Specialization training of doctors in the surgical specializations in Poland

Kształcenie podyplomowe lekarzy w specjalnościach zabiegowych w Polsce

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KEYWORDS:

- residency
- treatment specializations
- postgraduate education
- doctors
- Poland

ABSTRACT

Introduction: The specialization education system in Poland is subject to constant changes, the aim of which is to adapt it to changing needs, while ensuring the highest quality of education. The need for reform is indicated by the doctors themselves who undergo specialization training, and who know its strengths and weaknesses best. Potential changes should be evaluated and implemented on an ongoing basis to ensure the continuous development of the specialization education system. Moreover, the quality of education should be constantly monitored to maintain its appropriate level.

Aim of the article: The study aims to characterize the changes taking place in the system of specialization education in nine selected treatment areas of medicine as well as in anesthesiology and intensive therapy in 2011-2020, with particular emphasis on quantitative changes.

Material and methods: The material for analysis consists of data from the register of doctors undergoing specialization training conducted by the Centre of Postgraduate Medical Education of Warsaw (CMKP) from 2011 to 2020, data provided by The Supreme Medical Chamber (NIL) and the Medical Examinations Centre (CEM) in 2011-2018. The material analysis was quantitative and was carried out with the use of Microsoft Excel.

Results: The data analysis carried out indicates that in the analyzed set of specializations in 2011-2020:

- the number of doctors undergoing specialization training has increased,
- the share of doctors undergoing specialization training as part of residency has increased,
- the share of women in the group of doctors undergoing specialization increased,
- the number of training places has increased,
- the number of accredited units has increased,
- the use of training places has decreased (the number of training places per specialist doctor has increased), and
- the average age of a person undergoing specialization has decreased.

Conclusions: The postgraduate education system for doctors in Poland in 2011-2020 was subject to numerous reforms and was constantly developing. Modular Specializations have been introduced to improve accessibility and reduce the time to complete Specializations that were formerly Detailed Specializations. The number of doctors in the surgical specializations in Poland shows a growing trend.

SŁOWA KLUCZOWE:

- rezydentura
- specjalizacje zabiegowe
- kształcenie podyplomowe
- lekarze
- Polska

STRESZCZENIE

Wprowadzenie: System kształcenia specjalizacyjnego w Polsce podlega ciągłym zmianom, których celem jest dostosowanie go do zmieniających się potrzeb, przy jednoczesnym zapewnieniu najwyższej jakości kształcenia. Na potrzebę reform wskazują sami lekarze, którzy odbywają szkolenie specjalizacyjne i najlepiej znają jego mocne oraz słabe strony. Potencjalne zmiany powinny być oceniane i wdrażane na bieżąco, aby zapewnić ciągły rozwój systemu kształcenia specjalizacyjnego. Ponadto jakość kształcenia powinna być stale monitorowana w celu utrzymania odpowiedniego poziomu.

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Cel artykułu: Celem pracy jest scharakteryzowanie zmian zachodzących w systemie kształcenia specjalizacyjnego w dziewięciu wybranych obszarach medycyny oraz w anestezjologii i intensywnej terapii w latach 2011-2020, ze szczególnym uwzględnieniem zmian ilościowych.

Materiał i metody: Materiałem do analizy są dane z rejestru lekarzy odbywających szkolenie specjalizacyjne prowadzone przez Centrum Podyplomowego Kształcenia Medycznego w Warszawie (CMKP) w latach 2011-2020, dane dostarczone przez Naczelną Izbę Lekarską (NIL) oraz Centrum Egzaminów Lekarskich (CEM) w latach 2011-2018. Analiza materiałowa miała charakter ilościowy i została przeprowadzona przy użyciu programu Microsoft Excel.

Wyniki: Przeprowadzona analiza danych wskazuje, że w analizowanym zestawie specjalizacji w latach 2011-2020:
- wzrosła liczba lekarzy odbywających szkolenia specjalizacyjne,
- zwiększył się udział lekarzy odbywających kształcenie specjalizacyjne w ramach rezydentury,
- zwiększył się udział kobiet w grupie lekarzy odbywających specjalizację,
- wzrosła liczba miejsc szkoleniowych,
- wzrosła liczba akredytowanych jednostek,
- zmniejszyło się wykorzystanie miejsc szkoleniowych (wzrosła liczba miejsc szkoleniowych przypadających na lekarza specjalistę), oraz
- średnia wieku osoby przechodzącej specjalizację uległa obniżeniu.

Wnioski: System kształcenia podyplomowego lekarzy w Polsce w latach 2011-2020 podlegał licznym reformom i stale się rozwijał. Specjalizacje modułowe zostały wprowadzone w celu poprawy dostępności i skrócenia czasu realizacji specjalizacji, które wcześniej były specjalizacjami szczegółowymi. Liczba lekarzy specjalizujących się w dziedzinach zabiegowych w Polsce wykazuje tendencję wzrostową.

Introduction

General physician demographics

Aging of medical professionals is one of the key problems of the Polish health system (1). This phenomenon concerns especially doctors, who are specialists. According to the data provided by the Supreme Medical Chamber, the total number of doctors in Poland (including doctors with a dual license to practice) in 2020 was 151,707 – women constituted 58.8% and men 41.2% (2). It shows an upward trend – in the statistics for 2021 it amounted to 157,055 people (3). At the end of 2012, only 137.1 thousand doctors had the Right to Practice a Profession, so a gradual increase in the number of doctors can be noticed (4).

In 2020, the number of practicing physicians was 140,119 (the indicated number also includes people with a dual license to practice) – in 2021 this number increased to 146,103 (2, 3).

Broken down into 5-year age groups, in 2020 the most numerous group among doctors were people aged 51-55 (16,285 doctors, i.e., 11.6% of professionals), then people aged 71 and more (16,094 and 11.5%, respectively) and people aged 61-65 (15,714 and 11.2%, respectively) (2).

Apart from the age group of 25 years and less, due to its very small representation, the group of doctors aged 41-45 years was the least numerous – 11,188 people (8.0% of practicing doctors), 66-70 years (11,252, i.e., 8.0%) and 36-40 years (11,544, i.e., 8.2%) (2).

In 2020, the number of working physicians who were under 35 years of age was 29,709 (21.2% of practicing physicians), and in 2021 – 35,105 (24.0%, respectively) (2, 3).

Postgraduate medical education in Poland

The system of medical education in Poland is constantly changing. To start medical specialization (a postgraduate education), an individual must complete 6 years of study, 13 months of postgraduate internship and pass the Medical Final Exam. As a result of the recruitment, the voivode (a state administration organ) may refer a doctor to specialize in a training unit of his choice (5).

In the recruitment procedure, it is allowed to submit two applications for specialization training (separately in the form of residency and non-residence mode), but they can be submitted only in one voivodeship and must relate to one field of medicine. A doctor who does not have the 1st or 2nd degree of specialization or the title of a specialist may join the specialization training as part of the residency (6).

From October 1, 2014, a reformed medical specialization program is in force. The previously distinguished basic and detailed specializations were replaced with modular specializations. Surgical and non-surgical medical specializations were distinguished, with surgical ones lasting longer (6 years vs. 5 years non-surgical). Nine surgical specializations and related anesthesiology and intensive care were analyzed. One of the analyzed specializations – vascular surgery – was not a basic specialization before the 2014 reform, but it was a specific specialization (7-9).

The greater popularity of some specializations may be influenced by the so-called priority specializations scheme, in which taking up a specific (deficit) specialization is financially rewarded and additional places for residency are granted (10).

To facilitate the ongoing monitoring of the course of the specialization, gathering information about the postgraduate education process, submitting and assessing applications for a specialization place and supporting the examination process, the Education Monitoring System was established (11). Since 2017, recruitment for specialization training has been conducted through it (12).

Aim of the article

The study aims to present the changes that took place over 10 years (from 2011 to 2020) in education in surgical

specializations as well as in anesthesiology and intensive therapy, with particular emphasis on quantitative changes.

Material and methods

The material for the analysis was the data obtained from the register of doctors undergoing specialization training between 2011 and 2020. This register is kept by the Centre of Postgraduate Medical Education of Warsaw (CMKP), which is the sole entity responsible for the organization and coordination of postgraduate education for physicians.

The data from the Medical Exams Centre were used to analyze the results of the State Specialist exam (exams ending the specialization training) in the 2011-2018 period. At the time of publication of this article, the statistics for 2019-2020 have not yet been published.

The analysis covers nine treatment specializations. The areas studied are pediatric surgery, thoracic surgery, vascular surgery, general surgery, plastic surgery, cardiac surgery, neurosurgery, orthopaedics and traumatology, and ophthalmology. The analysis also included anesthesiology and intensive care. The fact that this specialization is included in the table below is due to its close relationship with other surgical specializations, including, in particular, surgery.

Only medical specialities were selected for the analysis. Due to the selection of specializations, all aggregate statistics relate to doctors only – not including dentists, unless explicitly stated.

The data on the number of doctors specializing in particular fields (including the number of women and men and their age), doctors specializing in residency, training places and entities specializing in specializations were analyzed. The pass rate during the PES was also analyzed, separately for each specialization.

Microsoft Excel was used to develop the quantitative characteristics of the studied group.

Results

As a result of the conducted analysis, the quantitative changes taking place in the education system in the surgical specializations of medicine in 2011-2020 were presented. The analysis covered nine surgical specializations as well as anesthesiology and intensive care out of 77 fields in which doctors can specialize. Obtained results accurately characterize the specialization process in the selected areas. However, some conclusions can be generalized to the entire population of physicians in the course of the specialization.

Based on the data from the register of the Postgraduate Medical Education Centre, the total number of doctors undergoing medical and dental specialization in 2020 was: 25,963 people. Among them, as many as 20,012 (77.1%) people were trained in residency mode. This is a significant increase compared to 2011, with, respectively: 22,873 people and 12,586 (55.0%) residents (Table 1).

Number of doctors who are undergoing training in selected specializations, including residents

Among the ten analyzed specializations, the most numerous group in 2020 specialized in the following areas: anesthesiology and intensive care (1,450 people, i.e., 5.6% of all doctors and dentists in the course of specialization), orthopaedics and traumatology of the musculoskeletal system (1,098, i.e., 4.2%) and general surgery (994, i.e., 3.8%). On the other hand, the least numerous were: thoracic surgery (43, i.e., 0.2%), cardiac surgery (71, i.e., 0.3%) and plastic surgery (80, i.e., 0.3%) (Table 2).

Table 1. Data from the CMKP register for all specializations – summary.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
The number spec. in total	22873	23292	23782	23962	23582	24050	24485	26272	24726	25963
of which residents	12586	13548	14222	14105	15722	16612	16818	18830	18663	20012
% of residents	55.0%	58.2%	59.8%	58.9%	66.7%	69.1%	68.7%	71.7%	75.5%	77.1%
of which women	13804	14193	14567	14763	14632	15023	15247	16549	15657	16476
% of women	60.4%	60.9%	61.3%	61.6%	62.0%	62.5%	62.3%	63.0%	63.3%	63.5%
The average age of the person undergoing the specialization	33.8	33.7	33.5	33.6	32.8	32.7	33.3	32.9	32.6	31.6
The number of training places	36317	37031	37238	38670	39569	43595	42122	43660	43423	45248
The number of entities conducting specializations	5106	5215	5375	5677	6124	6579	6512	6833	6798	7140
The number of training places up to the number of people	1.6	1.6	1.6	1.6	1.7	1.8	1.7	1.7	1.8	1.7

In the years 2011-2020, the largest percentage increase in the number of specialized doctors was recorded in plastic surgery (+100.0%), ophthalmology (+48.4%) and vascular surgery (+42.9%). On the other hand, a decrease in the number of specialist doctors was recorded in two analyzed areas, i.e., cardiac surgery (-40.8%) and thoracic surgery (-12.2%).

Among the analyzed specializations, in 2020 the largest share of residents was in the following areas: pediatric surgery (95.1%), ophthalmology (94.0%) and general surgery (92.1%). The lowest percentage of residents was recorded in vascular surgery (44.7%) and plastic surgery (52.5%) (Table 2).

In the years 2011-2020, the percentage of doctors specializing in residency increased in all analyzed areas. The largest increase in specialization in residency was recorded in the following areas: vascular surgery (+41.8%), pediatric surgery (+35.6%) and plastic surgery (+35.0%).

Table 2. Data from the CMKP register concerning the 10 analyzed specializations.

Pediatric surgery	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	143	160	172	156	160	147	149	154	143	162
of which residents	85	116	142	132	142	138	139	145	135	154
% of residents	59.4%	72.5%	82.6%	84.6%	88.8%	93.9%	93.3%	94.2%	94.4%	95.1%
of which women	85	99	107	98	105	101	103	104	100	116
% of women	59.4%	61.9%	62.2%	62.8%	65.6%	68.7%	69.1%	67.5%	69.9%	71.6%
The average age of the person undergoing the specialization	31.8	30.9	30.6	31.0	30.5	30.5	31.3	31.3	31.0	29.7
The number of training places	168	181	193	192	215	210	225	231	227	232
The number of entities conducting specializations	37	43	48	48	56	53	55	56	55	56
The number of training places to the number of doctors undergoing the specialization ratio	1.2	1.1	1.1	1.2	1.3	1.4	1.5	1.5	1.6	1.4
Thoracic surgery	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	49	53	53	49	49	46	52	51	44	43
of which residents	26	28	30	31	34	35	36	36	33	30
% of residents	53.1%	52.8%	56.6%	63.3%	69.4%	76.1%	69.2%	70.6%	75.0%	69.8%
of which women	14	13	15	15	15	12	12	11	11	8
% of women	28.6%	24.5%	28.3%	30.6%	30.6%	26.1%	23.1%	21.6%	25.0%	18.6%
The average age of the person undergoing the specialization	33.6	34.5	34.0	33.4	32.5	31.7	33.4	33.4	32.7	32.9
The number of training places	80	80	79	79	80	83	78	80	82	84
The number of entities conducting specializations	21	21	21	21	21	21	21	23	23	23

Thoracic surgery	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
The number of training places to the number of doctors undergoing the specialization ratio	1.6	1.5	1.5	1.6	1.6	1.8	1.5	1.6	1.9	2.0
Vascular surgery	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	105	112	111	109	119	138	144	149	152	150
of which residents	3	0	0	4	27	34	35	44	56	67
% of residents	2.9%	0.0%	0.0%	3.7%	22.7%	24.6%	24.3%	29.5%	36.8%	44.7%
of which women	6	8	10	13	21	28	27	31	30	28
% of women	5.7%	7.1%	9.0%	11.9%	17.6%	20.3%	18.8%	20.8%	19.7%	18.7%
The average age of the person undergoing the specialization	41.2	40.8	40.5	39.2	36.1	35.8	36.5	36.7	36.0	33.9
The number of training places	159	161	166	167	179	182	189	197	197	212
The number of entities conducting specializations	43	43	47	48	57	56	58	61	60	63
The number of training places to the number of doctors undergoing the specialization ratio	1.5	1.4	1.5	1.5	1.5	1.3	1.3	1.3	1.3	1.4
General surgery	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	935	981	1011	981	990	990	983	1070	983	994
of which residents	675	744	767	743	832	848	852	946	902	915
% of residents	72.2%	75.8%	75.9%	75.7%	84.0%	85.7%	86.7%	88.4%	91.8%	92.1%
of which women	270	305	312	334	347	359	350	420	397	406
% of women	28.9%	31.1%	30.9%	34.0%	35.1%	36.3%	35.6%	39.3%	40.4%	40.8%
The average age of the person undergoing the specialization	31.1	30.9	30.9	30.8	30.4	30.5	31.3	31.0	30.8	30.2
The number of training places	1364	1383	1392	1399	1445	1518	1477	1508	1484	1543
The number of entities conducting specializations	370	372	376	379	389	410	398	404	395	403
The number of training places to the number of doctors undergoing the specialization ratio	1.5	1.4	1.4	1.4	1.5	1.5	1.5	1.4	1.5	1.6

Plastic surgery	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
The number of doctors undergoing the specialization	40	49	47	45	54	66	71	75	72	80
of which residents	7	11	15	18	20	30	32	33	32	42
% of residents	17.5%	22.4%	31.9%	40.0%	37.0%	45.5%	45.1%	44.0%	44.4%	52.5%
of which women	14	16	18	21	27	30	32	32	28	32
% of women	35.0%	32.7%	38.3%	46.7%	50.0%	45.5%	45.1%	42.7%	38.9%	40.0%
The average age of the person undergoing the specialization	33.5	34.5	34.9	35.4	34.0	34.2	34.1	34.8	33.8	32.3
The number of training places	53	57	58	65	72	75	81	81	81	90
The number of entities conducting specializations	13	13	13	14	16	16	16	16	16	17
The number of training places to the number of doctors undergoing the specialization ratio	1.3	1.2	1.2	1.4	1.3	1.1	1.1	1.1	1.1	1.1
Cardiac surgery	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	120	108	116	112	100	87	86	81	74	71
of which residents	54	56	65	69	69	60	58	58	58	56
% of residents	45.0%	51.9%	56.0%	61.6%	69.0%	69.0%	67.4%	71.6%	78.4%	78.9%
of which women	19	14	17	20	17	16	16	17	18	15
% of women	15.8%	13.0%	14.7%	17.9%	17.0%	18.4%	18.6%	21.0%	24.3%	21.1%
The average age of the person undergoing the specialization	32.5	32.6	32.0	31.6	31.6	31.4	32.1	32.2	31.6	31.2
The number of training places	176	179	178	171	157	158	159	161	161	163
The number of entities conducting specializations	33	34	35	34	34	34	35	36	36	36
The number of training places to the number of doctors undergoing the specialization ratio	1.5	1.7	1.5	1.5	1.6	1.8	1.8	2.0	2.2	2.3
Neurosurgery	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	104	111	124	125	120	131	135	145	136	142
of which residents	44	57	77	78	85	93	94	104	103	109

Neurosurgery	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
% of residents	42.3%	51.4%	62.1%	62.4%	70.8%	71.0%	69.6%	71.7%	75.7%	76.8%
of which women	22	21	29	27	21	22	24	27	26	30
% of women	21.2%	18.9%	23.4%	21.6%	17.5%	16.8%	17.8%	18.6%	19.1%	21.1%
The average age of the person undergoing the specialization	31.2	31.1	30.7	31.0	30.0	29.8	30.4	30.7	31.0	30.2
The number of training places	135	141	141	149	153	154	152	157	156	166
The number of entities conducting specializations	39	41	41	42	43	43	43	44	44	46
The number of training places to the number of doctors undergoing the specialization ratio	1.3	1.3	1.1	1.2	1.3	1.2	1.1	1.1	1.1	1.2
Orthopaedics and traumatology of the musculoskeletal system	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	1047	1079	1083	1036	1057	1024	1057	1113	1018	1098
of which residents	824	894	895	841	943	910	938	994	918	1001
% of residents	78.7%	82.9%	82.6%	81.2%	89.2%	88.9%	88.7%	89.3%	90.2%	91.2%
of which women	80	99	111	117	120	124	129	142	124	130
% of women	7.6%	9.2%	10.2%	11.3%	11.4%	12.1%	12.2%	12.8%	12.2%	11.8%
The average age of the person undergoing the specialization	31.2	31.1	31.0	30.9	30.4	30.5	31.2	30.8	30.8	29.9
The number of training places	1376	1407	1462	1503	1561	1600	1601	1666	1701	1760
The number of entities conducting specializations	253	259	263	271	276	287	278	289	294	297
The number of training places to the number of doctors undergoing the specialization ratio	1.3	1.3	1.3	1.5	1.5	1.6	1.5	1.5	1.7	1.6
Opthalmology	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	591	593	595	636	681	708	735	781	800	877
of which residents	436	467	459	463	559	616	630	686	731	824
% of residents	73.8%	78.8%	77.1%	72.8%	82.1%	87.0%	85.7%	87.8%	91.4%	94.0%

Opthalmology	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
of which women	479	474	482	513	545	555	578	617	640	699
% of women	81.0%	79.9%	81.0%	80.7%	80.0%	78.4%	78.6%	79.0%	80.0%	79.7%
The average age of the person undergoing the specialization	30.7	30.4	30.1	30.2	29.7	29.7	30.4	30.4	30.1	29.3
The number of training places	710	725	722	741	788	866	844	908	912	974
The number of entities conducting specializations	95	96	98	98	103	111	111	115	115	119
The number of training places to the number of doctors undergoing the specialization ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.1
Anesthesiology and intensive care	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
The number of doctors undergoing the specialization	1412	1407	1409	1395	1377	1414	1400	1455	1363	1450
of which residents	1038	1077	1120	1139	1183	1244	1226	1285	1223	1310
% of residents	73.5%	76.5%	79.5%	81.6%	85.9%	88.0%	87.6%	88.3%	89.7%	90.3%
of which women	817	822	824	840	840	841	834	863	786	822
% of women	57.9%	58.4%	58.5%	60.2%	61.0%	59.5%	59.6%	59.3%	57.7%	56.7%
The average age of the person undergoing the specialization	31.8	31.7	31.6	31.4	30.9	30.8	31.6	31.5	31.2	30.3
The number of training places	1840	1877	1902	1911	1931	2021	1961	2018	1978	1995
The number of entities conducting specializations	165	173	176	180	183	192	195	202	201	210
The number of training places to the number of doctors undergoing the specialization ratio	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.4

Age of doctors who are in the process of specialization

In the set of 10 analyzed specializations, the average age of a doctor undergoing specialization in 2020 was 30.2 years. It is much lower than the average for all doctors and dentists in the course of the specialization, which by 2020 was 31.6 years.

In 2020, among the analyzed domains, the highest average age of specialist doctors was recorded in vascular surgery (33.9 years). On the other hand, the lowest average age of doctors was found in the field of ophthalmology (29.3 years), pediatric surgery (29.7 years) and orthopaedics and traumatology of the musculoskeletal system (29.9 years) (Table 2).

Gender of doctors who undergo specialization

In 2020, in the analyzed set of 10 specializations, women constituted 45.1% (Table 3). The percentage of women completing the above-mentioned specializations in 2011-2020 showed an upward trend (+5.4%). Even in specialities so far considered to be a male bastion, such as orthopaedics and traumatology of the musculoskeletal system, an increase in the percentage of women was from 7.6% to 11.8% (Table 3).

In 2020, in the analyzed set of surgical specializations, the highest percentage of women was found in the following fields: ophthalmology (79.7%) and pediatric surgery

Table 3. Data from the CMKP register regarding the 10 analyzed specializations – summary.

Summary table for the above 10 specializations	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
The number of doctors undergoing the specialization	4546	4653	4721	4644	4707	4751	4812	5074	4785	5067
of which residents	3192	3450	3570	3518	3894	4008	4040	4331	4191	4508
% of residents	70.2%	74.1%	75.6%	75.8%	82.7%	84.4%	84.0%	85.4%	87.6%	89.0%
of which women	1806	1871	1925	1998	2058	2088	2105	2264	2160	2286
% of women	39.7%	40.2%	40.8%	43.0%	43.7%	43.9%	43.7%	44.6%	45.1%	45.1%
The average age of the person undergoing the specialization	31.6	31.5	31.4	31.2	30.7	30.7	31.4	31.3	31.0	30.2
The number of training places	6061	6191	6293	6377	6581	6867	6767	7007	6979	7219
The number of entities conducting specializations	1069	1095	1118	1135	1178	1223	1210	1246	1239	1270
The number of training places to the number of doctors undergoing the specialization ratio	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.4

(71.6%). On the other hand, the lowest percentage of women was observed in orthopaedics and traumatology of the musculoskeletal system (11.8%), thoracic surgery (18.6%) and vascular surgery (18.7%), in which men predominated (Table 2).

Between 2011 and 2020, the percentage of women increased in 6 out of 10 analyzed areas: vascular surgery (+13.0%), pediatric surgery (+12.2%), general surgery (+12.0%), and cardiac surgery (+5.3%), plastic surgery (+5.0%) and orthopaedics and traumatology of the musculoskeletal system (+4.2%).

There was only a decrease in 3 areas, i.e., thoracic surgery (-10.0%), ophthalmology (-1.3%), and anesthesiology and intensive care (-1.2%). On the other hand, in neurosurgery, the percentage of women remained constant.

Doctors usually specialize in residency mode. The percentage of residents increased from 55% of all specialists in 2011 to 77.1% in 2020 (Table 3).

Comparison of the number of doctors specializing in selected specializations with the number of specialists

According to the data from 2020, among the 10 analyzed specializations, the highest percentage of doctors in the course of specialization to specialist doctors or doctors with 1st-degree specialization practicing the profession was recorded in the case of plastic surgery (specialization specialists constitute 34.0% of the number of professionally active specialists), orthopaedics and traumatology of the musculoskeletal system (26.0%) and vascular surgery (25.3%) (13).

Training places and entities conducting the specialization

In 2020, the number of announced new medical and dental-medical residence places in the spring and autumn proceedings amounted to 6,082, of which 975 related to the analyzed set of 10 specializations (14, 15). In 2021, an upward trend can be noticed, as 1,131 residential places were related to the analyzed specializations, and the total number of places granted was 6,154 (16, 17).

In the analyzed set of specializations, in the period 2011--2020, the total number of training places and the number of entities conducting specialization increased (Table 3). Compared to 2011, in 2020 there were nearly one-fifth more training places (+19.1%) and entities conducting specialization (+18.8%). The increase in the number of training places occurred in all analyzed areas, except for cardiac surgery (-7.4%). The largest increase in the number of places was recorded in such areas as plastic surgery (+69.8%) and pediatric surgery (+38.1%).

The number of entities offering specialization increased in all 10 analyzed areas, with the largest increase in pediatric surgery (+51.4%).

State Specialization Exam results

Based on the data obtained from the Medical Exams Centre, the pass rate in individual years can be analyzed (18).

The best pass rate among the analyzed group of specializations, in 2011-2018, was obtained by people specializing in plastic surgery and cardiosurgery – all participants passed the exam (Table 4).

Table 4. Data from the CEM register on the 10 analyzed specializations – individuals taking the PES (enrolled), diplomas issued.

Specialization	Type of data	2011	2012	2013	2014	2015	2016	2017	2018
Pediatric surgery	enrolled	15	17	16	15	22	22	21	15
	issued diplomas	15	17	14	15	18	20	21	14
Thoracic surgery	enrolled	10	3	7	12	6	11	4	10
	issued diplomas	9	3	7	12	6	11	4	10
Vascular surgery	enrolled	37	41	35	37	37	35	16	10
	issued diplomas	37	41	35	37	37	34	16	6
General surgery	enrolled	158	166	129	120	120	116	139	127
	issued diplomas	152	163	127	118	116	109	135	115
Plastic surgery	enrolled	2	6	7	8	16	10	7	9
	issued diplomas	2	6	7	8	16	10	7	9
Cardiac surgery	enrolled	20	16	7	14	21	12	13	11
	issued diplomas	20	16	7	14	21	12	13	11
Neurosurgery	enrolled	14	24	15	16	22	22	13	18
	issued diplomas	14	23	15	15	19	21	11	14
Orthopaedics and traumatology of the musculoskeletal system	enrolled	125	147	137	150	145	154	163	141
	issued diplomas	118	143	131	142	135	147	157	123
Ophthalmology	enrolled	81	118	115	100	97	86	86	111
	issued diplomas	81	116	111	97	96	84	82	101
Anesthesiology and intensive care	enrolled	163	196	195	219	175	162	147	141
	issued diplomas	158	185	188	212	169	151	143	126

Table 5. Data from the CEM register on the 10 analyzed specializations – percentage pass rate.

Specialization	2011	2012	2013	2014	2015	2016	2017	2018	2011-2018
Pediatric surgery	100.0%	100.0%	87.5%	100.0%	81.8%	90.9%	100.0%	93.3%	93.7%
Thoracic surgery	90.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	98.4%
Vascular surgery	100.0%	100.0%	100.0%	100.0%	100.0%	97.1%	100.0%	60.0%	98.0%
General surgery	96.2%	98.2%	98.4%	98.3%	96.7%	94.0%	97.1%	90.6%	96.3%
Plastic surgery	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cardiac surgery	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Neurosurgery	100.0%	95.8%	100.0%	93.8%	86.4%	95.5%	84.6%	77.8%	91.7%
Orthopaedics and traumatology of the musculoskeletal system	94.4%	97.3%	95.6%	94.7%	93.1%	95.5%	96.3%	87.2%	94.3%
Ophthalmology	100.0%	98.3%	96.5%	97.0%	99.0%	97.7%	95.3%	91.0%	96.7%
Anesthesiology and intensive care	96.9%	94.4%	96.4%	96.8%	96.6%	93.2%	97.3%	89.4%	95.3%

In the analyzed time period, the highest pass rate was recorded in the case of the neurosurgery exam – 91.7%. On the other hand, the lowest annual pass rate was recorded for the vascular surgery exam in 2018 – it was 60% (Table 5).

In 2018, the lowest total pass rate, taking into account all analyzed specializations, took place – it was 89.2%, while in 2012 it reached the highest value – 97.1% (Table 5).

The average pass rate of specialization exams in 2011-2018 for each of the analyzed specializations exceeded 90% (Table 5). This proves that people taking the exam are properly prepared.

Discussion

Doctors undergoing specialization, their number, mode of specialization, gender and average age

In 2012, the average number of doctors per 1000 inhabitants was 2.2 (19), while in 2017 it was 2.4 doctors per 1000 inhabitants (20). This places Poland far beyond most European countries. The average rate in the European Union, according to OECD data, is 3.6 (21). However, it is close to the US index. Undoubtedly, it is one of the most frequently used measures for assessing the quality of health care. However, other elements of the health care organization mean that, for example, Greece ranks 26th in the overall quality assessment of CEO World Biz, while the index of the number of doctors, mainly specialists, is the highest in Europe (6.4). Poland ranks 51st in this ranking (22).

In 2020, the most numerous group among doctors divided into 5-year age groups were 51-55 years of age (11.6% of professionally active doctors), over 70 (11.5%) and 61-65 years of age (11.2%). This phenomenon may be the result of migration that took place after Poland joined the European Union (23, 24). The shortage of specialists is also caused by many years of difficult access to education in the field of medicine chosen by the doctor, which limits the possibilities for the professional development of doctors.

Some doctors continue to work in the profession after reaching the retirement age. There are various reasons for this, ranging from the need to share knowledge and experience, through financial aspects, ending with the belief that their departure would be associated with organizational problems in the current workplace (25). In 2014, the average age of doctors in Poland was 49 years, while in 2017 it was 52 years (26). In surgical practice, too many surgeons of retirement age may be important, especially in procedures requiring high physical fitness. In such specializations, care should be taken to quickly fill the generation gap. Moreover, among all medical specializations, these procedures require the transfer of knowledge and practices by senior specialists to adepts directly at the operating table. Healthcare providers should develop incentive mechanisms to ensure that experienced specialization tutors are available until generational renewal.

A noticeable trend is the increased interest in surgical specializations in areas where one may doubt whether they constitute a priority given the epidemiological trends and forecasts. This is probably due to many years of perturbations in the valuation of the costs of services, which makes some treatments "profitable" more than others. In line with the market laws, healthcare organizers focus on providing such services and competitively recruiting staff. There is a lack of specialization places for such specializations, which is comparatively indicated by an appropriate indicator. This is probably the case not only because of the growing interest of doctors who are ready to specialize but perhaps also because of the reluctance to create new places of specialization. Such a phenomenon is called cream-skimming, i.e., the selection of the best-paid services by healthcare entities is detrimental to the sustainable development of human resources. It has been noticed by the European Commission and is the subject of calls within the HORIZON-HLTH-2022-CARE-08-04 Program: Better financing models for health systems, for the implementation of projects creating new tools for shaping human resources, relevant to real health needs. Independently, while improving training mechanisms, it is necessary to consistently prioritize surgical specializations necessary in the treatment of diseases that are the main causes of death. Invariably, the most common diseases with the highest mortality rate are coronary heart disease and lung cancer. The data presented in this study indicate a declining number of students in cardiac and thoracic surgery. The development of interventional cardiology may have a negative impact on the demand for the treatment of coronary bypass surgery. However, taking into account the very high prevalence of coronary heart disease and its prognostic only slightly decreasing risk of death due to it, the decreased interest in education in cardiac surgery is worrying. The lack of screening programs intended for the early detection of lung cancer and the COVID-19 pandemic means that a large proportion of lung cancer cases are at an advanced stage, which puts their treatment beyond the capabilities of thoracic surgeons. Nevertheless, because of increasing epidemiological trends, there is a continuing need for early lung cancer detection and surgical treatment and rapid surgical development. Therefore, it is necessary to maintain education in the field of thoracic surgery, as well as a tool to promote interest in education in oncological surgery.

A promising prognosis is the constantly growing number of doctors with a license to practice – in recent years (since 2012) it has increased by nearly twenty thousand (3, 4). In addition, a steady increase in the number of the youngest doctors can be seen. In 2021, 24% of professionally active physicians were aged up to 35 years (3).

A favorable trend is an increase in the share of residency among the forms of employment during specialization. Most likely, it is caused by stable employment conditions based on an employment contract and a wide range of accredited units. The decisions of the Ministry of Health, which concerned the number of residency places granted in a given procedure, had a significant impact on the increase in the number of doctors specializing in particular fields. The number of available training places was also important, mainly due to the number of accredited units and the number of specialization managers. Their number, in turn, depends on the adopted health policy and the availability of specialists in a given field.

The residency model gives a sense of stability, because it is financed by the Ministry of Health, and the doctor has the option to choose the place where it will be held. Within the analyzed group of surgical specialities, the lowest percentage of residents was recorded in vascular surgery (in 2020 – 44.7%). This may be due to the selection of this specialization as a complement to general surgery by physicians who obtained the specialization before implementing modular specializations. This makes it impossible for doctors to complete another specialization in residency mode.

Efforts should be made to ensure that decisions on granting residency positions reflect as much as possible the demand for specialists in particular fields of medicine. In the analyzed group, three specializations are the so-called priority

specializations, i.e., anesthesiology and intensive therapy, pediatric surgery and general surgery (27). This translates into the great popularity and number of doctors of these specializations in the analyzed group of surgical specializations.

The average age of all doctors and dentists undergoing specialization, amounting to 33.8 years in 2011, decreased in 2020 when it amounted to 31.6 years.

Based on the collected data, it can be concluded that in 2011-2020 there was a moderate increase in doctors during their specialization – by 13.5 percentage points. Growth was gradual and peaked in 2018.

Broader access to specialization training translates into lowering the average age of doctors during specialization.

The share of women among doctors with surgical specializations in 2020 was 45.1% which is lower than in the entire population of doctors, where it was 58.8% (2), and also lower than in the population of doctors with medical and dental and medical specializations – 63.5%.

Training places and entities conducting the specialization

Both in the analyzed set of specializations and among all specializations, in the period 2011-2020 the total number of training places and the number of entities conducting specializations increased. This contributed to the selection of the field of medicine in accordance with the interests and predispositions.

In the analyzed set, as well as among all specializations, in 2011-2020, the use of training places, expressed as the ratio of the number of training places in relation to the number of physicians undergoing specialization, slightly decreased (the number of training places grew faster than the number of physicians in specialization). The greatest increase in training places per specialist can be observed in cardiac surgery. The number of specialized doctors decreased by 40.8%, while the number of training places decreased by only 7.4%, which resulted in an increase in the value of the above-mentioned index from 1.5 to 2.3.

State Specialization Exam results

In order to obtain a complete picture of the issues related to the State Specialization Exam, more detailed data should be collected on persons taking this exam, including, in particular, the number of attempts to take the exam.

Conclusions

Concluding on the analyses carried out for the years 2011-2020, it should be noted that the specialist training system for doctors in Poland was constantly developing.

In the analyzed period:

- the number of doctors undergoing specialization training has increased,
- the share of women in the group of doctors undergoing specialization increased,
- the share of doctors undergoing specialization in residency mode has increased,
- the number of accredited units has increased,
- the number of training places has increased,
- the average age of a person undergoing specialization has decreased.

In the long them the introduced reforms may contribute to a gradual increase in the number of doctors in Poland. However, the decreasing utilization of training places has to be of concern.

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