



## The landscape of ovarian cancer surgery in Italy: Data from PNE

Laura Grazia Zompi<sup>a,\*</sup>, Cerbone Marco<sup>a,1</sup>, Pietro Quarto<sup>a</sup>, Christopher Clark<sup>a</sup>,  
Tommaso Difonzo<sup>a</sup>, Salvatore Lopez<sup>b</sup>, Vera Loizzi<sup>a,c</sup>, Cormio Gennaro<sup>a,b</sup>

<sup>a</sup> Interdisciplinary Department of Medicine (DIM), University of Bari, "Aldo Moro", 70124 Bari, Italy

<sup>b</sup> Gynecologic Oncology Unit, Istituto Tumori Giovanni Paolo II - IRCCS, University of Bari, 70124 Bari, Italy

<sup>c</sup> Department of Translational Biomedicine and Neuroscience (DiBrain), University of Bari, "Aldo Moro", 70124 Bari, Italy

### A B S T R A C T

**Objective:** Ovarian cancer (OC) in Italy is tenth in incidence among tumors in females, and it is the cause of 30 % of deaths due to gynecological tumors. The objective of this study is to evaluate the volume of patients undergoing surgical treatment for OC in Italian hospital facilities.

**Methods:** An analysis of hospitalization volumes due to OC in Italian medical facilities in 2022 based on the Piano Nazionale Esiti was performed. Centers were divided into 3 categories, according to the annual number of hospitalizations due to OC (above 30, between 20 and 29, below 20); the percentage of patients treated in each category of hospitals was calculated. Additionally, an evaluation of the active mobility (meaning the number of patients living outside the region but receiving treatment in the region taken into examination) and passive mobility (meaning the number of patients living inside the examined region but choosing to receive treatment in centers located outside of the region itself) was carried out for each region.

**Results:** The study showed that, in 11 Italian regions, most of OC cases are treated in medical centers with patient volumes of less than 20 cases per year. Only in 6 regions, OC cases are mostly treated in larger centers; in these same regions, the highest percentages of active mobility are recorded. Finally, in 6 Italian regions, passive mobility exceeds 50 % of regional cases.

**Conclusions:** Nowadays, the landscape of OC treatment in Italy is extremely heterogeneous. In most regions, patients receive treatment in low volume centers; concurrently, huge volumes of patients hailing from the entire national territory are treated in a limited number of centers.

### Introduction

Ovarian cancer is tenth in incidence among all female cancers in Italy. In 2022, 6000 people were diagnosed with ovarian cancer and about 3600 died from it [1].

Cytoreductive surgery is the treatment of choice for ovarian cancer, and also the most important prognostic factor. Hence, the importance of optimal surgery being performed in high quality centers.

Some Authors have investigated the impact of centralization of care in ovarian cancer in terms of patient outcomes.

According to these studies, women who undergo surgery at referral centers are more likely to receive complete tumor resection and, consequently, to have better chances of survival.

ESGO (European Society of Gynaecological Oncology) has recently appointed a list of quality indicators (Qis) for advanced ovarian cancer surgery: among them, the number of cytoreductive surgeries performed per center per year is significant, with an optimal target of more than 100 surgeries, and a minimum required target of 20 surgeries [2].

The aim of this study is to explore the Italian landscape of ovarian

cancer treatment, focusing on the differences of treatment in the several administrative regions in terms of hospital volume.

According to current Italian government policies, a "hub-and-spoke" model of healthcare should be provided in each region, so as to ensure that high volume hospitals (hubs) provide specialized care to a larger number of patients, treating especially the most difficult cases. In intermediate and low volume hospitals (spoke), patients should receive diagnosis and also first line medical treatment, or undergo minor surgeries.

### Materials and methods

Data was collected from the Italian PNE (Piano Nazionale Esiti) registry, which is published every year by the Italian National Agency for Regional Health Services [3].

PNE collects information from all the Italian hospitals using hospital discharge forms.

The focus was set on the number of surgeries for ovarian cancer performed in Italian hospitals, both public and private, from January

\* Corresponding author.

E-mail address: [lauragzompi@libero.it](mailto:lauragzompi@libero.it) (L.G. Zompi).

<sup>1</sup> These authors contributed equally.

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In 2022, 4100 surgeries were performed in 359 hospitals located in the 21 Italian administrative regions.

Hospitals were divided into three categories: high volume hospitals, which performed more than 30 surgeries per year; intermediate volume hospitals, which performed from 20 to 29 surgeries per year; low volume hospitals, which performed less than 19 surgeries per year. Then, an investigation about which category of hospitals performed the largest number of surgeries was carried out for each region (in other words, the aim was to identify, for each region, the type of hospital in which patients diagnosed with ovarian cancer received surgical treatment).

34 high volume centers, 22 intermediate volume centers and 302 low volume centers were identified (Table 1).

Statistical analysis was carried out using IBM SPSS 29.0.

## Results

In 2022, about 55 % of cases of ovarian cancer were distributed in 4 of the most populated regions: LOMBARDIA, LAZIO, VENETO, EMILIA ROMAGNA. Another 20 % of cases were registered in PIEMONTE, SICILIA, CAMPANIA, while the other regions registered a lower number of cases.

A statistically significant difference was found comparing the number of patients treated in high volume centers and intermediate volume centers ( $p < 0.007$ ), and between intermediate volume and low volume centers ( $p < 0.007$ ).

The study highlighted that, in 11 out of 20 regions (Abruzzo, Basilicata, Campania, Liguria, Marche, Piemonte, Sardegna, Toscana, Provincia autonoma di Trento, Umbria), most patients were treated in low volume hospitals, whereas only in 6 out of 20 regions (Emilia Romagna, Friuli Venezia Giulia, Lazio, Lombardia, Puglia, Sicilia), patients were treated in high volume hospitals.

Moreover, 302 low volume centers are distributed in Italian territory, and in this category of hospitals 1458 ovarian cancer surgeries out of the overall 4100 surgeries performed in Italy (about 35,5 %) were performed in 2022 (Figs. 1 and 2). Furthermore, in the PNE, active mobility percentages (meaning the number of patients living outside the region but receiving treatment in the region taken into examination) were presented together with passive mobility percentages (meaning the number of patients living inside the analyzed region but choosing to

receive treatment in centers located outside of the region itself). It is worth noticing that, in 6 Italian regions (Abruzzo, Basilicata, Calabria, Provincia autonoma di Trento, Umbria, Valle d'Aosta), passive mobility involves more than 50 % of regional cases.

## Discussion

By looking at these numbers, it becomes evident that the centralization of ovarian cancer surgery in Italy is far from being obtained.

Each region should have at least one high volume center, in order to limit the dispersion of cases in low volume centers, in which about 1/3 of the patients are currently treated.

Establishing minimum volume standards for hospitals treating this type of cancer would certainly help this process.

In addition, other aspects that should be taken into account are the social and economic consequences of an unequal distribution of high-volume centers, which often leads patients to move across the country in order to be treated in these centers, where waiting lists seem to be shorter and medical care seems better.

This applies, in Italy, to a large part of medical conditions, as we can see in the AGENAS 2022 [4] report on healthcare mobility: the mobility index (calculated on all types of medical treatment) is higher when southern regions are considered (13,36 %), while lower in northern and central regions (10,30 % and 8,85 %).

The association between higher volume hospitals and improved outcomes furnishes a compelling rationale for minimum volume standards for ovarian cancer.

Numerous studies have demonstrated the superiority of high volume centers in the treatment of affected women in terms of outcomes, when treatment is provided by specialists with expertise in gynecologic oncology.

In America, Wright et al. tried to assess the potential effects of implementing minimum hospital volume standards for ovarian cancer on survival and access to care.

They selected hospitals treating women with ovarian cancer from 2005 to 2015 and discovered that increasing hospital volumes was associated with decreased 60-day, 1-year, 2-year and 5-year mortality [5].

Another retrospective study was conducted by Huguet on a cohort of 267 patients in the Rhone-Alpes Region of France during 2012,

**Table 1**

Data from PNE (Piano Nazionale Esiti 2022). Hospitals performing OC surgery in Italy, classified by hospital volume

	Surgeries per region in 2022	Total number of centers	High volume hospitals	Intermediate volume hospitals	Low volume hospitals
Northern Italy					
Lombardy	935	59	8	6	45
Piedmont	319	29	5	2	22
Veneto	362	33	3	1	29
Emilia Romagna	350	22	3	3	16
Liguria	85	10	0	1	9
Bolzano	32	6	0	1	2
Trento	19	6	0	0	3
Friuli Venezia Giulia	104	11	1	1	9
Aosta Valley	0	0	0	0	0
Central Italy					
Lazio	599	37	3	0	34
Tuscany	239	27	2	0	25
Marche	72	10	1	0	9
Umbria	25	6	0	0	6
Abruzzo	24	8	0	0	8
Molise	27	3	0	1	2
Southern Italy					
Campania	269	32	2	2	28
Sicily	306	30	3	1	25
Calabria	35	8	0	1	7
Sardinia	67	9	0	1	8
Apulia	218	17	3	1	13
Basilicata	13	2	0	0	2
Total	4100	365	34	22	202

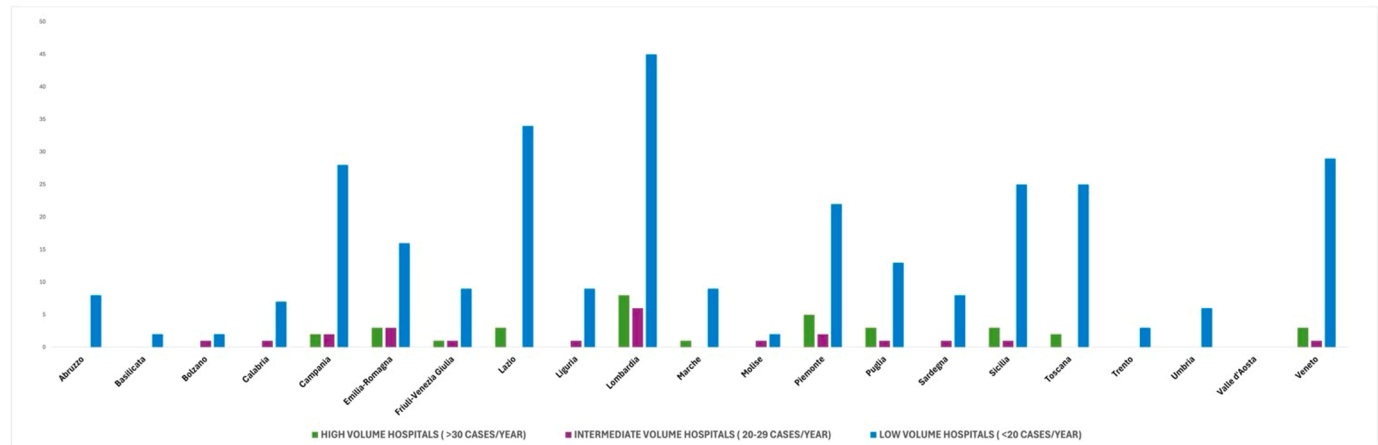


Fig. 1. Distribution of high/intermediate/low volume hospitals for OC surgery in Italian regions

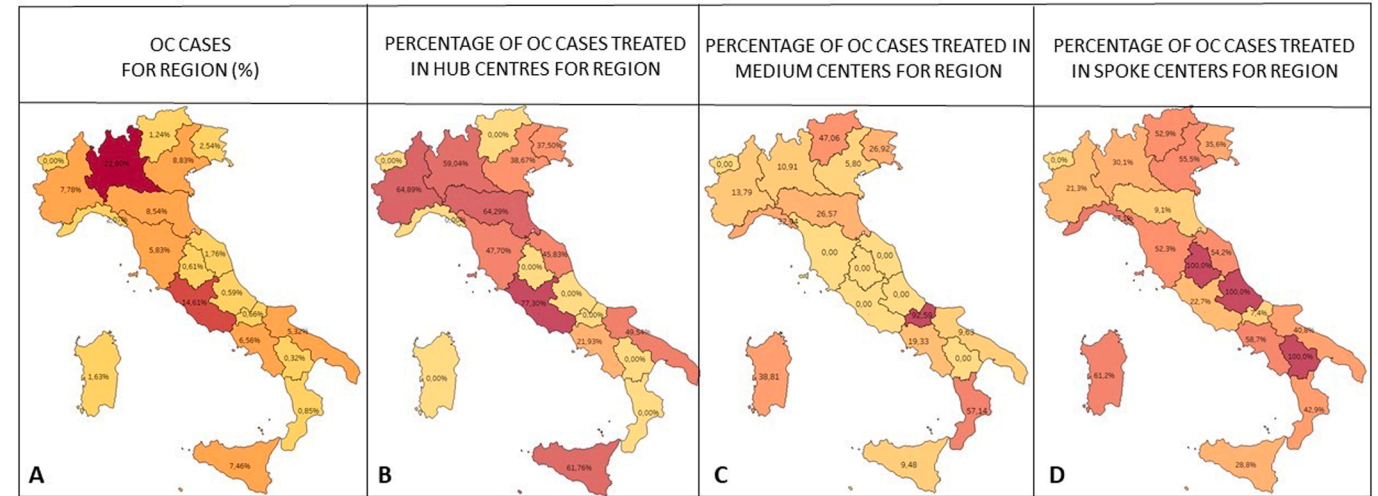


Fig. 2. The maps visually represent the disparity in ovarian cancer treatment in Italy, where some regions benefit from specialised care in Hub centers, while others rely on smaller, less specialized facilities. Darker colors represent regions with a higher percentage of cases. A: percentage of the total number of Italian OC cases for each region. Some regions have higher percentage of cases, such as Lombardia and Lazio. B: percentage of OC cases treated in high-capacity "hub" centers (>30 cases/year) for each region. There is a disparity between northern regions with high hub treatment rate and southern regions with lower or none. C: percentage of OC cases treated in medium-capacity centers (20-20 cases/year). D: percentage of OC cases treated in spoke centers (< 20 cases/year).

comparing progression-free survival for Epithelial Ovarian Carcinoma patients receiving treatment in high- (i.e.  $\geq 12$  cases/ year) vs. low-volume hospitals.

According to their work, patients treated in the low-volume hospitals had a probability of relapse that was almost twofold higher compared to that of patients treated in the high-volume hospitals [6].

A similar study was conducted in Poland by Piątek et al., considering patients who underwent surgery for ovarian and endometrial cancer between 2017 and 2020. Hospitals where patients underwent surgery were divided according to number of surgeries performed per year, establishing a minimum requirement of 100 surgeries for ovarian cancer per year and 80 surgeries for endometrial cancer per year. The authors noticed that most surgeries were performed in centers that did not meet this requirement. Hence, they concluded that in Poland surgical treatment of these type of cancer is decentralized [7].

At the moment, population-based studies regarding ovarian cancer care according to hospitals volume are available for few European countries, such as Austria [8,9], Finland [10], Germany [11] and

Belgium [12,13], even though they differ for data sources and time periods. In these studies, the proportion of patients operated in high-volume hospitals varies between 25 % in Finland and 50 % in Tyrol, Austria and Germany.

A similar retrospective study was conducted in Switzerland by Wieser et al. [14], which takes into account all patients who underwent surgery for ovarian cancer in Swiss hospitals from 1998 to 2012: more than 40 % of patients were treated in hospitals with fewer than 20 cases per year.

Although it is not the proper subject of our discussion, we cannot refrain from making a consideration regarding the landscape of ovarian cancer in Europe.

It is evident, in fact, that the process of centralizing care for ovarian cancer should be reconsidered in several countries, including Italy.

One possible solution could be to strengthen the hub-and-spoke system, ensuring that complex cases—whether due to the characteristics of the pathology, the patient’s status, or the surgical skills required—are referred to larger centers with highly specialized staff. In this

way, the safety of both patients and healthcare workers would be protected.

Another important issue is the training of gynecological oncologists, a topic often overlooked by Italian and European training systems. In Italy, as well as in other European countries, there is no national accreditation system for the subspecialty of gynecological oncology, nor is there a system for the periodic evaluation of these professionals' performance, which could help maintain high standards of care for patients. This training program is, however, currently available for gynecologists in few countries, such as UK and Netherlands.

As previously mentioned, ESGO has developed quality indicators for centers involved in the treatment of ovarian cancer, but currently, there are no national policies that limit the treatment of this pathology to centers that meet, even partially, ESGO requirements.

Furthermore, available studies in Italy and Europe regarding ovarian cancer treatment lack of standardized methods for evaluating outcomes, and the data available in various national registries (in Italy represented by the PNE) are often incomplete. For example, they report the annual number of hospitalizations for ovarian cancer but fail to provide any data on short- and long-term mortality, readmissions, or the onset of complications. This makes it impossible to make truly comparisons between different centers within the same country or between different countries.

## Conclusion

From the PNE database analysis, it's evident that there are substantial differences in ovarian cancer surgery among the various Italian regions.

Currently, the PNE database for ovarian cancer does not report any data about postoperative mortality rate, rehospitalization, and types of complications, which are all parameters that could be used to evaluate whether the existing differences in the quality of care indeed determine a difference in patient outcomes, as appointed in studies carried out in other countries.

## CRediT authorship contribution statement

**Christopher Clark:** Supervision. **Salvatore Lopez:** Resources. **Vera Loizzi:** Methodology. **Cormio Gennaro:** Investigation. **Laura Grazia Zompi:** Writing – original draft. **Cerbone Marco:** Writing – review & editing. **Pietro Quarto:** Resources. **Tommaso Difonzo:** Supervision.

## Declaration of Competing Interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

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