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MARTA VELGAN

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ABBREVIATIONS

COVID-19	Coronavirus Disease of 2019
EEA	The European Economic Area
EU	The European Union
GP	General practitioner
FM	Family medicine
FP	Family physician
OECD	Organisation for Economic Co-operation and Development
UK	United Kingdom
WHO	World Health Organization

1. INTRODUCTION

The Declaration of Alma-Ata emphasised the importance of primary care as the first level of contact between individuals, the family, and the community, with the national health system to bring health care as close as possible to the people (WHO, 1978). Primary care aims to treat the person as a whole and support the individual health needs of the person – from health promotion to disease prevention, treatment, rehabilitation, palliative care, and more. Primary care is considered the most comprehensive, equitable, and cost-effective way to achieve universal health coverage. It is also key to strengthening the resilience of health systems to prepare for, respond to, and recover from crises (WHO, i.a.). Substantial evidence underscores the benefits of a strong primary care system, showing that it helps prevent illness and death, and reduces unnecessary healthcare costs. Additionally, in contrast to speciality care, primary care is associated with a more equitable distribution of health (Starfield et al., 2005).

Considering population ageing and the growing burden of chronic diseases in Europe and worldwide, ensuring effective and high-quality care for people living with chronic conditions while avoiding unnecessary use of hospitals and specialised services is essential and a major challenge. By focusing on primary care being available and close to patients, especially those with complex care needs, it is possible to make healthcare systems more efficient, effective, and equitable (OECD, 2020). More accessible primary care reduces the need for costly and scarce facilities, such as emergency rooms and hospitals, and can prevent unnecessary procedures (OECD, 2020; Sandvik et al., 2022).

Primary care physicians, also called general practitioners or family physicians, have a significant role in primary care. A variety of healthcare specialists are required to ensure adequate access to healthcare. In all Organisation for Economic Co-operation and Development (OECD) countries, the number of physicians has increased rapidly over the past decade. On average, the number of physicians per 1000 population rose from 3.2 in 2011 to 3.7 in 2021. In most OECD countries, concerns about physician shortages relate more specifically to shortages of family physicians, who represented, on average, less than one-quarter (23%) of all physicians across OECD countries in 2021, down from 30% in 2015 (OECD, 2023a). This shortage of family physicians can threaten the organisation of the entire healthcare system (Kringos et al., 2013). Although there is a lack of data on the proportion of family physicians needed to ensure adequate availability of primary care services, it has been repeatedly demonstrated that well-established primary care benefits both the individual and health care systems. Several factors may cause an imbalance between specialists in hospital care and specialists in family medicine regarding the recruitment and retention of family physicians. Literature and reports indicate inefficient and insufficient capacity planning, organisational difficulties in primary care and the health system, considerable dropout of family physicians, and often a lack of exposure to primary care in undergraduate medical education. The family physician profession does not seem attractive enough to

recruit sufficient medical students. Additionally, there are problems regarding job retention and migration. The declining attractiveness of the family physician career, poor societal recognition, negative perceptions, difficult working conditions, and, in substantial areas, poor remuneration are essential issues. (Marchand & Peckham, 2017)

However, further research is still needed to deepen and widen existing knowledge, especially in non-English-speaking European countries, such as Estonia. Regarding medical students' career intentions, most studies are done in English-speaking countries, and the factors are looked at separately and rarely in combination. Early-career family physicians' career intentions are also a less researched topic. Although healthcare professionals' migration is well-studied, studies are primarily quantitative and see physicians as a homogenous group. Only a few studies have focused on family physician migration. This additional knowledge can help policymakers and other stakeholders make informed decisions and policies regarding primary care workforce planning.

2. REVIEW OF THE LITERATURE

2.1. Physicians' workforce

The number of physicians per 100,000 inhabitants increased in nearly all European Union (EU) Member States between 2017 and 2022. This trend may be due to the ageing population in Europe, which has also increased the demand for health and social services and the burden on the healthcare system in general. The most significant relative increase was recorded in Cyprus (34.1%), while Estonia saw a slight change in this ratio (0.1% increase). The healthcare workforce has rapidly aged across much of the EU (Figure 1). In twelve EU Member States, the share of physicians aged 55 years and over was over 40% in 2022. Among these, the share was over 50% in Italy and Bulgaria, and 46% in Estonia. In most remaining Member States, the share of physicians aged 55 years and over was between 24.3% and 38.2%. The highest proportions of younger physicians (under 35 years) were in Malta (45.5%), Ireland (35.5%) and Romania (34.4%). In Estonia, 21% of physicians were under 35 (Eurostat, 2024; WHO Regional Office for Europe, 2022). Based on a World Health Organization (WHO) report released in 2022, the number of ageing healthcare professionals poses a threat to the sustainability of the workforce and immediate action from the governments is needed (WHO Regional Office for Europe, 2022). There were considerable differences between EU Member States concerning each gender's share of the total number of physicians. Over the last decade, the proportion of women physicians has gradually increased. By 2018, there was a slight majority of women physicians in the EU. In 2021, 17 EU Member States out of 26 reported more women than men physicians. The most significant shares of women physicians were recorded in Estonia (73%) and Latvia (74%). (Eurostat, 2024)

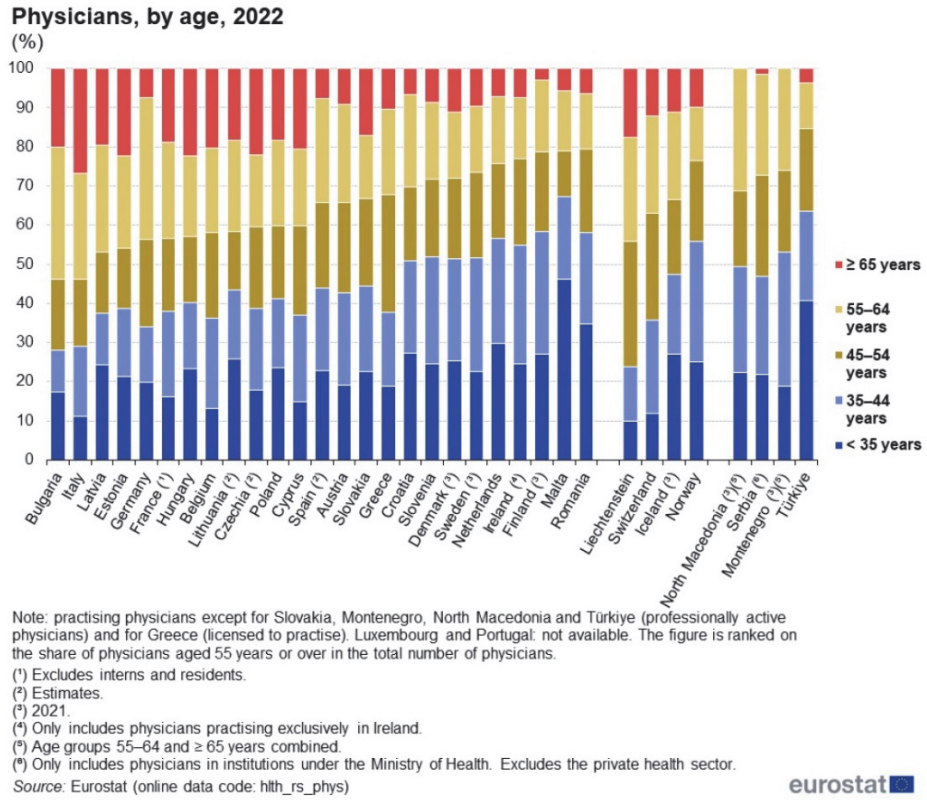
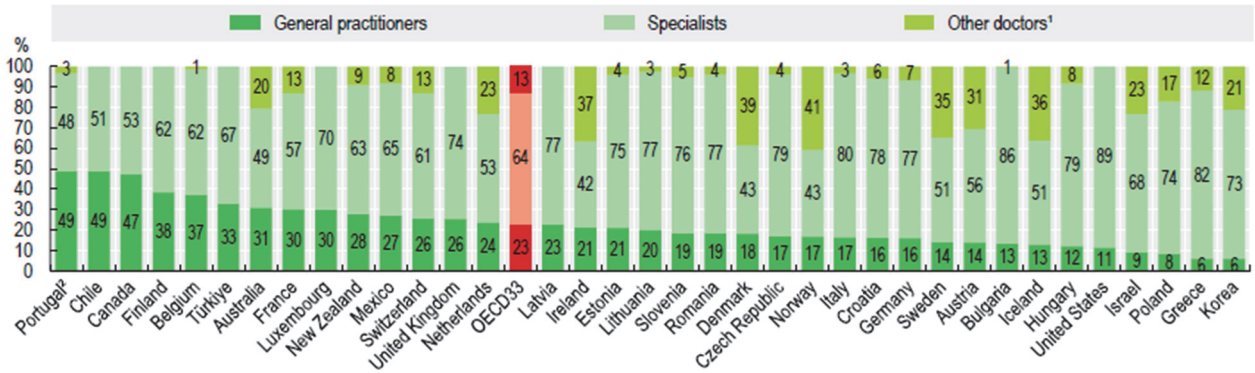


Figure 1. Physicians, by age, in the EU in 2022 (Eurostat, 2024)

According to the OECD, concerns about physician shortages relate more specifically to shortages of family physicians. In 2021, there were 18 EU Member States, including Estonia, with more hospital care specialists than family medicine specialists (Figure 2). Family physicians represented less than one-quarter (23%) of all physicians across OECD countries in 2021, down from 30% in 2015. However, the number of family physicians can be challenging to compare across countries as the classification of physicians is different. The proportion of specialist physicians varied between 82% in Greece and 48% in Portugal, with 75% in Estonia (OECD, 2023a). In 2021, Portugal and Ireland reported the highest number of family physicians per 100,000, 298.2 and 233.3 per 100,000 inhabitants, respectively. In Estonia, the number of family physicians was 86.9 per 100,000 (Eurostat, 2024).



1. Includes non-specialist doctors working in hospitals and recent medical graduates who have not yet started postgraduate specialty training. 2. In Portugal, only about 30% of doctors employed by the public sector work as GPs in primary care – the other 70% work in hospitals.
Source: OECD Health Statistics 2023.

Figure 2. The proportion of GPs, specialists, and other physicians in OECD countries in 2021 (OECD, 2023a)

2.2. Reasons for the family physician shortage

Several factors may cause the imbalance between specialist physicians and family physicians and determine whether there will be enough family physicians in healthcare: medical students' interest in family medicine as a career, career intentions of early-career family physicians, migration of family physicians, and the dropout of family physicians at any career stage. (Marchand & Peckham, 2017)

Literature and reports from Europe and North America indicate inefficient and insufficient capacity planning, organisational difficulties in primary care and the healthcare system, considerable drop-out within the primary care workforce, and lack of exposure to primary care in medical education. Decreasing attractiveness of a career as a family physician, poor societal recognition, negative perceptions, difficult working conditions, and, in some areas, poor remuneration are also essential issues (Kringos et al., 2015). Working as a family physician often entails rural deployment, worse working conditions, higher burn-out rates, and comparatively lower pay and prestige than other specialities (McPake et al., 2014). According to the Estonian National Institute for Health Development, in 2022, family physicians had one of the lowest hourly pay rates among physicians (Rummo, 2022).

Retaining family physicians is becoming more challenging due to increased workloads (Hobbs et al., 2016). Meanwhile, working conditions have worsened due to poor communication and coordination of care among healthcare providers, increased administrative tasks and the use of technology (Cohidon et al., 2020). Job satisfaction and dissatisfaction significantly predict family physicians' retention and turnover (Hann et al., 2011). A survey of nearly 10,000 family physicians conducted in the United Kingdom (UK) and nine other countries worldwide showed a decrease in job satisfaction among family physicians between 2019 and 2022. The higher workload reported by most family physicians participating in this survey was the primary contributor to decreased satisfaction since 2020. Also, a considerable number of family physicians have experienced feelings of hopelessness, anxiety, or other signs of emotional distress. Over half of family physicians in most countries believe the quality of care their patients receive throughout the healthcare system has gotten worse since the start of the COVID-19 pandemic. The primary issue reported was the decline in access to medical care. (Beech et al., 2023)

Women family physicians in their 30s and 40s make up a considerable proportion of the workforce in primary care, yet women still face systemic barriers. A recent review of the gender pay gap in medicine found that primary care has one of the most significant disparities, even after adjusting for hours worked (Dacre et al., 2020). A key reason for this is likely that women continue to provide more unpaid care in their personal lives (European Institute for Gender Equality, 2021). While careers in family medicine may offer a better work-life balance than other medical specialities, women may find it harder to remain in the workforce, particularly when they have young children to care for (Buddeberg-Fischer et al., 2010).

2.2.1. Medical students' career intentions

Medical students must decide on their specialities at the end of their studies. Choosing a speciality is one of the most critical decisions medical students will make at the end of their studies. Medical students' career choices also affect the composition of the future healthcare workforce. After completing basic medical education, most new physicians acquire a speciality by entering residency training. Previous studies have found that surgical and hospital-based specialities are preferred over family medicine (Cleland et al., 2014; Kiolbassa et al., 2011; Leutritz et al., 2024). In many countries, the number of medical students choosing family medicine as their career is insufficient to meet healthcare needs (Cleland et al., 2014). The process of selecting a speciality often starts before entering medical studies. From the beginning of their studies, some medical students have a specific vision of which speciality they want to choose, while others may change their choice repeatedly during their studies (Rachoin et al., 2023; Sinclair et al., 2006). These factors can be divided into three groups: factors related to students like age, gender, and origin (Cleland et al., 2012; Dorsey et al., 2005; Leutritz et al., 2024; Soethout et al., 2008); factors related to a specific speciality (Zinn et al., 2001; Kiolbassa et al., 2011; Leutritz et al., 2024); and factors related to the curriculum (Bland et al., 1995; Marchand & Peckham, 2017; Pfarrwaller et al., 2015; Rachoin et al., 2023; Zinn et al., 2001). Other studies have described how medical students' career intentions can also be influenced by their assessment of their skills and attributes and how they fit in with the requirements of a specific speciality (Bland et al., 1995; Soethout et al., 2008). Factors that have been shown to increase medical students' interest in family medicine are frequent exposure to family medicine during medical studies, the existence of a compulsory family medicine internship, the size and commitment of a family medicine department, and the existence of positive family medicine role models (Leutritz et al., 2024; Pfarrwaller et al., 2017; Shadbolt & Bunker, 2009; Soethout et al., 2008). Student characteristics that have been previously associated with interest in family medicine are being women, older, and married; having a broad undergraduate background and having non-physician parents; having relatively low-income expectations; being interested in diverse patients and health problems; and having less interest in prestige, high technology, and surgery (Bland et al., 1995; Cleland et al., 2014; Pfarrwaller et al., 2017; Shadbolt & Bunker, 2009). Others have found that medical students prefer family medicine for its variety, continuity of care, and work-life balance (Deutsch et al., 2015; Smith et al., 2015). In recent studies, it has been shown that overall, the quality of life and flexibility at work have become more critical (Cleland et al., 2014; Dorsey et al., 2005; Leutritz et al., 2024; Rachoin et al., 2023; Van der Horst et al., 2010; Zinn et al., 2001) than remuneration when choosing a future career (Cleland et al., 2014; Marchand & Peckham, 2017; Zinn et al., 2001).

2.2.2. Recruitment and retention of family physicians

Problems with family physicians' recruitment and retention at any career stage are one of the reasons for the family physician shortage (Marchand & Peckham, 2017). Early-career family physicians' career intentions and motivations are poorly studied in Europe. Kinouani et al. (2016) investigated factors influencing young family physicians in France when choosing between private or salaried practice. The study revealed that the main factors influencing their choice were working conditions, the need for a varied scope of practice, the quality of the physician-patient relationship, and career flexibility (Kinouani et al., 2016). A study conducted in Switzerland found that most future family physicians prefer to start their careers working part-time in small, family physicians-owned group practices in the suburbs or the countryside. They see themselves as co-owners of a practice within five years (Gisler et al., 2017). Similarly, a study among family medicine trainees in England reported that most participants plan to work as salaried family physicians or locums rather than entering a family medicine practice partnership for at least the first five years after completion of training (Dale et al., 2017). Research in the USA found that trainees were more likely to intend to work in an underserved area if they came from a rural or disadvantaged background (Talib et al., 2018). Conversely, in Canada, most trainees reported eventually planning to open practices in urban areas (Lu et al., 2008). Reasons for shunning practising in rural areas were related to workload, lifestyle issues, family obligations, and perceived lack of medical support in the community (Eley et al., 2007; Lu et al., 2008). Some studies have explored the impact of post-graduate training on the career choice of new family physicians. A qualitative study by Spooner et al. (2019) in the UK found that most family physicians feel that the training programs prepare them to deal confidently with most aspects of clinical work. However, they felt underprepared for the additional roles of managing a practice and leading a primary care team (Spooner et al., 2019). Optional part-time and longer general practice training modules have also been associated with more trainees becoming family physicians (Studerus et al., 2018).

2.2.3. Migration of family physicians

The global shortage of physicians leads to the migration of physicians from lower-income to higher-income countries, exacerbating the physician deficit in the former. This phenomenon, known as 'Brain Drain', is well-documented (Aluttis et al., 2014; Wright et al., 2008). While migration of physicians to major immigrant-receiving countries like the UK, Ireland, the USA, Australia, New Zealand, and Canada has been extensively studied, the migration of family physicians, as well as migration to and from other European countries, has been less frequently researched (Aluttis et al., 2014; Brugha et al., 2016; Ling & Belcher et al., 2014; McAleese et al., 2016; Wright et al., 2008).

There are significant differences among European countries regarding the number of foreign-trained physicians. Several European countries, such as Ire-

land, Switzerland, and the United Kingdom, have traditionally depended on the international recruitment of physicians. This dependence has grown in some countries since the COVID-19 pandemic (OECD, 2023b). In 2021, nearly one-fifth (19%) of physicians on average across OECD countries had obtained their first medical degree abroad, up from 15% a decade earlier. The proportion of foreign-trained physicians in 2021 varied widely, from less than 3% in Lithuania and 4.2% in Estonia to around 40% in Switzerland, Ireland, and Norway. Many foreign-trained physicians in Norway, Sweden, and Finland are natives who studied abroad before returning home (OECD, 2023a). While these numbers provide some insight into the distribution of foreign-trained physicians in Europe, they do not clearly explain the migration flow within Europe or the number of physicians coming from non-European countries. The lack of data on physicians' outward and return migration makes it challenging to fully understand healthcare professionals' migration (Ognyanova et al., 2012).

Additionally, there is a distinction between foreign-trained and foreign-born physicians, which these statistics do not always make clear. A region such as Scandinavia faces a natural shortage of physicians due to insufficient training. In contrast, countries such as Ireland and the UK experience significant scarcity due to the outflow of healthcare professionals. Both types of countries suffer from shortages and actively seek foreign-trained physicians to fill their vacancies. (Cronin et al., 2019; Humphries et al., 2017; Kuusio et al., 2014; Ognyanova et al., 2012)

In the EU and European Economic Area (EEA), a legal framework regulates the recognition of professional qualifications and the free movement of physicians. This means that once a professional qualification is recognised in one EU/EEA country, it is automatically eligible for recognition in any other EU country. Physicians migrating from EU/EEA countries typically do not need additional training to ensure their professional qualifications and right to practice in other EU/EEA countries. Additionally, there is no requirement to prove language competencies unless mandated by the employer (European Commission, 2013; Kovacs et al., 2014). On the other hand, non-EU/EEA physicians must prove medical and language competencies while also undergoing additional training in the destination country. Standards for licensing and registration of non-EU/EEA physicians differ across EU/EEA countries, without any uniform approach throughout the EU/EEA. This could explain discrepancies between European countries. (Kovacs et al., 2014)

The reasons and mechanisms behind migration are complex and have been extensively studied. However, the factors driving physician migration are varied and constantly changing. While there are standard features in the migration of physicians, new aspects continue to emerge (Brennan et al., 2023; Wright et al., 2008). Many authors discuss the concept of push and pull factors as a practical framework for exploring and researching the causes of migration globally. Push factors are elements within a healthcare system or country that drive healthcare professionals away, while pull factors attract them to a particular healthcare system or country. Different articles cite that a combination of better pay, better

and safer working conditions, less workload, more suitable organisation of the healthcare, political situation, personal safety, epidemics, and better career opportunities were only some of the reasons for physician migration (Buchan & Perfilieva, 2006; Lee, 1966). Later, plant factors were added to this framework, referring to elements that encourage physicians to remain in the country they have migrated to (Klein et al., 2009).

2.3. Family medicine in Estonia

To become a family physician in Estonia, physicians must complete a 4-year family medicine training program (expanded from three years in 2018). As in Norway, Denmark, and Germany, family physicians in Estonia work as practice owners with a patient list as part of a group practice or alone, the latter being more common. Only physicians who have completed a family medicine residency can apply for a patient list; the Estonian Health Insurance Fund sets the total number of these lists. One family physician can have one patient list at a time, and the size of this list is usually 1600±400 individuals. In Estonia, family physicians exercise a partial gatekeeping function and are directly funded by the Estonian Health Insurance Fund. (Kasekamp et al., 2023; WHO Regional Office for Europe, 2022)

According to the National Institute for Health Development, in 2023, there were 4772 physicians registered in Estonia, and the number of physicians has increased by 4.3% since 2021. At the same time, 939 family physicians were working in Estonia, making up 19.7% of all physicians. The number of family physicians has decreased in 2023 compared to 2022 (National Institute for Health Development, 2023). As mentioned in the WHO report, the age of Estonian physicians has also increased in recent years, averaging 50.6 years for all physicians and 56.1 years for family physicians in Estonia in 2023 (National Institute for Health Development, 2023; WHO Regional Office for Europe, 2022). The share of physicians of retirement age has increased consistently over the past ten years. In 2023, 22.6% of all physicians and 29.4% of family physicians were 65 or older in Estonia. The proportion of working family physicians over 65 has almost doubled in the last decade. Between 2013 and 2023, the share of full-time physicians has continuously decreased, and more physicians work part-time. (National Institute for Health Development, 2023)

According to Leemet and Mets (2024), Estonia faces a shortage of new family physicians to replace retiring physicians. Nearly half of the current family physicians (n=420) will retire in the next 10 years, but only 255 new family physicians are expected to enter primary care (Leemet & Mets, 2024). Despite an increase in residency placements from 32 in 2013 to 40 in 2023, from 2028, more than 50 new family physicians are needed annually to maintain current numbers (Leemet & Mets, 2024; Riigikontroll, 2020). Between 2015 and 2019, 97 out of 171 competitions organised by the Health Board of Estonia to find new family physicians failed (Riigikontroll, 2020). In 2023, about 123,000 Estonians lacked

permanent family physicians and were served by locum physicians, while 385,000 people were on the patient lists of family physicians of retirement age (Leemet & Mets, 2024).

2.4. Study rationale

Population ageing presents numerous challenges for future healthcare services. Timely medical assistance requires an adequate number of various healthcare professionals. Many European countries, including Estonia, are experiencing a shortage of family physicians. Given their pivotal role in providing primary care, this shortage can significantly disrupt the organisation of the entire healthcare system. The family physician shortage is a complex problem with various contributing factors at various levels, making it difficult to find one universal solution. Several key factors influence the availability of family physicians: medical students' interest in family medicine as a career, the career intentions of early-career family physicians, the migration of family physicians, and the dropout rate of family physicians at any stage during their career. Each of these reasons is further shaped by various additional factors, showing the complexity of this issue.

Concrete and timely actions are needed as many countries still struggle with the family physician shortage, a problem likely to worsen over time. To address this issue effectively, additional research is required to explore the factors contributing to the shortage of family physicians. This research will help to strengthen existing knowledge and inform the development of targeted interventions. Most previous studies have been conducted in English-speaking countries, with fewer investigations in other European nations, and none have been conducted in Estonia. Furthermore, prior research has often examined the reasons for the family physician shortage, such as medical students' career intentions, family physicians' retention and migration, separately. Studies have a notable gap considering multiple factors contributing to the shortage. Therefore, a comprehensive approach that examines these factors collectively is essential to develop a more nuanced understanding and practical solutions.

3. RESEARCH AIMS

The main aim of this research was to add to our understanding of the causes of the family physician shortage and to provide evidence on factors influencing this phenomenon. The specific research aims were:

1. To describe medical students' career intentions and assess their readiness to choose family medicine as their future career in Belgium (Flanders), Estonia, and Hungary. (Publication 1)
2. To analyse which factors influence medical students' career intentions in different countries. (Publication 1)
3. To explore newly qualified family physicians' perceptions and experiences on early career intentions in primary health care in Estonia. (Publication 2)
4. To identify motivating and demotivating factors influencing family physicians' migration in Europe: reasons to migrate, stay, return, or migrate further. (Publication 3)

4. MATERIALS AND METHODS

Three studies with different designs using both quantitative and qualitative methods were conducted to achieve the research aims (Table 1). Belgium (Flanders), Estonia, and Hungary were selected to describe medical students' career intentions because of previous collaborations through the European Academy of Teachers in General Practice/Family Medicine and their varying socioeconomic profiles (Publication 1). To explore early-career family physicians' career intentions, the study design and interview guide were developed with Mari Katariina Kangasniemi, a medical researcher with experience in qualitative methodology (Publication 2).

Table 1. Summary of the three studies' aims, methods, and study objects

Research aims	Method	Study objects
	Publication 1	
To describe medical students' career intentions, assess their readiness to choose family medicine as their career, and analyse which factors influence medical students' career intentions in different countries.	A cross-sectional, mixed-methods, multi-country study using an online questionnaire. Multivariate logistic regression analysis was used to create different models. Thematic analysis was conducted to analyse qualitative data (Braun & Clark, 2006).	Medical students from Estonia, Belgium (Flanders) and Hungary. 1601 medical students completed the online questionnaire: 764 from Flanders, Belgium, 214 from Estonia and 623 from Hungary.
	Publication 2	
To explore newly qualified family physicians' perceptions and experiences on early career intentions in primary health care in Estonia.	Qualitative study with semi-structured online group interviews. Thematic analysis was conducted (Braun & Clark, 2006). The study was reported using the Standards for Reporting Qualitative Research (SRQR) Checklist (O'Brien et al., 2014)	Final year family medicine trainees and family physicians within five years of completing the training from Estonia. Six group interviews were conducted: three with 12 trainees and three with 13 family physicians.
	Publication 3	
To identify motivating and demotivating factors influencing family physicians' migration in Europe: reasons to migrate, stay, return, or migrate further.	An exploratory qualitative research method with online individual interviews. Thematic analysis was conducted Thematic analysis was conducted (Braun & Clark, 2006). The study was reported using the SRQR Checklist (O'Brien et al., 2014)	Emigrant and returned family physicians from the WHO European region countries who have lived and worked in the new country for at least one year. Fifteen individual interviews were conducted with family physicians from 8 different countries.

4.1. Medical students' career intentions

4.1.1. Participants and recruitment

Using SurveyMonkey, a multi-purpose online questionnaire was sent via official university mailing lists to undergraduate medical students in all medical faculties in the Flemish Region of Belgium (University of Antwerp, KU Leuven, Vrije Universiteit Brussel, and Ghent University), Estonia (University of Tartu) and Hungary (Semmelweis University, University of Pécs, University of Debrecen, and University of Szeged). The online survey was available in Estonia in February 2020, and repeated participant invitations were sent. In April 2020, the survey was sent to Flemish students, but due to a low response rate, it was reopened from October until December 2020. From June until October 2020, data were collected from Hungarian medical students. The questionnaire was open longer in Belgium and Hungary due to the lower response rate.

4.1.2. Data collection

The questionnaire (Appendix 1) was developed based on previous studies and two formerly used questionnaires in medical schools in the Netherlands (Vergouw et al., 2015). It was reviewed by an expert panel (Marta Velgan, Peter Vajer, Nele Michels, Ruth Kalda), and a pilot study was conducted in 2018 (Vajer et al., 2019). The questionnaire was then reviewed after the pilot study. The questionnaire was divided into four parts: 1) questions regarding demographics and general information, 2) medical students' choice of speciality, 3) factors influencing speciality choice and 4) students' readiness to choose family medicine as their career. Participants were asked to choose their first and second choice of speciality since new physicians have this option when applying for postgraduate training in Belgium, Estonia, and Hungary. The students could choose from over 40 different specialities available in all three countries. Later, these specialities were divided into seven groups: general practice/family medicine, internal medicine, emergency medicine and anaesthesiology, paediatrics, surgical specialities, obstetrics and gynaecology, and others (Appendix 2). In the last two parts of the questionnaire, most questions consisted of statements measured on a 5-point Likert scale. The questionnaire also included open-ended questions to gather students' opinions on what would increase their interest in family medicine.

4.1.3. Data analysis

Statistical analysis of quantitative data was conducted using IBM® SPSS® Statistics version 29.0.0.0. For most of the analysis, we combined medical students' first and second choices and created two groups: students preferring family medicine (n=296) and those preferring other specialities (n=1305). Mann–Whitney U-tests and chi-squared tests were used to test the individual impact of different factors between students who prefer family medicine versus other specialities. Multivariate logistic regression analysis was used to create models to

describe medical students who prefer family medicine. A purposeful selection process was used for logistic regression analysis. The regression analyses included independent variables significantly differing between the two groups (Bursac et al., 2008). In the first regression model, the independent influence of variables frequently found to be relevant in earlier studies was examined: gender, age, study year, origin, relatives working in medicine, previous education, internship experience at a family medicine practice, and having a family physician as a role model. In the second regression model, we tested the importance of factors related to certain specialities, which were divided into six groups: postgraduate training; scope of practice: family medicine or hospital specialities; preferred working conditions; prestige/success orientation; influence to choose a specific speciality (Appendix 3). Lastly, different models were combined to find the best models which describe medical students who prefer a career as a family physician. Statistical significance was assumed at $p<0.05$.

Qualitative analysis was applied to the answers to the open-ended question, 'What would increase your interest in choosing family medicine?' The answers were first translated into English, and all the answers from Flemish, Estonian, and Hungarian medical students were analysed as one data set. Thematic analysis, following the steps set out by Braun and Clark (2006), was conducted by three researchers (Maarja Kiisk, Brita Kroosmann and Heleri Mürel-Sillaots) under the supervision of Marta Velgan. Thematic analysis was chosen because of its inductive approach and because researchers were familiar with it. First, the researchers read the data individually multiple times to get an overview. After that, initial codes and themes were generated separately, and finally, common themes were created. Final themes were reviewed with the entire research team.

4.2. Early-career family physicians' career intentions in Estonia

4.2.1. Participants and recruitment

Convenience sampling was used to recruit final-year family medicine trainees and family physicians within five years of training completion. The invitation letter was sent via official mailing lists to final-year family medicine trainees and the Estonian Society of Family Physicians and shared on the closed Facebook groups for Estonian family physicians. Voluntary participants were asked to contact researchers for enrolment in the study. Informed consent was obtained. Participants were asked to complete a questionnaire to collect general information using SurveyMonkey (Appendix 4). All family medicine trainees and newly qualified family physicians who expressed a wish to participate in this study were included. Between October and December 2020, six group interviews with 25 participants were conducted: 12 final-year family medicine trainees and 13 newly qualified family physicians. All group interviews lasted for 90 minutes.

4.2.2. Data collection

The interview guide (Appendix 5) was developed based on the knowledge gained from previous studies (Kinouani et al., 2016; Spooner et al., 2019) and the review by Kallio et al. (2016). The interviews were carried out by three researchers (Marta Velgan (MV), Anett Uibu (AU), and Elinor Õunap EÕ)) in pairs with 3–5 participants in each group using Microsoft Teams software. Interviews were conducted online because of the ongoing COVID-19 pandemic. The group interview method was chosen to enable discussion of perceptions and experiences of the shared topic (Hammarberg et al., 2016). Groups were kept small so people could feel comfortable expressing their thoughts freely (Kitzinger, 1994). Trainees and newly qualified family physicians were interviewed separately to avoid family physicians' influence over trainees' answers. Otherwise, groups were formed randomly. During the interviews, MV worked as a locum, and AU and EÕ were final-year family medicine trainees. The content and order of the interview guide were tested in the first group interview, and no changes were made. The first interview was included in the analysis. Interviews were audio recorded and transcribed verbatim in Estonian using a web-based speech recognition program (Alumäe et al., 2018). First, we conducted six group interviews, and as the sixth group interview did not add any new themes compared to the previous interviews, we decided not to recruit any additional participants.

4.2.3. Data analysis

Thematic analysis, following the steps set out by Braun and Clark (2006), was conducted using NVivo (Release 1). Thematic analysis was chosen because of its inductive approach and because researchers were familiar with it. The data from trainees and family physicians was analysed by three researchers: MV, AU and EÕ. First, the researchers read the data individually multiple times to get an overview. After that, initial codes and themes were generated separately, and finally, common themes were created. Final themes were reviewed with the entire research team. Quotations were translated into English, marked according to the participant's career stage (family physicians as FP and trainees as TR), and numbered based on the order of appearance in interviews, including the group number (FG 1, etc.).

4.3. Family physicians' migration in Europe

4.3.1. Participants and recruitment

Through purposive and snowball sampling, using contacts, mailing lists, and online social media platforms (Facebook, Twitter, LinkedIn), emigrant and returned family physicians from the WHO Europe countries (WHO Regional Office for Europe, i.a.) were recruited to participate in individual interviews. Before the interview, participants completed a questionnaire using SurveyMonkey to collect

general information: name, contact information, gender, age, country of origin, the country they have migrated to, the number of years they have lived and worked in the country they migrated to and whether they have finished residency in family medicine or general practice and in which country. A total of 31 family physicians filled out the questionnaire, of which 15 agreed to participate. Included were family physicians who are proficient in English, have migrated after finishing undergraduate medical studies in their home country to start their family medicine or general practice specialisation or to become a family physician abroad, or migrated after having completed a specialisation in their home country. They have lived and worked in the new country for at least one year.

4.3.2. Data collection

An interview guide (Appendix 6) was developed using literature data and piloted in the first interview, where no changes were made. In-depth individual interviews were conducted between March and April 2021 with 15 family physicians from different European countries by Marta Velgan (MV) and Thierry Vanderheyde (TV). Since the participants were from different countries, it was decided to conduct the interviews online using Zoom®. Interviews lasted between 30 and 60 minutes.

4.3.3. Data analysis

An inductive approach to the analysis was chosen. Two researchers, MV and TV, conducted a thematic analysis following the steps set out by Braun and Clark (2006) using NVivo (Release 1). The researchers first familiarised themselves with the data by reading the transcriptions multiple times. Then, initial codes were generated, and each researcher independently searched for themes. After that, researchers compared each other's themes, and a standard thematic map was created, which was reviewed several times until a unified and mutually satisfying result was reached. Quotations were numbered based on the order of appearance in interviews.

4.4. Ethical approval

All study protocols were approved by the Research Ethics Committee of the University of Tartu (ref:299/T-4; ref:322/T-8 and ref:330/T-15). In addition, the study about medical students' career intentions and family physicians' migration was approved by the Ethical Committee of the Antwerp University Hospital (n°11/11/22 and 20/47/631). The Medical students' career intentions survey was part of a national program in Hungary based on Government Decision No.1234/2017 (IV. 28.); regarding approval, the Medical Research Council was consulted, and they deemed ethical approval unnecessary. Participation in all studies was voluntary. All participants received information on the study's aims, methods, and procedures. Written consent was obtained from the early-career family physicians, and oral consent was obtained from family physicians who participated in the migration study.

5. RESULTS

5.1. Medical students' career intentions

5.1.1. Characteristics of participants

Altogether, 1601 medical students completed the questionnaire, of whom 764 were from the Flemish region of Belgium, 214 were from Estonia, and 623 were from Hungary. Two-thirds of the participants identified as women (n=1083). Among the respondents, there was a relatively equal proportion of students from all study years (Table 2).

Table 2. Participant characteristics overall and based on the preferred speciality

	All students n=1601	**Students preferring FM n=296 (18.5)**	**Students preferring other specialities n=1305 (81.5)**
Gender, n (%)			
Man	518 (32.4)	72 (13.9)	446 (86.1) *
Women	1083 (67.6)	224 (20.7)	859 (79.3)
Country, n (%)			
Belgium (Flanders)	764 (47.7)	193 (25.3)	571 (74.7) *
Estonia	214 (13.4)	33 (15.4)	181 (84.6)
Hungary	623 (38.9)	70 (11.2)	553 (88.8)
Year of birth, n (%)			
Until 1993	84 (5.2)	21 (25)	63 (75)
1994-2003	1517 (94.8)	275 (18.1)	1242 (81.9)
Study year, n (%)			
1st	265 (16.6)	37 (14.0)	228 (86.0) *
2nd	274 (17.1)	36 (13.1)	238 (86.9)
3rd	250 (15.6)	37 (14.8)	213 (85.2)
4th	309 (19.3)	63 (20.4)	246 (79.6)
5th	255 (15.9)	60 (23.5)	195 (76.5)
6th	248 (15.5)	63 (25.4)	185 (74.6)
Origin, n (%)			
City	1073 (67)	169 (15.8)	904 (84.2) *
Rural area	528 (33)	127 (24.1)	401 (75.9)
Relatives in medicine, n (%)			
Yes	476 (29.7)	86 (18.1)	390 (81.9)
No	1125 (70.3)	210 (18.7)	915 (81.3)
Previous education, n (%)			
No	1439 (89.9)	256 (17.8)	1183 (82.2) *
Yes	162 (10.1)	40 (24.7)	122 (75.3)
Internship at FM practice, n (%)			
Yes	833 (52)	185 (22.2)	648 (77.8) *
No	768 (48)	111 (14.5)	657 (85.5)
FPs as a role model, n (%)			
Yes	726 (45.3)	219 (30.2)	507 (69.8) *
No	875 (54.7)	77 (8.8)	798 (91.2)

Notes: FM=family medicine and FP=family physician. Comparison between medical students preferring FM and those preferring other specialities * $p<0.05$.

5.1.2. Medical students' career intentions

The preferred speciality choices of studied medical students (first and second choice) were surgical specialities, internal medicine and paediatric specialities (Table 3). Surgical specialities were the leading first choice, and internal medicine specialities the second choice. Men were more drawn to surgical specialities, emergency medicine and anaesthesiology, but were much less interested in paediatric specialities, family medicine, gynaecology and obstetrics. 18.5% of participants considered family medicine their first or second choice, 25.2% in Belgium (Flanders), 15.4% in Estonia and 11.2% in Hungary.

Table 3. Medical students' choice of speciality based on gender and country of origin

	FM		**IM**		**EM&asth**		**Paed**		**Sur**		**Gyn**		**Other**	
	1st	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**
	127	**171**	**280**	**398**	**174**	**168**	**201**	**133**	**355**	**313**	**99**	**84**	**365**	**334**
	(7.9)	**(10.7)**	**(17.5)**	**(24.9)**	**(10.9)**	**(10.5)**	**(12.6)**	**(8.3)**	**(22.2)**	**(19.6)**	**(6.2)**	**(5.2)**	**(22.8)**	**(20.9)**
Gender, n (%)														
Men, 518 (32.4)	29	44	99	122	70	59	30	18	170	148	11	11	109	116
	(5.6)	(8.5)	(19.1)	(23.6)	(13.5)	(11.4)	(5.8)	(3.5)	(32.8)	(28.6)	(2.1)	(2.1)	(21.0)	(22.4)
Women, 1083 (67.6)	98	127	181	276	104	109	171	115	185	165	88	73	256	218
	(9.0)	(11.7)	(16.7)	(25.5)	(9.6)	(10.1)	(15.8)	(10.6)	(17.1)	(15.2)	(8.1)	(6.7)	(23.6)	(20.1)
Country, n (%)														
Belgium (Flanders),	83	110	109	170	100	89	94	76	179	161	43	26	156	131
764 (47.7)	(10.9)	(14.4)	(14.3)	(22.3)	(13.1)	(11.6)	(12.3)	(9.9)	(23.4)	(21.1)	(5.6)	(3.4)	(20.4)	(17.1)
Estonia, 214 (13.4)	16	17	39	61	25	27	13	11	58	34	8	13	55	51
	(7.5)	(7.9)	(18.2)	(28.5)	(11.7)	(12.6)	(6.1)	(5.1)	(27.1)	(15.9)	(3.7)	(6.1)	(25.7)	(23.8)
Hungary, 623 (38.9)	28	44	132	166	49	52	94	46	118	118	48	45	154	152
	(4.5)	(7.1)	(21.2)	(26.6)	(7.9)	(8.3)	(15.1)	(7.4)	(18.9)	(18.9)	(7.7)	(7.2)	(24.7)	(24.4)

Note: FM = family medicine; Sur = surgical specialities; IM = internal medicine specialities; Paed = paediatric specialities; EM&asth = emergency medicine and anaesthesiology; Gyn = obstetrics and gynaecology; Other = all the other. 1st = 1st specialty choice and 2nd = 2nd specialty choice

5.1.3. Factors influencing medical students' career intentions

Regarding factors related to a speciality, group comparisons were conducted between students preferring family medicine and those preferring other specialities. Based on these results and knowledge from previous studies (Kiolbassa et al., 2011; Sinclair et al., 2006), six groups were formed: 'postgraduate training', 'scope of practice: family medicine', 'scope of practice: hospital specialities', 'preferred working conditions', 'prestige/success orientation' and 'influence to choose a certain speciality' (Table 4).

Table 4. Factors related to a speciality: comparison based on career choice (5-point Likert-scale; 1=strongly disagree and 5=strongly agree)

	All n=1601	Students preferring FM n=296	Students preferring other specialities n=1305
		Mean ± SD	
Factors			
Postgraduate training			
The availability of places in postgraduate training	3.1 ± 1.3	3.3 ± 1.3	3.0 ± 1.3*
A short period of postgraduate training (short=2-4 years)	2.2 ± 1.2	2.7 ± 1.3	2.1 ± 1.1*
An intensive postgraduate training program[1]	3.1 ± 1.1	2.9 ± 1.1	3.1 ± 1.2*
Postgraduate training placement close to the place of residence	2.8 ± 1.3	3.0 ± 1.3	2.8 ± 1.3*
Sufficient employment places in this speciality	3.6 ± 1.2	3.8 ± 1.1	3.6 ± 1.2*
Complex admission requirements for the postgraduate training program[1]	2.7 ± 1.2	2.5 ± 1.2	2.7 ± 1.2*
Scope of practice: General practice			
Big variation in the types of patients	4.1 ± 1.0	4.2 ± 0.9	4.1 ± 1.0
Big variation in pathologies	4.1 ± 1.0	4.1 ± 0.9	4.1 ± 1.0
Dealing with the psychological problems of patients	3.3 ± 1.3	3.9 ± 1.2	3.2 ± 1.3*
Close contact with patients and their family members	3.6 ± 1.2	4.2 ± 1.0	3.4 ± 1.2*
Long-term relationships with patients	3.4 ± 1.3	4.2 ± 1.1	3.2 ± 1.3*
Continuity of care	3.7 ± 1.1	4.2 ± 1.0	3.6 ± 1.1*
Activities that mainly focus on prevention	3.0 ± 1.2	3.5 ± 1.1	2.9 ± 1.2*
Activities that mainly focus on supporting patients in managing their illness	3.3 ± 1.1	3.7 ± 1.0	3.3 ± 1.2*
Communicative skills are required	4.0 ± 1.0	4.3 ± 0.8	4.0 ± 1.0*
A lot of routine activities	2.9 ± 1.1	3.1 ± 1.1	2.9 ± 1.1*
Scope of practice: Hospital specialities			
Activities that mainly focus on treating patients	3.9 ± 1.0	3.9 ± 0.9	3.9 ± 1.0
Interest in highly specialised work	3.6 ± 1.2	2.9 ± 1.2	3.8 ± 1.1*
The specific patient population of this speciality	3.3 ± 1.2	3.1 ± 1.2	3.3 ± 1.2*
Intellectually challenging work	4.1 ± 0.9	4.0 ± 0.9	4.1 ± 0.9*

	All n=1601	Students preferring FM n=296	Students preferring other specialities n=1305
		Mean ± SD	
Technical skills are required	3.9 ± 1.0	3.6 ± 1.0	4.0 ± 1.0*
A lot of high-tech technical equipment	3.0 ± 1.2	2.4 ± 1.1	3.1 ± 1.2
Working in a hospital	3.6 ± 1.2	2.8 ± 0.9	3.8 ± 1.1*
Good opportunities to work in shifts	3.0 ± 1.2	2.9 ± 1.2	3.0 ± 1.2*
Emphasis on teamwork	4.0 ± 1.0	3.9 ± 1.0	4.1 ± 1.0*
Physically hard work	2.8 ± 1.2	2.7 ± 1.1	2.8 ± 1.2
A combination of communicative and technical skills is required	4.0 ± 1.0	4.1 ± 0.9	4.0 ± 1.0
Preferred working conditions			
Regular working hours	3.2 ± 1.3	3.6 ± 1.2	3.1 ± 1.3*
Acceptable number of working hours	3.7 ± 1.1	4.1 ± 1.0	3.7 ± 1.2*
Flexible working hours	3.3 ± 1.3	3.6 ±1.2	3.2 ± 1.3*
Mainly day job	3.5 ± 1.3	3.9 ± 1.1	3.4 ± 1.3*
Good opportunities to match private life	3.8 ± 1.2	4.3 ± 1.0	3.7 ± 1.2*
Prestige/success orientation			
A performance-oriented environment	3.3 ± 1.2	2.8 ± 1.1	3.4 ± 1.2*
An anticipated high salary	3.3 ± 1.2	3.1 ± 1.2	3.4 ± 1.1*
The prestige/reputation of doctors from this speciality	3.0 ± 1.2	2.6 ± 1.2	3.0 ± 1.2*
The attractive lifestyle of doctors in this speciality	3.3 ± 1.2	3.5 ± 1.2	3.2 ± 1.2*
Good opportunities to build a successful career	3.7 ± 1.1	3.4 ± 1.1	3.8 ± 1.0*
Good opportunities for a career in research	2.6 ± 1.3	2.0 ± 1.1	2.8 ± 1.3*
Good opportunities to combine with other working activities (academic/teaching career, governmental and societal institutions, professional institution, etc.)	3.2 ± 1.3	3.0 ± 1.3	3.2 ± 1.3*
High level of responsibility at work	3.6 ± 1.1	3.4 ± 1.1	3.7 ± 1.1*
Influence to choose a certain speciality			
Positive experiences with doctors/trainers/assistants from this speciality	4.1 ± 1.1	4.1 ± 1.0	4.1 ± 1.1
Expectations from family members to choose this speciality	1.6 ± 0.9	1.7 ± 0.9	1.6 ± 0.9*
Advice from doctors/teachers to choose this speciality	2.3 ± 1.2	2.3 ± 1.2	2.3 ± 1.2

Notes: *p<0.05

This was followed by multivariable binary logistic regression analyses (Table 5). The aim was first to test the independent factors related to students and curriculum (Model 1) and factors characterising the specialities separately (Model 2). In Model 1, four independent factors predicted the preference for family medicine: being a woman, being from Belgium (Flanders), being a 6th-year medical student, and having a family physician as a role model. In Model 2, factors related to speciality grouped under ‘postgraduate training’, ‘scope of practice: family medicine’, and ‘preferred working conditions’ (Table 4) predicted the preference

for family medicine. Secondly, independent factors related to students and curriculum and factors characterising the specialities were tested together. After combining Models 1 and 2, the correlation between being a woman and preferring family medicine disappeared (Model 3). However, the importance of other factors identified in the initial models persisted, affirming their relevance in influencing medical students' career choices. Despite not being significant in Model 1, the factor of coming from a rural area was revisited in Model 4 alongside other factors. This inclusion led to the loss of significance for factors like being a woman and being from Belgium (Flanders), indicating that other variables possibly confounded their earlier perceived influence.

Table 5. Multivariable binary logistic regression analyses predicting preference for a career in family medicine

	Model 1		Model 2		Model 3		Model 4	
	Pseudo-R^2	Nagelkerke 0.198	Pseudo-R^2	Nagelkerke 0.309	Pseudo-R^2	Nagelkerke 0.406	Pseudo-R^2	Nagelkerke 0.377
Variable	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Gender (women)	1.5	0.006						
Country								
Belgium (Flanders)	1	<0.001			1	<0.001		
Estonia	0.4	<0.001			0.3	<0.001		
Hungary	0.3	<0.001			0.3	<0.001		
Level of study								
1st year	1	<0.001			1	0.04	1	0.03
2nd year	0.9	0.548			0.9	0.847	1.0	0.933
3rd year	1.0	0.965			1.1	0.731	1.2	0.576
4th year	1.2	0.425			1.2	0.527	1.3	0.5302
5th year	1.7	0.036			1.7	0.067	1.6	0.074
6th year	2.3	<0.001			2.5	0.001	2.1	0.006
Origin (Rural area)							1.9	<0.001
Family physician role model	4.5	<0.001			3.5	<0.001	3.2	<0.001
Postgraduate training			1.4	<0.001	1.3	<0.001	1.3	<0.001
Scope of practice: Family medicine			1.5	<0.001	1.4	<0.001	1.5	<0.001
Scope of practice: hospital specialities			0.6	<0.001	0.6	<0.001	0.6	<0.001
Preferred working conditions			1.2	0.002	1.2	<0.001	1.2	0.006
Prestige/success orientation			0.8	<0.001	0.8	0.004	0.8	<0.001

Notes:

Model 1 resulted from the purposeful selection of the covariates process considering the influence of variables frequently found to be relevant in previous studies. The model-building process considered the following variables: gender, age, study year, origin, previous education, internship experience in family medicine, and family physician as a role model. Four independent predictors ended up in the model: gender, country of origin, year of study and having a family physician as a role model.

Model 2 explores the association of the factors related to a specific speciality, which were gathered into six groups: postgraduate training, the scope of practice: family medicine or hospital specialities, preferred working conditions, prestige/success orientation, and influence to choose a specific speciality.

Model 3 considers simultaneously factors from Models 1 and 2. As gender was found statistically insignificant in this model, it was removed.

Model 4 considers simultaneously factors from Models 1 and 2 also being from a rural area was included. Country of origin and gender were found statistically insignificant and removed.

5.1.4. Strategies to increase medical students' interest in family medicine

The results presented here have not been published before. A total of 653 answers were given to the open-ended question, 'What would increase your interest in choosing family medicine?' Of these, 151 answers were given by medical students from Estonia and 502 by students from Belgium (Flanders). Medical students' responses varied in length and content and were given in English or native languages (the latter were translated into English (Table 6)).

Table 6. Themes, subthemes and ideas on how to increase medical students' interest in family medicine

Theme 1: Exposure to family medicine during medical studies		
Subthemes	**Ideas**	**Quotes**
	More information and exposure to family medicine.	*'More information and contact with the field of family medicine during our curriculum. We see very little, considering about half of our cohort should specialise in family medicine.' – BE*
	More mandatory internships and/or possibilities to visit family medicine practices.	*'Probably a closer acquaintance with the speciality and to shadow a family physician to understand how comprehensive the speciality really is and what the typical patients you have to deal with daily are.' –EST*
	More family medicine-related subjects in the curriculum and inspiring role models.	*'More lessons and internships in this field to make sure you really know what it is to be a family physician.' – BE* *'...more inspiring teachers in this field.' –EST*
	More extended residency program with fewer one-month rotations.	*'Longer program in the specialisation to get the opportunity to know even more about all the various specialities and related pathologies [...]?' – BE*
Theme 2: Family medicine residency program		
Subthemes	**Ideas**	**Quotes**
	More comprehensive training program, including minor procedures and surgery.	*'A more integrated and longer training. Inclusion of small procedures and investigations. Inclusion of training in other disciplines as part of the family medicine education.' – BE*
	Supervisors in hospitals equipped with knowledge of family trainees' learning goals.	*'Family physician residency supervisors in hospitals give clearer instructions, what the future family physician will need to know (e.g., minor surgery in surgery, outpatient work rather than monitoring of operations).' – EST*
	Smaller workload/patient lists and more time for patients.	*'System, where family physicians work is not overcrowded, you have enough time for each patient and do not have to rush.' – BE*

	More family physicians working in group practices.	*'Being able to work in a group practice: I think it would be really important for me to have as many different contacts as possible in my work environment, which counts for both different patients and different colleagues.' – BE*
	Working system for replacements when family physicians want/need to take time off work.	*'When getting a vacation as a family physician was better regulated, not that a family physician who cannot find someone in his or her place during the holiday cannot rest.' – EST* *'If you wanted to go to live in a small town and take your own list of patients there, you would not be left alone. There would be a solid support system so that family physicians could go on holiday every year, and there is a replacement, there is training, there are opportunities similar to the practices of big cities so that you do not drown in work and have time for your private life.' – EST*
Theme 3: The organisation of primary care		
Subthemes	**Ideas**	**Quotes**
	Simplifying the management of family medicine practice, or ways to avoid non-clinical tasks.	*'Better explanation of the family physician's administrative responsibilities or ways to avoid them, e.g. (in the form of a group practice).' – EST*
	More funding for family medicine in general.	*'More (financial) support from our healthcare system for family medicine (group) practices.' – BE*
	Support, financial and otherwise, when establishing a family medicine practice.	*'I am very interested in being a family physician. Maybe after graduating from residency, I would know that I have a good chance of having my practice, and it would be easier also to have financial aid from the government.' – EST*
Theme 4: Family physician's work-life		
Subthemes	**Ideas**	**Quotes**
Nature of the work	More excitement, challenges and variety in everyday work.	*'I do not care about the money or the timetable. I want interesting and challenging work.' – BE* *'If there were more variability between patients and not just dealing with high blood pressure alone.' – EST*
	More opportunities to do minor procedures/surgery in family medicine.	*'If they have to do more practical things, not just examine patients, then redirect them to a specialist.' – BE*
	Fair remuneration comparable to other specialists.	*'[...] a salary according to working hours. At present, family physicians are very overwhelmed and should be paid more.' – EST*
	Possibility to work in a group practice near a hospital.	*'Group practice and work close to a hospital.' – BE*

Working conditions	Opportunity to organise work to offer the best possible treatment.	*'Greater autonomy for the family physicians and longer appointment times. If I can devote more time to the patient and offer better quality care, then I would also feel that I am working for a reason.' – EST*
	Working hours that improve work-life balance.	*'If I could be sure that I could have a good work-life balance.' – BE* *'Examples of successful and happy family physicians, who have time both for work and for private life.' – BE*
	More opportunities for an academic career.	*'Ability to combine it with research, prevention/public health or other projects.' – BE* *'More opportunities for research and teaching.' – BE*
Theme 5: Career opportunities		
Subthemes	**Ideas**	**Quotes**
	More opportunities for self-development, both nationally and internationally.	*'If family medicine would present more challenges and offer a wide range of opportunities for self-improvement at various conferences, both at home and abroad.' – EST*
Theme 6: Reputation of family medicine speciality		
Subthemes	**Ideas**	**Quotes**
	Greater appreciation is shown by other healthcare specialists, teachers, supervisors, patients, and society in general.	*'If family physicians were more appreciated and not overlooked by society. I find it really sad that most people think that family physicians do little work just because the patient doesn't know how much knowledge and skills are required to do the work.' – BE* *'I think it is generally quickly deemed as a lesser specialisation. For example, when fellow students ask what they would like to specialise in, family medicine does not seem to be taken into consideration because it seems like what you do when you can't find another specialisation. So, I think the stigma needs to be handled because it makes students not consider it a first-choice option.' – BE* *'Recognition from society – at the moment, the reputation of family physicians among people and other physicians is still poor.' – EST*

Notes: EST=medical students from Estonia; BE=medical students from Belgium

Students felt they lacked sufficient exposure to family medicine and desired more practical experience and information about daily work, salary, and job opportunities. They found the theoretical education inadequate and wanted more inspiring role models and mandatory clinical practice. A well-organised, more extended residency program with fewer one-month rotations and qualified supervisors was viewed as essential (Table 6).

Fear of heavy workloads and burnout was a significant deterrent. Students suggested smaller patient lists, shared workloads, and psychological support to mitigate these issues. Group practices were favoured for collaboration and reducing non-medical tasks. They also emphasised the need for reliable replacements, increased government financial support, especially in rural areas, and greater financial freedom to make clinical decisions.

Students hoped for excitement, challenges, and variety in their future specialities. They wanted more independence and responsibility and relied less on other specialists for medical decisions. Students felt that family physicians often handle the same health issues daily and wanted more diversity in their daily work. They believed family physicians mainly treated chronic conditions and psychological problems, focusing more on communication and counselling than hands-on activities. Better technical and financial resources for patient examinations and more procedures, such as minor surgeries, along with longer appointment times to provide more comprehensive patient care, were suggested.

Fair pay, flexible and reasonable working hours, a workplace close to home, and sufficient time for patients were also important. Students believed family physicians should receive higher pay proportional to their workload and comparable to other specialists. They stressed the importance of flexible working hours for diverse work settings, such as emergency departments, ambulances, places abroad, or research. However, many stressed the importance of standard working hours, avoiding overtime and prioritising work-life balance. Family medicine would be more attractive with better career advancement opportunities. Students felt it was important to have the chance to progress in their careers, engage in research, and contribute to medical education. They wanted opportunities for self-development and continuous learning both nationally and internationally. Students felt that family physicians' work is undervalued in society. They noted that negative attitudes from patients and other healthcare specialists diminish their interest in this speciality. Greater recognition from other specialists and university teachers was seen as necessary to increase interest in the field.

5.2. Early-career family physicians' career intentions in Estonia

This study included 25 early-career family physicians from Estonia: 12 final-year family medicine trainees and 13 newly qualified family physicians. Most participants were women: 11 in the trainees' group and 11 in the family physicians' group (Table 7).

Table 7. Participants characteristics

	FM trainees n=12	FP n=13
Age		
34 and younger	9	7
35 and older	3	6
Nationality		
Estonian	10	13
Other	2	0
Years from finishing training		
<1		4
<2		2
<3		2
<4		3
<5		2
Currently working		
As an FP with a patient list		6
Without a patient list		4
Other		3
Workload		
Full time		7
Part-time in one place		2
Part-time in multiple places		4

Perceptions and experiences of early-career family physicians on how training and early work experiences influenced their career intentions were grouped under five themes (Table 8).

Table 8. Themes and subthemes of early-career family physicians' career intentions

Theme 1: Career as an independent practitioner in primary care	
Subthemes	**Quotes**
Family physician with or without a patient list	*'Where you need family medicine training, you need it when working in a family medicine practice as a family physician with or without a patient list.' – FP2 FG2* *'I finished in 2017, and then I worked as an assistant physician or a locum in different centres. […] But well, from the beginning, I actually still wanted to take a patient list.' – FP7 FG4*
Long-term career prospects	*'Generally, a family physician's career is not one where you somehow develop vertically to become a bigger boss. Well, usually at the end, you're your own boss.' – GP6 FG4* *'I have understood. I don't want to take a patient list at the moment. And I think that at the age of 40-45, it makes more sense to start doing this thing because, before that, you want to live a bit and then start doing this practice thing.' – TR8 FG3*

Theme 2: Preparation for family physicians' everyday work	
Subthemes	**Quotes**
Clinical skills	*'[…] I have learned many times more in these few months working in a family medicine centre than I have in the hospital. Because in the hospital, they go into such detail that I often feel like, why do I have to know from this point forward? I would refer this patient to a specialist anyway.' – TR8 FG3* *'I would not imagine that there is no family medicine residency, though it is tiring and exhausting, but what kind of experience does it give and to see all these opportunities in order to put together the best workplace as a family physician in the future, in that sense the residency is priceless.' – TR3 FG1* *'[…] I was definitely influenced in the sense that since I always had a plan to take a patient list and start my own practice, then actually it was very helpful that if you are working there, you think, what would I do the same way, what would I do differently.' – FP7 FG4*
Non-clinical skills	*'[…] How to manage a patient list and a practice in reality, how to do this whole management, in my opinion, this is not talked about. In that regard, I find that the training did not prepare us at all.' – FP4 FG2*
Theme 3: Opportunity to prioritise work-life balance	
Subthemes	**Quotes**
Work-life balance	*'Because I have a family and children, I still hope to have a planned vacation in the future. This is the main fear that suddenly I will sink into the responsibilities of having a patient list. And it is a little scary, in fact, that if you look at the young family physicians who have given up their patient lists or who have not managed, it raises questions.' – FP8 FG4*
Family planning	*'I am certainly not initially interested in taking a patient list, just in terms of a purely private background. If there may still be plans to raise a family, then taking the list seems to marry me immediately with work in such a way that I am not ready for it at the moment.' – TR2 FG1*
Replacement system	*'I'd like to take a patient list, but only if there was a replacement system […] If I take the list, it means that I might not be able to take a vacation, and also if I wanted to have another child, I could not, I would have to look for a replacement myself, which I find very difficult.' – TR4 FG3*
Theme 4: The process of becoming a practice owner with a patient list	
Subthemes	**Quotes**
Bureaucracy	*'When starting, I took the list that was sent by the authorities as an example … Additionally, there was a series of documents and requirements I needed to fulfil before opening the practice […] Fortunately, I had a colleague who helped me with going through these documents and requirements. I don't think I could have done it on my own and might have left dealing with it until the last minute.' – FP12 FG6*

Support from colleagues and the government	*'[…] and it would be helpful if there was some kind of clerk who encourages and helps you. Or there would be a ready-made general practice where you can start working the next day; you do not have to have any hustle associated with how to get things up and running.' – FP11 FG6*
Initial capital	*'I think it is important to talk about initial capital… in the situation where I do not know whether or not I should take a patient list, I would not invest any personal money to manage a patient list and family medicine practice.' – TR5 FG2*
Theme 5: Finding a suitable workplace	
Subthemes	**Quotes**
Group practice as a preferred workplace	*'In the group practice, you shake hands, and you have an office and equipment, and you can immediately start working as a family physician and see patients. On the other hand, with solo practice, especially if you start on your own, you have to get all this equipment. Not to mention all of the other things, in addition to the equipment and furniture.' – FP4 FG2*
Teamwork	*'I just feel that if you are like a solo independent practitioner, you have to do all this work yourself, so that in addition to clinical work, you are really a business manager, human resources manager, an accountant, at times a cleaner, whatever. However, in group practice, they can share these tasks. […] Working in group practice, you do not have to worry if you want to go on a vacation, you want to go to a conference, or you are planning to have a baby.' – FP1 FG2*
Burnout prevention	*'My wish is also that I do not want to work all the time, and I also appreciate that I have one or two days off a week from my family physician job, where I can do other things so that I do not get bored. So I would not burn out, and I would be happy to do family physician work.' – FP9 FG4*

Notes: FP=family physician, TR=trainee, FG=focus group. The number after FP and TR indicates the order of appearance in interviews, and the number after FG is the number of the focus group.

Career as an independent practitioner in primary care

Participants aimed to become practice owners with a patient list in the future. After training, they see themselves working as locums or employees before becoming practice owners. Unlike other medical specialities, the career path of family physicians does not follow a typical vertical trajectory, culminating in becoming a practice owner with a patient list.

Preparation for family physicians' everyday work

Participants believe that a comprehensive family medicine training program is essential to inspire early-career family physicians to pursue careers in primary care. They opined that their training programs prepare well for the clinical work of family physicians but lack preparation for non-clinical tasks, like establishing and managing a practice and taking a patient list.

Opportunity to prioritise work-life balance
When making decisions about their future career, newly qualified family physicians emphasised the importance of work-life balance, noting that practice ownership could hinder this due to increased responsibilities. Family planning significantly influenced career intentions, with finding a locum doctor for short- or long-term leave being one of the main obstacles.

The process of becoming a practice owner with a patient list
Establishing a practice and taking on a patient list was seen as bureaucratic, time-consuming, and demotivating. Participants sought more support and mentorship from experienced colleagues and simplified processes and assistance from authorities. Initial capital requirements were also mentioned as a barrier. Before committing to a patient list, participants wanted to find a suitable workplace, ideally one they had worked in before or one that colleagues recommended. Once early-career family physicians found a suitable workplace, they were ready to take on a patient list sooner.

Finding a suitable workplace
Participants favoured group practice to reduce bureaucracy and share tasks, to work in a team, and to manage workload and substitutions. This allows flexible working hours and reduces the risk of burnout, especially early in their careers.

5.3. Family physicians' migration in Europe

Fifteen family physicians from 8 different countries participated in these interviews. Men predominated among the participants (n=10). Most participants stayed in the country they migrated to (n=11). Additionally, more than half of the participants specialised as family physicians before migration (n=8) (Appendix 7).

Reasons for family physicians migrating and deciding to stay or to leave were grouped into three main themes: professional reasons, personal reasons and the overall situation in their home countries or organisation of healthcare systems (Table 9).

Table 9. Themes and subthemes of the reasons to migrate, stay or leave

Reasons to migrate	
Theme 1: Professional development	
Subthemes	**Quotes**
New experiences and challenges	*'I think professional factors also to develop my knowledge and to see different approaches to medical treatment. I'm very interested in the healthcare system and organisation and management, and I saw different views of how to manage healthcare.' – FP2* *'Back when I was studying family medicine, Estonian family physicians got a little bit less to do; it was a more hospital-centralised medicine system, and family doctors did less. And a lot of my colleagues went to Finland because, in Scandinavia, family physicians have more responsibility, more freedom in diagnostics and treating.' – FP4*
Medical education	*'Most Polish citizens that study in Poland then very quickly leave, mainly because of the circumstances of the healthcare system. So they do their studies and, such as myself, one year of internship and when they see what's happening, that their chances, for example, of residency are low, or that there are problems with getting residency spots, pays are inadequate, work hours are bad, the conditions are not the greatest and then, unfortunately, a lot of them leave.' – FP5*
Theme 2: Personal reasons	
Subthemes	**Quotes**
Family	*'It made things easier because I knew that I would cope with the money because, at the time, I was a single mom. So, I couldn't just decide that I would go somewhere and do lots of work. I need to be sure that my child is well cared for. That was one thing. It wasn't so much the money; it was the system, the school system, because my child was in the first grade. And when we came here, she went to second grade, and she didn't know any language. She coped.' – FP3* *'My main motivation was that I wanted to live in the countryside…That was the main motivation. But of course, there is the countryside in the Netherlands as well, but then me and my husband would have to work full time, and we didn't want to pay for the house, and here we can have a house in the countryside with my wage, so, so it was also motivation. And I don't work full-time. I work part-time.' – FP11*
Financial reasons	*'Of course, the salary is good. Absolutely, the salary is good in Norway, but life is also more expensive. So yeah, the year in Norway would have given a financial boost also. But that wasn't like, like, the primary reason. For financial gain, most family physicians will just do a weekend shift in Finland.' – FP4*

Experience life and work abroad	*'Since I was a child, I was travelling, going on holiday, my parents took me, we went to many-many countries in Europe, and it was another chance to see how, how the people live […] My cousin was living in London before the EU, and they were all happy and said, listen, I'm nearly sure you enjoy it. You see how it goes. So, it wasn't the way that I didn't know what life looks like, but I just wanted to see.' – FP12*
Theme 3: The overall situation in their home countries	
Subthemes	**Quotes**
Political situation and living environment	*'Better pay and the structure of the system. That corruption, I think, is the worst. And in order to achieve something, you have to either know someone or get to know someone and become their friend to be able to work and have a decent income.' – FP5*
Organisation of the healthcare system	*'When I decided to become a family physician, I was one of the visionaries. But then we just were looking at time passing without big steps, but there was still hope until we got that economic crisis. It was clear that the healthcare system was going to collapse, and the educational system was going to collapse. We migrated in order to find better work conditions and better scientific conditions. I wanted somehow to have the opportunity to use my competence and everything I have learned as a family physician. That's why it became my focus to migrate to a country with a well-organised primary healthcare system.' – FP6*
Reasons to stay or leave	
Theme 1: Professional development	
Subthemes	**Quotes**
New experiences and challenges	*'I still feel that the work in Sweden is more stimulating. And I still feel that I have things to learn.' – FP8* *'My parents are doctors, and they have a private clinic. And I ended up working there and developing my own clinics.' – FP7*
Theme 2: Personal reasons	
Subthemes	**Quotes**
Family	*'So, their life has been built here, and this is what they consider now their home. I don't want to go back anymore. I found professionally what I wanted and I needed, and of course, the rest of the family also likes it here.' – FP1* *'We were planning to move back to Estonia when our eldest son starts school [...] That will be the main reason for moving back. For him to be Estonian, he has to have Estonian friends or contact with relatives as well.' – FP8*
Living environment	*'We as a family are very happy that we can live here. It's too big a step to move again and to adapt again. Children, they are in school, and they have their friends. I wouldn't think of moving to another country.' – FP11*
Financial reasons	*'But generally, life and work here enable me to buy a new car every other year. We are building a house. And now we can travel every year or every other year to far distant*

	countries for vacation without thinking about money or anything.' – FP14
	'The bank loan that the bank in my home country would have considered us was considerably smaller, and we could have afforded just an apartment. And here the bank said that 'we can see a very big potential in the future, and it wouldn't be any problem to take out a loan for a house'. So, we decided to migrate.' – FP4
Experience life and work in a new country	*'I would stay here, but I just want to get more experience; I'm not sure, maybe in the medical field or not in the medical field. I want to travel more, maybe to stay somewhere for a longer time.' – FP15*
Theme 3: Organisation of healthcare systems	
Subthemes	**Quotes**
Satisfaction with the organisation of healthcare	*'So, I think the stability of the system is probably the most important factor, that it is predictable. I know it's going to stay the same.' – FP10*
	'There is professionally no reason to go back. The situation for my colleagues even worsened with the pandemic and everything, running out of money and less is pumped into the primary care, and they just get more and more things to do and be responsible for.' – FP12
The way FPs work	*'[...] Working there, as a family physician, I'd either be working in a health centre where I have little control over the service I provide. And no control over who I'm, over the patient population I'm dealing with. Or I work privately, where I am fully self-employed, and therefore, only earn money If I, if I'm at work. So, there's no annual leave, there's no sick leave, if I'm sick, I'm not getting paid. And that requires quite a lot of buy-in, at least initially [...].' – FP6*
	'And then in my home country, as a family physician, you are self-employed. […] You have to employ nurses; you have to just do everything else as well. And I think I will be ready for that in five years, but not now.' – FP3
Improvement of the healthcare system in their home country	*'I think the idea that you can come back and improve and help improve something, I think that's also a motivation.' – FP9*
Recertification	*'In my home country, you have to re-register every 5th year to be a family physician, even when you live abroad. But I didn't do that. So now, if I were to move back, I would have to register. So, it's also a threshold to move back.' – FP11*
Experience life and work in a new country	*'I would stay here, but I just want to get more experience; I'm not sure, maybe in the medical field or not in the medical field. I want to travel more, maybe to stay somewhere for a longer time.' – FP15*

Notes: FP=family physician

5.3.1. Reasons to migrate

Family physicians migrated for professional and personal reasons, as well as the overall situation in their home countries (Table 9). According to participants, migration can offer the opportunity to experience life and work abroad, but can also indicate potential problems and dissatisfaction with the overall situation in the home country. Professional development was one of the leading reasons for migration. Many family physicians felt they had not fully realised their potential in their current roles and were seeking new professional challenges. Interest in experiencing working in another healthcare system was also mentioned as a reason for migrating.

Early-career family physicians cited higher-quality training programs, increased remuneration, and improved supervision as key reasons for seeking family medicine training abroad. Some felt exploited as trainees in their home country, lacking proper training and supervision. Early-career family physicians migrated to gain more work experience, finding their roles at home less challenging and hindered by financial and legal constraints that limited their ability to provide comprehensive, multidisciplinary care.

Personal reasons for migrating, such as wanting to provide their family a better life and higher education for their children, were mentioned. Although financial stability was not the primary reason for migration, it significantly influenced their decisions. Higher pay was associated with improving their family's quality of life, allowing them to work part-time and maintain a desirable work-life balance.

Some family physicians chose to migrate due to dissatisfaction with the political climate and living conditions of their home country. They felt undervalued and frustrated with the overall functioning of society. Corruption within and outside the healthcare system hindered their professional goals. Additionally, participants pointed out the poor organisation of healthcare, especially primary care. Despite years of effort in developing and educating within this system, they saw little progress and sought opportunities to work in a better-organised healthcare environment.

5.3.2. Reasons to stay or leave

Family physicians decided to stay or leave for professional and personal reasons, and due to the organisation of healthcare systems (Table 9). When migrating, some family physicians planned to return home, while others had no specific plans. Participants mentioned further professional development, a stimulating work environment, new career opportunities, and professional stability as reasons to stay. For some, the motivation to return home was driven by the prospect of opening and developing their practice.

Family was a crucial factor in their decision to stay or to leave. Overall satisfaction with life in the new country, including their children's education and social network, played a significant role. Some family physicians decided or planned to return home to be closer to their families or for their children's future.

Participants who had not yet decided also noted that family could be a potential reason for them to return eventually.

Satisfaction or dissatisfaction with the living environment was also a key reason to stay or leave. Once settled into a new life, leaving was challenging. A well-established network of social institutions, such as social security and education, significantly contributed to satisfaction in the countries they migrated to. Participants noted that some countries are more family-friendly, making working part-time and achieving a more manageable work-life balance possible. The migration process, especially with a family, was described as challenging and stressful, making participants reluctant to go through it again.

For some participants, financial considerations influenced their decision. Returning home could have jeopardised their newly achieved financial stability and standard of living, which provided a better work-life balance and prospects. Financial investments made in the new country also complicated leaving. Some participants encountered financial obstacles when planning to return to their home country, forcing them to migrate elsewhere.

Satisfaction with the organisation and stability of the healthcare system were important reasons for staying. The organisation of healthcare, particularly primary care, and the working environment for family physicians significantly influenced their decisions. Negative attitudes towards emigrated physicians also deterred them from returning home. Some participants noted that little had changed or that the primary care situation had worsened in their home country during their time abroad, discouraging their return. While most were satisfied with the working conditions in the new country, a positive change in primary care or the opportunity to help improve their home country's system might motivate them to return. Family physicians also faced professional challenges regarding recertification and speciality recognition when returning to their home country.

6. DISCUSSION

The shortage of family physicians is a complex issue influenced by various factors, including the career intentions of medical students and newly qualified family physicians and the migration of family physicians. Our research aimed to explore these topics together to understand these phenomena better and seek possible solutions.

The findings highlight the importance of medical students' exposure to family medicine during medical studies and having family physicians as role models. These also emphasise the need for improvements in training programs, particularly in preparing family physicians for the management aspects of running a practice and working with a patient list. Moreover, this study underscores the importance of policy changes and better funding to support family physicians, addressing issues like poor working conditions, inadequate remuneration and lack of recognition. Emphasising work-life balance and career flexibility is vital for creating sustainable career paths, reducing burnout, and enhancing job satisfaction among future and current family physicians.

6.1. Medical students' career intentions

In this study, 11.2% of students from Hungary, 15.4% from Estonia and 25.2% from Belgium (Flanders) considered family medicine a top choice. These are consistent with previous evidence showing that interest in family medicine among medical students varies widely (Deutsch et al., 2015; Kiolbassa et al., 2011; Leutritz et al., 2024; Mariolis et al., 2007; Sinclair et al., 2006). Low or high interest in specific specialities during medical studies often predicts the final speciality choice, with students rarely switching to the speciality they have low interest in later (Curran & Rourke, 2004). There may be several reasons why students from these three countries have different interests in family medicine. This discrepancy is not solely due to the strength of primary care, as Estonia and Belgium have strong primary care systems (Kringos et al., 2015). Economic factors, such as higher remuneration for Belgian family physicians compared to Estonia and Hungary, can play a significant role (Kringos et al., 2015; Kringos et al., 2013; OECD, 2023a). Also, Belgium has the highest proportion of family physicians (120.4 per 100,000 inhabitants), compared to Estonia (86.9 per 100,000) and Hungary (66.8 per 100,000) (Eurostat, 2024). This may indicate that people have closer contact with family physicians, and the profession is more valued in society.

In this study, the strongest predictor of interest in family medicine was having a family physician as a role model. This aligns with previous studies, which have shown that positive role models in family medicine and positive experiences in the field (Barber et al., 2018; Leutritz et al., 2024; Nicholson et al., 2016; Shadbolt & Bunker, 2009; Soethout et al., 2008), particularly early in medical studies (Soethout et al., 2004), are associated with a higher likelihood of choosing a

career in family medicine. Conversely, negative experiences deter students from this career path (Barber et al., 2018; Nicholson et al., 2016).

While some studies have identified a strong link between being a woman and choosing a career in family medicine (Bennett et al., 2010; Cleland et al., 2014; Shadbolt & Bunker, 2009), other research (Buddeberg-Fischer et al., 2010; Deutsch et al., 2015; Maiorova et al., 2010), including ours, has found that this relationship diminishes when other factors related to the future speciality are considered. This indicates that gender's role is contextual; it appears significant at first but loses its influence when analysed alongside other variables, suggesting its impact is intertwined with other factors. Previous studies also indicate that differences may influence any gender effect in work-related values and motivation between genders (Cleland et al., 2012; Heiligers, 2012).

This study's findings indicate that 6th-year medical students are most interested in family medicine, with no significant correlation to age alone. Previous studies have shown that the decision to pursue a career as a family physician often occurs later in medical education (Chellappah & Garnham, 2014), during advanced age (Smith et al., 2015; Kiolbassa et al., 2011; Scott et al., 2011), or early postgraduate training (Buddeberg-Fischer et al., 2010). Several aspects of medical education can explain this. By their final year, students have been exposed to various specialities and may better understand the crucial role of primary care and family physicians in the healthcare system. Additionally, clinical rotations in family medicine, which typically occur in the final years (University of Tartu, i.a.), can positively influence students' perceptions, especially with positive mentorship and role model experiences. A Dutch study also highlighted that the importance of work-life balance becomes more significant in later stages of undergraduate studies (Maiorova et al., 2008), and many medical students believe that a career in family medicine offers a better quality of life compared to hospital specialities (Cleland et al., 2014; Dorsey et al., 2005; Merrett et al., 2017; Scott et al., 2011; Van der Horst et al., 2010; Zinn et al., 2001).

The study findings align with previous studies regarding factors influencing speciality choice. Career post availability can significantly impact physicians' career decisions (Spooner et al., 2017). Consistent with other research, medical students interested in family medicine value continuity of care (Buddeberg-Fischer et al., 2011; Sinclair et al., 2006; Soethout et al., 2004; Spooner et al., 2017) and close long-term relationships with patients and their family members (Kiolbassa et al., 2011; Sinclair et al., 2006). Work-life balance and flexible working conditions are crucial factors for medical students and newly qualified physicians when choosing a speciality (Chellappah & Garnham, 2014; Cleland et al., 2012; Dorsey et al., 2005; Lambert et al., 2017; Leutritz et al., 2024; Merrett et al., 2017; Van der Horst et al., 2010; Zinn et al., 2001), further favouring family medicine (Cleland et al., 2014; Merrett et al., 2017; Nicholson et al., 2016). Interestingly, some studies report that aversion to hospital environments and highly specialised medicine drives some students to pursue family medicine (Buddeberg-Fischer et al., 2011; Sinclair et al., 2006). Some studies have reported that students may prefer family medicine due to the opportunity to work in a team

(Buddeberg-Fischer et al., 2011; Sinclair et al., 2006). However, since family physicians in Estonia and Hungary work primarily in solo practices (Kasekamp et al., 2023; Kringos et al., 2015), in this study, working in teams was viewed as a characteristic of hospital specialities.

6.2. Early-career family physicians' career intentions in Estonia

This study emphasises that early-career family physicians often prioritise work compatible with their desired lifestyle and value work-life balance over income and career advancement, regardless of gender. These findings align with existing research from Europe and Canada (Beaulieu et al., 2006; Dale et al., 2017; Gisler et al., 2017; Grudniewicz et al., 2023; Lloyd & Leese, 2006; Lu et al., 2008; Smith et al., 2015; Spooner et al., 2017; Spooner et al., 2019). As was also observed in this study, such a preference leads many to start their careers as locums or employees, with plans to become practice owners or co-owners later (Beaulieu et al., 2006; Gisler et al., 2017; Grudniewicz et al., 2023; Dale et al., 2017; Lloyd & Leese, 2006; Lu et al., 2008; Spooner et al., 2019).

Early-career family physicians who participated in this study felt unprepared for the non-clinical tasks of family physicians' work. The impact of the family medicine training program content and training experiences on career intentions was similarly described among family physicians in the UK, Belgium and France. Feeling unprepared for the management tasks of family medicine practice can deter early-career family physicians from taking on these responsibilities (Beaulieu et al., 2006; Kinouani et al., 2016; Spooner et al., 2019). This led early-career family physicians to seek workplaces that offer work-life balance and shared non-clinical tasks, for example, as a form of group practice. Consistent with our findings, young family physicians in Switzerland prefer to work in the future in a small family physicians-owned group practice (Gisler et al., 2017). Previous studies also have emphasised the importance of working conditions when choosing a workplace and their influence on career intentions (Geneau et al., 2007; Gisler et al., 2017; Kinouani et al., 2016; Scott, 2001; Van Ham et al., 2006), having, in some studies, a more significant impact than remuneration (Kinouani et al., 2016).

6.3. Family physicians' migration in Europe

Many studies attempt to explain physicians' migration by using the concepts of push, pull, and plant factors. This study focused more on the migratory phases: migrating, staying, or leaving. This study's specific reasons for migration reappeared throughout these phases and can be viewed simultaneously as pull, push, or plant factors. Greater career and training opportunities, better working and living conditions, higher pay, and political instability were identified as the

main reasons for family physicians' migration, as in previous studies (Aluttis et al., 2014; Buchan et al., 2014; Humphries et al., 2015; Klein et al., 2009; OECD, 2023a; Wright et al., 2008).

This study also explored the reasons physicians decide to return or migrate further. These reasons correspond to the same reasons they migrated in the first place. Once emigrated family physicians found what they sought in the new country, their wish to return or migrate further diminished. Consistent with previous studies, family and better career opportunities at home were mentioned as potential reasons to return. When studying physician migration from the UK to New Zealand, Gauld and Horsburgh (2015) found that many migrated physicians do not plan to stay in New Zealand and want to leave at some point. Physicians who planned to return to the UK migrated for a better quality of life, better working conditions, and career opportunities, and 'pull' to home and family was mentioned as a reason to return (Gauld & Horsburgh, 2015). Family as the main reason for return was also mentioned in other studies (Buchan et al., 2014; Humphries et al., 2015). Even if this study's participants think of returning at some point, several obstacles were mentioned. Among others, difficulties with re-entry and recertification after a time abroad or the fear of facing the same problems they once fled were mentioned. According to Sharma et al. (2012), facilitating re-entry would increase the likelihood of UK physicians returning after migration. Some family physicians who want to migrate further seem to be influenced by the same professional and personal reasons that first led them to migrate (Brugh et al., 2016; Gauld & Horsburgh, 2015). In our study, family physicians from Eastern Europe were overrepresented compared to those from Western Europe. This may be related to previous literature that indicates physicians often migrate from lower-income to higher-income countries (Esmail et al., 2017; McAleese et al., 2016; Petterson et al., 2015; Schumann et al., 2019; Wright et al., 2008).

Although literature emphasises the importance of retention strategies to address physician shortages caused by migration, few studies offer specific strategies. McAleese et al. (2016) argued that developing retention strategies is necessary to stop countries' need to recruit physicians actively. Understanding why physicians migrate could contribute to much-needed policy changes (Gauld & Horsburgh, 2015; Taderera, 2021). These solutions must be multifaceted and comprehensive; otherwise, they will not have an impact. For example, Ireland has implemented national retention measures since 2014 (Department of Health, Ireland, 2014; 2019). Still, it has failed to address stressful working conditions and unsatisfactory training effectively and has had little impact on physician migration (Brugha et al., 2021). Also, improved home-country economic conditions alone may not decrease physician emigration (Humphries et al., 2019).

There are factors contributing to migration and the wish to stay in a country instead of returning, mainly personal factors, which policymakers cannot do much about. Other factors, like higher pay, better working conditions and career opportunities, facilitation of re-entry after being away for a longer time, and overall improvement of primary care and healthcare systems, could contribute to

the retention of family physicians and even the return of emigrated family physicians. As Brugha et al. (2021) concluded, no solution alone can solve the problem of physicians' migration, and a comprehensive set of strategies is needed to cover different aspects.

6.4. Strengths and limitations

The strengths of the studies discussed here mainly relate to their comprehensive design and methodological rigour, incorporating both qualitative and quantitative approaches. All studies were designed with previous research and results in mind. The medical students' career intentions questionnaire was based on a prior pilot study (Vajer et al., 2019) and reviewed by an expert panel. Both qualitative studies were designed with the help of qualified specialists. Multiple formal digital channels were used to recruit participants to reach a broad target group. All eligible volunteers with informed consent were included in the studies. The questionnaire and interview guides covered an extensive range of subtopics. Researchers involved in all the studies mainly had backgrounds in family medicine and a good overview of the study topics. The involvement of researchers with backgrounds in family medicine ensured a good understanding of the study topics. Efforts to avoid bias, such as conducting interviews and analyses by multiple researchers, further strengthened the studies.

The main limitations of these studies are primarily related to the challenges posed by the COVID-19 pandemic, which negatively affected participant recruitment and potentially influenced responses. For medical students' career intentions, the data collection in Belgium (Flanders) had to be repeated, and fewer participants than planned were recruited for the migration study. As the focus of all these studies was not the impact of the COVID-19 pandemic on the family physician shortage, it is difficult to estimate how it may have affected results. Online data collection, including questionnaires and interviews, was both an advantage and a disadvantage, offering convenience and presenting challenges. Online questionnaires and interviews enabled easier data collection. During online interviews, some participants had connection issues that hindered participation.

A reliance on voluntary participation may have introduced selection bias, and the cross-sectional survey design about students' career intentions limits the ability to conclude causality. Additionally, using convenience samples in qualitative studies can restrict the generalizability of findings. The viewpoints of medical students, family physicians, and trainees who did not participate in these studies cannot be represented.

6.5. Implications for practice and future considerations

The results of the studies regarding medical students' and new family physicians' career intentions and reasons for family physicians' migration are comparable,

highlighting similar issues and potential solutions. These findings have practical implications for the organisers of medical education and healthcare, policymakers, and family physicians already working in education and healthcare.

Organisers of medical education

It is crucial to emphasise the essential role of family medicine in healthcare from the start of medical studies, ensuring students are well-informed about possible career opportunities. Early exposure is important to spark students' interest in family medicine. This interest is influenced by mandatory courses in family medicine and the duration of internships in this field.

It is essential for medical education to offer opportunities for students to interact with skilled family physicians who exemplify inspiring values through shadowing, clinical rotations, and case discussions. Also, more opportunities are needed for family physicians to improve their teaching and supervising skills. As the lack of recognition and respect for family physicians in education and healthcare can affect medical students' career intentions, increasing awareness among university teachers and supervisors about their impact on student career choices is vital.

Improving family medicine training programs and offering additional training for supervisors can better prepare future family physicians for their diverse roles. Early-career family physicians should have clinical and management skills for successful practice management.

Organisers of healthcare

Simplifying administrative processes and providing financial support for setting up a practice and managing a patient list could encourage early-career family physicians to take this career step earlier. Providing individualised support from experienced colleagues and governmental institutions can help early-career physicians feel less isolated and prevent burnout.

Healthcare organisations must adapt to physicians' growing demands for flexible working conditions, which can be challenging without supportive national regulations. It is necessary to discuss which flexible working conditions can be implemented at the primary care level and to create a favourable environment for their implementation. The existing work model for family physicians, where one physician owns their patient list and operates their centre, does not promote the establishment of flexible working conditions. National efforts and incentives should encourage the concentration of family physicians in group practices, as this allows for dividing or delegating non-clinical tasks and provides better opportunities for flexible work arrangements and short- and long-term replacement.

Policymakers

Migration is both a cause and a consequence of the shortage of family physicians. To minimise its impact, retention strategies such as financial incentives and support systems should be implemented nationally and internationally. Countries

can address the migration of family physicians driven by dissatisfaction with healthcare and primary care organisations and living conditions by improving postgraduate training, work conditions, and career opportunities, which can help retain domestically trained family physicians and encourage their return. Collaborative efforts between countries that rely on a migrant workforce and those that have lost highly specialised workers due to migration are needed to reduce disparities between countries and mitigate the brain drain from Eastern to Western Europe.

Continuing research

Further research into the timing and context of students' interactions with role models and the qualities they admire in these role models could enhance our understanding of how family physicians can be better supported in advocating for their speciality. Additionally, exploring why interest in family medicine varies across countries could provide valuable insights into strategies for increasing interest in this field. Further research with early-career family physicians who have left primary care or given up their practice and patient list could offer valuable insights into challenges later in their careers. Lastly, further research into evidence-based retention strategies for addressing family physician shortages is necessary.

7. CONCLUSIONS

1. Medical students' interest in family medicine as a future career depends considerably on their exposure to family medicine during their studies, with family physicians as role models playing the most impactful role.
2. Working with flexible conditions and achieving work-life balance drives the career decisions of future physicians and family physicians already working in healthcare.
3. Simplifying the process of establishing family medicine practice, managing a patient list, and improving working conditions, work culture, and healthcare organisation can encourage early-career family physicians to take this career step sooner and help prevent family physicians from leaving primary care or migrating to another country.
4. Family physicians decide to migrate mainly for personal and professional reasons, and these same reasons generally determine whether they decide to stay or leave, including returning to their home country. Facilitating the return can encourage migrated family physicians to go back home.

REFERENCES

Alumäe, T., Tilk, O., & Asadullah. (2018). Advanced Rich Transcription System for Estonian Speech. In *Human Language Technologies – The Baltic Perspective* (pp. 1–8). IOS Press. https://doi.org/10.3233/978-1-61499-912-6-1

Aluttis, C., Bishaw, T., & Frank, M. W. (2014). The workforce for health in a globalized context – global shortages and international migration. *Global Health Action*, *7*, 10.3402/gha.v7.23611. https://doi.org/10.3402/gha.v7.23611

Barber, S., Brettell, R., Perera-Salazar, R., Greenhalgh, T., & Harrington, R. (2018). UK medical students' attitudes towards their future careers and general practice: a cross-sectional survey and qualitative analysis of an Oxford cohort. *BMC Medical Education*, *18*(1), 160. https://doi.org/10.1186/s12909-018-1197-z

Beaulieu, M.-D., Dory, V., Pestiaux, D., Pouchain, D., Gay, B., Rocher, G., & Boucher, L. (2006). General practice as seen through the eyes of general practice trainees: A qualitative study. *Scandinavian Journal of Primary Health Care*, *24*(3), 174–180. https://doi.org/10.1080/02813430600795498

Beech, J., Fraser, C., Gardner, T., Buzelli, L., Williamson, S., & Alderwick, H. (2023). *Stressed and overworked: What the Commonwealth Fund's 2022 International Health Policy Survey of Primary Care Physicians in 10 Countries means for the UK*. The Health Foundation. https://doi.org/10.37829/HF-2023-P12

Bennett, K. L., & Phillips, J. P. (2010). Finding, Recruiting, and Sustaining the Future Primary Care Physician Workforce: A New Theoretical Model of Specialty Choice Process. *Academic Medicine*, *85*(10), S81. https://doi.org/10.1097/ACM.0b013e3181ed4bae

Bland, C. J., Meurer, L. N., & Maldonado, G. (1995). Determinants of primary care specialty choice: a non-statistical meta-analysis of the literature. *Academic Medicine*, *70*(7), 620. https://doi.org/0.1097/00001888-199507000-00013

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brennan, N., Langdon, N., Bryce, M., Burns, L., Humphries, N., Knapton, A., & Gale, T. (2023). Drivers and barriers of international migration of doctors to and from the United Kingdom: a scoping review. *Human Resources for Health*, *21*(1), 11. https://doi.org/10.1186/s12960-022-00789-y

Brugha, R., McAleese, S., Dicker, P., Tyrrell, E., Thomas, S., Normand, C., & Humphries, N. (2016). Passing through – reasons why migrant doctors in Ireland plan to stay, return home or migrate onwards to new destination countries. *Human Resources for Health*, *14*(1), 35. https://doi.org/10.1186/s12960-016-0121-z

Brugha, R., Clarke, N., Hendrick, L., & Sweeney, J. (2021). Doctor Retention: A Cross-sectional Study of How Ireland Has Been Losing the Battle. *International Journal of Health Policy and Management*, *10*(6), 299–309. https://doi.org/10.34172/ijhpm.2020.54

Buchan, J., & Perfilieva, G. (2006). *Health Worker Migration in the European Region: Country Case Studies and Policy Implications*. World Health Organization. https://iris.who.int/bitstream/handle/10665/347915/WHO-EURO-2006-3956-43715-61498-eng.pdf?sequence=1&isAllowed=y (06.02.2025)

Buchan, J., Wismar, M., Glinos, I. A., & Bremner, J. (2014). *Health professional mobility in a changing Europe: New dynamics, mobile individuals and diverse responses*. European Observatory on Health Systems and Policies. https://iris.who.int/bitstream/handle/10665/326372/9789289050258-eng.pdf (06.02.2025)

Buddeberg-Fischer, B., Stamm, M., Buddeberg, C., Bauer, G., Hämmig, O., Knecht, M., & Klaghofer, R. (2010). The impact of gender and parenthood on physicians' careers – professional and personal situation seven years after graduation. *BMC Health Services Research*, *10*(1), 40. https://doi.org/10.1186/1472-6963-10-40

Bursac, Z., Gauss, C. H., Williams, D. K., & Hosmer, D. W. (2008). Purposeful selection of variables in logistic regression. *Source Code for Biology and Medicine*, *3*(1), 17. https://doi.org/10.1186/1751-0473-3-17

Chellappah, M., & Garnham, L. (2014). Medical students' attitudes towards general practice and factors affecting career choice: a questionnaire study. *London Journal of Primary Care*, *6*(6), 117–123. https://doi.org/10.1080/17571472.2014.11494362

Cleland, J., Johnston, P. W., French, F. H., & Needham, G. (2012). Associations between medical school and career preferences in Year 1 medical students in Scotland. *Medical Education*, *46*(5), 473–484. https://doi.org/10.1111/j.1365-2923.2012.04218.x

Cleland, J. A., Johnston, P. W., Anthony, M., Khan, N., & Scott, N. W. (2014). A survey of factors influencing career preference in new-entrant and exiting medical students from four UK medical schools. *BMC Medical Education*, *14*(1), 151. https://doi.org/10.1186/1472-6920-14-151

Cohidon, C., Wild, P., & Senn, N. (2020). Job stress among GPs: associations with practice organisation in 11 high-income countries. *British Journal of General Practice*, *70*(698), e657–e667. https://doi.org/10.3399/bjgp20X710909

Cronin, F., Clarke, N., Hendrick, L., Conroy, R., & Brugha, R. (2019). The impacts of training pathways and experiences during intern year on doctor emigration from Ireland. *Human Resources for Health*, *17*(1), 74. https://doi.org/10.1186/s12960-019-0407-z

Curran, V., & Rourke, J. (2004). The role of medical education in the recruitment and retention of rural physicians. *Medical Teacher*, *26*(3), 265–272. https://doi.org/10.1080/01421590420000192055

Dacre, D. J., Woodhams, C., Atkinson, C., Laliotis, I., Williams, M., Blanden, J., Wild, S., & Brown, D. (2020). *Mend the Gap: The Independent Review into Gender Pay Gaps in Medicine in England*. Department of Health and Social Care. https://assets.publishing.service.gov.uk/media/5fd893a7e90e076631fb2286/Gender_pay_gap_in_medicine_review.pdf (06.02.2025)

Dale, J., Russell, R., Scott, E., & Owen, K. (2017). Factors influencing career intentions on completion of general practice vocational training in England: a cross-sectional study. *BMJ Open*, *7*(8), e017143. https://doi.org/10.1136/bmjopen-2017-017143

Department of Health, Ireland. (2014). *Strategic Review of Medical Training and Career Structure. Final Report*. Department of Health. https://www.gov.ie/pdf/?file=https://assets.gov.ie/67570/3b813d24dc0b4f51b73e6122448cbfeb.pdf (06.02.2025)

Department of Health, Ireland. (2019). *Strategic Review of Medical Training and Career Structure: Tenth Progress Report. February 2019 – July 2019*. Department of Health. https://www.gov.ie/pdf/?file=https://assets.gov.ie/67837/ef25ea1322f74672bfa1442d9ac3768b.pdf (06.02.2025)

Deutsch, T., Lippmann, S., Frese, T., & Sandholzer, H. (2015). Who wants to become a general practitioner? Student and curriculum factors associated with choosing a GP career – a multivariable analysis with particular consideration of practice-orientated GP courses. *Scandinavian Journal of Primary Health Care*, *33*(1), 47–53. https://doi.org/10.3109/02813432.2015.1020661

Dorsey, E. R., Jarjoura, D., & Rutecki, G. W. (2003). Influence of Controllable Lifestyle on Recent Trends in Specialty Choice by US Medical Students. *JAMA*, *290*(9), 1173–1178. https://doi.org/10.1001/jama.290.9.1173

Eley, D., Young, L., Shrapnel, M., Wilkinson, D., Baker, P., & Hegney, D. (2007). Medical students and rural general practitioners: Congruent views on the reality of recruitment into rural medicine. *Australian Journal of Rural Health*, *15*(1), 12–20. https://doi.org/10.1111/j.1440-1584.2007.00844.x

Esmail, A., Panagioti, M., & Kontopantelis, E. (2017). The potential impact of Brexit and immigration policies on the GP workforce in England: a cross-sectional observational study of GP qualification region and the characteristics of the areas and population they served in September 2016. *BMC Medicine*, *15*(1), 191. https://doi.org/10.1186/s12916-017-0953-y

European Commission. (2013). *Modernisation of the Professional Qualifications Directive – frequently asked questions*. https://ec.europa.eu/commission/presscorner/api/files/document/print/en/memo_13_867/MEMO_13_867_EN.pdf (06.02.2025)

European Institute for Gender Equality. (2021). *Gender differences on household chores entrenched from childhood*. Gender Equality Index 2021: Health. https://eige.europa.eu/sites/default/files/documents/gender_equality_index_2021_health.pdf (06.02.2025)

Eurostat. (2024). *Healthcare personnel statistics- physicians: Statistics Explained* (p. 10). European Union. https://ec.europa.eu/eurostat/statistics-explained/SEPDF/cache/37382.pdf (06.02.2025)

Gauld, R., & Horsburgh, S. (2015). What motivates doctors to leave the UK NHS for a "life in the sun" in New Zealand; and, once there, why don't they stay? *Human Resources for Health*, *13*(1), 75. https://doi.org/10.1186/s12960-015-0069-4

Geneau, R., Lehoux, P., Pineault, R., & Lamarche, P. A. (2007). Primary care practice à la carte among GPs: using organizational diversity to increase job satisfaction. *Family Practice*, *24*(2), 138–144. https://doi.org/10.1093/fampra/cml073

Gisler, L. B., Bachofner, M., Moser-Bucher, C. N., Scherz, N., & Streit, S. (2017). From practice employee to (co-)owner: young GPs predict their future careers: a cross-sectional survey. *BMC Family Practice*, *18*(1), 12. https://doi.org/10.1186/s12875-017-0591-7

Grudniewicz, A., Randall, E., Lavergne, M. R., Marshall, E. G., Jones, L., Rudoler, D., Horrey, K., Mathews, M., McKay, M., Mitra, G., Scott, I., Snadden, D., Wong, S. T., & Goldsmith, L. J. (2023). Factors influencing practice choices of early-career family physicians in Canada: a qualitative interview study. *Human Resources for Health*, *21*(1), 84. https://doi.org/10.1186/s12960-023-00867-9

Hammarberg, K., Kirkman, M., & de Lacey, S. (2016). Qualitative research methods: when to use them and how to judge them. *Human Reproduction*, *31*(3), 498–501. https://doi.org/10.1093/humrep/dev334

Hann, M., Reeves, D., & Sibbald, B. (2011). Relationships between job satisfaction, intentions to leave family practice and actually leaving among family physicians in England. *European Journal of Public Health*, *21*(4), 499–503. https://doi.org/10.1093/eurpub/ckq005

Heiligers, P. J. (2012). Gender differences in medical students' motives and career choice. *BMC Medical Education*, *12*(1), 82. https://doi.org/10.1186/1472-6920-12-82

Hobbs, F. D. R., Bankhead, C., Mukhtar, T., Stevens, S., Perera-Salazar, R., Holt, T., & Salisbury, C. (2016). Clinical workload in UK primary care: a retrospective analysis

of 100 million consultations in England, 2007–14. *The Lancet*, *387*(10035), 2323–2330. https://doi.org/10.1016/S0140-6736(16)00620-6

Humphries, N., McAleese, S., Matthews, A., & Brugha, R. (2015). 'Emigration is a matter of self-preservation. The working conditions . . . are killing us slowly': qualitative insights into health professional emigration from Ireland. *Human Resources for Health*, *13*(1), 35. https://doi.org/10.1186/s12960-015-0022-6

Humphries, N., Crowe, S., McDermott, C., McAleese, S., & Brugha, R. (2017). The consequences of Ireland's culture of medical migration. *Human Resources for Health*, *15*(1), 87. https://doi.org/10.1186/s12960-017-0263-7

Humphries, N., Connell, J., Negin, J., & Buchan, J. (2019). Tracking the leavers: towards a better understanding of doctor migration from Ireland to Australia 2008–2018. *Human Resources for Health*, *17*(1), 36. https://doi.org/10.1186/s12960-019-0365-5

Kallio, H., Pietilä, A.-M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, *72*(12), 2954–2965. https://doi.org/10.1111/jan.13031

Kasekamp, K., Habicht, T., Võrk, A., Köhler, K., Reinap, M., Kahur, K., Laarmann, H., & Litvinova, Y. (2023). Estonia: health system review. *Health Systems in Transition*, *25*(5). https://iris.who.int/bitstream/handle/10665/374315/9789289059527-eng.pdf?sequence=2&isAllowed=y (06.02.2025)

Kinouani, S., Boukhors, G., Luaces, B., Durieux, W., Cadwallader, J.-S., Aubin-Auger, I., & Gay, B. (2016). Private or salaried practice: how do young general practitioners make their career choice? A qualitative study. *BMC Medical Education*, *16*(1), 231. https://doi.org/10.1186/s12909-016-0754-6

Kiolbassa, K., Miksch, A., Hermann, K., Loh, A., Szecsenyi, J., Joos, S., & Goetz, K. (2011). Becoming a general practitioner – Which factors have most impact on career choice of medical students? *BMC Family Practice*, *12*(1), 25. https://doi.org/10.1186/1471-2296-12-25

Kitzinger, J. (1994). The methodology of Focus Groups: the importance of interaction between research participants. *Sociology of Health & Illness*, *16*(1), 103–121. https://doi.org/10.1111/1467-9566.ep11347023

Klein, D., Hofmeister, M., Lockyer, J., Crutcher, R., & Fidler, H. (2009). Push, Pull, and Plant: The Personal Side of Physician Immigration to Alberta, Canada. *International Family Medicine*, *41*(3), 197–201. PMID: 19259842

Kovacs, E., Schmidt, A. E., Szocska, G., Busse, R., McKee, M., & Legido-Quigley, H. (2014). Licensing procedures and registration of medical doctors in the European Union. *Clinical Medicine*, *14*(3), 229–238. https://doi.org/10.7861/clinmedicine.14-3-229

Kringos, D., Boerma, W., Bourgueil, Y., Cartier, T., Dedeu, T., Hasvold, T., Hutchinson, A., Lember, M., Oleszczyk, M., Pavlic, D. R., Svab, I., Tedeschi, P., Wilm, S., Wilson, A., Windak, A., Zee, J. V. der, & Groenewegen, P. (2013). The strength of primary care in Europe: an international comparative study. *British Journal of General Practice*, *63*(616), e742–e750. https://doi.org/10.3399/bjgp13X674422

Kringos, D. S., Boerma, W. G. W., Hutchinson, A., & Saltman, R. B. (Eds.). (2015). *Building primary care in a changing Europe: Case studies*. European Observatory on Health Systems and Policies. http://www.ncbi.nlm.nih.gov/books/NBK459010/ (06.02.2025)

Kuusio, H., Lämsä, R., Aalto, A.-M., Manderbacka, K., Keskimäki, I., & Elovainio, M. (2014). Inflows of foreign-born physicians and their access to employment and work

experiences in health care in Finland: qualitative and quantitative study. *Human Resources for Health*, *12*(1), 41. https://doi.org/10.1186/1478-4491-12-41

Lambert, T. W., Smith, F., & Goldacre, M. J. (2017). Trends in attractiveness of general practice as a career: surveys of views of UK-trained doctors. *The British Journal of General Practice*, *67*(657), e238–e247. https://doi.org/10.3399/bjgp17X689893

Lee, E. S. (1966). A theory of migration. *Demography*, *3*(1), 47–57. https://doi.org/10.2307/2060063

Leemet, A., & Mets, U. (2024). *Tulevikuvaade tööjõu- ja oskuste vajadusele: perearstiabi*. SA Kutsekoda. https://uuringud.oska.kutsekoda.ee/uuringud/perearstiabi#ptk-7 (06.02.2025)

Leutritz, T., Krauthausen, M., Simmenroth, A., & König, S. (2024). Factors associated with medical students' career choice in different specialties: a multiple cross-sectional questionnaire study at a German medical school. *BMC Medical Education*, *24*(1), 798. https://doi.org/10.1186/s12909-024-05751-1

Ling, K., & Belcher, P. (2014). Medical migration within Europe: opportunities and challenges. *Clinical Medicine*, *14*(6), 630–632. https://doi.org/10.7861/clinmedicine.14-6-630

Lloyd, J. R., & Leese, B. (2006). Career intentions and preferences of GP registrars in Yorkshire. *The British Journal of General Practice*, *56*(525), 280–282. PMID: 16611517

Lu, D. J., Hakes, J., Bai, M., Tolhurst, H., & Dickinson, J. A. (2008). Rural intentions factors affecting the career choices of family medicine graduates. *Canadian Family Physician*, *54*(7), 1016-1017.e5. PMID: 18625827

Maiorova, T., Stevens, F., van der Zee, J., Boode, B., & Scherpbier, A. (2008). Shortage in general practice despite the feminisation of the medical workforce: a seeming paradox? A cohort study. *BMC Health Services Research*, *8*(1), 262. https://doi.org/10.1186/1472-6963-8-262

Marchand, C., & Peckham, S. (2017). Addressing the crisis of GP recruitment and retention: a systematic review. *British Journal of General Practice*, *67*(657), e227–e237. https://doi.org/10.3399/bjgp17X689929

Mariolis, A., Mihas, C., Alevizos, A., Gizlis, V., Mariolis, T., Marayiannis, K., Tountas, Y., Stefanadis, C., Philalithis, A., & Creatsas, G. (2007). General Practice as a career choice among undergraduate medical students in Greece. *BMC Medical Education*, *7*(1), 15. https://doi.org/10.1186/1472-6920-7-15

McAleese, S., Clyne, B., Matthews, A., Brugha, R., & Humphries, N. (2016). Gone for good? An online survey of emigrant health professionals using Facebook as a recruitment tool. *Human Resources for Health*, *14*(1), 34. https://doi.org/10.1186/s12960-016-0130-y

McPake, B., Scott, A., & Edoka, I. (2014). *Analyzing markets for health workers: insights from labor and health economics*. International Bank for Reconstruction and Development / The World Bank. https://documents1.worldbank.org/curated/en/787041468155118598/pdf/Analyzing-markets-for-health-workers-insights-from-labor-and-health-economics.pdf (06.02.2025)

Merrett, A., Jones, D., Sein, K., Green, T., & Macleod, U. (2017). Attitudes of newly qualified doctors towards a career in general practice: a qualitative focus group study. *The British Journal of General Practice*, *67*(657), e253–e259. https://doi.org/10.3399/bjgp17X690221

National Institute for Health Development. (2023). *Health statistics and health research database. Health care resources and their use: Health care personnel 2023*.

https://statistika.tai.ee/pxweb/en/Andmebaas/Andmebaas__04THressursid__05Tootajad/?tablelist=true (06.02.2025)
Nicholson, S., Hastings, A. M., & McKinley, R. K. (2016). Influences on students' career decisions concerning general practice: a focus group study. *British Journal of General Practice*, *66*(651), e768–e775. https://doi.org/10.3399/bjgp16X687049
O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for Reporting Qualitative Research: A Synthesis of Recommendations. *Academic Medicine*, *89*(9), 1245. https://doi.org/10.1097/ACM.0000000000000388
OECD. (2020). *Realising the Potential of Primary Health Care*. OECD Health Policy Studies. https://doi.org/10.1787/a92adee4-en
OECD. (2023a). *Health at a Glance 2023: OECD Indicators*. OECD. https://www.oecd.org/en/publications/health-at-a-glance-2023_7a7afb35-en/full-report.html (06.02.2025)
OECD. (2023b). *Ready for the Next Crisis? Investing in Health System Resilience*. OECD Health Policy Studies. https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/02/ready-for-the-next-crisis-investing-in-health-system-resilience_a8424ec8/1e53cf80-en.pdf (06.02.2025)
Ognyanova, D., Maier, C. B., Wismar, M., Girasek, E., & Busse, R. (2012). Mobility of health professionals pre and post 2004 and 2007 EU enlargements: Evidence from the EU project PROMeTHEUS. *Health Policy*, *108*(2), 122–132. https://doi.org/10.1016/j.healthpol.2012.10.006
Petterson, S. M., Liaw, W. R., Tran, C., & Bazemore, A. W. (2015). Estimating the Residency Expansion Required to Avoid Projected Primary Care Physician Shortages by 2035. *Annals of Family Medicine*, *13*(2), 107–114. https://doi.org/10.1370/afm.1760
Pfarrwaller, E., Sommer, J., Chung, C., Maisonneuve, H., Nendaz, M., Junod Perron, N., & Haller, D. M. (2015). Impact of Interventions to Increase the Proportion of Medical Students Choosing a Primary Care Career: A Systematic Review. *Journal of General Internal Medicine*, *30*(9), 1349–1358. https://doi.org/10.1007/s11606-015-3372-9
Pfarrwaller, E., Audétat, M.-C., Sommer, J., Maisonneuve, H., Bischoff, T., Nendaz, M., Baroffio, A., Junod Perron, N., & Haller, D. M. (2017). An Expanded Conceptual Framework of Medical Students' Primary Care Career Choice. *Academic Medicine*, *92*(11), 1536. https://doi.org/10.1097/ACM.0000000000001676
Rachoin, J.-S., Vilceanu, M. O., Franzblau, N., Gordon, S., & Cerceo, E. (2023). How often do medical students change career preferences over the course of medical school? *BMC Medical Education*, *23*(1), 596. https://doi.org/10.1186/s12909-023-04598-2
Riigikontroll. (2020). *Esmatähtsate avalike teenuste tulevik*. Riigikontroll. https://www.riigiteataja.ee/aktilisa/3131/1202/0003/RK_11112020_ettek.pdf (06.02.2025)
Rummo, T.-L. (2022). *Tervishoiutöötajate palk 2022 | Tervise Arengu Instituut*. Tervise Arengu Instituut. https://www.tai.ee/sites/default/files/2022-12/Tervishoiutootajate_palk_2022.pdf (06.02.2025)
Sandvik, H., Hetlevik, Ø., Blinkenberg, J., & Hunskaar, S. (2022). Continuity in general practice as predictor of mortality, acute hospitalisation, and use of out-of-hours care: a registry-based observational study in Norway. *The British Journal of General Practice: The Journal of the Royal College of General Practitioners*, *72*(715), e84–e90. https://doi.org/10.3399/BJGP.2021.0340
Schumann, M., Maaz, A., & Peters, H. (2019). Doctors on the move: a qualitative study on the driving factors in a group of Egyptian physicians migrating to Germany. *Globalization and Health*, *15*(1), 2. https://doi.org/10.1186/s12992-018-0434-x

Scott, A. (2001). Eliciting GPs' preferences for pecuniary and non-pecuniary job characteristics. *Journal of Health Economics*, *20*(3), 329–347. https://doi.org/10.1016/S0167-6296(00)00083-7

Scott, I., Gowans, M., Wright, B., Brenneis, F., Banner, S., & Boone, J. (2011). Determinants of choosing a career in family medicine. *CMAJ: Canadian Medical Association Journal*, *183*(1), E1–E8. https://doi.org/10.1503/cmaj.091805

Shadbolt, N., & Bunker, J. (2009). Choosing general practice: A review of career choice determinants. *Australian Family Physician*, *38*(1), 53–55. PMID: 19283237

Sharma, A., Lambert, T. W., & Goldacre, M. J. (2012). Why UK-trained doctors leave the UK: cross-sectional survey of doctors in New Zealand. *Journal of the Royal Society of Medicine*, *105*(1), 25–34. https://doi.org/10.1258/jrsm.2011.110146

Sinclair, H. K., Ritchie, L. D., & Lee, A. J. (2006). A future career in general practice? A longitudinal study of medical students and pre-registration house officers. *European Journal of General Practice*, *12*(3), 120–127. https://doi.org/10.1080/13814780600780833

Smith, F., Lambert, T. W., & Goldacre, M. J. (2015). Factors influencing junior doctors' choices of future specialty: trends over time and demographics based on results from UK national surveys. *Journal of the Royal Society of Medicine*, *108*(10), 396–405. https://doi.org/10.1177/0141076815599674

Soethout, M. B. M., ten Cate, Th. J., & van der Wal, G. (2004). Factors Associated with the Nature, Timing and Stability of the Specialty Career Choices of Recently Graduated Doctors in European Countries, a Literature Review. *Medical Education Online*, *9*(1), 4360. https://doi.org/10.3402/meo.v9i.4360

Soethout, M. B. M., Heijmans, M. W., & Cate, O. T. J. ten. (2008). Career preference and medical students' biographical characteristics and academic achievement. *Medical Teacher*, *30*(1), E15–E22. https://doi.org/10.1080/01421590701759614

Spooner, S., Pearson, E., Gibson, J., & Checkland, K. (2017). How do workplaces, working practices and colleagues affect UK doctors' career decisions? A qualitative study of junior doctors' career decision making in the UK. *BMJ Open*, *7*(10), e018462. https://doi.org/10.1136/bmjopen-2017-018462

Spooner, S., Laverty, L., & Checkland, K. (2019). The influence of training experiences on career intentions of the future GP workforce: a qualitative study of new GPs in England. *British Journal of General Practice*, *69*(685), e578–e585. https://doi.org/10.3399/bjgp19X703877

Starfield, B., Shi, L., & Macinko, J. (2005). Contribution of Primary Care to Health Systems and Health. *The Milbank Quarterly*, *83*(3), 457–502. https://doi.org/10.1111/j.1468-0009.2005.00409.x

Studerus, L., Ahrens, R., Häuptle, C., Goeldlin, A., & Streit, S. (2018). Optional part-time and longer GP training modules in GP practices associated with more trainees becoming GPs – a cohort study in Switzerland. *BMC Family Practice*, *19*(1), 5. https://doi.org/10.1186/s12875-017-0706-1

Taderera, B. H. (2021). Doctor Retention in Ireland – What it may mean for the Global Health Workforce Reform Agenda; Comment on "Doctor Retention: A Cross-sectional Study of How Ireland Has Been Losing the Battle". *International Journal of Health Policy and Management*, *10*(10), 647–649. https://doi.org/10.34172/ijhpm.2020.126

Talib, Z., Jewers, M. M., Strasser, J. H., Popiel, D. K., Goldberg, D. G., Chen, C., Kepley, H., Mullan, F., & Regenstein, M. (2018). Primary Care Residents in Teaching Health

Centers: Their Intentions to Practice in Underserved Settings After Residency Training. *Academic Medicine*, *93*(1), 98. https://doi.org/10.1097/ACM. 0000000000001889

University of Tartu. (i.a.). *Medicine: Integrated bachelor's and master's studies*. Medicine. https://ut.ee/en/curriculum/medicine (06.02.2025)

Vajer, P., Jarmohammed, J., Velgan, M., Ficzere, F., Torzsa, P., Kalda, R., & Michels, N. (2019). A multi-country study on students' career choices: towards a balance between the need for general practitioners and what students choose. *Education for Primary Care*, *30*(3), 186–187. https://doi.org/10.1080/14739879.2019.1600045

Van Der Horst, K., Siegrist, M., Orlow, P., & Giger, M. (2010). Residents' reasons for specialty choice: influence of gender, time, patient and career. *Medical Education*, *44*(6), 595–602. https://doi.org/10.1111/j.1365-2923.2010.03631.x

Van Ham, I., Verhoeven, A. A. H., Groenier, K. H., Groothoff, J. W., & De Haan, J. (2006). Job satisfaction among general practitioners: A systematic literature review. *European Journal of General Practice*, *12*(4), 174–180. https://doi.org/10.1080/13814780600994376

Vergouw, D., Heiligers, P., & Batenburg, R. (2015). *De Keuzemonitor Geneeskunde: Een nationaal en longitudinaal meetinstrument voor het volgen van specialisatievoorkeuren en het ondersteunen van specialisatiekeuzen van geneeskundestudenten in Nederland*. NIVEL. https://www.nivel.nl/sites/default/files/bestanden/keuzemonitor_geneekunde_2015.pdf (06.02.2025)

WHO. (i.a.). *Primary health care*. https://www.who.int/health-topics/primary-health-care#tab=tab_1 (06.02.2025)

WHO. (1978). *Declaration of Alma-Ata*. World Health Organization. https://iris.who.int/bitstream/handle/10665/347879/WHO-EURO-1978-3938-43697-61471-eng.pdf?sequence=1 (06.02.2025)

WHO Regional Office for Europe. (i.a.). *WHO/Europe Countries*. https://who-sandbox.squiz.cloud/en/countries (06.02.2025)

WHO Regional Office for Europe. (2022). *Health and care workforce in Europe: time to act*. WHO. https://www.who.int/europe/publications/i/item/9789289058339 (06.02.2025)

Wright, D., Flis, N., & Gupta, M. (2008). The 'Brain Drain' of physicians: historical antecedents to an ethical debate, c. 1960–79. *Philosophy, Ethics, and Humanities in Medicine*, *3*(1), 24. https://doi.org/10.1186/1747-5341-3-24

Zinn, W. M., Sullivan, A. M., Zotov, N., Peters, A. S., Connelly, M. T., Singer, J. D., & Block, S. D. (2001). The Effect of Medical Education on Primary Care Orientation: Results of Two National Surveys of Students' and Residents' Perspectives. *Academic Medicine*, *76*(4), 355. https://doi.org/10.1097/00001888-200104000-00014

SUMMARY IN ESTONIAN

Perearstide puuduse põhjused Eestis ja Euroopas: eriala- ja karjäärivalikud ning perearstide migratsioon

Sissejuhatus

Perearstide puudus on paljude riikide tervishoiusüsteemi ohustav probleem, mis vajab konkreetseid lahendusi ja sekkumisi. WHO Alma-Ata deklaratsioonis tähtsustati perearstiabi kui inimeste esmast ja kodulähedast kokkupuudet riikliku tervishoiusüsteemiga (WHO, 1978). On tõestatud, et hästi korraldatud esmatasand aitab ennetada kroonilisi haigusi ja enneaegset surma ning vähendada ebavajalikke tervishoiukulutusi. Erinevalt eriarstiabist seostatakse perearstiabi ka tervishoiuressursside õiglase jaotumisega elanikkonnarühmade vahel (Starfield et al., 2005). Elanikkonna vananemine ning sagedam kroonilistesse haigustesse haigestumine raskendab piisava ja kvaliteetse arstiabi tagamist. Tervishoiusüsteeme on võimalik muuta tõhusamaks, tulemuslikumaks ja õiglasemaks, keskendudes perearstiabi kättesaadavuse parandamisele, eriti neile inimestele, kellel on keerulisemad vajadused (OECD, 2020).

Selleks, et perearstiabi toimiks ja oleks inimestele kättesaadav, on vaja piisavalt personali, sealhulgas perearste. OECD andmetel on viimasel kümnendil arstide üldarv suurenenud pea kõikides riikides, kuid perearstide hulk on jäänud samaks või isegi vähenenud. 2021. aastal moodustasid perearstid alla veerandi (23%) kõikidest OECD riikide arstidest (OECD, 2023). Tervise Arengu Instituudi andmetel oli 2023. aastal Eestis kokku 4772 arsti, kellest 939 (19,7%) olid perearstid. Kui arstide üldarv on viimastel aastatel Eestis kasvanud, siis perearstide arv on vähenenud. Lisaks oli 2023. aastal Eesti perearstide keskmine vanus (56,1 aastat) suurem võrreldes kõikide arstide keskmise vanusega (50,6 aastat), kusjuures üle 65-aastaste perearstide hulk on viimasel kümnendil peaaegu kahekordistunud. Selline perearstide puudus võib ohustada kogu tervishoiusüsteemi korraldust ja toimimist (Kringos et al., 2013).

Perearstide puudus on kompleksne probleem, mida mõjutavad paljud tegurid eri tasanditel, mistõttu üht kindlat lahendust ei ole. Perearstide arvu piisavus tervishoius sõltub mitmest tegurist: arstiüliõpilaste huvi peremeditsiini eriala vastu, uute perearstide edasised karjäärivalikud, perearstide väljaränne või nende lahkumine peremeditsiinist mistahes karjäärietapis (Marchand & Peckham, 2017). Perearstide puudus süveneb paljudes riikides, mistõttu on vaja kiiret tegutsemist ning täiendavaid teadusuuringuid probleemi mõistmiseks ja lahendamiseks. Enamik eelretsenseeritud teadusajakirjades avaldatud selleteemalisi uuringuid on tehtud ingliskeelsetes riikides, teistes Euroopa riikides on teemat vähem käsitletud. Eestis ei ole perearstide puuduse põhjuseid seni kordagi uuritud. Varasemad uuringud on sageli vaadelnud üksikuid põhjuseid eraldi, kujundamata tervikvaadet, ent tõhusate lahenduste väljatöötamiseks on vaja probleemi terviklikku käsitlust.

Eesmärgid

Doktoritöö peamine eesmärk oli täiendada teadmisi perearstide puuduse põhjustest ning kirjeldada tegureid, mis seda probleemi mõjutavad. Doktoritöö konkreetsemad eesmärgid:

1. Kirjeldada Eesti, Belgia ja Ungari arstiüliõpilaste karjäärivalikuid ja nende valmisolekut valida peremeditsiini eriala.
2. Analüüsida, millised tegurid mõjutavad arstiüliõpilaste karjäärivalikuid eelnimetatud riikides.
3. Kirjeldada Eesti uute perearstide karjäärivalikuid ning neid mõjutavaid kogemusi ja arusaamu.
4. Selgitada välja Euroopa perearstide migratsiooni mõjutavad tegurid: lahkumise, teise riiki jäämise, tagasi- või edasirände põhjused.

Uuritavad ja meetodid

Doktoritöö eesmärkide saavutamiseks tehti kolm erineva disainiga uuringut:

1. Erialavaliku ja seda mõjutavate tegurite kirjeldamiseks korraldati Eesti, Belgia ja Ungari arstiüliõpilaste hulgas läbilõikeuuring, kasutades veebipõhist küsimustikku. Küsimustik oli koostatud varasemate uuringute ning Hollandi ülikoolide arstiteaduskondades kasutatud küsimustike põhjal (Vergouw et al., 2015) ning testitud 2018. aastal (Vajer et al., 2019). Küsimustik võimaldas koguda nii kvantitatiivseid kui kvalitatiivseid andmeid ning see koosnes neljast osast: 1) üld- ja demograafilised andmed; 2) erialavalik; 3) erialavalikut mõjutavad tegurid ja 4) valmisolek valida peremeditsiini eriala. Veebipõhine küsimustik edastati ülikoolide ametlike meililistide kaudu kõikidele Eesti, Belgia Flandria piirkonna ja Ungari arstiüliõpilastele. Statistilise analüüsi käigus koondati üliõpilaste esimene ja teine erialavalik ning moodustati kaks gruppi: arstiüliõpilased, kes eelistavad peremeditsiini eriala, ja arstiüliõpilased, kes eelistavad teisi erialasid.
2. Eesti uute perearstide edasisi karjäärivalikuid mõjutavate kogemuste ja arusaamade kirjeldamiseks korraldati grupiintervjuudel põhinev kvalitatiivne uuring. Intervjuu kava koostati varasemate uuringute andmete põhjal. Uuringusse kaasati vabatahtlikkuse alusel viimase aasta peremeditsiini residendid ning perearstid, kellel oli uuringu ajaks residentuuri lõpetamisest möödas kuni 5 aastat. Programmi Microsoft Teams vahendusel tehti kuus grupiintervjuud kokku 25 osalejaga (12 peremeditsiini residenti ja 13 uut perearsti). Intervjuud salvestati ja hiljem transkribeeriti. Andmete analüüsimiseks kasutati temaatilist analüüsi (Braun & Clark, 2006).
3. Euroopa perearstide rände põhjuste väljaselgitamiseks tehti individuaalintervjuudel põhinev kvalitatiivne uuring. Intervjueeritavad värvati WHO Euroopa piirkonna riikidest pärit perearstide hulgast, kasutades isiklikke kontakte, ametlikke meililiste ning sotsiaalmeediaplatvorme. Uuringusse kaasati perearstid, kes oskasid piisaval tasemel inglise keelt, kes olid omandanud pere-

meditsiini eriala kodu- või välisriigis ning kes olid elanud välisriigis vähemalt ühe aasta. Intervjueeriti kokku 15 perearsti 8 riigist.

Tulemused

Arstiüliõpilaste erialavalikud ja neid mõjutavad tegurid Eestis, Belgias ja Ungaris

Küsimustikule vastas kokku 1601 arstiüliõpilast, kellest 214 olid Eestist, 764 Belgiast ja 623 Ungarist. Enamik vastanutest eelistas (nii esimese kui teise erialavalikuna) kirurgilisi erialasid, sisehaiguste ja pediaatrilisi erialasid ning erakorralist meditsiini ja anestesioloogiat. Vastanutest 18,5% kaalus peremeditsiini eriala esimese või teise valikuna, täpsemalt 15,4% Eesti, 11,2% Ungari ja 25,2% Belgia üliõpilastest. Tegurid, mis ennustasid huvi peremeditsiini eriala vastu, olid naissugu, Belgia päritolu, maapiirkonna päritolu, õppimine 6. kursusel ning perearstist eeskuju olemasolu. Erialalised tegurid, mis peremeditsiini eelistanud üliõpilastele oluliseks osutusid, olid järgmised: piisavalt residentuurikohti elukoha läheduses; lühem ja väiksema intensiivsusega residentuuriprogramm, sealhulgas lihtsamad sisseastumistingimused; pikaajalised suhted patsientide ja nende lähedastega ning nende toetamine tervisemuredega toimetulekul; ennetustöö ning ravi järjepidevuse esmatähtsustamine; päevase töö ja paindlike tingimuste eelistamine, et saavutada töö ja eraelu tasakaal. Üliõpilased andsid ka soovitusi, kuidas huvi peremeditsiini vastu suurendada, näiteks võimaldada üliõpilastele õpingute ajal erialaga sagedasemat kokkupuudet; arendada peremeditsiini süsteemi, et perearstidel oleksid paremad töö- ja rahastustingimused, sealhulgas suurem töötasu, ning tunnustada perearstide tööd senisest enam nii tervishoiu kui ka ühiskonna tasandil.

Eesti uute perearstide karjäärivalikuid mõjutavad kogemused ja arusaamad

Uued perearstid astusid peremeditsiini residentuuri eesmärgiga kandideerida tulevikus oma nimistule, kuid plaanivad enne seda omandada kogemusi, töötades abiarsti või asendusarstina olemasolevate nimistute juures. Nende arvates valmistab peremeditsiini residentuur piisavalt hästi ette perearstitöö kliinilisteks aspektideks, kuid puudu jääb mittekliiniliste oskuste ja teadmiste kujundamisest. Uued perearstid näevad oma perearstikeskust ja oma nimistut karjääri tipuna, mistõttu nad ei kiirusta seda kohe saavutama. Nende karjäärivalikuid mõjutab tugevasti pereplaneerimine ning soov säilitada töö ja eraelu tasakaal. Uued perearstid näevad praegust nimistule kandideerimist ja perearstikeskuse asutamist bürokraatliku protsessina ning soovivad saada rohkem igakülgset tuge kogenumatelt kolleegidelt ja ametiasutustelt. Seetõttu eelistatakse töökohana grupipraksiseid, kus on võimalik mittekliinilisi ülesandeid delegeerida ja keskenduda arstitööle ning on lihtsam reguleerida töökoormust ja korraldada asendusi.

Euroopa riikide perearstide rände põhjused

Rände peamise põhjusena toodi välja erialane areng ehk soov saada paremat peremeditsiinialast väljaõpet või teha märksa laiahaardelisemat perearstitööd, kui see nende koduriigis oleks võimalik olnud. Osa perearste otsustas kodusriigist lahkuda, kuna nad olid rahulolematud poliitilise olukorra, elutingimuste ja tervishoiukorraldusega.

Sihtriiki jäämise põhjused sarnanesid rände põhjustega. Eelkõige just perekonna heaolu, elukorraldus ja elukeskkond olid peamised põhjused, miks otsustati sihtriiki jääda või, vastupidi, plaanitakse koduriiki naasta. Perekonnaga teise riiki kolimine ning sealse kultuuri ja keskkonnaga harjumine oli paljudele suureks katsumuseks, mistõttu ei taheta seda ilma mõjuva põhjuseta uuesti ette võtta. Koduriiki naasmise ees nähti mitmeid takistusi: sealne negatiivne suhtumine välisriigis töötanud arstidesse, erialase pädevuse tõendamise keeruline protsess ning jätkuvad probleemid tervishoiukorralduses.

Järeldused

Perearstide puudus on mitmetahuline probleem, mida mõjutavad mitmesugused tegurid, sealhulgas arstiüliõpilaste ja uute perearstide karjääriplaanid ning perearstide ränne. Uuringu eesmärk oli kirjeldada neid aspekte kompaktselt, et paremini mõista probleemi olemust ja leida võimalikke lahendusi. Kolme eri uuringu tulemustest selgusid küllaltki sarnased probleemid ning võimalikud lahendused.

Peremeditsiini eriala vastu huvi äratamiseks on oluline üliõpilaste varane kokkupuude peremeditsiiniga õpingute ajal ning eeskätt perearstidest eeskujude olemasolu. Pärast seda, kui arst on valinud oma erialaks peremeditsiini, on väga tähtis pakkuda talle tuge karjääriteel püsimiseks. Paindlikud töötingimused, mis võimaldavad saavutada töö ja eraelu tasakaalu, mõjutavad nii tulevaste arstide kui juba tervishoius töötavate perearstide karjäärivalikuid, sealhulgas ka teise riiki tööle suundumist. Üldiselt näevad uued perearstid end tulevikus perearstipraksise ja nimistu omanikena, kuid enne sellele karjäärietapile pühendumist soovivad nad keskenduda pereplaneerimisele, saada rohkem kliinilisi kogemusi ning tutvuda põhjalikult perearstitöö muude aspektidega. Seetõttu soovivad nad leida endale sobiliku töökoha, eelistatult grupipraksises. Väljaränne on samal ajal perearstide puuduse põhjus ja tagajärg. Perearstid otsustavad teise riiki tööle suunduda peamiselt isiklikel või tööalastel põhjustel ning üldiselt needsamad põhjused määravad ka selle, kas otsustakse teise riiki jääda või sealt lahkuda, sealhulgas naasta koduriiki. Perearstide lahkumist peremeditsiinist või rännet teise riiki on võimalik vähendada, lihtsustades perearstipraksise loomise ja patsientide nimistule kandideerimise protsessi ning parandades töötingimusi, töökultuuri ja tervishoiukorraldust.

Praktiline väärtus

Doktoritöö tulemused on väärtuslikud arstiõppe korraldajatele, tervishoiuorganisatsioonidele, poliitikakujundajatele ning hariduses ja peremeditsiinis töötavatele perearstidele. Perearstide arvu suurendamiseks või selle vähenemise pidurdamiseks oleks vaja rakendada samal ajal eri meetmeid:

1. Kogu arstiõppe jooksul (kohustuslikes peremeditsiini õppeainetes ja praktikal) tuleb rõhutada peremeditsiini osatähtsust tervishoiusüsteemis ja patsiendi käsitluses. Samuti on oluline pakkuda üliõpilastele kontaktivõimalusi perearstidest eeskujudega, kes kannavad endas peremeditsiini väärtusi.
2. Peremeditsiini residentuuriprogrammi täiustamine ja juhendajate laialdasem koolitamine aitaks tulevasi perearste veelgi paremini välja õpetada nende mitmekülgseks tööks.
3. Perearstipraksise loomise ja nimistule kandideerimise protsessi lihtsustamine ning igakülgse toetuse pakkumine julgustaks uusi perearste senisest varem kõnealust karjäärisammu tegema.
4. Perearstide väljarände vähendamiseks tuleks eeskätt tegelda selliste põhjustega, mis kätkevad rahulolematust tervishoiu ja peremeditsiini korraldusega, ning parandada residentuuriprogrammi, töötingimusi ja karjäärivõimalusi.
5. Teise riiki tööle läinud perearstide tagasitulekut soodustaks see, kui lihtsustada nende naasmist ning tööle asumist koduriigi tervishoiusüsteemis.

Eelkirjeldatu eeldab, et probleemi lahendamiseks saavad kokku eri huvipooled (ülikool, ministeeriumid, erialaseltsid ning tervishoiuasutused) ning teevad ühise eesmägi nimel koostööd, sest tervishoiusüsteemi tulevik ja järjepidevus sõltuvad otseselt perearstiabi jätkusuutlikkusest.

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I want to thank all the medical students and family physicians who were willing to participate in our studies and thereby contributed to the completion of this doctoral thesis.

My friends and family
Thank you for your many-sided support and help during challenging moments.

APPENDICES

Appendix 1. Questionnaire: What factors influence medical students' career intentions?

Personalia

1) Gender
   a) Male
   b) Female
2) Year of birth
3) In which country do you study?
   a) Belgium
   b) Estonia
   c) Hungary
4) What year are you in?
   a) 1st
   b) 2nd
   c) 3rd
   d) 4th
   e) 5th
   f) 6th
5) Where did you grow up?
   a) City
   b) Rural area
6) Did any of your close relatives study medicine?
   a) Yes
   b) No
7) Do you have any other degrees?
   a) No
   b) Bachelor's degree
   c) Master's degree
   d) Doctoral degree

If yes, specify in which field. (Optional for students)

8) What are you planning to do after finishing your medical studies?
   a) Start residency in the home country
   b) Start PhD studies in the home country
   c) Go abroad to work or study
   d) Other...

Specialisation choice

1) Which of the following reasons influenced your choice to study medicine? Please, circle the number that corresponds with your choice: **1 = strongly disagree and 5 = strongly agree**
   a) This was my main interest.
   b) Professional challenges
   c) I want to do research
   d) The opportunity to work abroad
   e) Family influence
   f) The way of living as a doctor
   g) Income

h) Professional recognition
i) Innovation and improvement opportunities
j) Appreciation by the society
k) The relationship with the patients
l) Good job opportunities
m) The will to help
n) Positive example by another doctor
o) By chance

2) If you had to choose your future speciality now, what would be your 1st choice? What would be your 2nd choice?
a) Allergology and immunology
b) Anaesthesiology and intensive care
c) Cardiology
d) (Cardio)thoracic surgery
e) Cardiovascular surgery
f) Clinical pathology
g) Clinical pharmacology
h) Dermatology
i) Emergency medicine
j) Endocrinology (diabetology)
k) Forensic medicine
l) Gastroenterology
m) General and abdominal surgery
n) General internal medicine
o) General practice
p) Geriatrics
q) Haematology
r) Infectious diseases
s) Laboratory medicine, clinical biology and microbiology
t) Medical genetics
u) Nephrology
v) Neurology
w) Neurosurgery
x) Obstetrics and gynaecology
y) Occupational medicine
z) Oncology (radiation therapy and chemotherapy)
aa) Ophthalmology and eye surgery
bb) Oral and maxillofacial surgery
cc) Orthopaedics and trauma surgery
dd) Otorhinolaryngology
ee) Paediatric surgery
ff) Paediatrics and neonatology
gg) Physical medicine and rehabilitation, sports medicine
hh) Plastic, reconstructive and aesthetic surgery
ii) Psychiatry and child psychiatry
jj) Pulmonology
kk) Radiology and nuclear medicine
ll) Rheumatology
mm) Urology and andrology

nn) Social medicine (school medicine, public health, health care management)
oo) Other…

3) How familiar are you with the specialisation of your choice?
   a) First choice 1 = not familiar at all, 5 = very familiar
   b) Second choice 1 = not familiar at all, 5 = very familiar
4) How sure are you that you will specialise in your first choice?

1= not sure at all, 5 = completely sure

5) Did your choice change during the last year?
   a) Yes
   b) No

If yes, then why? (Optional for students)

6) Have you ever received information on different specialities or advice on which specialisation to choose?
   a) Yes
   b) No
7) Do you feel like you could use more information and advice on which specialisation to choose?
   a) Yes
   b) No
8) What kind of information and advice would you like to get, and in what way? (Optional for students)

Reasons for choosing a speciality

Below, you will find a number of reasons for choosing one or another speciality. Which of these reasons apply to your 1st choice of specialisation? Please rate on the scale of 1 to 5, **1=strongly disagree** and **5=strongly agree**.

1) Postgraduate training
   a) The availability of places in postgraduate training
   b) A short period of postgraduate training (short=2-4 years)
   c) An intensive postgraduate training program
   d) Postgraduate training placement close to the place of residence
   e) Complex admission requirements for the postgraduate training program
2) Working conditions
   a) Physically hard work
   b) Intellectually challenging work
   c) Technical skills are required
   d) Communicative skills are required
   e) A combination of communicative and technical skills is required
   f) A lot of high-tech technical equipment
   g) A lot of routine activities
   h) Working in a hospital
   i) High-level of responsibility at work
   j) An anticipated high salary
3) Working hours
   a) Regular working hours
   b) Acceptable amount of working hours
   c) Flexible working hours
   d) Good opportunities to work in shifts
   e) Mainly day job

4) Nature of work
    a) Big variation in the types of patients
    b) Big variation in pathologies
    c) Dealing with the psychological problems of patients
    d) Close contact with patients and their family members
    e) Long-term relationships with patients
    f) Continuity of care
    g) Activities that mainly focus on treating patients
    h) Activities that mainly focus on prevention
    i) Activities that mainly focus on supporting patients in managing their illness
    j) Interest in highly specialised work
    k) The specific patient population of this speciality
5) Working relationships
    a) A performance-oriented environment
    b) Emphasis on teamwork
    c) Positive experiences with doctors/trainers/assistants from this speciality
6) Other factors
    a) The prestige/reputation of doctors from this speciality
    b) An attractive lifestyle of doctors from this speciality
    c) Sufficient employment places in this speciality
    d) Expectations from family members to choose this speciality
    e) Advice from doctors/teachers to choose this speciality
    f) Good opportunities to build a successful career
    g) Good opportunities for a career in research
    h) Good opportunities to combine with other working activities (academic/teaching career, governmental and societal institutions, professional institution, etc.)
    i) Good opportunities to match private life

Family Medicine/General Practice

1) To what extent do you agree with the following statements about family medicine/general practice (FM/GP)? **1 = strongly disagree, 5 = strongly agree**
    a) FM/GP service should have a more important role in the healthcare
    b) FP/GPs main task is to forward the patients to the appropriate outpatient care
    c) FP/GPs, other specialists, hospitals and other healthcare providers should work more closely together
    d) Doctors who become FP/GPs are not suitable for other specialities
    e) FP/GPs have less opportunities to pursue a career than doctors in other clinical fields
    f) FP/GPs can have an income as high as any other doctor
    g) Most of the cases that FP/GPs encounters could be managed by a specialised nurse
    h) FP/GPs could have a more important role in health promotion and prevention
    i) FP/GPs are appreciated by the society
    j) FP/GPs are appreciated by other specialist doctors and healthcare workers
    k) More medical students would choose to become an FP/GP if they could work in group practice
2) To what extent can you imagine becoming a family physician/general practitioner?
    a) I plan to become a family physician/general practitioner

b) My priority is family medicine/general practice, but I consider other fields as well
c) I think about various fields, including family medicine/general practice
d) My priorities are in other fields, but I do not exclude family medicine/general practice
e) I do not plan to become a family physician/general practitioner

3) If you are considering FM/GP, what factors do you consider important? (For students who have answered a.-d. in the previous question) **1 = not important at all, 5 = very important**
   a) The professional appreciation of FP/GPs by other doctors
   b) Professionalism and professional achievements
   c) Relationships with patients and continuity of care
   d) Opportunity to work as an independent entity
   e) Professional independence
   f) Working in a team
   g) Technical as well as communicative skills are required
   h) Big variation in the types of patients
   i) Big variation in pathologies
   j) Emphasis on prevention
   k) Appreciation by the patients and society
   l) Financial considerations
4) What would increase your interest in choosing FM/GP? (Optional for students)
5) Medical studies at my university contain enough training focused on family medicine/general practice (courses, subjects, internships, etc). **1 = strongly disagree, 5 = strongly agree**
6) What has been the attitude of others towards family medicine/general practice during your medical studies?
   a) Teachers and other doctors: **1 = very negative, 5 = very positive**
   b) Other medical students **1 = very negative, 5 = very positive**
7) Have you had an internship in an FM/GP centre?
   a) Yes
   b) No
8) In case you have done an internship in an FM/GP centre did you have a positive experience?
   a) Yes
   b) No
   c) Other...

If you want, you can explain your answer. (Optional for students)

9) Have you had any GP role models who did have an influence on your choice of choosing family medicine?
   a) Yes
   b) No

Appendix 2. List and grouping of the specialities

1) General practice/Family medicine
2) Internal medicine
    a) Allergology and immunology
    b) Cardiology
    c) Endocrinology (diabetology)
    d) Gastroenterology
    e) General internal medicine
    f) Geriatrics
    g) Haematology
    h) Infectious diseases
    i) Nephrology
    j) Neurology
    k) Pulmonology
    l) Rheumatology
3) Emergency medicine and anaesthesiology
4) Paediatrics
    a) Paediatric surgery
    b) Paediatrics and neonatology
5) Surgical specialties
    a) (Cardio)thoracic surgery
    b) Cardiovascular surgery
    c) General and abdominal surgery
    d) Neurosurgery
    e) Ophthalmology and eye surgery
    f) Oral and maxillofacial surgery
    g) Orthopaedics and trauma surgery
    h) Otorhinolaryngology
    i) Plastic, reconstructive and aesthetic surgery
    j) Urology and andrology
6) Obstetrics and gynaecology
7) Other
    a) Clinical pathology
    b) Clinical pharmacology
    c) Dermatology
    d) Laboratory medicine, clinical biology and microbiology
    e) Medical genetics
    f) Forensic medicine
    g) Occupational medicine
    h) Oncology (radiation therapy and chemotherapy)
    i) Physical medicine and rehabilitation, sports medicine
    j) Psychiatry and child psychiatry
    k) Radiology and nuclear medicine
    l) Social medicine (school medicine, public health, health care management)
    m) Other...

Appendix 3. Factors related to the speciality

Postgraduate training
- The availability of places in postgraduate training
- A short period of postgraduate training (short=2–4 years)
- An intensive postgraduate training program[1]
- Postgraduate training placement close to the place of residence
- Sufficient employment places in this speciality
- Complex admission requirements for the postgraduate training program[1]

Scope of practice: General practice
- Dealing with the psychological problems of patients
- Close contact with patients and their family members
- Long-term relationships with patients
- Continuity of care
- Activities that mainly focus on prevention
- Activities that mainly focus on supporting patients in managing their illness
- Communicative skills are required
- A lot of routine activities

Scope of practice: Hospital specialities
- Interest in highly specialised work
- The specific patient population of this speciality
- Intellectually challenging work
- Technical skills are required
- Working in a hospital
- Good opportunities to work in shifts
- Emphasis on teamwork

Preferred working conditions
- Regular working hours
- Acceptable amount of working hours
- Flexible working hours
- Mainly day job
- Good opportunities to match private life

Prestige/success orientation
- A performance-oriented environment
- An anticipated high salary
- The prestige/reputation of doctors from this speciality
- An attractive lifestyle of doctors in this speciality
- Good opportunities to build a successful career
- Good opportunities for a career in research
- Good opportunities to combine with other working activities (academic/teaching career, governmental and societal institutions, professional institution etc)
- High level of responsibility at work

Influence to choose certain speciality
- Expectations from family members to choose this speciality

[1] In multivariable analysis for these factors the medical students who disagreed with this statement were counted, for other factors the students who agreed with the statement were counted.

Appendix 4. Questionnaires to the participants

I Questionnaire for last year's trainees

1) Gender
   a) Male
   b) Female
2) Age
   a) 25–29
   b) 30–34
   c) 35–49
   d) 50 or older
3) Nationality
   a) Estonian
   b) Other
4) The location of the main training placement during residency
   a) Tallinn or Tartu
   b) Other

II Questionnaire for the family physicians

1) Gender
   a) Male
   b) Female
2) Age
   a) 25–29
   b) 30–34
   c) 35–49
   d) 50 or older
3) Nationality
   a) Estonian
   b) Other
4) How long ago did you finish family medicine training?
   a) <1 year
   b) >1 and <2 years
   c) >2 and <3 years
   d) >3 and <4 years
   e) >4 and <5 years
5) Currently, I work as
   a) A family physician with a patient list
   b) A locum or employee
   c) Other
6) My workload
   a) I work full-time
   b) I work part-time for one employer
   c) I work part-time for multiple employers
7) My workplace is located
   a) Tallinn or Tartu
   b) Other
8) The location of the main training placement during residency
   a) Tallinn or Tartu
   b) Other

Appendix 5. Interview guide early-career family physicians' career intentions

Topics	Questions – **FM trainees**	Questions – **FP**
Introduction	1. A short introduction to this study and this interview is provided. 2. Please introduce yourself briefly (Name, place of work)	1. A short introduction to this study and this interview is provided. 2. Please introduce yourself briefly (Name, place of work)
Career intentions - Short- and long-term career intentions	1. What are the different job and career opportunities that family medicine specialisation provides? 2. What are Your career intentions after completing family medicine training? Short-term and long-term intentions.	1. What are the different job and career opportunities that family medicine specialisation provides? 2. Describe Your career since completing family medicine training. 3. How have Your career intentions changed since completing the training? 4. What are your future career plans?
Factors influencing career intentions - Personal factors - Work-life balance - Working conditions - Place of work (City vs rural area) - Expected income - Public opinion	1. What is influencing Your career intentions? How? 2. What affects Your long-term career intentions? How?	3. What has influenced Your career intentions? How? 4. What has affected Your long-term career intentions? How?
The influence of postgraduate training on career intentions - Experience during family medicine residency training (supervision, work organisation, team) - Preparation for the medical work of family physicians - Preparation for non-medical tasks	1. How has family medicine training influenced Your career intentions? 2. How did family medicine training prepare You for the job and different roles of family physician?	3. How did family medicine training influence Your career intentions? 4. How did family medicine training prepare You for the job and different roles of family physician?

Appendix 6. Interview guide family physicians' migration.

Research questions	Topics	Questions
Icebreaker	**Migration**	1. A short introduction to this study and this interview is provided. 2. Please introduce yourself briefly (Name, place of work) 3. How would you define migration? What is migration to you? / How would you describe the situation of family physicians' migration to your country? How big of a problem is it?
1. Which factors and how influenced family physicians to migrate to another country?	**Push and pull factors influencing migration to another country** - Financial factors - Professional factors - Sociopolitical factors - Personal factors - Facilitators and barriers to mobility	1. Why did you migrate to another country? 2. Why did you migrate to that country in particular? 3. Which factors influenced your choice to migrate (different themes)?
2. What factors encourage family physicians to stay in a new country?	**Factors that encourage staying in a new country** - Financial factors - Professional factors - Sociopolitical factors - Personal factors - Facilitators and barriers to mobility - Plant factors	1. What factors keep you in the country instead of returning to your country of origin? 2. What factors are keeping you from going to another country?
3. What would motivate or have motivated General Practitioners to go back to their home country?	**The influence of postgraduate training on career intentions** - Financial factors - Professional factors - Sociopolitical factors - Personal factors - Facilitators and barriers to mobility	1. What factors would motivate you to go back? 2. If you plan to go back, which factors have motivated you? 3. Is there anything you want to add?

Appendix 7. Characteristics of the migrated family physicians

Gender	Male	Female							
	10	5							
Age	28–34	35–45	46–58						
	5	7	3						
Country of origin	Croatia	Estonia	Greece	Malta	Poland	Romania	Russia	The Netherlands	
	1	5	1	1	4	1	1	1	
Destination country	Belgium	Estonia	Finland	France	Ireland	Norway	Sweden	Switzerland	The UK
	1	1	2	1	1	2	5	1	2
Stay or leave?	Stayed in the destination country	Further migration	Migrated back						
	11	1	3						
FP qualification	FP trainee at the moment of the interview	FP qualification before migration	FP qualification in the destination country						
	2	8	5						

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