

# Changes in interregional migration of patients hospitalized in Poland – 2013–2017

Karol Tarkowski<sup>1,A-D,F</sup>, Iwona Bojar<sup>2,A,D-F</sup>, Agnieszka Kister<sup>3,D,F</sup>, Dorota Raczekiewicz<sup>4,A,C-F</sup>

<sup>1</sup> University of Economics and Innovation, Lublin, Poland

<sup>2</sup> Department for Women's Health, Institute of Rural Health, Lublin, Poland

<sup>3</sup> Faculty of Economics, Maria Curie-Skłodowska University, Lublin, Poland

<sup>4</sup> Institute of Statistics and Demography, Collegium of Economic Analysis, SGH Warsaw School of Economics, Warsaw, Poland

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of article

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## Abstract

**Objectives.** The aim of the study is to determine the scale of interregional migrating patients' hospitalizations in Poland in 2013–2017, as well as their demographic and medical factors, total costs and time changes.

**Materials and method.** Data from the NHF (National Health Fund) regarding hospitalizations in a given province of patients registered in another province in Poland in 2013–2017 were statistically analyzed. Times series analyses as well as coefficients of correlation, determination and variation were used.

**Results.** The number of patients hospitalized outside their regional registration and the cost of their hospitalization increased from year-to-year during 2013–2017. There was a large variation in provinces in terms of inflow of patients and costs of their hospitalization, while there was only a small variation in terms of outflow of patients and costs of their hospitalization in the analyzed years. Among the patients hospitalized outside the province where they were registered, there were more women than men, while the age group was dominated by 60-year-olds and their share in the subsequent years increased, while the share of other age groups remained unchanged or decreased. The most and increasingly more from year-to-year hospitalizations outside the regional registration were due to neoplasms and diseases of the circulatory system.

**Conclusions.** The results of the study may significantly contribute to the proper planning of securing the health needs of the inhabitants of particular regions, and to improving the quality and economic efficiency of health services in individual NHF branches.

## Key words

migration of patients, hospitalization, interregional migration

## INTRODUCTION

Mobility of the population in order to take advantage of the health services in another region belongs to the group of so-called interregional migrations and is one of the basic human activities [1]. Patient migration is a special form of mobility and belongs to the group of the so-called temporary migrations, the concept of which was first used by Clyde Mitchell in the 1950s, with reference to the mobility of the central-southern African population [1]. Currently, these activities are becoming more and more common, as evidenced by data on patient migrations included in the reports of the National Health Fund (NHF). This phenomenon is so serious that it involves the redistribution of funds between virtually all the NHF regional branches. It has become the subject of scientific research and an incentive to consider the reasons for this state of affairs, bearing in mind the quality of service, safety of patients and, at the same time, the effects associated with the need to plan investments in the health care or migration of medical personnel. This problem is solved by creating regional maps of health needs under the Act of 21 March 2014,

amending the act on health care services financed from public funds, among others [2]. The problem of the allocation of resource in the context of ensuring patients' health needs and their safety was the subject of discussion that resulted in the implementation of the project entitled "Improving the quality of management in health care by supporting the process of creating regional health needs maps as a tool to improve management processes in the health care system – training in estimating health needs". This project was co-financed by the European Union from the European Social Fund under the Human Capital Operational Programme. It aimed to improve the quality of the management of resources of the health care system through the development and popularization of forecasting tools. In addition, it was to support management decisions regarding selected groups of diseases, especially cardiac and cancer diseases. The assumed effects of the project included, among others, helping the beneficiaries in developing a prognostic model in the area of morbidity in selected groups of diseases, and in the area of optimizing the contracting of medical services and investment planning. In addition, this initiative aimed to present demographic and epidemiological trends, existing infrastructure in health care, as well as determine future needs in this area with the support of EU funds [3]. This, in turn, was expected to translate into improved strategic planning, both at the central and regional level (level of provinces and counties).

Address for correspondence: Dorota Raczekiewicz, Institute of Statistics and Demography, Collegium of Economic Analysis, SGH Warsaw School of Economics, Niepodległości 162, 02-554, Warsaw, Poland  
E-mail: dbartos@sgh.waw.pl

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The aim of the study is to determine the scale of interregional migrating patients' hospitalizations in Poland during 2013–2017, as well as their demographic and medical factors, total costs and time changes.

## MATERIALS AND METHOD

The research material involved individual, anonymous data from the National Health Fund (NHF) concerning hospitalization of patients in a given province who were registered in another province in Poland in 2013–2017. For each such hospitalization, the following were given: regional branch of the NHF in which the patient was hospitalized, regional branch of the NHF in which the patient was registered, age, gender, group of diseases according to the ICD10 classification, medical specialties with which a patient was treated, and cost of the services provided.

Statistical analyses were performed using the STATISTICA software (StatSoft, Poland). Absolute and percentage changes, as well as linear trends, were estimated for time series of number and hospitalization costs of migrating patients. Regression models of the above-mentioned variable with the explanatory variable representing the number of time series, coefficient of determination and Pearson's correlation coefficient were used. Pearson's coefficient was also used to analyse correlation between inflow and outflow of number and hospitalization costs of migrating patients. Absolute numbers and percentages were estimated for categorical variables, such as gender, age group, region, group of diseases, medical specialties, as well as means and standard deviations for continuous variables, such as patients' age. Sums were calculated for total costs, total number of patients, and according to regions, group of diseases, medical specialties. Coefficients of variation were estimated in order to assess variation of inflow and outflow of patients and hospitalization costs between regions. Pearson chi-square test of independence was used in correlation analyses between age groups and years, between groups of diseases and years. The value of  $p < 0.05$  was considered to be statistically significant.

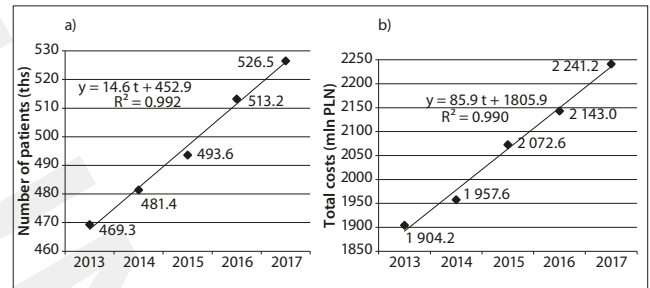
## RESULTS

The National Health Fund financed 469.3 thousand hospitalizations of patients outside provinces of registration in Poland in 2013, and in 2014 – more by 12.1 thousand, i.e. by more than 2.6%, in 2015, more by 12.2 thousand, i.e. by more than 2.5%; in 2016, more than 19.6 thousand, i.e. by more than 4%; and in 2017, more by 13.3 thousand, i.e. by more than 2.6% than in the previous year. The total costs of migrating patients' hospitalizations amounted to PLN 1,904.2 million in 2013; in 2014, they were higher by PLN 53.4 million, i.e. 2.8%; then in 2015 – higher by PLN 115.1 million, i.e. 5.9%; in 2016, by PLN 70.4 million, i.e. 3.4%; and in 2017, increased by PLN 98.2 million, i.e. 4.6%, compared to the previous year (Tab. 1).

During 2013–2017, there were significant increasing trends in the number and costs of hospitalizations of patients outside the provinces of their registration (Fig. 1). The number of such hospitalizations grew significantly by 14.6 thousand, on average, from year to year ( $p < 0.001$ ), and the total costs of

**Table 1.** Number and total costs of migrating patients' hospitalizations

Year	No. of patients			Total costs		
	ths.	Change compared to previous year		mIn PLN	Change compared to previous year	
		ths.	%		mIn PLN	%
2013	469.3			1 904.2		
2014	481.4	+12.1	+2.6	1 957.6	+53.4	+2.8
2015	493.6	+12.2	+2.5	2 072.6	+115.1	+5.9
2016	513.2	+19.6	+4.0	2 143.0	+70.4	+3.4
2017	526.5	+13.3	+2.6	2 241.2	+98.2	+4.6

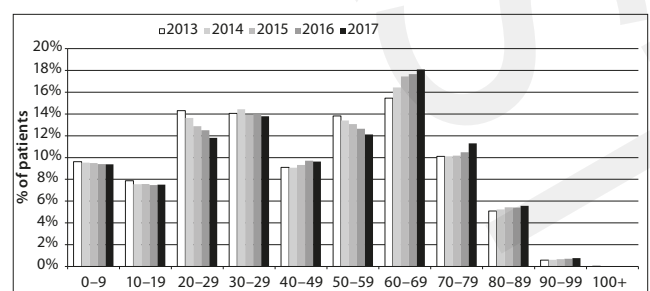


**Figure 1.** Increasing trend of the number and total costs of migrating patients' hospitalizations

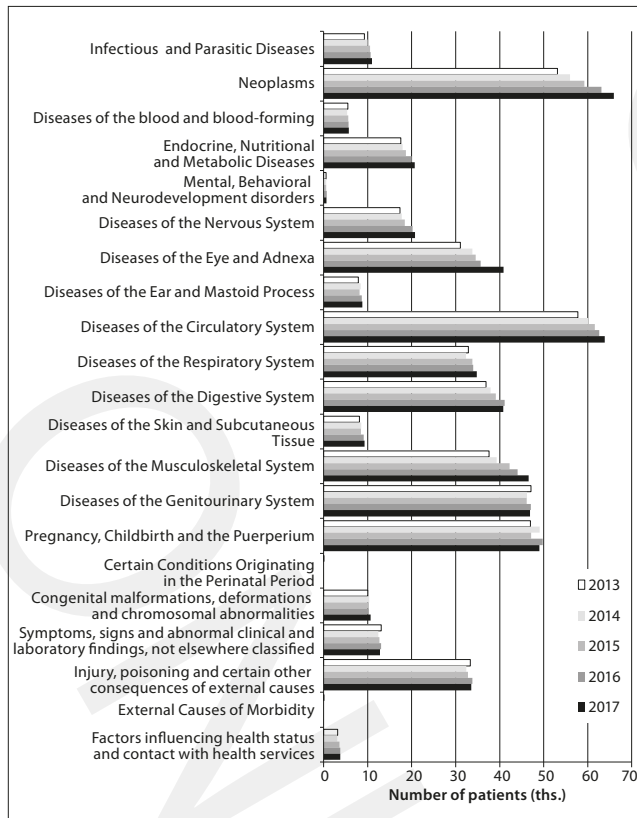
such hospitalizations grew significantly by PLN 85.9 million, on average, from year to year ( $p < 0.001$ ).

Among the patients hospitalized outside the provinces of their registration, women dominated in all the examined years. Women constituted 56.5% of such hospitalizations in 2013, 57.1% in 2014, 56.6% in 2015, 56.7% in 2016 and 56.4% in 2017.

The patients hospitalized in other provinces than they were registered in 2013–2017 were between 0–110 years of age. Their average age was similar in the analyzed years:  $43.9 \pm 23.5$  years in 2013,  $44.4 \pm 23.6$  years in 2014,  $44.9 \pm 23.6$  years in 2015,  $45.1 \pm 23.6$  years in 2016, and  $45.6 \pm 23.8$  years in 2017. Age groups of migrating patients hospitalized differed significantly between the years analysed ( $\chi^2 = 4552$ ,  $p < 0.001$ ). In each of the analyzed years, 60-year-olds dominated numerically in terms of age, in addition, their share grew regularly in subsequent years from 15.5% in 2013 to 18.1% in 2017 (Fig. 2). The shares of other age groups were smaller and remained at a similar level or decreased in the analyzed years. The shares of 20-year-olds, 30-year-olds and 50-year-olds were relatively high. Thirty-year-olds accounted for 13.8–14.0% of all the migrating hospitalized patients in the analyzed years and their participation did not change. 20-year-olds accounted for 14.3% of all the migrating hospitalized patients in 2013, and their share decreased regularly from year to year



**Figure 2.** Age of migrating patients hospitalized



**Figure 3.** Groups of diseases for migrating patients' hospitalizations. Certain conditions originating in the perinatal period and external causes of morbidity – less than 100 patients

to 11.8% in 2017. The share of 50-year-olds also decreased: from 13.8% in 2013 to 12.1% in 2017. Children up to 9 years of age constituted 9.4–9.6% of all the migrating hospitalized patients, teenagers from 7.5–7.9%, 40-year-olds – from 9.1–9.6%, and the shares of these 3 age groups remained at a similar level. 70-year-olds accounted for 10.1–10.5% of all the

migrating hospitalized patients in 2013–2016, and slightly more, namely, 11.3% in 2017. 80-year-olds accounted for 5.1–5.6% of all the migrating hospitalized patients, 90-year-olds from 0.6–0.8%, and centenarians 0.01%.

The number of patients hospitalized outside the provinces of their registration was analyzed in terms of disease group according to the ICD10 classification (Fig. 3). There were significant differences between the causes of migratory hospitalizations in particular years ( $\chi^2=2643$ ;  $p<0.001$ ). The highest, and in addition growing from year to year, number of migratory hospitalizations was due to neoplasms (53.1 thousand in 2013 to 66.0 in 2017) and diseases of the circulatory system (57.8 thousand in 2013 to 63.9 in 2017). Fewer migratory hospitalizations were due to diseases of the eye and adnexa, as well as respiratory, digestive, musculoskeletal or genitourinary systems, pregnancy, childbirth and the puerperium or injury, poisoning, and certain other consequences of external causes (from 30 to 50 thousand per year each). Other groups of diseases were less frequently the causes of migratory hospitalizations.

Table 2 presents the numbers and costs of inflows and outflows of hospitalizations to and from particular provinces in 2013–2017. The greatest inflow of hospitalizations occurred in the Mazowieckie province (about 100 thousand hospitalizations) and thus the most funds (about 500 million PLN). Twice as few hospitalizations (about 50,000 each) flowed into the following provinces: Małopolskie, Śląskie and Wielkopolskie. Even fewer hospitalizations flowed into the remaining provinces. Inflows of hospitalizations to 15 provinces increased year by year with the exception of Mazowieckie, where the inflow decreased from 2013 to 2015, while in 2016 and the following year it increased again.

The variation of provinces in terms of the number and costs of hospitalization inflow was very high. Provinces differed by an average of 78% in terms of the inflow of patients in 2013, by 74% in 2014, by 71% in 2015, by 69% in 2016 and by 68% in 2017. The variation of provinces in terms of the costs

**Table 2.** Inflow and outflow of patients' hospitalizations and costs acc. to provinces

Provinces	Patients (thsz.)										Total costs (mln PLN)									
	Inflow					Outflow					Inflow					Outflow				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
dolnośląskie	31.5	31.8	31.7	33.2	34.4	30.0	31.0	31.1	33.7	34.0	124.6	129.4	131.6	135.7	145.9	125.3	131.4	135.4	143.5	144.9
kujawsko-pomorskie	22.5	24.0	25.7	27.1	29.0	21.7	21.7	21.9	22.6	23.0	93.6	99.8	111.1	114.3	127.8	93.5	93.5	98.5	101.5	108.1
lubelskie	20.8	22.0	22.5	23.5	24.2	32.1	31.7	32.3	32.7	33.1	87.9	88.2	95.7	97.4	100.2	121.2	122.4	124.9	126.7	132.7
lubuskie	13.1	14.5	15.4	16.1	16.8	26.3	26.5	25.7	27.0	27.9	53.2	59.7	64.9	65.5	67.4	102.4	105.8	106.0	109.9	115.2
łódzkie	26.0	25.9	27.1	28.0	29.5	35.8	36.4	37.4	38.2	39.0	82.2	82.0	92.5	96.4	107.6	150.1	154.4	166.0	170.1	173.4
małopolskie	39.9	42.2	43.3	44.4	46.0	36.5	37.5	39.4	41.2	42.5	168.4	178.3	189.7	195.6	207.9	143.8	144.0	159.0	166.7	167.6
mazowieckie	105.6	103.6	102.4	104.3	104.7	43.5	46.2	49.1	52.8	55.6	484.1	474.7	483.4	490.1	513.4	151.8	161.3	178.1	195.1	203.1
opolskie	13.1	13.8	14.6	14.5	14.6	18.7	18.9	19.4	20.3	20.9	39.8	44.1	45.0	44.2	47.2	81.5	80.8	85.0	89.8	92.3
podkarpackie	16.2	17.4	18.6	19.5	20.2	29.0	29.1	29.1	29.2	29.5	47.8	52.8	58.4	59.4	65.1	135.7	135.0	140.7	137.1	140.7
podlaskie	14.8	15.4	16.0	16.5	17.3	15.0	15.0	14.6	15.1	15.3	50.9	53.3	56.8	60.6	64.7	67.1	66.4	64.5	69.3	74.6
pomorskie	19.4	20.5	21.2	22.5	23.7	28.4	29.5	31.2	31.9	32.4	77.8	78.3	82.0	85.3	95.1	115.6	121.8	131.8	129.9	137.9
śląskie	46.7	47.2	49.0	50.7	51.7	36.6	38.8	40.2	41.0	42.5	225.5	223.3	245.6	254.5	245.1	148.2	160.9	175.0	177.7	194.9
świętokrzyskie	19.6	20.6	23.0	24.7	25.4	28.8	29.5	29.9	30.8	31.2	70.6	78.9	96.6	103.5	104.5	112.3	114.6	121.8	123.9	128.5
warmińsko-mazurskie	19.5	20.7	21.4	21.7	22.2	29.4	29.4	29.7	30.8	30.8	64.4	72.0	74.4	74.7	83.6	120.2	118.9	125.5	127.8	131.7
wielkopolskie	42.6	42.5	42.5	46.3	47.2	36.1	37.7	39.3	42.0	43.5	164.5	167.9	170.2	186.6	184.8	142.2	151.1	159.2	167.5	185.9
zachodniopomorskie	18.1	19.2	19.2	20.0	19.5	21.3	22.5	23.1	24.0	25.3	68.8	74.9	74.6	79.2	80.8	93.1	95.2	101.3	106.5	109.8

**Table 3.** Number of migrating patients' hospitalizations and their costs according to medical speciality units

Medical speciality*	% of patients					% of total costs				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Allergology	0.8	0.7	0.7	0.8	0.7	0.2	0.2	0.1	0.2	0.2
Paediatric Allergology	0.5	0.5	0.5	0.5	0.5	0.2	0.2	0.2	0.2	0.3
Angiology	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Audiology and Phoniatics	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Paediatric Audiology and Phoniatics	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paediatric Surgery	2.2	2.2	2.2	2.2	2.2	1.3	1.3	1.3	1.3	1.3
Thoracic Surgery	1.1	1.1	1.1	1.1	1.1	2.3	2.3	2.1	2.2	2.2
Vascular Surgery	1.2	1.4	1.5	1.4	1.4	2.8	2.8	3.4	3.0	2.9
General Surgery	10.3	10.2	10.1	10.1	10.2	8.1	8.1	8.0	8.3	8.4
Oncological Surgery	1.8	1.8	1.7	1.9	1.9	2.2	2.2	2.2	2.4	2.4
Plastic Surgery	0.6	0.6	0.6	0.6	0.5	1.0	1.1	1.0	1.0	0.8
Maxillofacial Surgery	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.8	0.8	0.8
Pediatric maxillofacial Surgery	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Pulmonology	1.9	1.9	2.0	2.0	2.0	1.4	1.4	1.4	1.4	1.5
Pediatric Pulmonology	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.4
Internal Medicine	6.8	6.7	6.6	6.4	6.1	3.7	3.7	3.7	3.7	3.7
Infection Diseases	1.5	1.4	1.4	1.4	1.3	1.1	1.1	1.0	1.0	1.0
Paediatric Infection Diseases	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Dermatology and Venereology	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5
Paediatric Dermatology and Venereology	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Diabetology	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Paediatric Diabetology	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Endocrinology	1.4	1.4	1.5	1.6	1.6	1.3	1.4	1.6	1.7	1.7
Paediatric Endocrinology	0.3	0.3	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2
Gastroenterology	1.5	1.5	1.6	1.6	1.6	1.0	1.0	1.0	1.0	1.0
Paediatric Gastroenterology	0.7	0.7	0.7	0.7	0.7	0.5	0.4	0.4	0.4	0.4
Geriatrics	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2
Haematology	0.8	0.8	0.8	0.8	0.9	1.5	1.3	1.3	1.1	1.4
Immunology	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Paediatric Immunology	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Cardiosurgery	0.5	0.5	0.5	0.4	0.4	2.3	2.1	2.1	1.8	2.0
Paediatric Cardiosurgery	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Cardiology	6.3	6.2	6.2	6.0	6.0	11.0	11.0	11.0	10.3	9.8
Paediatric Cardiology	0.6	0.6	0.6	0.6	0.6	0.8	0.8	0.8	0.8	0.8
Nephrology	0.6	0.6	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.4
Paediatric Nephrology	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.3
Neurosurgery	2.2	2.3	2.3	2.4	2.3	6.1	6.2	6.4	6.5	6.3
Paediatric Neurosurgery	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.6
Neurology	3.0	3.0	3.0	3.0	3.0	2.5	2.4	2.5	2.6	2.6
Paediatric Neurology	0.6	0.6	0.6	0.6	0.6	0.4	0.3	0.4	0.4	0.4
Ophthalmology	6.4	6.8	6.7	6.7	7.5	5.1	4.8	4.6	4.5	4.8
Paediatric Ophthalmology	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3
Pediatric Oncology and Hematology	0.5	0.5	0.5	0.6	0.6	0.7	0.7	0.6	0.7	0.8
Oncology	0.6	0.6	0.8	0.8	0.8	0.3	0.3	0.4	0.4	0.5
Orthopedics and Traumatology	7.8	7.8	7.9	8.0	8.0	11.9	12.4	12.6	12.8	12.5
Paediatric Orthopedics and Traumatology	0.5	0.6	0.7	0.7	0.7	0.8	0.9	0.9	1.1	1.2
Otolaryngology	4.8	4.8	4.7	4.5	4.4	6.0	6.1	5.9	5.7	5.6
Paediatric Otolaryngology	0.7	0.6	0.7	0.7	0.7	0.4	0.4	0.4	0.4	0.5
Paediatrics	3.9	3.8	3.9	3.8	3.8	2.0	2.0	2.0	2.0	2.1
Obstetrics and Gynaecology	16.0	16.1	15.3	15.5	14.9	7.9	8.2	7.8	8.1	8.0
Reumatology	1.3	1.3	1.4	1.4	1.4	1.0	1.0	0.9	0.9	0.9
Paediatric Reumatology	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Toxicology	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Transplantology	0.2	0.2	0.2	0.2	0.2	4.6	4.7	4.5	4.5	4.1
Paediatric Transplantology	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.1
Urology	5.0	4.7	4.7	4.6	4.7	2.8	2.7	2.8	2.8	3.0
Paediatric Urology	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1

of hospitalization inflow was even higher and amounted to 93% in 2013, 87% in 2014, 84% in 2015, 83% in 2016 and 81% in 2017.

However, there were much smaller differences between provinces in terms of the number and costs of hospitalizations outflows. Provinces differed, on average, by 26% in terms of hospitalizations outflow in 2013, by 27% in 2014, by 29% in 2015, by 30% in 2016 and 2017. Variation of provinces in terms of costs of hospitalizations outflow was similar and amounted to 22% in 2013, 23% in 2014, 25% in 2015, 26% in 2016 and 2017.

Between the inflow and outflow of hospitalizations to and from provinces there were very strong positive correlations:  $r=0.742$ ,  $p=0.001$  in 2013;  $r=0.778$ ,  $p<0.001$  in 2014;  $r=0.804$ ,  $p<0.001$  in 2015;  $r=0.837$ ,  $p<0.001$  in 2016;  $r=0.8572$ ,  $p<0.001$  in 2017. This means that the more hospitalizations flowed into a province, the more hospitalizations flowed out from it. However, between the inflow of hospitalization costs to provinces and the outflow of such costs from provinces there were also positive correlations, but somewhat weaker:  $r=0.581$ ,  $p=0.018$  in 2013;  $r=0.623$ ,  $p=0.010$  in 2014;  $r=0.668$ ,  $p=0.005$  in 2015;  $r=0.774$ ,  $p=0.001$  in 2016;  $r=0.742$ ,  $p=0.001$  in 2017. This means that the more hospitalization costs flowed into a province, the more, on average, such costs flowed out.

Positive migration balances of the number and costs of migratory hospitalizations were held by the provinces with the largest inflow: Mazowieckie, Małopolskie, Śląskie and Wielkopolskie. In addition, the following provinces had a positive balance in the number of migratory hospitalizations: Dolnośląskie, Kujawsko-Pomorskie and Podlaskie. The Kujawsko-Pomorskie province had a positive balance of migration hospitalization costs. The remaining provinces recorded negative migration balances of the number and costs of hospitalization (Fig. 4). In the Mazowieckie province, the balance of the number of hospitalizations decreased from

year to year from +62.1 thousand in 2013 to 49.2 thousand in 2017. The balance of migration hospitalization costs there decreased from PLN 332.3 million in 2013 to PLN 295.0 million in 2016, but in 2017 it increased to PLN 310.4 million.

Analyzing the groups of medical specialties that patients were hospitalized (Tab. 3), it can be seen that the most migratory hospitalizations concerned obstetrics and gynecology (14% of total migratory hospitalizations in 2017), general surgery (10%), orthopedics and traumatology of the musculoskeletal system (8%), ophthalmology (7.5%), internal diseases and cardiology (6% each). The highest costs of migratory hospitalizations concerned: orthopedics and traumatology of the musculoskeletal system (12.5% of the total costs of migratory hospitalizations in 2017), cardiology (9.8%), general surgery (8.4%), obstetrics and gynecology (8%).

About every tenth migration hospitalization concerned children, 9% in 2013, 8.9% in 2014, 9.2% in 2015, 9.3% in 2016 and 9.4% in 2017. The share of costs of children migrant hospitalizations in the total costs of migratory hospitalizations was 6.6% in 2013 and 2014, 6.5% in 2015, 6.9% in 2016 and 7.4% in 2017.

## DISCUSSION

The results obtained in this study show that the number of migratory hospitalizations in the analyzed years increased together with the total costs of hospitalizations. This may have resulted from the spatial accessibility of health services as well as their availability [4, 5, 6, 7]. Limited accessibility may result from a failure to obtain a benefit in a short time or from social inequalities [8, 9, 10, 11, 12, 13]. According to A. Frączkiewicz-Wronka, the accessibility of medical services is one of the conditions of a well-organized health care system [14]. This can be considered from the point of view, not only of the above-mentioned availability and spatial accessibility, but also the organizational accessibility from the point of view of the degree of adjustment of organizational conditions for access to benefits, and practical options for patients to use the solutions, as well as cost accessibility analyzed at the macro-level (which applies to the rules of granting permits to use the services) and micro-level (perceived by a patient as own ability to bear the cost involved in the individual contact with the health care system).

The distribution of healthcare entities is an important issue in the context of planning activities to guarantee the health security of the population [15, 16]. The accessibility of all services, including those provided by hospitals, is an important criterion differentiating the living standard of people in various areas [17, 18] and, at the same time, determining social security [19, 20]. A lower accessibility of services for patients in some areas was confirmed by a NIK (Supreme Audit Office) audit [21]. A drop in the accessibility of health services can also be associated with the fluctuation of medical staff. The NIK audit carried out in hospitals showed worrying solutions in the field of employing medical staff, especially physicians, which could pose significant organizational and financial risks for the functioning of hospitals in the future [21]. Changes in the organization of health service have brought uncertainty about the functioning of a healthcare facility in an unchanged mode [22]. It should be assumed that this has also translated into the movement

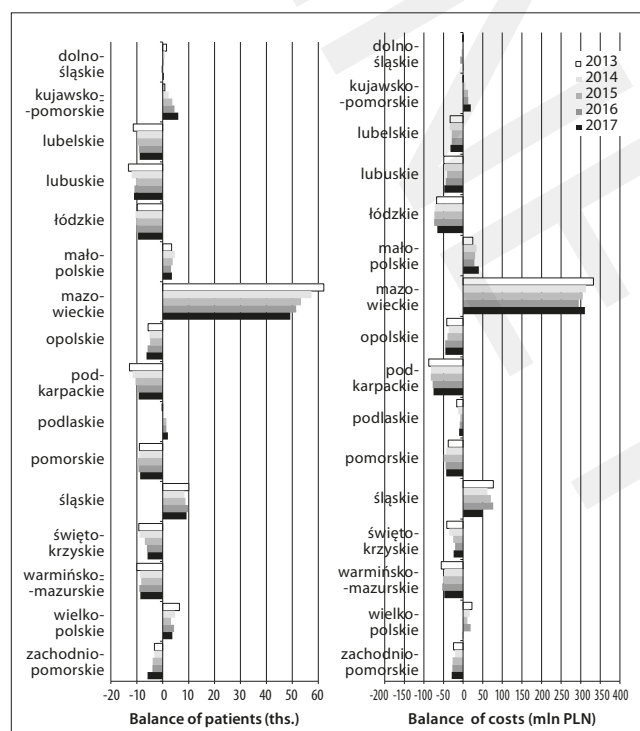


Figure 4. Balance of the number and total costs of patients' hospitalization according to provinces

of patients from their place of residence to other regions for the purpose of hospitalization. The reason for the migration of patients, which, as has been shown, was consequently related to increased patient costs, could have been the recommendations of other participants in the process of providing health services [23, 24]. De Groot and others have shown that public information has little impact on the choice of hospitals by patients; however, this impact may be greater for the providers who had compared healthcare facilities before choosing a hospital [25]. Information from other patients is also important [26]. According to K. Rogoziński, in the professional services, if the patient is unable to assess the competences of medical staff or equipment, then he or she will be guided by the feelings that constitute the environment of the service [27]. Patients are guided in their choices by the high quality of services [23, 28], professionalism of doctors in the provision of services [24, 29] as well as trust, which reduce the patient's fear and uncertainty [30]. Kobayashi and others have examined the preferences of diabetic patients regarding the choice of medical facility [29]. It was shown that the quality of the medical facility was the most important and the organizational form was of lesser importance. Among various organizational forms, public hospitals were of the greatest interest to patients. The study of factors influencing the choice of hospital was also carried out by Yoshii et al. [31]. The choices of patients undergoing colon cancer surgery were analyzed, and showed that the increase in hospitalizations in a given hospital was influenced by previous experiences of a patient, e.g. sending him home from non-medical facilities, as well as the fact that the institution was a clinical hospital.

In addition, geographic factors and the function of the hospital determined the choice. Vonberg and others have pointed out that most patients are free to choose a hospital if they are not emergencies. Of the 1,000 German households, people (aged 14 and over) were randomly selected to examine what they considered important when choosing a hospital. As a result of the research, it was proved that the choice of hospital was influenced by "distance to hospital", "friendly staff", "staff's attitude to a patient", "cleanliness", "nosocomial infections rate", "own experience", "friend's opinion" and "reputation of the institution in the public media". The most important factors proved to be cleanliness, low rates of nosocomial infections and friendly staff. Reputation was of less importance [32].

The reasons for migrations have also been investigated by Finkelstein and others [33], as well as by Vonberg [32]. Finkelstein and his team investigated the specific characteristics of patients, their health, patterns of medical practice and the characteristics of healthcare organizations. They showed that demand factors (and thus demand on the part of patients) played the biggest role in geographical variability in the mobility of patients in order to benefit from health services. According to Murto and other researchers, migration can be a strategy to achieve a higher standard of living, access to better quality employment, education and the infrastructure of health services which occurs between poor rural areas and urban areas [34, 35, 36].

The presented study has shown that the factors for the choice of service providers by patients are diverse. An important factor determining the choice is the quality of services, and also patient safety. The issue of distance in some studies seemed irrelevant, but in some cases did matter.

In the above studies, analysis of the gender of migrating persons and the cost of hospitalization was not given much space. These issues are the subject of practical analyses in the field of considering hospital treatment maps, as well as from the broad aspect of medical tourism [37, 38, 39]. The current study shows that knowledge about the spatial distribution of health services can be used to assess the location of healthcare entities, and to shape the supply of benefits in response to demand from patients, although such analyses are already being carried out by the Ministry of Health. The relevant data, along with the data provided by the Ministry, can be a tool supporting systemic decision-making in healthcare and in relation to the participants of this system. Patient migrations are closely related to the supply of hospital services. Coordination of supply is a complicated process which is largely influenced by central and regional authorities. The role of both central and local administration is to ensure conditions for the proper functioning of healthcare system and to assess the health needs of the population [40]. Their task is also to ensure a balance between the supply and demand of services. Public hospitals have to face the fundamental issue of improving the cost-effectiveness of functioning, and adapting to the health needs of the population, based on epidemiological and demographic indicators [41]. The current study provides evidence for this.

The issues of coordination and supply of hospital services and/or investment planning remain unresolved, as are the provision of the desired number of hospital beds. The planning of the number of beds for each specialization must be included in the strategy of guaranteeing access to benefits. The contract with the payer also plays a key role here. All these issues must be taken into account simultaneously.

It is difficult to assess whether or not to restrict migratory mobility of patients. In the case of negative assessment of this trend by healthcare decision-makers, some systemic actions are required, including: development of investments in the areas from which patients migrate, as well as an increase in the number of resident physicians, as the problem may lie in the inaccessibility of or limited access to health services. It should be emphasized that in studies of this type, the subject of the analysis is travel impedance to the nearest provider. Unfortunately, the availability issue is omitted from such studies. Goodman et al. point out that in the case of tests carried out in urban areas, the fact should be taken into account that patients do not always use the services of the closest healthcare facilities [42]. This is also confirmed by de Groot et al. who show that patients who compared hospitals attributed more importance to information about patient safety and respect for patients than to the distance to a service-providing unit – a hospital [25].

Satisfying the health needs of the population is the responsibility of public authorities, but it depends mainly on: the size of financial resources in the healthcare system, number of medical staff, their qualifications, spatial distribution and efficiency, accessibility of infrastructure, and the degree of use and efficiency of the facilities, as well as access to specialist medical knowledge (know-how) [43].

## CONCLUSIONS

- 1) The number of patients hospitalized outside the regional registration and the costs of their hospitalization increased each year during 2013–2017.
- 2) There was a large variation of provinces in terms of the inflow of patients and the costs of their hospitalizations, while there was a small variation in terms of the outflow of patients and the costs of their hospitalizations in the analyzed years.
- 3) Among the patients hospitalized outside the province of their registration, women were slightly dominant, they constituted 56.6–57.0% of such hospitalizations in particular years.
- 4) In terms of the age of patients hospitalized outside their regional registration, 60-year-olds dominated, and their share in the subsequent years increased, while the shares of other age groups remained unchanged or decreased.
- 5) The highest, and growing from year to year number of hospitalizations outside the regional registration, was due to neoplasms and diseases of the circulatory system.
- 6) The results obtained can significantly contribute to the proper planning of solutions to the health needs of residents in particular regions, and to improvement of the quality and economic efficiency of health services in individual NHF branches.

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