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DATABASE ANALYSIS

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Assessment of Hospital Volume in the Surgical Management of Endometrial and Ovarian Cancer: A Polish Population-Based Study

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Background: Surgery is a cornerstone in management of ovarian and endometrial cancer. The European Society of Gynecological Oncology introduced quality indicators to improve management of these cancers. The optimal annual number of surgeries per unit was established for high-quality surgical treatment.

Material/Methods: The database of the National Health Fund on surgical management of endometrial and ovarian cancer was analyzed. Patients treated between 2017 and 2020 were included. Departments where patients underwent surgery were divided according to number of surgeries performed per year in endometrial cancer: ≥80, 79-50, 49-20, 19-0; and ovarian cancer: ≥100, 99-50, 49-20, 19-0. Optimal number of surgeries per center was defined as at least 100 and 80 surgeries per year in ovarian and endometrial cancer, respectively.

Results: Totally, there were 22 325 surgeries in 316 units and 10 381 surgeries in 251 units due to endometrial and ovarian cancer, respectively. Most surgeries in endometrial cancer (n=15 077; 67.5%) and ovarian cancer (n=9642; 92.88%) were performed in departments that did not meet optimal criteria in number of surgeries. Between 2017 and 2019, an increasing trend in number of surgeries per year in endometrial and ovarian cancer was found. In 2020, there was a decrease in the number of surgeries by 7.8% (n=453) and 8.6% (n=234) in endometrial and ovarian cancer, respectively.

Conclusions: In Poland, surgical treatment of ovarian and endometrial cancer is decentralized. Most cancer patients underwent surgery in low-volume general gynecologic departments. The COVID-19 pandemic impaired cancer management, leading to a decreased number of surgeries.

Keywords: Endometrial Neoplasms • Ovarian Neoplasms • Quality Indicators, Health Care • Surgery Department, Hospital

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Background

Endometrial and ovarian cancers are leading in incidence among gynecological malignancies in North America and Europe [1]. In total, in those regions, the estimated number of new cases of endometrial and ovarian cancer in 2020 were 198 453 and 93 323, respectively [1]. Survival improvement remains the main goal of anticancer treatment. Today, targeted therapies are in the spotlight, and numerous studies confirmed their efficacy in clinical practice [2,3]. However, surgery remains the main treatment method in primary endometrial and ovarian cancer.

In Poland, the survival rate in endometrial and ovarian cancer is one of the lowest in Europe [4,5]. The low survival rate in Eastern Europe was noted in the European Society of Gynecological Oncology/European Society Radiation Oncology European Society of Pathology (ESGO/ESTRO/ESP) endometrial cancer guidelines in 2021 [6]. Concin et al suggested that the worse survival compared with that of Western and Northern Europe may result from a more aggressive type of cancer occurring in this part of Europe [6]. However, it also may be caused by more advanced stages, low healthcare expenditure, or a poorly organized healthcare system. Bradley et al found that lower survival in cancer patients is more associated with the lack of access to quality care and not biological differences between tumors [7]. It has been shown that centralization of oncological treatment improves patients' survival in both ovarian and endometrial cancer [8-10]. In the ESGO quality indicators in endometrial cancer and advanced ovarian cancer, the number of surgical procedures performed per center is a principle indicator [11,12]. In endometrial cancer, the optimal and minimal number of surgeries per year were 80 and 50, respectively [11]; while in ovarian cancer, at least 100 surgeries of advanced cases per year was established as the optimal number [12].

Healthcare in Poland is potentially fully accessible for patients, but ultimately it does not guarantee the availability of healthcare of a standardized quality. Currently, a vast minority of hospitals in Poland have a quality certificate from the Ministry of Health [13]. Among approximately 1200 hospitals, 164 (13.6%) providers are certified.

The aim of this study was to assess how many surgeries in endometrial and ovarian cancer in Poland are performed in accordance with the ESGO qualitative index regarding the number of surgeries.

Material and Methods

The Bioethical Committee of the Medical University of Warsaw approved the study (approval no.: AKBE/222/2022). Informed consent was exempted due to the type of the research.

Data Source

Healthcare in Poland is provided by the National Health Fund (Narodowy Fundusz Zdrowia [NFZ]), which finances health services for all Poles. However, in 2021, 90% of Polish citizens (34 062 250 of 37 907 700) were registered as "insured" in the National Health Fund database [14,15]. Data on the surgical management of 13 types of cancer in every publicly funded hospital are available on the site of the National Health Fund (https://ezdrowie.gov.pl/portal/home/badania-i-dane/zdrowe-dane); instructions on how to access the data are presented step by step in **Figure 1**. Diagnoses and surgical procedures were recorded according to the International Classification of Disease, Tenth Revision (ICD-10) and International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM), respectively. Among gynecological malignancies, data on endometrial (C54) and ovarian (C56) cancer were available; they included number of cancer patients treated surgically, number of units providing surgical treatment, and duration of hospital stay. Completeness of data is mandatory for healthcare reimbursement.

Analyzed data did not include patients and units outside the system of the National Health Fund. Although the number of commercially treated patients remained unknown, they constituted a small group of patients and omitting them should not affect presented data.

National Cancer Registry collects data on cancer incidence and mortality in Poland. Reporting every new case of cancer to the National Cancer Registry and National Health Fund is mandatory and required by Polish law.

Study Construction

From National Health Fund database, data on patients with endometrial and ovarian cancer treated surgically between 2017 and 2020 were retrieved. The number of patients undergoing surgery was related to the total number of newly diagnosed cases reported by the National Cancer Registry. Among all hospitals registered by the National Health Fund, a distinction was made between cancer centers and university/teaching hospitals. All units were divided according the number of surgeries performed per year. The optimal number of surgeries per center was defined as at least 80 and 100 surgeries per year in endometrial and ovarian cancer, respectively. Those were regarded as high-volume centers. Other (suboptimal) units were divided according to the number of surgeries, as follows, for endometrial cancer: 79-50/year (middle volume), 49-20/year (low volume), and 19-0/year (very low volume); and for ovarian cancer: 99-50/year (middle volume), 49-20/year (low volume), and 19-0/year (very low volume).

This article presents crude numbers and percentages.

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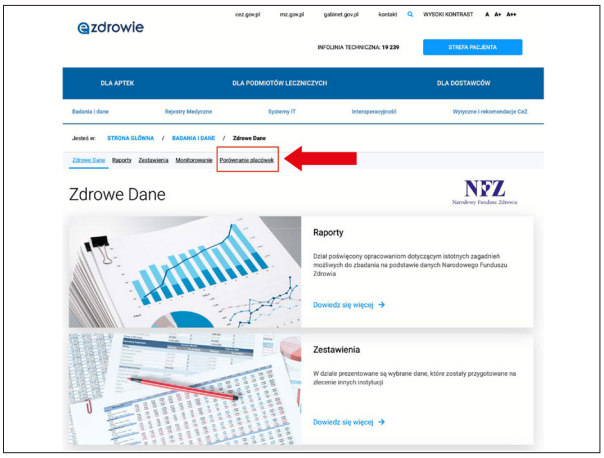
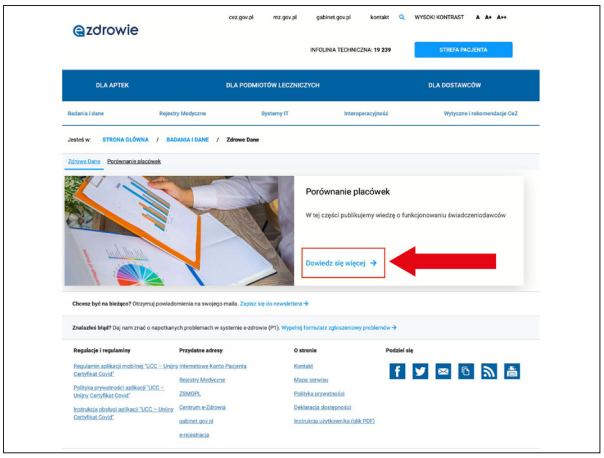
1) Open https://ezdrowie.gov.pl/portal/home/badania-i-dane/zdrowe-dane (link provided in the article).

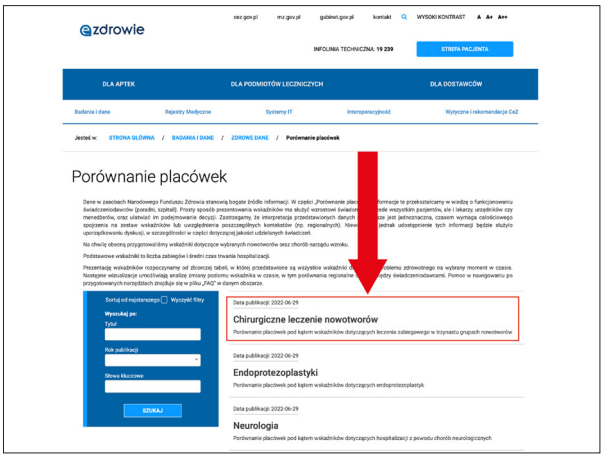
2) Click on ***"Porównanie placówek"***.



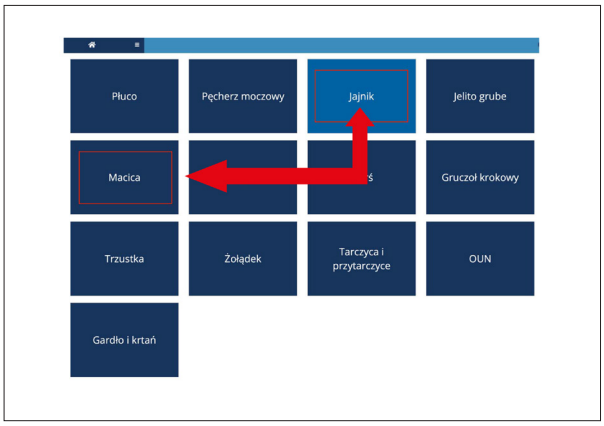
3) Click on ***"Dowiedz się więcej"***.



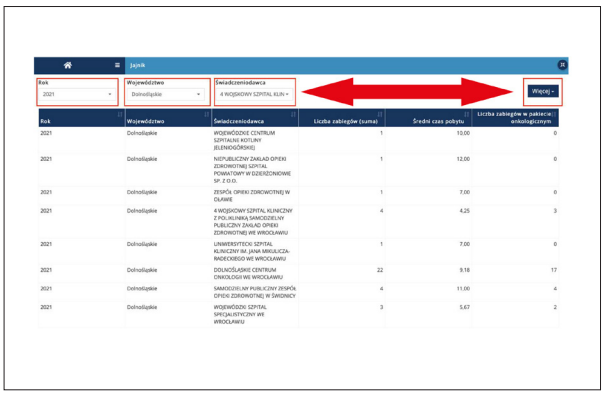
4) Click on ***"Chirurgiczne leczenie nowotworów"***.



5) Click on ***"jajnik"*** to access to ovarian cancer surgeries or ***"macica"*** to access to endometrial cancer surgeries.



6) You can change year ***"rok"***, province ***"województwo"*** or hospital ***"świadczeniodawca"***. By clicking on ***"Więcej"***, you can create graphs, trends, maps, etc.



7) Click on ***"Pobierz dane"*** to download data in xlsx or csv file.

Figure 1. Instructions to access database "Zdrowe Dane" on surgical treatment in Poland.

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Table 1. New cases and surgeries for endometrial and ovarian cancer. The number of new cases was retrieved from annual reports "Cancer in Poland" [21-23].

Malignancy	Year	Number of surgeries	Number of new cases	Percentage of surgeries to new cases
Endometrial cancer	2017	5470	5984	91%
	2018	5644	6059	93%
	2019	5832	6023	97%
	2020	5379	–*	
Ovarian cancer	2017	2616	3775	69%
	2018	2549	3734	68%
	2019	2725	3710	73%
	2020	2491	–*	

* Data on number of new cases in 2020 were not available at the time of this writing.

Table 2. Surgical treatment of endometrial cancer in Poland from 2017 to 2020.

Year		Number of surgeries in unit per year				Total
		≥80	50-79	20-49	<20	
2017	Number of units (%)	14 (5.5)	11 (4.4)	54 (21.3)	174 (68.8)	253 (100)
	Number of patients (%)	1987 (36.3)	693 (12.7)	1741 (31.8)	1049 (19.2)	5470 (100)
2018	Number of units (%)	15 (6)	15 (6)	49 (19.7)	170 (68.3)	249 (100)
	Number of patients (%)	2029 (35.9)	991 (17.5)	1453 (25.8)	1171 (20.8)	5644 (100)
2019	Number of units (%)	14 (5.7)	17 (6.9)	46 (18.8)	168 (68.6)	245 (100)
	Number of patients (%)	2120 (36.4)	1031 (17.6)	1438 (24.7)	1243 (21.3)	5832 (100)
2020	Number of units (%)	10 (4)	19 (7.6)	49 (19.7)	171 (68.7)	249 (100)
	Number of patients (%)	1513 (28.1)	1285 (23.9)	1449 (26.9)	1132 (21.1)	5379 (100)
Total number of patients (%)		7649 (34.3)	4000 (17.9)	6081 (27.2)	4595 (20.6)	22325 (100)

Results

In total, there were 22 325 surgeries in 316 units and 10 381 surgeries in 251 units conducted in cases of endometrial and ovarian cancer, respectively (**Tables 1, 2**). A total of 245 units provided surgical treatment of both malignancies; of them were 26 university hospitals and 17 cancer centers. Of newly diagnosed cases, more than 90% of endometrial and about 70% of ovarian cancer patients underwent surgical treatment (**Table 3**). The ratio of surgically treated neoplasms to newly diagnosed cases varied among provinces. The free choice of hospital leads to the migration of patients all over the country. In endometrial cancer, the ratio ranged from 77% in the Opolskie province to 114% in the Mazowieckie province. In ovarian cancer, the lowest ratio was in the Podkarpackie province, while the highest rate was in the Pomorskie province. A detailed inter-region analysis is shown in **Table 4**.

Between 2017 and 2019, there was an increasing number of surgeries per year in endometrial and ovarian cancer. In 2020 (first year of COVID-19 pandemic) compared with 2019, there was a decrease in the number of surgeries by 7.8% (n=453) and 8.6% (n=234) in endometrial and ovarian cancer, respectively.

Endometrial Cancer

Among 316 units that provided surgical treatment for endometrial cancer, most (86.4%; n=274) were general gynecology departments, while university units and cancer centers constituted 8.2% (n= 26) and 5.4% (n=17), respectively. A total of 10 947 (49%) surgeries for endometrial cancer were performed in general gynecologic departments, while 5693 (25.5%) and 5685 (25.5%) of 22 325 endometrial cancer surgeries were performed in teaching hospitals and cancer centers, respectively. Units that met the ESGO quality indicator

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Table 3. Surgical treatment of ovarian cancer in Poland from 2017 to 2020.

Year		Number of surgeries in unit per year				Total
		≥100	50-99	20-49	<20	
2017	Number of units (%)	2 (1.1)	11 (5.9)	30 (16.1)	143 (76.9)	186 (100)
	Number of patients (%)	252 (9.6)	746 (28.5)	944 (36.1)	674 (25.8)	2616 (100)
2018	Number of units (%)	1 (0.5)	12 (6.7)	26 (14.7)	139 (78.1)	178 (100)
	Number of patients (%)	186 (7.3)	813 (31.9)	780 (30.6)	770 (30.2)	2549 (100)
2019	Number of units (%)	2 (1.1)	12 (6.7)	26 (14.7)	138 (77.5)	178 (100)
	Number of patients (%)	278 (10.2)	836 (30.7)	856 (31.4)	755 (27.7)	2725 (100)
2020	Number of units (%)	1 (0.5)	12 (6.6)	27 (14.7)	143 (78.2)	183 (100)
	Number of patients (%)	123 (4.9)	863 (34.7)	810 (32.5)	695 (27.9)	2491 (100)
Total number of patients (%)		839 (8.1)	3258 (31.4)	3390 (32.6)	2894 (27.9)	10381 (100)

Table 4. Ratio of number of surgeries and number of new cases in Poland between 2017 and 2019: an inter-region analysis.

Province	Endometrial cancer			Ovarian cancer		
	Number of surgeries	Number of new cases according to Polish National Cancer Registry	Ratio of surgeries to the number of new cases	Number of surgeries	Number of new cases according to Polish National Cancer Registry	Ratio of surgeries to the number of new cases
All provinces (Poland)	16946	18066	0.94	7884	11219	0.70
Dolnośląskie	1312	1499	0.88	531	924	0.57
Kujawsko-pomorskie	1116	985	1.13	674	773	0.87
Lubelskie	901	1046	0.86	330	495	0.67
Lubuskie	312	398	0.78	182	274	0.66
Łódzkie	1257	1376	0.91	653	903	0.72
Małopolskie	1573	1481	1.06	557	768	0.73
Mazowieckie	2525	2216	1.14	1145	1304	0.88
Opolskie	421	550	0.77	140	263	0.53
Podkarpackie	859	1089	0.79	297	656	0.45
Podlaskie	537	482	1.11	262	331	0.79
Pomorskie	1101	1004	1.10	571	588	0.97
Śląskie	2026	2423	0.84	1030	1673	0.62
Świętokrzyskie	534	665	0.80	242	363	0.67
Warmińsko-mazurskie	482	527	0.91	264	405	0.65
Wielkopolskie	1325	1619	0.82	664	936	0.71
Zachodniopomorskie	665	706	0.94	342	563	0.61

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in optimal number of surgeries constituted 4.35% (11/253) in 2017, 5.2% (13/249) in 2018, 5.7% (14/245) in 2019, and 4% (10/249) in 2020 (**Table 2**). Most surgeries (15 077; 67.5%) were performed in departments that did not meet the optimal criteria in number of surgeries, and nearly half of the patients (10 676; 47.8%) were treated in units that did not fulfill the minimum ESGO requirement (low and very low volume). Between 2017 and 2019, 6 of 26 (23%) teaching/university units and 7 of 17 (41.2%) cancer centers met ESGO criteria for the optimal number of surgeries.

Ovarian Cancer

A total of 3172 (30.56%) patients with ovarian cancer underwent surgery in cancer centers, 3251 (31.32%) patients in university departments, and 3958 patients (38.13%) in general gynecologic units. Only 839 of 10 381 (8.08%) patients were treated surgically in units with at least 100 surgeries per year, while 9642 (92.88%) patients underwent surgeries in units that met suboptimal criteria regarding the number of surgeries (**Table 3**). Of those, 2894 (27.88%) ovarian cancer patients underwent surgery in very low-volume units (<20 surgeries per year). Between 2017 and 2019, none of the 26 teaching/university hospitals and only 3 of 17 (17.65%) cancer center units met the criteria for the optimal number of surgeries in ovarian cancer.

Discussion

The survival rates of patients with ovarian and endometrial cancer in Poland were found to be some of the lowest in Europe. Poland had one of the highest age-standardized death rates from ovarian cancer, which reached 6.45%, compared with 5.19% in the European Union and 4.85% in the United States [4]. Between 1990 and 2017, Poland had an increasing trend in endometrial cancer age-standardized mortality rate, with +0.512% (95% CI: 0.333-0.692%) per year [5]. Our results showed that decentralized treatment in units with suboptimal volumes of surgeries may be one of the reasons. Other possible explanations include more advanced staging, prevalence of unfavorable histopathologic and molecular subtypes, and comorbidities. In Poland, no national quality indicators have been developed so far; therefore, we decided to use ESGO quality indicators as a benchmark. The number of surgeries performed in units is an easily measurable indicator, which allows a direct comparison between departments. Numerous gynecologic wards providing surgical treatment facilitates access to healthcare; however, this leads to the dispersion of surgical treatment. Most patients with ovarian (92.88%) and endometrial (67.5%) cancer underwent surgeries in units with suboptimal volume. The optimal number of operations is a cornerstone for high-quality surgical treatment. It also allows appropriate training for doctors during gynecologic oncology fellowship.

The centralization of oncological treatment improves survival with a simultaneous reduction in complications [16]. In Italy, most surgeries for ovarian cancer were performed by general gynecologists, but their oncological results were worse than those of gynecologic oncologists [17]. Recently, similar observations were reported by Jochum et al during the International Gynecologic Cancer Society Congress in New York [18]. An analysis of a French registry, including the 29 879 ovarian cancer patients who underwent surgery between 2013 and 2019, showed that most of them were operated in low-volume hospitals. The volume of the hospitals was an independent risk factor, and the difference in overall survival was 63 versus 53 months between high- and low-volume centers, respectively. They concluded that high-volume centers are expected to improve the prognosis of ovarian cancer; moreover, adequate management of comorbidities and postoperative complications are expected in high-volume centers. Although centralization of treatment can cause barriers related to long travel, improvements in oncological outcome fully justifies the development of high-volume centers [17,19].

The absence of quality control may lead to low system value. Cancer treatment without quality verification can lead to a poor level of care and may contribute to poor outcomes in cancer treatment. Even the implementation of new drugs (immunotherapy, targeted therapies) may not lead to improved survival if surgical treatment remains below the quality criteria. Actually, in Poland, some gynecologic oncology subunits were established within obstetrics and gynecologic departments. The oncological surgeries in endometrial and ovarian cancers were highly valued by the National Health Fund and could be performed without limit. This leads to easy access to oncologic treatment; however, the medical staff were not prepared for cancer management. Doctors had to share time between oncologic and obstetric care. Even specialists in gynecologic oncology had obstetrical duties in these departments. Finally, upgrading oncologic surgical skills was not obligatory.

Experienced and well-educated healthcare professionals are of key importance in cancer management but are insufficient to ensure high-quality care. Readiness to implement pro-quality changes is not only the issue of obstetricians and gynecologists and gynecologic oncologists, but also of decision makers, including the National Health Fund. Recently, the COVID-19 pandemic and the migration crisis related to the military conflict in Ukraine showed that healthcare flexibility in Poland is high and the implementation of quick changes is possible.

Treatment in suboptimal volume centers cannot be synonymous with suboptimal surgery. Some units had a significant number of surgeries, but they did not exceed the thresholds established by the ESGO. The cut-off levels for the optimal number of operations were set arbitrarily by ESGO experts. The

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lack of a methodology on how the number of optimal number of surgeries was determined is a burden for the ESGO qualitative indicators.

The COVID-19 pandemic had a negative impact on healthcare system worldwide, including limited access to healthcare professionals. It resulted in the reduction in the number of surgeries in 2020. Although the Polish data on the number of new cases in 2020 are not yet published, a reduced number of new cases can be expected. However, this will not reflect a decreasing incidence trend. It might be expected that the pandemic impaired survival rates in cancer patients. However, paradoxically, there may be an improvement in survival, because some advanced patients may have died without a diagnosis of cancer due to limited access to healthcare. This trend may be more pronounced in countries with a high number of excess deaths, such as Poland, where 60 687 excess deaths were recorded [20].

A limitation of our study is the lack of clinical data. Complications after surgery and readmissions were not compared between units. Finally, survival data were not available for these patients. Therefore, it cannot be concluded that prognosis is related to surgical volume of the department.

Conclusions

In Poland, surgical treatment of ovarian and endometrial cancer is decentralized. Most patients with cancer undergo surgery in low-volume general gynecologic departments. The decentralization of surgical treatment may have arisen from the easier access to surgery, shorter waiting time for surgery, or proximity to the place of residence. However, the extent of surgery in low-volume hospitals may be naturally limited due to the lack of intensive care units and the avoidance of potential complications. It may have negative consequences, especially in patients with ovarian cancer, in which optimal debulking is the key factor of potential success.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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