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Supply and demand for radiographers in Lithuania: A prognosis for 2012–2030

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ABSTRACT

Background: This is the first ever study on the planning of the supply and demand for radiographers in Lithuania. The aim of this study was to analyze the supply and demand for radiographers in the labor market with respect to their number, structure, and services, and to provide a prognosis for the period of 2012–2030.

Materials and methods: Supply was calculated using two scenarios with differing duration of studies, annual student drop-out rates, rates of failure to start working, the annual number of new entrants into the labor market, and emigration rates. Annual mortality rates, the number of first-year students, and retirement rates were evaluated equally in both scenarios.

Two projections of the demand for radiographers, based on the population's differing (by age and gender), need for outpatient radiology services, computed tomography, and magnetic resonance scans. Subsequently, the supply and demand scenarios were compared.

Results: Evaluation of the perspective supply and demand scenarios – which are the most probable – revealed a gap forming during the analyzed period, the predicted specialist shortage will reach 0.13 full-time equivalents per 10,000 population, and in 2030—0.37 full-time equivalents per 10,000 population.

Conclusions: Considering the changes in education of radiographers, the socio-demographic characteristics of the staff, and the increasing need for radiographers' services, the supply of radiographers during the next two decades will be insufficient. To meet the forecasted demand for radiographers in the perspective scenario, the number of students choosing this specialty from 2013 on should increase by up to 30%.

1. Introduction

The Republic of Lithuania is situated on the east coast of the Baltic Sea and has a population of 3 million. The main objectives of the health system are to improve population health, access to health-care services and the quality of services [1].

Radiology is one of the most rapidly developing fields of modern medicine where technological progress and an increasing number, complexity, and extent of radiological services require strategic planning of the supply and demand for human resources (radiographers) in order to ensure further provision of quality services [2].

Many literature sources define a radiographer as a health care specialist responsible to perform safe and accurate imaging examinations and post processing, using a wide range of sophisticated technology in medical imaging [3,4]. A radiographer is professionally accountable for the patient's physical, psychological, and social well-being, prior to, during diagnostic procedures [3,5,6]. The fields of these specialists' activity include organization of the workplace, an accurate and safe execution of medical radiological procedures [4], and ensuring the quality of medical radiology services [6,7].

At the beginning of 2012, 869 radiographers were working in Lithuania; in 2011, there were 2.7 radiographers and 1.4 radiologists per 10,000 population [8]. In Lithuania, a radiographer usually works in a team with a radiologist who prescribes and coordinates

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the radiological procedure, and thus such principles of work organization result in a low radiologist–radiographer ratio (1:1.9). In Northern Ireland, the standard radiologist–radiographer ratio is 1:6.07 [9]. In 2005, the number of radiographers per 10,000 population in Northern Ireland was 3.2, and in 2010, there were 3.7 radiographers and 0.4 radiologists per 10,000 population. In Great Britain, the respective numbers were 0.5 radiologists and 4.2 radiographers per 10,000 population. In European countries, the average number of radiologists is 0.8 per 10,000 population [2], i.e. nearly half that in Lithuania, while the respective numbers of radiographers are higher: in Great Britain—by nearly one-third, and in Northern Ireland—by one-fourth.

The extent of radiographers' services in Lithuania has significantly increased over the last decade. Compared to 2000, the number of X-ray images produced in 2011 increased by 22%, the number of computed tomography (subsequently—CT) scans—by 50%, and the number of magnetic resonance imaging (subsequently—MRI) procedures—by nearly 15-fold [8].

Despite significant progress in the field of radiology and an increasing number of radiological services, a radiographer's position in Lithuania may be taken by nurses, midwives, or other healthcare specialists who had undergone additional 4.5 month-long non-formal training, which does not meet the European Union (subsequently-EU) trends. In many EU countries professional training of radiographers covers bachelor, master's, and doctoral studies [10].

Since 2013, higher education of radiographers has been introduced in Lithuania and this will influence the supply during the next two decades. A transition period in education and training of radiographers is likely—at least until the first wave of graduates complete their bachelor studies. Employees in the future will not be able to react sufficiently rapidly to the growing demand for radiographers.

The prognosis of the supply and demand for radiographers in Lithuania may be influenced by the perspective increase in the efficiency of healthcare technology use and the growth in the number CT and MRI scanners in an attempt to approach average European levels [11]. In 2012, the number of CT scanners per 1 million population in Lithuania was 17.7—i.e. by 13% less than the EU average (20.4 CT scanners per 1 million population); the number of CT scans per 1,000 population in 2012 was 58, compared to an average of 140 CT scans per 1000 population in the rest of Europe in 2008 [12]. The percentage of CT scans per 1,000 population in Estonia is by 79%, in Iceland—by 64%, in Germany—by 50%, in Denmark—by 45%, and in The Netherlands—by 12% higher than that in Lithuania [11].

The average number of MRI scanners per 1 million population in the rest of Europe is more than twice as high as that in Lithuania, and the number of the scans per 1000 population in Lithuania is among the lowest, compared to the other European countries. In 2012, the number of MRI scans per 1000 population performed in Lithuania was 14, which is less than 1/3 of the average number of MRI scans per 1000 population (i.e. 48) in the rest of Europe in 2008. The number of MRI scans per 1000 population performed in the aforementioned countries (Estonia, Iceland, Germany, Denmark, and The Netherlands) exceeds that registered in Lithuania by 70–86% [11,12].

These data suggest that during the next two decades, the number of MRI and CT scanners in Lithuania will increase by, accordingly, 56% and 13%, and the number of scans per 1,000 population—by, accordingly, 70% and 59% to reach the level of other European countries [11,12]. These changes would result in a significant rise in the need for radiographers.

Over the last decade, several studies have been performed in Lithuania, focusing on the evaluation of the supply and demand for human resources in various fields of healthcare [13–16]; however, so far there have been no studies in Lithuania on the prognostication of the supply and demand for radiographers.

2. Materials and methods

Data about radiographers were collected from several sources; the usefulness of these sources was limited by incomplete information they contained, and thus data from several databases were combined (Table 1).

2.1. Supply projections

To evaluate the *supply* of the specialists, the following data sources were used in the study:

- The State Register of Sources of Ionizing Radiation and Occupational Exposure compiled by the Radiation Safety Center (RSC). Upon request, the RSC provided data on the number of the specialists, their age, and the number of specialists entering and leaving the labor market during 2002–2011.
- Annual reports of the Health Information Center of the Institute of Hygiene (HI SIC). They provided data for the analysis of changes in the number of radiographers and radiologists and their full-time equivalents (subsequently—FTE) during 2000–2011.
- Specialist training institutions: upon request, the Center for the Self-Training and Specialization of Nursing Personnel (CSTCNP) and Vilnius College provided information about specialist training during 2000–2011.

Supply was calculated using two scenarios (Table 2).

2.2. Annual enrollment in radiography programs rate

According to the available data received on request from specialist training institutions, on the average, 35 radiographers started their studies annually during 2002–2011. This parameter was set at $n = 35$ in both scenarios.

2.3. Annual student drop-out rate

Student drop-out rates in radiography studies were not appropriate due to the short duration of the studies (4.5 months), but the perspective scenario included the drop-out rate of 16% based on foreign experience and studies of other health care socialist groups in Lithuania. A study on the planning of the demand and supply of radiographers in Australia showed that, the student drop-out rate was 16% [17]; in Northern Ireland—8% [9], and in Great Britain—25% [18], the average evaluation in those three countries being 16%. Also, student drop-out rates in radiography may be expected to be similar to those in nursing (also 16%) due to the relationship between the two specialties [13], and thus such percentage was selected on the basis of the study "A Pilot Analysis of Medical Personnel: Numbers, Demand, and Workload" conducted in Lithuania.

2.4. Annual number of graduates who fail to start working

In the intermediate scenario, the influence of those who graduated yet failed to start working was evaluated as 14.3% ($n = 5$), according to the available data for 2002–2011 from the training institutions and the RSC register. Considering the transfer of radiographer training from non-formal education to professional bachelor studies, an assumption was made in the perspective scenario that students who choose this specialty are more motivated and determined to become radiographers. It is also likely that the increased duration of the studies will reduce the number of healthcare specialists who would like to acquire this specialty merely as