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Impact of COVID-19 in gynecologic oncology: a Nationwide Italian Survey of the SIGO and MITO groups

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ABSTRACT

Objective: Coronavirus disease 2019 (COVID-19) has caused rapid and drastic changes in cancer management. The Italian Society of Gynecology and Obstetrics (SIGO), and the Multicenter Italian Trials in Ovarian cancer and gynecologic malignancies (MITO) promoted a national survey aiming to evaluate the impact of COVID-19 on clinical activity of gynecologist oncologists and to assess the implementation of containment measures against COVID-19 diffusion.

Methods: The survey consisted of a self-administered, anonymous, online questionnaire. The

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survey was sent via email to all the members of the SIGO, and MITO groups on April 7, 2020, and was closed on April 20, 2020.

Results: Overall, 604 participants completed the questionnaire with a response-rate of 70%. The results of this survey suggest that gynecologic oncology units had set a proactive approach to COVID-19 outbreak. Triage methods were adopted in order to minimize in-hospital diffusion of COVID-19. Only 38% of gynecologic surgeons were concerned about COVID-19 outbreak. Although 73% of the participants stated that COVID-19 has not significantly modified their everyday practice, 21% declared a decrease of the use of laparoscopy in favor of open surgery (19%). However, less than 50% of surgeons adopted specific protection against COVID-19. Additionally, responders suggested to delay cancer treatment (10%–15%), and to perform less radical surgical procedures (20%–25%) during COVID-19 pandemic.

Conclusions: National guidelines should be implemented to further promote the safety of patients and health care providers. International cooperation is of paramount importance, as heavily affected nations can serve as an example to find out ways to safely preserve clinical activity during the COVID-19 outbreak.

Keywords: Surgical Oncology; Health Care Surveys; COVID-19; SARS-CoV-2 Infection

INTRODUCTION

Coronaviruses (CoVs) are a large family of single-stranded RNA viruses [1]. In the past, 6 types of CoVs have been identified as human-susceptible viruses, among which 2 α -CoVs (HCoV-229E and HCoV-NL63), and 2 β -CoVs (HCoV-HKU1 and HCoV-OC43) have low pathogenicity and cause mild respiratory symptoms. Other types (ie SARS-CoV and MERS-CoV) lead to severe and potentially life-threatening respiratory tract infection [2].

The novel respiratory coronavirus (severe acute respiratory syndrome coronavirus 2; SARS-CoV-2) disease (coronavirus disease 2019; COVID-19) has been spreading in Europe and the United States by early 2020 [1]. Though the mortality rate of COVID-19 is much lower than that of severe acute respiratory syndrome coronavirus 1 (SARS-CoV-1) (i.e., SARS of 2003), its transmission has been significantly greater, with a significant increase in the crude number of deaths [1,2].

The COVID-19 pandemic has dramatically changed our everyday life, keeping individuals in their homes all over the world. Medical practice has changed, as well. COVID-19 threatens to curtail patient access to evidence-based treatment. COVID-19 is testing our health care system. Several guidelines suggested avoiding unnecessary treatments during COVID-19 outbreak [3,4]. The World Health Organization recommended strengthening the health systems and reorganize service delivery to respond to COVID-19 while maintaining essential core services across the continuum of care, especially in the field of oncology [5]. However, health care system resources are limited, and COVID-19 is directly impacting on our practice. The present situation requires growing resources for the treatment of infected patients, but patients without COVID-19 infection are not less important. In the field of gynecologic oncology, COVID-19 directly impacts on patients with cancer, who are at high risk of infections due to several predisposing factors [6]. Indirectly, COVID-19 impacts on our ability to treat patients. In fact, not all oncologic procedures can be delayed without compromising the efficacy of treatment itself.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Author Contributions

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In Italy, the number of COVID-19 cases is rising day after day, even though the implementation of drastic national containment [7]. Almost every hospital was reorganized in order to meet the needs of patients with COVID-19. New areas and new intensive care units were set up. As a result, all elective activities were postponed or cancelled. A dedicated pathway was created in order to guarantee access in case of non-deferrable cases, including cancer management. Hospitals were classified into 2 main categories: 1) dedicated hubs for highly specialized treatments (including cancer treatment) named COVID-19-free HUBs and 2) spoke for treatment of patients with COVID-19 [4].

To date, evidence on the diffusion and management of COVID-19 in gynecologic oncologic patients is scant. This situation has led gynecologic oncologists to join forces, with the aim to find a way not to compromise patients' care and to preserve the safety of health care providers. In Italy, 2 main societies promote working and research activities in gynecologic oncology on a national basis: the Italian Society of Gynecology and Obstetrics (SIGO – Società Italiana di Ginecologia Ostetrica), and the Multicenter Italian Trials in Ovarian cancer and gynecologic malignancies (MITO). Altogether these societies promoted a national survey aiming to evaluate the impact of COVID-19 on clinical activity and the implementation of containment measures of COVID-19 diffusion. Here, we present the results of this survey, providing an overview of the impact of COVID-19 on gynecologic oncology practice and methods applied to improve the safety of health care providers.

MATERIALS AND METHODS

The study protocol was approved by Institutional Review Board of the Fondazione IRCCS Istituto Nazionale dei Tumori. The SIGO, and MITO groups approved this investigation. Through a national survey, they aimed to assess changing in gynecological oncologic practice in Italy, during COVID-19 outbreak. The survey consisted of a self-administered, anonymous, online questionnaire (**Supplementary Data 1**). The survey was sent via email to all the members of the SIGO, and MITO groups on April 7, 2020, and was closed on April 20, 2020. **Supplementary Fig. 1** shows the status of COVID-19 outbreak in Italy during the period from April 7 to April 20.

The research center developed the survey under the supervision of the first and last authors. A dedicated team of expert and certificated statistics of the Fondazione IRCCS Istituto Nazionale dei Tumori evaluated the data and performed the statistical analysis. Before starting, the survey was tested in a selected group of ten physicians working in the setting of gynecologic oncology. No technical issues occurred, and the survey was completed by all physicians (their responses were not included in the results of the survey). Therefore, the research center sent individualized emails to SIGO, and MITO members, such that each member was assigned a unique survey link that allowed completing the survey only once. The use of the unique link allowed our research center to send 3 reminder emails to non-respondents. The survey was designed following the recommendation provided by the Questionnaire Design, Development, Evaluation, and Testing (QDET2), the World Association for Public Opinion Research (WAPOR), and the American Association for Public Opinion Research (AAPOR) [8-10]. The survey was in English and was not translated in Italian. The intended population included physicians working in the field of gynecologic oncologists (i.e. surgeons, medical oncologists, general gynecologists, and radiation oncologists) currently affiliated with the SIGO, and MITO groups at the time of the

survey. The primary aim of the survey was to assess the impact of COVID-19 in the field of gynecologic oncology. Specifically, the survey included a total of 45 questions, which were divided into 6 sections: the first section assessed the personal characteristics of responders (e.g., age, role, working setting, activity/patients' volume). The second section included questions related to the impact of COVID-19 on gynecologic oncology practice. The third section contained questions related to the triage procedures and protective measures adopted in the hospital against COVID-19. The fourth section addressed possible concerns related to surgery and methods adopted to protect health care providers. The fifth section included questions related to changes in the management of ovarian, endometrial and cervical cancer after COVID-19 outbreak. The last section contained questions related to the way COVID-19 has impacted patients' follow-up schedules and their inclusion in clinical trials.

1. Statistical analysis

Basic descriptive statistics were used to describe the results. Results are reported as frequency and percentages and mean±standard deviation (SD), when appropriate. For analytic purposes, participants were classified into 2 main categories: physician working in a COVID-free hub or general hospital treating also patients with COVID-19. Additionally, results were classified on the basis of the role of responders (i.e., gynecologic surgeons, oncologists, radiation oncologists, and general gynecologists). Comparisons among respondents were evaluated with the Fisher's exact test or χ^2 test. Differences in categorical variables were analyzed using the Fisher's exact test. Odds ratio (OR) and 95% confidence intervals (CIs) were calculated for each comparison. The t-test and Mann-Whitney test were used to compare continuous variables as appropriate. All calculated p-values were 2-sided; p-values <0.05 were considered statistically significant. Statistical analysis was performed with GraphPad Prism version 6.0 (GraphPad Software, San Diego, CA, USA) and IBM-Microsoft SPSS version 20.0 (SPSS Statistics; International Business Machines Corporation [IBM], Armonk, NY, USA) for Mac.

RESULTS

Over the 14 days' study period, the survey was sent via email to 860 participants working in the setting of gynecologic oncology in Italy. Overall, 604 participants completed the questionnaire with a response-rate of 70%. The median time for questionnaire completion was 7 minutes. Among those who responded, 519 completed the questionnaire (86%). Age distribution of responders was <35, 35–50, 50–65, and >65 years of age in 24%, 33%, 35% and 8%, respectively. The baseline characteristics of responders are displayed in **Supplementary Fig. 2**. Responders were classified as surgeons, medical oncologists, radiation oncologists and general gynecologists in 43%, 12%, 3%, and 33% of cases, respectively. Additionally, 9% were classified as “other,” including residents in obstetrics and gynecology. Overall, 205 responders (34%) belonged to COVID-free hubs, and 76% declared they feel adequately informed about COVID-19. However, on a scale between 0 (no risk) and 100 (maximum risk), the mean perceived risk for COVID-19 was 65±9. These data are presented in **Supplementary Fig. 3**. We observed that results of the survey in term of baseline characteristics of participants and response were not influenced by time of response (first vs. second week) and the affiliation (SIGO vs. MITO).

1. Triage methods

Triage methods for patients admitted for surgery, chemotherapy, and radiotherapy procedures are shown in **Supplementary Fig. 4**. The most adopted method for triaging patients was the evaluation of patient's anamnestic data (e.g., history of fever, respiratory symptoms, exposure to COVID-19 case). SARS-CoV-2 rhino-pharyngeal swabs were adopted in 50%, 20%, and 20% as triage methods for patients admitted for surgery, chemotherapy, and radiotherapy procedures, respectively. Serology for SARS-CoV-2 immunoglobulins (immunoglobulin [Ig] M and IgG) was performed in 7%, 4%, and 4% of patients admitted for surgery, chemotherapy, and radiotherapy procedures, respectively. Low dose basal CT scan of the thorax was used in patients admitted for surgery, chemotherapy, and radiotherapy, in 13%, 5%, and 3% of cases, respectively. **Fig. 1** shows differences in terms of triage methods on the basis of the participants' role (surgeons, oncologist, radiation oncologist, and general gynecologist) and type of hospital (COVID-free HUB vs. other). Surgeons and general gynecologists adopted similar triage methods. In comparison to those latter, oncologists and radiation oncologists were more likely to avoid the use of CT scan of the thorax ($p=0.060$, χ^2 test) and swabs for COVID-19 ($p<0.001$, χ^2 test). No difference in the adoption of serologic tests were observed ($p=0.677$, χ^2 test). Triage methods stratified by surgical volume are reported in **Supplementary Fig. 5** participants rated the use of "anamnestic data" as the best triage method, followed by swabs, IgM/IgG dosing, Chest X-ray, low-dose chest CT scan, and blood exams (**Supplementary Fig. 6**).

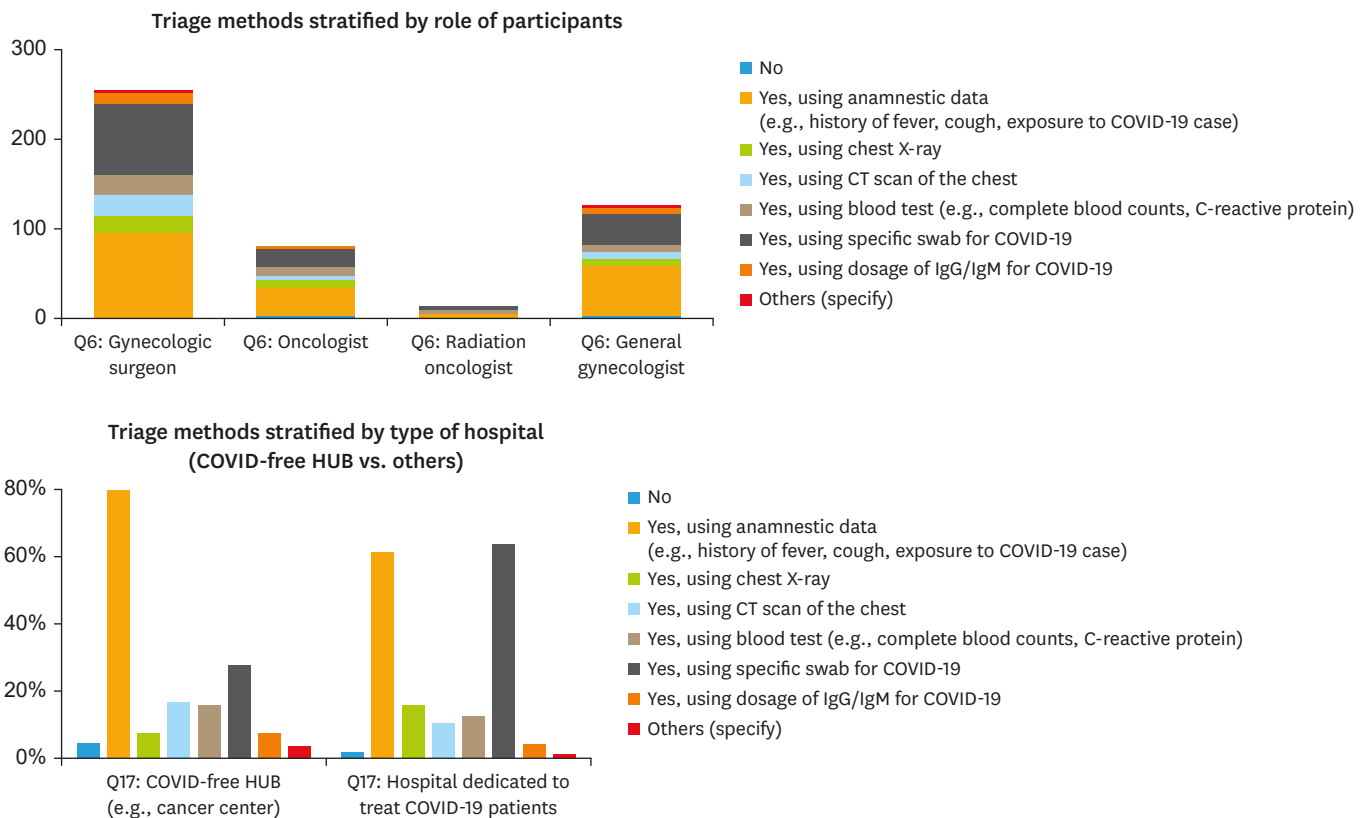


Fig. 1. Triage methods. COVID, coronavirus disease; CT, computed tomography; Ig, immunoglobulin.

2. Impact of COVID-19 on surgical practice

Considering surgical procedures, 98 gynecologic surgeons (38%) declared that they are not concerned during the present COVID-19 outbreak. However, they stated to be concerned about performing laparoscopy, robotic-assisted surgery, open abdominal and vaginal surgery in 44%, 14%, 34%, and 13% of cases, respectively (multiple answers allowed). On a scale between 0 (no concern) and 100 (maximum concern), gynecologic surgeons rated the mean concern of performing laparoscopy as 42 ± 31 . Although 73% of the participants stated that COVID-19 has not significantly modified their everyday practice, 21% declared a decrease of the use of laparoscopy in favor of open (19%) and vaginal (2%) surgery. Interestingly, about 5% of the participants stated that the use of laparoscopic surgery has increased during the COVID-19 outbreak. These data, also stratified by surgical volume are reported in **Supplementary Fig. 7**.

Surgeons adopted specific protections during open abdominal and laparoscopic surgery in 59% and 51% of cases, respectively. Respirator masks were routinely used by 33%, and 35% of surgeons performing open surgery and laparoscopy, respectively. In case of laparoscopic procedure, smoke filters were adopted by 14% the responders. **Table 1** shows the specific protection adopted during open abdominal and laparoscopic procedures. **Fig. 2** reports differences in protection adopted by surgeons during laparoscopic procedures on the base of their setting (i.e., COVID-free HUBs vs. other centers). **Supplementary Fig. 8** displayed specific protection used during laparoscopic procedures classified by surgical volume. No statistical difference existed in terms of protection used between COVID-free HUBs vs. other centers ($p > 0.200$). Of note, surgeons working in COVID-free HUBs and other centers did not adopt specific protections in 47% and 50% of cases, respectively ($p = 0.962$, Fisher's exact test).

Table 1. Protection adopted during surgery

Variables	Frequency
Changes in surgical approaches during COVID-19 outbreak	
Laparoscopic surgery decrease in favor of open surgery	2.29%
Laparoscopic surgery decrease in favor of vaginal surgery	0.38%
Laparoscopic surgery decrease in favor of robotic-assisted surgery	4.96%
Laparoscopic surgery increase	72.52%
Other (specify)	3.05%
Protections used during open abdominal procedures	
No specific protections (surgical mask, gloves and apron)	45.59%
Face shield (full face protection)	28.35%
Eye goggles (eye protection)	41.00%
N95 respirators	6.51%
FFP3 respirator masks	18.01%
Other respirators that offer a high level of protection	8.81%
Other (specify)	3.07%
Protections used during laparoscopic procedures	
No specific protection (surgical mask, gloves and apron)	48.85%
Face shield (full face protection)	22.52%
Eye goggles (eye protection)	38.17%
N95 respirators	7.63%
FFP3 respirator masks	19.85%
Other respirators that offer a high level of protection	7.63%
Laparoscopic smoke filtration filters	14.12%
Other (specify)	1.91%

COVID-19, coronavirus disease 2019.

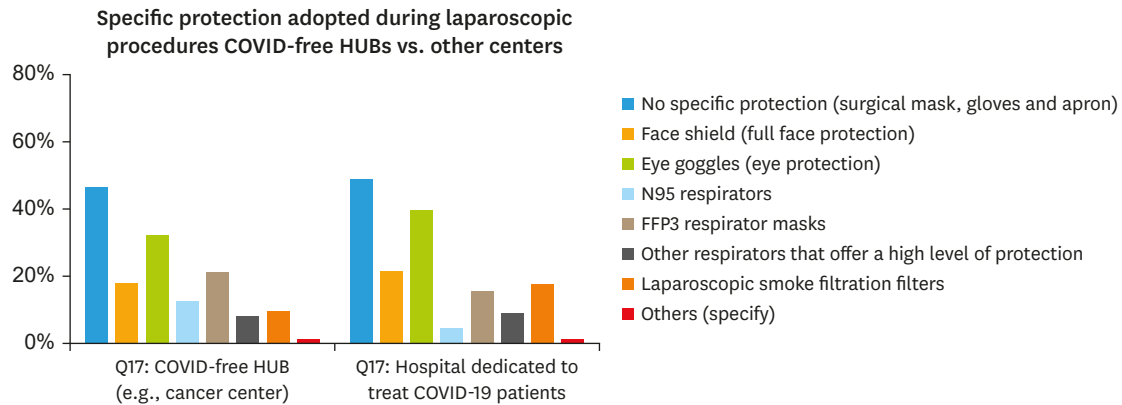


Fig. 2. Specific protection adopted for laparoscopic surgery during COVID-19 outbreak. COVID, coronavirus disease.

3. Impact of COVID-19 on gynecologic cancers

Evaluating the impact of COVID-19 in gynecologic oncology practice, we observed that on a scale between 0 (no concern/impact) and 100 (maximum concern/impact), the mean±SD concern rate was 70±14. Similarly, responders rated as 70±15 the impact of COVID-19 in gynecologic oncology practice. Responders rated the impact of COVID-19 on the quality of care of gynecologic oncology patients as 46±18. Specifically, the impact of COVID-19 on the quality of care of patients needing surgery, chemotherapy, and radiotherapy was rated as 48±5, 34±30, and 32±10, respectively. Considering different types of gynecological cancers, responders rated that the negative impact of COVID-19 to early-stage ovarian cancer, advanced-stage ovarian cancer, endometrial cancer, and cervical cancer was 27±20, 35±19, 29±8, and 27±9, respectively. Survey participants evaluated how COVID-19 outbreak impacted on the current clinical management of ovarian (Fig. 3), endometrial, and cervical cancer (Table 2). Considering patients with ovarian cancer, the preferred treatment modalities of patients with advanced but potentially resectable disease were diagnostic laparoscopy followed by cytoreduction in case of low burden of disease (rating: 4.31), cytoreduction via open surgery (rating: 4.24), diagnostic laparoscopy followed by cytoreduction even in case of high burden of disease (rating: 4.10), diagnostic laparoscopy followed by neoadjuvant

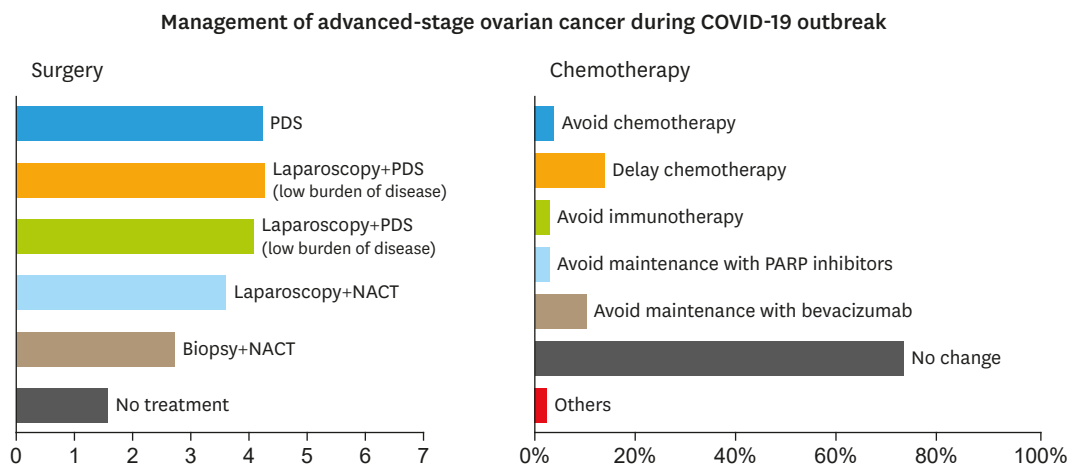


Fig. 3. Changing in the management of advanced stage ovarian cancer. COVID-19, coronavirus disease 2019; NACT, neoadjuvant chemotherapy; PDS, primary debulking surgery; PARP, poly(ADP-ribose) polymerase.

Table 2. The impact of COVID-19 outbreak on the management of endometrial, and cervical cancer

Variables	Frequency
Changing in management of endometrial cancer (multiple choice allowed)	
Avoiding surgery (in favor of radiotherapy)	3.59%
Avoiding surgery (in favor of medical treatment)	5.38%
Only hysterectomy (no nodal dissection)	7.62%
Avoiding lymphadenectomy	8.07%
Avoiding sentinel node mapping	2.69%
Delaying treatments	14.35%
No changes	69.96%
Other (specify)	3.59%
Changing in management of cervical cancer (multiple choice allowed)	
Avoiding surgery (in favor of radiotherapy)	9.55%
Decreasing radicality of hysterectomy	5.91%
Avoiding lymphadenectomy in favor of sentinel node mapping	6.82%
Delaying treatments	10.00%
No changes	75.45%
Other (specify)	2.73%

chemotherapy, regardless of disease burden (rating: 3.63), radiological-guided biopsy followed by neoadjuvant chemotherapy (rating: 2.75), and avoiding treatments (rating: 1.60). Additionally, they suggested delaying chemotherapy and avoiding maintenance with bevacizumab in 14% and 10% of cases, respectively. Overall, 70% of the responders stated that they had not modified their approach to recurrent ovarian cancer (**Supplementary Table 1**). The most common recommendation was to avoid surgery in case of potentially resectable recurrent disease (13%) and to use neoadjuvant chemotherapy to delay secondary cytoreduction (17%). Responders stated that they had not modified their management of endometrial and cervical cancer in 70% and 75% of cases, respectively. Changing in endometrial cancer management included: delaying all treatments (14%), avoiding lymphadenectomy (8%), performing hysterectomy (with or without salpingo-oophorectomy) alone (8%), and avoiding surgery in favor of medical treatments (5%). Changing in cervical cancer management included: delaying all treatments (10%), avoiding surgery in favor of radiotherapy (10%), and avoiding lymphadenectomy in favor of sentinel node mapping (7%), and decreasing radicality intent/rate of surgery (6%). COVID-19 outbreak modified follow-up schedules (**Fig. 4**). On a scale between 0 (no impact) and 100 (maximum impact), responders rated that the impact of COVID-19 on quality of care for patients in follow-up was 42 ± 5 . The impact of COVID-19 on the inclusion of new patients in clinical trial was rated as 62 ± 15 .

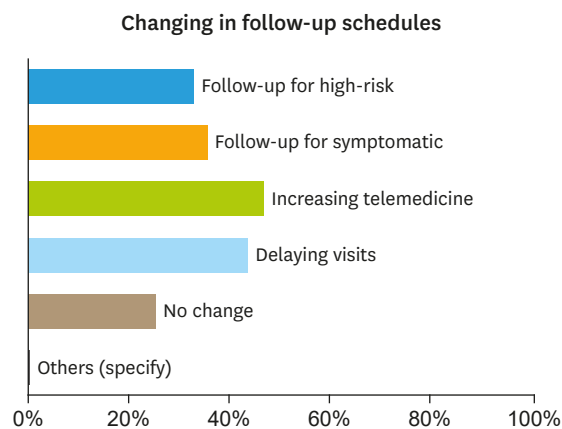


Fig. 4. Changing in follow-up schedules.

Physicians working in COVID-free HUBs were more likely to have fewer concerns in including patients into clinical trials than physician other centers (median rating: 38 vs. 61; $p < 0.001$).

DISCUSSION

The widespread diffusion of COVID-19 requires preventive measures to reduce in-hospital viral transmission. Oncologic departments should be kept as COVID-free places. Drastic measures should be implemented to maintain an adequate standard of care for oncologic patients and to reduce the risk of contamination for health care providers and other patients. Recent guidelines suggested to minimize the number of clinical examinations and follow-up visits and to reduce surgical procedures that may be associated with prolonged operative time, risk of significant complications and admission to intensive care units [11,12]. Postponing surgery in women with low-risk cancers has also been recommended, favoring medical treatment whenever possible [13]. To date, the risk for patients having chemotherapy is not clear. Whilst, the risk of for patients undergoing general anesthesia and extensive surgery seems to be high [14].

In order to save resources and avoid unnecessary exposure to infected patients, there is the need to redefine the timing of the surgery, scheduling interventions depending on patients' priority [15]. Our study highlights a marked heterogeneity in measures adopted by the Italian gynecologic community. Triage methods of patients who deserve to be admitted to hospitals differ among hospitals and regions. At present, there is a lack of COVID-19 testing guidelines through the Italian territory. Our survey highlighted that triage methods widely differ. Basically, anamnestic data represent the main method for triaging patients. SARS-CoV-2 rhino-pharyngeal swabs are performed only by a limited group of physicians. According to the results of our survey, gynecologists are more likely to test with swabs patients who are scheduled for surgery compared with those who are scheduled for chemotherapy or radiotherapy. Similarly, immunoglobulin testing is performed by less than 10% of physicians. However, we have to point out that to date, no validated immunoglobulin test exists.

Another point deserving attention is the impact of COVID-19 in the surgical practice. There are growing concerns on the use of laparoscopic surgery due to possible contamination of the staff working in the operative theatre [12,13]. An essential part of laparoscopic surgery is the establishment and maintenance of an artificial pneumoperitoneum, which is related to the risk of aerosol exposure into the operative room. Previous publications have suggested that laparoscopy could lead to aerosolization of viruses, but data on this way of transmission of COVID-19 are limited, at present. Nevertheless, erring on the side of safety would warrant treating the coronavirus as exhibiting similar aerosolization properties. Theoretically, SARS-CoV-2 might infect the operative room staff during the laparoscopic procedures through aerosol formation. Consequently, viral particles released by trocar valves might infect health care providers. Approximately one out of four survey participants stated that they limited the use of laparoscopy, mostly in favor of the use of open procedures. Surprisingly, only 1 out of 2 surgeons adopted specific protection during laparoscopic procedures. In particular, only 35% of surgeons used respirator masks (including N95, FFP3, or other respirator masks that offer high level of protection). To date, there are no data promoting the use of open instead of minimally invasive surgery. The surgical teams have to identify the better approach for the patient. Surgeons have to perform procedures that guarantee their safety and provide the

best outcome for their patients. By this point of view, minimally invasive surgery is related to a short length of hospital stay and low complication rate than open surgery, and it should be preferred to reduce potential in-hospital contamination by COVID-19. In order to increase the adoption of minimally invasive procedures, adequate protection of the surgical team is needed [16].

Interestingly, several physicians stated that they changed their surgical plan during COVID-19 outbreak. The lack of medical sources/equipment (including the intensive care unit) and the possible risk of developing severe consequences for patients for patients harboring asymptomatic COVID-19 are the main reason to avoid extensive surgical procedure. Recently, the Fondazione IRCCS Istituto Nazionale dei Tumori, reported data of 5 cancer patients affected by COVID-19 undergoing surgery at the beginning of the outbreak [11]. Among those 5 patients, 2 died in the early postoperative period; while other 2 patients needed prolonged hospitalization and intensive care unit admission [11].

There are 5 main weaknesses of the present paper. First, the majority of the questions contained in the survey are closed-ended questions, thus not capturing the full range of practice behaviors of responders. However, this method was chosen to avoid the answers' heterogeneity of open-text questions, that though yielding richer information can complicate analysis and interpretation of the results. Second, although we achieved a high response rate to the survey, our results may be affected by non-response bias. However, according to "continuum of resistance" model that place individuals who were interviewed during the first contact on 1 end of the continuum and nonparticipants on the other end. Basically, this model suggested that late-responders are expected to provide similar responses than non-respondents [17]. In our survey, no differences in term of baseline characteristics and responses were observed comparing early- and late-responders. Third, COVID-19 outbreak is a rapidly evolving situation. Therefore, attitudes and practice behaviors are changing rapidly, and the current practice registered at this moment might soon be changed across various centers. Fourth, we evaluated the situation in whole Italy; while COVID-19 had a different impact across the regions of Italy. Therefore, we can speculate that in some regions with a high incidence of COVID-19 (e.g., North of Italy), the impact of COVID-19 is higher than in other regions with low incidence of COVID-19 (e.g., South of Italy) [18]. Fifth, owing to the anonymous nature of the survey, we cannot evaluate how many responders belong from the same hospital, thus we cannot evaluate differences in responses from physician coming from the same center.

China and Italy have been the first and most affected countries worldwide. Gynecologists oncologists need to preserve the continuum of care of their patients, as the benefit of ensuring a well-delivered treatment plan outweighs the risk of COVID-19 infection. Results of this Italian survey suggest that gynecologic oncology departments have promptly set a proactive approach. Until now, evidence on the diffusion and management of COVID-19 in gynecologic oncologic patients is scant. This situation has led physicians to join forces [19-22]. Additionally, International cooperation is of paramount importance, as heavily affected nations (including Italy) can serve as an example to find out pathways to safely preserve health activity during the pandemic, worldwide. In conclusion, the present survey evaluated the impact of COVID-19 in gynecologic oncology practice. This survey highlighted a marked heterogeneity in the management of gynecologic oncologic patients during COVID-19 outbreak. Although about 70% of responders stated that they did not change their treatment paradigms, about 10%–15% of the responders have delayed

cancer treatment, and 20%–25% have performed less radical surgical procedures. National guidelines should be implemented to further promote the safety of patients and health care providers. Additionally, collaborative studies are needed to test the safety of different triage methods and to identify the best surgical treatment modality for our patients.

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SUPPLEMENTARY MATERIALS

Supplementary Data 1

Questionnaire.

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Supplementary Table 1

Changing in the management of recurrent ovarian cancer

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Supplementary Fig. 1

The Italian situation during April 7 and April 20.

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Supplementary Fig. 2

Characteristics of participants.

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Supplementary Fig. 3

The impact of COVID-19 in gynecologic oncology practice.

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Supplementary Fig. 4

Triage methods for surgery, chemotherapy and radiotherapy.

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Supplementary Fig. 5

Triage methods on the basis of volume of patients treated.

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Supplementary Fig. 6

Identification of the better methods to triaging patients.

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Supplementary Fig. 7

Changing in surgical approaches during COVID-19 outbreak: in COVID-free HUBs and other hospitals (A) and on the basis of volume of patients treated (B).

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Supplementary Fig. 8

Specific protection adopted during laparoscopic surgery on the basis of volume of patients treated.

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