per 1,000 inhabitants [16, 22].

The aim of the manuscript the present an analysis of the number, structure, provision, supply and demand of nurses, midwives and radiographers in the labour market and forecasts to 2030.

Materials and methods

In this study we used secondary data without any identifying information and internal hospital statistical data with the oral permission of the head of hospital [14].

In this study, we used a “demand-based” approach to project the required numbers of nurses, midwives, and radiographers necessary to meet the healthcare needs of

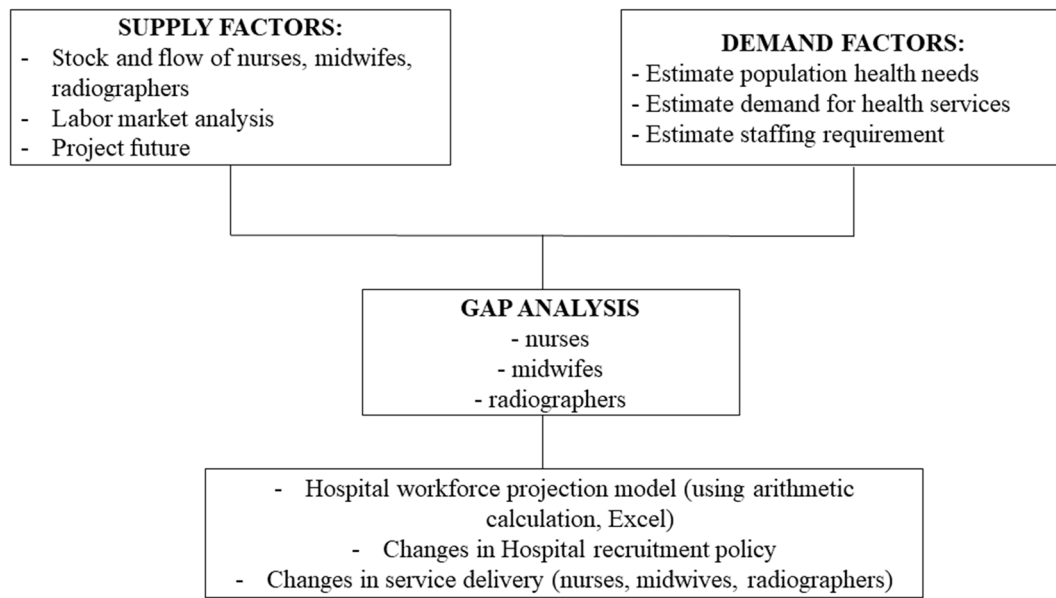


Fig. 1 Factors of health workforce planning model

Table 1 Information sources and model parameters providing data and impact on the calculation of staff supply and demand [13]

Model parameters	Data availability by model parameter and profession			Data sources for the calculation of supply	Data sources for the calculation of supply
	Nurses	Midwives	Radiographers		
Annual reports	Yes	Yes	Yes	+	+
Headcounts	Yes	Yes	Yes	+	+
Full-time equivalent	Yes	Yes	Yes	+	+
Nurse-to-doctor ratio	Yes	No	No	+	+
Age	Yes	Yes	Yes	+	
Number of outpatient visits	Yes	Yes	Yes		+
Number of day inpatient visits	Yes	Yes	Yes		+
Number of hospitalizations	Yes	Yes	No		+
Number of births	No	Yes	No		+
Number of CT and MRI scans	No	No	Yes		+
Number of labour market entrants	Yes	Yes	Yes	+	
Number of those who left the labour market	Yes	Yes	Yes	+	

the population at University Hospital through 2030 [3]. This approach focuses on the current and future demand for health services, which is estimated based on population composition, demographics, and health service utilization, and from there, determines the necessary capacity of health workers [23]. These practices are extended to forecast future healthcare service demands across different demographic groups [24]. Assessing provider needs relies on established productivity norms to estimate expected service delivery rates per provider [25]. An important aspect of our methodology involved translating this analytical framework into a simulation model that projects the current availability of service providers and predicts future requirements (Fig. 1).

Data on nurses, midwives and radiographers were collected from internal hospital databases and the Annual reports of the Hospital and National Health Information Centre of the Hygiene Institute (HI HIC) (Table 1).

In order to assess the supply of staff, the study used public information on the total headcounts of nurses, midwives, radiographers, full time equivalent (FTE), services and equipment available in the annual activity reports of the institution and in the annual reports of the Health Information Centre of the Hygiene Institute (HI HIC). More detailed information for the calculation of staff supply was obtained from the institution’s internal information systems: Hospital information system (HIS), Hospital HR database and Annual Hospital activity reports for the period 2015–2020 [14].

Staff supply projections

The supply of nurses, midwives and radiographers up to 2030 was calculated: average number of headcounts (at the beginning of the year for the period 2015–2020)+headcounts entering - leaving the labour market (2015–2020) due to retirement and other reasons+number of headcounts aged 66 and over remaining in the labour market. (Table 2).

In order to evaluate workforce demand, the study used data from the institution's internal information system on services provided in 2017–2019 (Table 2).

1. This study assumed that outpatient service, day inpatient treatment service and one hospitalisation in the facility is equivalent to one service provided by a nurse (hereafter referred to as nurse service). One service provided by an obstetrician-gynaecologist and one case of childbirth is equivalent to service provided by a midwife (hereafter midwife service), and one outpatient service provided by a radiologist (X-ray, nuclear medicine), one CT and MRI scan is equivalent to one service provided by a radiographer (hereafter radiographer service). In this study were evaluated services provided by nurses, midwives and radiographers.
2. Data from Statistics Lithuania. Population by age group and sex for 2017–2019 and projected population by age group and sex until 2030 were taken from the Demographic Yearbook.

3. Annual reports and internal information system data of the hospital. The weighted average change in the number of services between 2017 and 2019 was assessed. Data for 2020 on services provided in the facility were not included in the forecasting of workforce demand due to the potential impact of the Covid-19 pandemic on the results of the study.

Projections of workforce demand

The demand for nurses, midwives and radiographers up to 2030 has been projected using a service use and demand methodology. Medium and prospective scenarios for planning the demand for professionals were selected (Table 2):

Scenarios for forecasting demand for nurses

I. Medium - which assumes that the distribution of projected patient services by age group and gender in 2030 is the same as in 2017–2019; the nurse-to-doctor ratio of 1.93, and that functions indirectly related to nursing will increase the demand for nurses by 1% annually.

II. Prospective - which assumes that the distribution of services provided by age group and gender will increase by 0.5% annually; that functions indirectly related to nursing will increase the demand by 1% annually, and that the nurse-to-doctor ratio will be 2.6 in 2030.

Table 2 Scenarios and assumptions for supply and demand projections

Parameters	Supply scenario (n/%)	Demand medium scenario	Demand prospective scenario	Impact on supply	Impact on demand
Nurses					
Headcounts entering labour market each year	224	-	-	Increases	-
Headcounts leaving labour market for various reasons each year	229/14.47	-	-	Decreases	-
Headcounts > 66 years remaining in labour market	29/1.71	-	-	Increases	-
Weighted average change in the number of nurse services	-	in 2017–2019	0.5% annually	-	Increases
Functions indirectly related to clinical activities	-	1% annually	1% annually	-	Increases
Nurse-to-doctor ratio	-	1.93	2.6	-	Increases
Midwives					
Headcounts entering labour market each year	7	-	-	Increases	-
Headcounts leaving labour market for various reasons each year	6/5.37%	-	-	Decreases	-
Headcounts > 66 years remaining in labour market	1/1.3%	-	-	Increases	-
Weighted average change in the number of midwife services	-	in 2017–2019	in 2017–2019	-	Decreases
Functions indirectly related to clinical activities	-	1% annually	1% annually	-	Increases
Number of independently-provided services in the community	-	-	1% annually	-	Increases
Radiographers					
Headcounts entering labour market each year	10	-	-	Increases	-
Headcounts leaving labour market for various reasons each year	6/4.81%	-	-	Decreases	-
Headcounts > 66 years remaining in labour market	8/6.68%	-	-	Increases	-
Weighted average change in the number of radiographer services	-	in 2017–2019	4.36% annually	-	Increases
Complexity of examinations, new technologies	-	1% annually	1% annually	-	Increases

Scenarios for forecasting demand for midwives

I. Medium - which assumes that the number of services provided by a midwife to patients by age group in 2030 is the same as in 2017–2019, and that functions indirectly related to clinical activities will increase the demand by 1% annually.

II. Prospective - which assumes that the number of services provided by a midwife will grow by 1% annually because of independently-provided services in the community, and that functions indirectly related to clinical activities will increase the demand by 1% annually.

Scenarios for forecasting demand for radiographers

I. Medium - which assumes that the distribution of projected patient services by age group and gender in 2030 is the same as in 2017–2019, and that complexity of procedures and emerging new technologies will increase the demand by 1% annually.

II. Prospective - which assumes that radiographer services will increase by 4.36% annually, and that complexity of procedures and emerging new technologies will increase the demand by 1% annually.

Increasing number of services

Despite the trends of population decline, it is forecasted that the number of nurse and radiographer services for patients in age and gender groups will increase. The weighted average change in the number of services in 2017–2019 reflecting the trends of the last three years, and has been used to forecast the demand for nurses, radiographers and midwives up to 2030 (Table 3).

Functions indirectly related to nursing and clinical activities

They include activities such as administration, management, and support services. Indirect patient care is essential to the delivery of high-quality, safe, and efficient health care [24]. The implementation of long-term and integrated care services in primary care also increases the number of independently-provided services in the community, so we have estimated the impact of this

parameter on the increase in demand in both scenarios at 1% annually or 10% by 2030.

Development of new technologies and complexity of procedures

Despite the considerable advancements of radiology to date, it is difficult to predict the future development of technology, new imaging procedures and methods. Based on a study at the University of California on the demand for radiologists [26], we estimated the effect of this parameter on the increase in demand in both scenarios at 1% per year or 10% by 2030.

The demand forecasting scenarios for nurses, midwives and radiographers assume that the number of services provided by a 1 FTE in 2030 is equivalent to the number of services provided by a 1 FTE in 2017–2019. This study used the classical assumption that the current number of nurses, midwives, and radiographers (both in terms of headcount and full-time equivalents) is sufficient. Based on the services these professionals provide and how these services are distributed across different gender and age groups in the population, the study projects the future demand for these professionals accordingly.

Gap analysis

The gap analysis was carried out by comparing supply and demand scenarios with each other to assess the future shortage or surplus of nurses, midwives and radiographers in the labour market. We have also tried to assess the possible assumptions that will have the greatest impact on the demand for this staff in the future.

Results

Changes in the number of workforces in the hospital in 2015–2020

The total number of headcounts and FTE of nurses, midwives and radiographers in the institution increased over the period analysed (Table 4). The number of headcounts and FTE of nurses increased by 16.3% and 15% respectively, of midwives by 2.97% and 8.42%, and of radiographers by 11.86% and 9.44%.

Table 3 Changes in services (2017–2019), included in the demand forecast of the need for nurses, radiographers, midwives

Profession	Parameters	Average changes, 2017–2019	Weighted average change, 2017–2019
Nurses	Outpatient visits	-0,5% annually	0.5% annually
	Day surgery visits	6,2% annually	
	Hospitalisation cases	0,0% annually	
	The average length of stay in hospital	-2,1% annually	
Radiographers	Outpatient radiology service (X-ray, Nuclear medicine)	3,3% annually	4,36% annually
	CT	8,5% annually	
	MRI	10,1% annually	
Midwives	Outpatient visits	0,01% annually	-0,25% annually
	Number of births	-2,4% annually	

Table 4 Changes in the workforce in 2015–2020

Year	2015	2016	2017	2018	2019	2020	Weighted average
Nurses:							
Headcounts /FTE	1406/1394	1468/1435	1628/1591	1488/1457	1861/1827	1635/1603	1581/1551
FTE to headcounts ratio	0.99	0.98	0.98	0.98	0.98	0.98	0.98
Headcounts entering the labour market (n/%)	149 (11)	119 (8)	290 (18)	194 (13)	458 (25)	131(8)	224 (14.14)
Headcounts leaving the labour market (n/%)	410 (29)	57 (4)	130 (8)	334 (22)	85 (5)	357 (22)	229 (14.47)
Headcounts aged over 66 in the labour market (n/%)	17 (1)	24 (2)	24 (1)	21 (1)	41 (2)	48 (3)	29 (1.71)
Midwives:							
Headcounts /FTE	101/92	101/92	102/93.25	103/98.5	104/101	104/99.75	103/96.1
FTE to headcounts ratio	0.91	0.91	0.91	0.96	0.97	0.96	0.94
Headcounts entering the labour market (n/%)	6 (5.9)	5 (5.0)	9 (8.8)	10 (9.7)	3 (2.9)	7 (6.7)	7 (6.5)
Headcounts leaving the labour market (n/%)	2 (2.0)	5 (5.0)	8 (7.8)	9 (8.7)	2 (1.9)	7 (6.7)	6 (5.37)
Headcounts aged over 66 in the labour market (n/%)	-	1 (1.0)	3 (2.9)	2 (1.9)	2 (1.9)	-	2 (1.3)
Radiographers:							
Headcounts /FTE	118/120.75	120/123.25	124/124.45	128/125.45	126/127.10	132/132.15	125/125.53
FTE to headcounts ratio	1.02	1.03	1.00	0.98	1.01	1.00	1.01
Headcounts entering the labour market (n/%)	8 (6.8)	5 (4.2)	10 (8.1)	9 (7.0)	11 (8.7)	14 (10.6)	10 (7.62)
Headcounts leaving the labour market (n/%)	1 (0.8)	3 (2.5)	6 (4.8)	5 (3.9)	13 (10.3)	8 (6.1)	6 (4.81)
Headcounts aged over 66 in the labour market (n/%)	8 (6.8)	8 (6.7)	9 (7.3)	10 (7.8)	7 (5.6)	8 (6.1)	8 (6.68)

Forecast of staff supply in the hospital for 2021–2030

Based on the actual data of the numbers of nurses, midwives and radiographers, the supply scenario shows an average of 224 nurses, 7 midwives and 10 radiographers entering the labour market annually over the analysed 2021–2030 period. On average, 14.47% of nurses, 5.37% of midwives and 4.81% of radiographers will leave the labour market each year out of the total number headcounts in that occupational group (Table 3). These average changes in the workforce over the period analysed were used to forecast the supply of specialists in the institution up to 2030.

The biggest differences in the supply scenarios between staff groups are due to the different numbers of headcounts entering and leaving the labour market and the headcounts aged over 66 remaining in labour market (Fig. 2).

In 2030, the number of midwives and radiographers is projected to increase by 7.8% and 20.8% respectively compared to 2021. Meanwhile, the projected supply of nurses is decreasing, with 1,553 nurses in 2030, which is 1.8% less than in 2021. This decline is due to the number of professionals leaving the labour market for various reasons and the low number of people staying in employment over the age of 66.

Scenarios for demand forecasting

Demographic changes in the population

The population in Lithuania is projected to decrease by 7.61% in 2030, the declining but ageing population will have an impact on the growth of services provided by nurses and radiographers [1, 8, 10, 16].

When evaluating the factual data on nurse, midwife and radiographer services provided in the hospital in 2017–2019, the change in demand for these services was projected, taking into account the demand for services, gender and age groups. The forecast of the demand for services is based on the average projection of change of the population by gender and age groups.

On average, the highest number of nurse and radiographer services were provided in the 45–64 and 65+ age groups in 2017–2019. More than a third of all nurse services were provided to males (36%) and females (37%) in the 65 and over age group, which is almost three times higher than in the 0–18 year's age group (19% of nurse services for males and 13% for females respectively). The number of services provided by a radiographer was also three times higher for women aged 65+ and then for women aged 0–18 years (35% and 12% respectively), and 1.5 times higher for men aged 65+ than for men aged 0–18 years (27% and 18% respectively). Almost one-third of all nurse and radiographer services were provided to men and women in the 45–64 age group.

According to 2021–2030 population change on the demand for nurses and radiographer services, the positive change was caused by the increase in the population of men and women aged 65 and older, but the negative change is caused by the decrease of population aged 20–39, which is not compensated by the aging of the population and the greater need for nurse and radiographer services.

Analysing the scenarios of demand of nurses, midwives and radiographers, is noted that in the medium scenario, at the end of the period, the demand for midwives will decrease by 8.0%, while the demand for nurses will

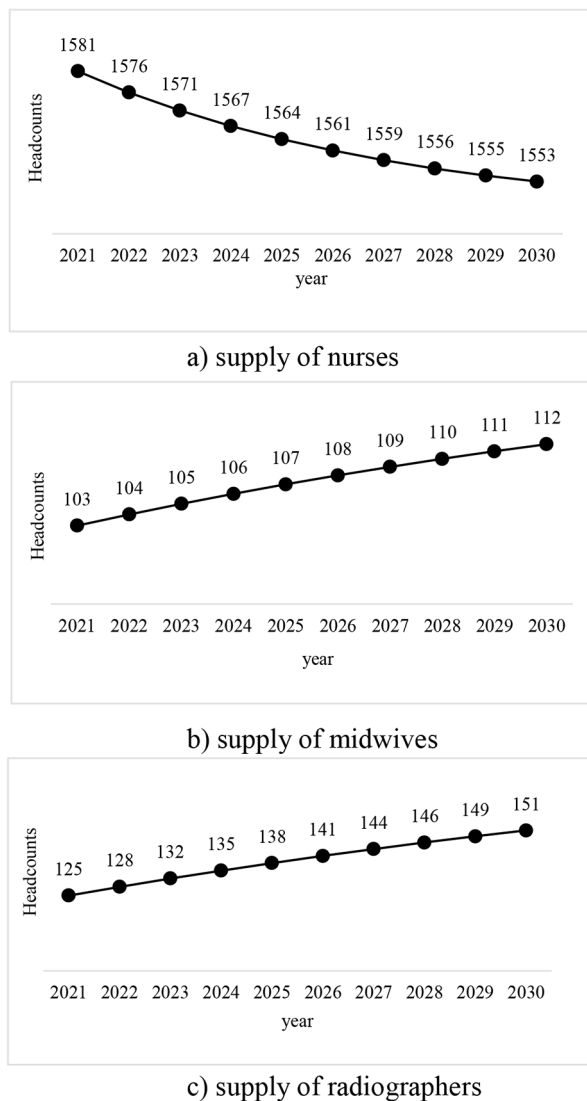


Fig. 2 Projection of nurses, midwives and radiographers supply up to 2030

increase by 9.4% and the demand for radiographers will increase by 0.8%.

In the medium scenario, the decline in demand for midwives isn't compensated by functions indirectly related to clinical activities. In the prospective scenario, the demand for nurses is projected to increase, driven by a 1% annual growth of functions indirectly related to clinical activities and the predicted ratio of nurse to doctor – 2.6. The demand for radiographers will grow due to the impact of 1% growth in functions indirectly related to clinical activity each year and the impact of 1% growth in the complexity of examinations and new technologies each year. However, even in the prospective scenario, the decrease in the need for midwives will not be offset by the impact of the 1% growth in functions indirectly related to clinical activity each year and the impact of

the 1% growth in independently-provided services in the community each year.

Gap analysis

The supply and two demand scenarios were compared (Fig. 3). Based on the actual average number of services provided in the facility between 2017 and 2019, the ratio of nurses, midwives, radiographers to the services they provided was calculated. This ratio was used for the gap analysis.

Discussion of results

World Health Organization (WHO) has embraced the 2030 Agenda for Sustainable Development. The 2030 Agenda and its Goals offer a comprehensive vision for sustainable development that aims to strengthen health systems toward universal health coverage (UHC). Health systems can only function with an adequate number of health workers and the health sector requires large numbers of skilled and unskilled health workers to provide safe health services. The Institute of Medicine's (IOM) report "Keeping Patients Safe: Transforming the Work Environment of Nurses" indicates that low nurse staffing in hospitals is one of the causes contributing to 98,000 preventable deaths each year in the United States [27]. Previous studies indicate that hospitals with inadequate workforce have an increase in adverse events, leading to unsafe patient services [27–31]. The data of various studies showed that the lack of nurses is one of the most important predictors in the increased mortality of patients due to their neglect [32–35].

Currently, in the absence of a coherent nursing policy in Lithuania, there is no monitoring system for monitoring and forecasting the need for nurses that would assess the development of new competencies and the demand for positions and their even distribution in the country [12]. This makes it difficult to plan the number of students choosing nursing studies and to recruit graduates in the regions and in health care institutions. Insufficient differentiation of nursing jobs by education and lack of career opportunities lead to a shortage of motivation to study and pursue higher education [36].

One of the directions of the guidelines of the National Nursing Policy in Lithuania until 2025 is planning of the demand for nurses, and the development and improvement of competencies, which makes this study timely and relevant.

An aging and declining population has an impact on the growth of the demand for nurse and radiographer services, as older people are more likely to use health-care services [6, 10]. Furthermore, the demand for nurses and radiographers is expected to rise as a result of growing incidence of cancers and other chronic diseases, the expansion of palliative care services, and the

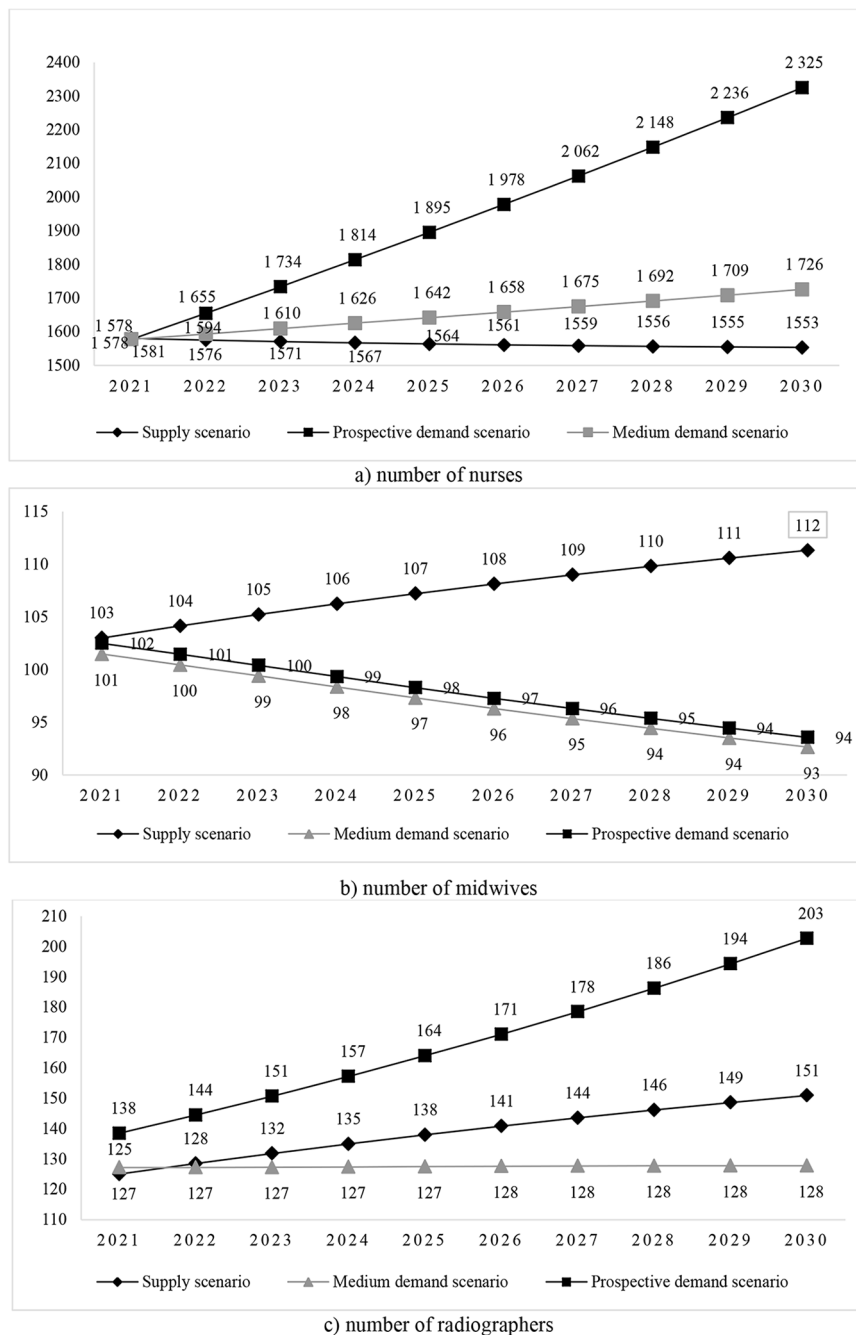


Fig. 3 Gap between projected supply and demand

implementation of both established and emerging preventive health screening initiatives targeted at older individuals [37]. Despite the significant advancements and AI in radiology, is difficult to predict the future development and complexity of technology [26].

Depending on the country’s development, of the organization of the health system, a midwife’s practice can be done completely independently or in a team with a doctor [38]. An appropriately educated well-resourced

midwifery workforce is recognized as an essential element within national workforce planning activity. A shortage of midwives could have serious implications for the care of women during pregnancy, birth, and the early parenting period [38, 39]. Factors related to the lack of midwives are poor access to education, workloads, and stress [40, 41]. One of the most important factors - is the lack of professional responsibility and the inability to practice according to the practice scope [40, 42, 43].

Therefore, when planning the number of midwives, their competencies should be considered, and opportunities to practice independently should be expanded, which would improve the availability of services and patient satisfaction [42].

The *State of the world's nursing 2020* report: investing in education, jobs and leadership it is said: "Countries should strengthen capacity for health workforce data collection, analysis and use" [4, 5]. Driven by ageing populations, demand for healthcare and for nurses will continue to grow, whilst the supply of available nurses will drop. It is therefore expected that the shortages will accelerate in the coming decade and will be more serious than the cyclical shortages of the past. This nursing and other health care specialist shortage will ultimately constrain health system reform and innovation, and contribute to escalating costs [39].

The effectiveness of healthcare services is directly contingent on the health human resources who provide them, so their planning must be integrated with health service planning [4, 7, 33].

Higher patient-to-health care specialist ratio, poor staffing, and lack of resource adequacy were significantly associated with higher odds of reporting missed care. Missed care reflects specialist' decision-making processes and the prioritization of care when resources are not sufficient to provide all the needed care to patients. Reasons for higher levels of missed care can often be traced to organizational factors, such as inadequate staffing levels, and poor work environment, teamwork, and hospital safety climate [44]. Staff turnover can have a significant impact on hospital costs beyond the direct costs associated with recruitment, hiring, and training of new staff [37].

Human resources planning is essential at the institutional level to guarantee the appropriate number of specialists with the right competencies for service provision [16, 32, 33]. This strategic process involves systematically identifying, acquiring, and deploying human resources to meet the present and future needs of the organization [7, 24, 25]. By optimizing workforce composition, aligning with organizational goals, and anticipating talent requirements, HR planning contributes to cost efficiency, employee productivity, and overall success. It is a vital element in achieving organizational effectiveness and excellence in service delivery [6, 7].

This study allow us to plan the need for nurses, midwives, and radiographers until 2030 according to the services provided by these specialists in the institution, their number and type taking into account the age and gender groups of the population.

Strengths and limitations of the study

Several studies have been carried out in Lithuania assessing the supply and demand of human resources for healthcare, mainly doctors, in different professional qualifications and the factors influencing that supply and demand [12, 45] but this is the first multi-professional study of supply and demand in the country's largest health care institution. This health workforce forecasting study is important not only for the institution but also for the whole healthcare system. This study is the start of a systematic monitoring approach for human resources, able to ensure the stability in the organisation.

There are some limitations in the study. The methodology used in this study was limited by the absence of accurate data on services provided by nurses and midwives. In this study, the available data did not allow for an accurate measurement of the nurses' workload and productivity in alignment with the actual conditions. The hospital's information system contained a limited amount of data, it was not possible to assess the reasons for employees leaving the labour market. A widely recognized constraint of the needs-based workforce planning approach is its high demand for substantial data inputs [3, 25] and a deficiency of user-friendly tools [11, 46], particularly in settings with limited analytical capabilities.

Conclusions

In the most likely supply and demand scenarios, a shortage of 331 nurses and 26 radiographers is projected in 2025 and 772 and 52 respectively in 2030. In order to ensure an adequate supply of nurses by 2030, the annual recruitment of nurses would need to be increased by 86 nurses in the medium-demand scenario and by 378 nurses in the prospective demand scenario, by 38% and 69% respectively. In order to ensure an adequate supply of radiographers by 2030, in the prospective demand scenario the annual recruitment of radiographers would need to be increased three times. Meanwhile, in the prospective demand scenario for midwives, the number of midwives recruited each year would need to be reduced by 30%.

To ensure a balance between supply and demand is a very challenging but important goal, which would not only optimise the work of nursing staff in the institution but would also ensure the efficiency of the entire healthcare system in the future. Appropriate nursing workforce forecasting can help nurse managers, administrators and policymakers to understand the local supply and demand changes of the nursing workforce. Organisational leaders should contribute to efforts designed to prepare and maintain a skilled current and future nursing workforce by understanding the local contexts and factors related to turnover.

Supplementary Information

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Supplementary Material 1

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Author contributions

Study conception and design: AV. Data acquisition and analysis: AV and DZ. Interpretation of data: AV and AB and KS. Relevant policy and literature review: AV, KS, DZ. Draft of the manuscript: AV and AB. Substantive revisions: All authors. All authors have agreed to be personally accountable for the authors' contributions and ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated and resolved. All authors read and approved the final manuscript.

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Data availability

In this study we used secondary data without any identifying information and internal hospital statistical data with the oral permission of the head of hospital. All data used in this study were fully anonymized and the study was performed in accordance with the relevant guidelines and regulations of the Declaration of Helsinki. For this study approval from Ethics committee does not require. Availability of data and materials The data used in this study can be freely and openly accessed at the Hospital website: <https://www.kaunoklinikos.lt/apie-mus/veiklos-ataskaitos/> [47].

Declarations

Ethics approval and consent to participate

In this study we used secondary data without any identifying information and internal hospital statistical data with the oral permission of the head of hospital. All data used in this study were fully anonymized and the study was performed in accordance with the relevant guidelines and regulations of the Declaration of Helsinki. For this study approval from Ethics committee does not require.

Consent for publication

Not applicable.

Competing interests

Aurelija Blaževičienė is an Guest Editor of the Journal BMC Nursing special issue Nursing workforce shortage. All other authors declares that they do not have any competing interest.

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