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Surgical care in Poland after COVID-19 outbreak: a national survey

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Abstract: Background: During COVID-19 pandemic, it is necessary to collect and analyze data concerning management of hospitals and wards to work out solutions for potential future crisis. The objective of the study was to investigate how surgical wards in Poland are managing during rapid development of the COVID-19 pandemic.
Methods: An anonymous, online survey was designed and distributed to surgeons and surgery residents working in surgical departments during pandemic. Responders were divided into two groups: Group 1 (responders working in a "COVID-19-dedicated" hospital) and Group 2 (responders working in other hospitals).
Results: Overall, 323 responders were included in the study group, 30.03% of which were female. Medical staff deficits were reported by 21.15% responders from Group 1 and 29.52% responders from Group 2 ($p = 0.003$). The mean number of elective surgeries performed weekly prior to the pandemic in Group 1 was 40.37 ± 46.31 and during the pandemic was 13.98 ± 37.49 ($p < 0.001$). In Group 2, the mean number of elective surgeries performed weekly before the start of the pandemic was 26.85 ± 23.52 and after the start of the pandemic, it was 7.65 ± 13.49 ($p < 0.001$). There were significantly higher reported levels of preparedness in Group 1 in terms of: theoretical training of the staff, equipping the staff and adapting the operating theater to safely perform procedures on patients with COVID-19. Overall, 62.23% of responders presume being infected with SARS-CoV-2.
Conclusions: SARS-CoV-2 pandemic had a significantly negative impact on surgical wards. Despite the preparations, the number of responders who presume being infected with SARS-CoV-2 during present crisis is high.

Keywords: surgery, COVID-19 pandemic, survey study.

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Introduction

The SARS-CoV-2 virus outbreak began in Wuhan in December 2019. It spread quickly throughout China and other countries. Since then, the epidemic has evolved rapidly, and COVID-19 was recognized by the World Health Organization (WHO) as a global pandemic in March 2020 [1]. By April the 8th, 2020 Polish Ministry of Health reported 5205 confirmed cases of SARS-CoV-2 infections in Poland with 159 deaths due to COVID-19 [2]. At that time WHO reported over 1300000 cases globally [3].

The pandemic affected all fields, especially medicine [4]. We had to re-evaluate our work and health priorities. Hospitals and wards, including surgical departments are being reorganized globally to face the current pandemic and better prepare for potential future crisis [5]. Currently, it is necessary to collect and analyze data on this subject in order to work out better solutions for the future. There are reports from around the world, that the COVID-19 pandemic significantly affects the activity of surgical wards [6–9].

We aimed to investigate how surgical wards in Poland are managing during the COVID-19 pandemic.

Materials and Methods

Study design

Study was conducted under the patronage of the *The Association of Polish Surgeons* (TChP) and *Polish National Consultant in General Surgery*. An anonymous online survey was designed and published on the official website of TChP. Invitation for the study was also sent to all active members of TChP by email with instructions how to complete the survey. Data was collected between March the 30th and April the 6th of 2020. Online survey included single choice and open-ended questions. Response to every question was not obligatory. After data analysis responders were divided into two groups: Group 1 (responders currently working in a "COVID-19-dedicated" hospital, which was transformed by Polish Ministry of Health during SARS-CoV-2 pandemic into institution designated only for SARS-CoV-2 patients, including those developing symptoms and quarantined) and Group 2 (responders currently working in "non-COVID-19-dedicated" hospital).

Inclusion criteria

The study group included Polish surgeons and surgery residents working in surgical departments during pandemic, who granted an informed consent to participate in the study. Retired surgeons, physicians and residents with non-surgical specializations,

medical interns, medical students, other health-care professionals were excluded from this study.

Survey

The survey included 44 questions and comprised four parts:

1. Study group characteristics (four single choice and three open-ended questions)
2. Status of surgical wards during the pandemic (three single choice)
3. Impact of the pandemic on conducting surgery (eight single choice and ten open-ended questions)
4. SARS-CoV-2 prevention (eight single choice and ten open-ended questions).

The survey is presented in Appendix 1.

Statistical analysis

All data were analyzed using Statistica version 13.1PL (StatSoft Inc., Tulsa, OK, USA). The normal distribution was checked using a Shapiro–Wilk test. The results are presented as number and percentage, a mean with standard deviation (SD) or median with interquartile range (IQR), when appropriate. A comparison of quantitative data was made using Student's t-test or Mann–Whitney's test. Results were considered statistically significant at $p < 0.05$.

Ethical considerations

The designed survey was fully anonymous. Personal data of participants collected during study, was not disclosed at any stage. The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments (Fortaleza). Participants were informed about the aim of the study and informed consent was obtained electronically prior to the beginning of the survey. The study was approved by the Bioethics Committee of the Jagiellonian University (1072.6120.103.2020).

Results

Participants

Overall, 323 responders were included in the study group, 30.03% of which were female. Median age was 38 years (32–51.5). Majority of responders were specialists — 206 (63.78%).

Hospitals

Academic hospitals were represented by 102 (31.58%) responders, state hospitals by 60 (18.58%) responders, municipal hospitals by 46 (45.20%) responders and other types of institutions by 15 (4.64%) responders. Median number of specialists employed at responder's ward was 7 (5–10) and median number of residents was 4 (2–6) (Table 1).

Table 1. Basic characteristics.

Parameter	Total	Group 1 (COVID-19-dedicated)	Group 2 (non-COVID-19-dedicated)	p
	323 (100%)	52 (16.10%)	271 (83.90%)	—
Median age, years (IQR)	38 (32–51.5)	37.5 (31.75–52)	38 (32–51)	0.871*
Sex (female), n (%)	97 (30.03%)	14 (26.92%)	83 (30.63%)	0.594**
Specialist/resident, n (%)	206 (63.78%) / 117 (36.22)	33 (63.46%) / 19 (36.54%)	173 (63.84%) / 98 (36.16%)	0.958**
Type of hospital Academic, n (%) State, n (%) Municipal, n (%) Other, n (%)	 102 (31.58% 60 (18.58%) 146 (45.20%) 15 (4.64%)	 25 (48.08%) 7 (13.46%) 18 (34.62%) 2 (3.85%)	 77 (28.41%) 53 (19.56% 128 (47.23%) 13 (4.8%)	0.050**
Median number of specialists on the ward (IQR)	7 (5–10)	8 (5.5–13)	7 (5–10)	0.020*
Median number of residents on the ward (IQR)	4 (2–6)	7 (2–12.5)	3 (1–6)	<0.001*

* Mann-Whitney's test; **χ^2 — test

Status of surgical wards during the pandemic

Among responders from Group 1, SARS-CoV-2 positive patients were hospitalized in 45 (86.54%) cases and in Group 2 in 102 (37.64%) cases (p <0.001). In Group 1, 42 (80.77%) responders reported smaller than usual number of patients being hospitalized on their ward, 1 (1.92%) reported usual number of patients on the ward, 2 (3.85%) reported full occupancy of the ward, 1 (1.92%) reported occupancy, which significantly exceeds the availability of beds and 1 (1.92%) reported the need to conduct a triage of patients requiring intensive care. In Group 2, 237 (87.45%) responders reported smaller than usual number of patients on the ward, 23 (8.49%)

reported usual number of patients on the ward and 8 (2.95%) reported full occupancy of the ward (p <0.001). Medical staff deficits were reported by 11 (21.15%) responders from Group 1 and 80 (29.52%) responders from Group 2 (p = 0.003) (Table 2).

Table 2. Status of surgical wards during the pandemic.

Parameter	Total	Group 1 (COVID-19-dedicated)	Group 2 (non-COVID-19-dedicated)	p
N (%)	323 (100%)	52 (16.10%)	271 (83.90%)	—
Number of responders currently working in institutions hospitalizing patients with COVID-19:				<0.001*
Yes, n (%)	147 (45.51%)	45 (86.54%)	102 (37.64%)	
No, n (%)	137 (42.41%)	7 (13.46%)	130 (47.97%)	
I do not know, n (%)	39 (12.08%)	0	39 (14.39%)	
Current number of patients on the ward:				<0.001*
Smaller than usual, n (%)	279 (86.38%)	42 (80.77%)	237 (87.45%)	
As usual, n (%)	24 (7.43%)	1 (1.92%)	23 (8.49%)	
Occupancy full, n (%)	10 (3.1%)	2 (3.85%)	8 (2.95%)	
Exceeds the availability of beds, n (%)	0	0	0	
Significantly exceeds the availability of beds, n (%)	1 (0.31%)	1 (1.92%)	0	
Triage of patients requiring intensive care, n (%)	1 (0.31%)	1 (1.92%)	0	
I do not know, n (%)	8 (2.48%)	5 (9.62%)	3 (1.11%)	
Deficits of medical staff:				0.003*
Yes, n (%)	91 (28.17%)	11 (21.15%)	80 (29.52%)	
No, n (%)	229 (70.9%)	39 (75%)	190 (70.11%)	
I do not know, n (%)	2 (0.62%)	2 (3.85%)	0	

*χ^2 — test

Impact of the pandemic on conducting surgery

The mean number of elective surgeries performed weekly prior to the pandemic in Group 1 was 40.37 ± 46.31 and during the pandemic it was 13.98 ± 37.49 (p <0.001). In Group 2, the mean number of elective surgeries performed weekly before the start of the pandemic was 26.85 ± 23.52 and after the start of the pandemic, it was 7.65 ± 13.49 (p <0.001). The mean number of emergency surgeries performed weekly prior to the pandemic in Group 1 was 12.12 ± 9.67 and after the start of the pandemic it was 5.38 ± 6.13 (p <0.001). In Group 2, the mean number of emergency surgeries before the pandemic was 8.74 ± 6.97 and after the start of the pandemic it was 6.74 ± 5.61

(p <0.001) (Fig. 1). Overall, 50 (96.15%) responders from Group 1 and 254 (93.73%) responders from Group 2 reported canceling/postponing general surgery procedures (p = 0.496). For oncological surgery, 29 (55.75%) responders from Group 1 and 23 (8.49%) responders from Group 2 reported canceling/postponing operations (p <0.001). In case of bariatric surgery, 33 (63.46%) responders from Group 1 and 79 (29.15%) responders from Group 2 reported canceling/postponing procedures (p <0.001). Vascular surgery procedures were cancelled/postponed by 15 (28.85%) responders from Group 1 and 69 (25.46%) responders from Group 2 (p = 0.610) and plastic surgery operations were cancelled by 19 (36.54%) responders from Group 1 and 61 (22.51%) responders from Group 2 (p = 0.032). In case of general surgery, during the pandemic, responders reported performing on average 40.1% ± 43.9% of the normal number of procedures. For oncological surgery study group participants reported performing 41.9% ± 39.1% of the normal number of operations, for bariatric surgery 31.9% ± 45.9%, for vascular surgery 31.6% ± 45.3% and for plastic surgery 27.9% ± 40.5% (Fig. 2).

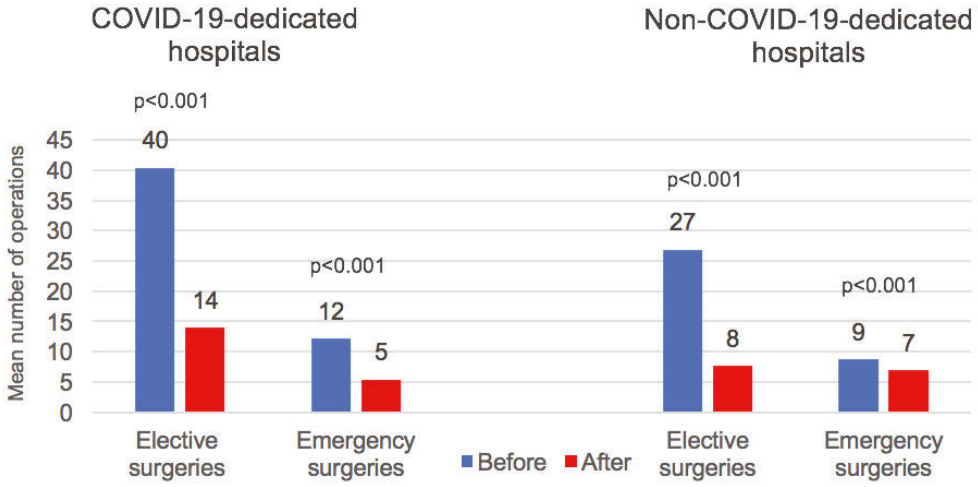

Fig. 1. Mean number of elective and emergency procedures performed weekly in Group 1 and 2 before and during the COVID-19 pandemic (comparison between number of surgeries before and after was done with Student's t-test for paired samples).

Responders from Group 1 had more frequently chance to operate on SARS-CoV-2 positive patients [35 (67.31%) vs. 42 (15.5%), p <0.001] (Appendix 2). Most commonly reported procedures performed on SARS-CoV-2 positive patients were emergency surgery — 38 (49.35%) and oncological operations 12 (15.58%) (Table 3). Majority of surgeons participating in our study preferred laparoscopic access during COVID-19 pandemic — 157 (48.61%) and believed it was a safe choice on a SARS-CoV-2 positive patients — 160 (49.54%) (Appendix 3).

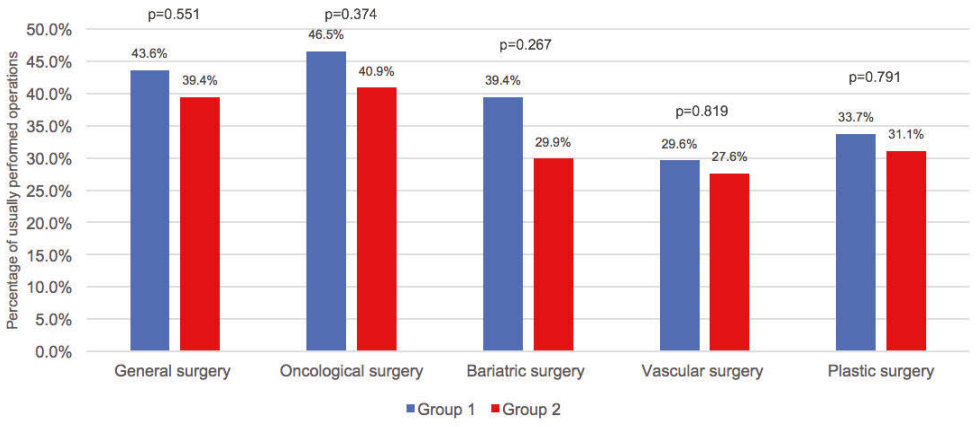

Fig. 2. Mean percentage of the norm performed during pandemic, for various types of surgery (Group 1 — COVID-19-dedicated hospitals; Group 2 — non-COVID-19-dedicated hospitals; Student's t-test was used to compere Group 1 and 2).

Table 3. Reported operations performed on SARS-CoV-2 infected patients.

Parameter	Total	Group 1 (COVID-19-dedicated)	Group 2 (non-COVID-19-dedicated)	p
	77 (100%)	35 (45.45%)	42 (54.55%)	—
Emergency surgery, n (%)	38 (49.35%)	20 (57.14%)	18 (42.86%)	<0.001*
Oncological surgery, n (%)	12 (15.58%)	7 (20%)	5 (11.9%)	<0.001*
Trauma surgery, n (%)	7 (9.09%)	3 (8.57%)	4 (9.52%)	0.051*
Neurosurgery, n (%)	6 (7.79%)	3 (8.57%)	3 (7.14%)	0.023*
Amputation of the lower limb, n (%)	5 (6.49%)	2 (5.71%)	3 (7.14%)	0.143*
Drainage of pneumothorax, n (%)	5 (1.55%)	2 (3.85%)	3 (1.11%)	0.143*
Cholecystectomy, n (%)	4 (1.24%)	3 (5.77%)	1 (0.37%)	<0.001*
Gynecological surgery, n (%)	4 (1.24%)	4 (7.69%)	0	<0.001*
Urological surgery, n (%)	1 (0.31%)	1 (1.92%)	0	0.022*

*χ^2 — test

SARS-CoV-2 prevention

Overall, a group of 34 (65.38%) responders from Group 1 and 148 (54.61%) responders from Group 2 reported, that their institution introduced measures to prevent SARS-CoV-2 staff infection before admitting first SARS-CoV-2 positive patients. Training of the staff concerning the treatment of infected patients was reported more frequently in Group 1 (86.54% vs. 61.25%, p <0.001). There was no significant difference between Group 1 and Group 2 in terms of reported level of knowledge concerning the COVID-19 pandemic (5.92 ± 1.71 vs. 6.07 ± 1.73, p = 0.565) and treatment of infected patients (4.71 ± 2.24 vs. 4.34 ± 2.12, p = 0.247). However, Group 1 reported significantly higher level of knowledge concerning preparation for surgery on a patient with suspected / confirmed COVID-19 and provision of appropriate personal protective equipment (PPE) during the procedure (6.62 ± 2.35 vs. 5.33 ± 2.48, p <0.001). There were significantly higher reported levels of preparedness in Group 1 vs. Group 2 in terms of: theoretical training of the staff (4.77 ± 2.26 vs. 3.36 ± 2.46, p <0.001), equipping the staff with appropriate PPE (5.21 ± 2.66 vs. 3.07 ± 2.21, p <0.001) and adapting the operating theater to safely perform procedures on patients with suspected / confirmed COVID-19 (5.85 ± 2.57 vs. 3.02 ± 2.32, p <0.001). Overall, 95 (29.41%) responders reported, that their institution introduced changes in the protocol of conduct in the operating theater, 66 (20.43%) responders reported, that their institution introduced changes in the perioperative care protocol and 236 (73,07%) responders reported, that their institution introduced changes in the protocol of conduct on the surgical ward. Comparable percentage of responders from Group 1 and Group 2 reported, that they presume being infected with SARS-CoV-2 during their work in the future (51.92% vs. 64.21%, p = 0.317) (Table 4) (Appendix 4).

Discussion

This study was conducted during the sudden outbreak of the COVID-19 pandemic. Distributing the survey using internet allowed us to gather a large number of respondents. We observed significant changes in functioning of surgical wards, both in terms of occupancy of beds as well as in number of performed operations. It is important to notice, that our results concerning the preparation and security of personnel are not optimistic.

Management of a hospital and a surgical ward during COVID-19 pandemic needs to quickly adapt. Bed capacity, especially on intensive care units can be rapidly depleted [10]. Additionally, providing continues coverage in terms of medical staff on infectious wards can be a challenge, due to high infection risk of medical staff and other circumstances associated with pandemic (i.e. closing schools, which results in members of medical staff being absent due to child care) [11]. In this study, respon-

Table 4. Most commonly reported adjustments introduced during COVID-19 pandemic.

Adjustments introduced in the operating theaters		Adjustments introduced in the perioperative care protocols		Adjustments introduced in the protocol of conduct on the surgical ward	
Adjustment	No respondents (%)	Adjustments	No respondents (%)	Adjustments	No respondents (%)
Additional PPE for operating theater staff, n (%)	30 (9.29%)	Additional PPE for staff attending the patient in the perioperative period, n (%)	13 (4.02%)	Shift work system, n (%)	129 (39.94%)
Division of operating rooms into COVID-19 (+) and COVID-19 (-), n (%)	26 (8.05%)	Limiting the length of stay, n (%)	9 (2.79%)	Limiting the number of people working at the surgical ward, n (%)	60 (18.58%)
Adapting the anesthesiological protocol, n (%)	10 (3.1%)	Taking additional epidemiological questionnaire, n (%)	6 (1.86%)	Additional PPE for surgical ward staff, n (%)	10 (3.1%)
Limiting the number of people working in the operating theater, n (%)	4 (1.24%)	Obligatory SARS-CoV-2 testing, n (%)	3 (0.93%)	Temporarily closing the surgical ward, n (%)	2 (0.62%)
		Additional imaging prior to hospitalization, n (%)	2 (0.62%)	Transferring patients to other wards / hospitals, n (%)	2 (0.62%)

ders reported most often a smaller than usual number of patients on the ward. Deficiency of the medical staff was reported by over 21% of responders in Group 1 and 29% of responders from Group 2. It is important to notice that Poland at this point has not reached the peak of pandemic and this country was not hit by the pandemic as hard as, for instance Italy, Spain or USA [12].

Currently, multiple guidelines, reviews and directives are being published to improve the quality of care during the pandemic [13–16]. Cohen *et al.* propose, that among COVID-19 positive patients we should postpone elective surgery until the patient has recovered [17]. Unfortunately, not every kind of procedure can be postponed indefinitely. When it comes to oncological procedures — time is of the essence. Postponing procedures can possible result in increased mortality, although reasonable delay, for example in case of colon cancer is acceptable [18, 19]. According to article by Tuech *et al.* it is important to balance the risk of pandemic and the risk of deferring the oncological procedure [20]. Our results present a major drop during the pandemic in reported mean number of performed elective surgeries weekly (28.99 vs. 8.69), which was not observed for emergency surgery (9.42 vs. 6.49). Oncological surgery was less frequently postponed, than bariatric, vascular or plastic operations. This results seem to be consistent with current recommendations [21]. In our study, most commonly performed operations on SARS-CoV-2 positive patients were emergency and oncological operations, which is consistent with available guidelines [22].

Although there is no scientific consensus, there are suspicions that laparoscopy, due to using pressured gas can potentially increase the risk of transmission of an aerosolized virus from infected patient to the operating theater staff [23]. Nevertheless, in this study, 48.61% of responders preferred using laparoscopy during the COVID-19 pandemic and 49.54% believed it is safe to perform on a SARS-CoV-2 positive patient.

COVIDSurg Collaborative advices to undertake pandemic preparations as part of routine hospital planning, before the emergence of crisis [24]. Majority of responders from both Group 1 and Group 2 reported that measures to prevent staff infection with SARS-CoV-2 were introduced before admitting the first patients with COVID-19 (65.38% and 54.61%, respectively). A recent report by Hasan *et al.* emphasizes the need to start training medical staff prior to the local start of the pandemic [11]. According to Al-Nsour *et al.* training programs should cover rapid response teams, points of entries, contact tracing, lab and sample management, infection control, cases management, and other processes [25]. Standardized training is immensely helpful in time of crisis by improving the clinical abilities of practitioners, which is reflected in better preparation for dealing with emergencies [26]. In this study, the level of knowledge about diagnosis and conservative treatment of COVID's-19 patients was comparable between groups but responders from Group 1 had higher level of knowledge

concerning surgical treatment. Moreover, participants of Group 1 reported higher levels of preparedness in terms of theoretical training, equipping staff with appropriate PPE and adapting the operating theater to safely perform procedures in patients with COVID-19. Unfortunately, present crisis has shown, that global stockpile of PPE is insufficient [27]. Nevertheless, preventive measures are key and using PPEs (gloves, medical masks, goggles or a face shield, gowns, etc.) appropriately is absolutely essential to decrease the risk of infecting individuals in health-care, including those working on surgical wards [28].

COVID-19-dedicated hospitals in Poland were supposed to be the first-line of defense during the fight with COVID-19 pandemic. Other hospitals were also involved in treatment of patients, however those institutions continued their work without complete reorganization. Our results report, that COVID-19-dedicated hospitals were less overwhelmed with the total number of hospitalized patients and less frequently reported deficits of the medical personnel. This results from discontinuing majority of admissions concerning non-COVID-19 patients and transferring them to other institutions. Surgeons working there had significantly more chances to operate on infected patients, including emergency and oncological operations. Responders from Group 1 were also significantly better prepared to treat infected patients. This may have resulted from training, which was conducted more often in those centers.

Unfortunately, despite the preparation and training we observed that a worrisome percentage of responders believe they will be infected with SARS-CoV-2 because of working on a surgical ward during this pandemic, which was higher in non-COVID-19-dedicated centers (51.92% vs. 64.21%).

This study is associated with several limitations. The study group consisted of 323 responders, only from Poland. Therefore, it is difficult to generalize our results to other countries. The study was conducted before the pandemic has reached its peak in Poland, therefore situation could have change. The survey used an unvalidated questionnaire. Moreover, due to rapid development of pandemic using a validated survey was impossible. Major limitation was also self-assessment of knowledge by participants in the study. Our results are based on subjective opinions of responders and therefore are prone to bias. Future studies should be conducted on larger and more diverse study groups.

In conclusion, although vast majority of surgeons participating in this study reported usual or smaller then usual number of surgical patients on the ward, deficiency of medical staff was reported by a relatively large number of responders. SARS-CoV-2 pandemic had a significantly negative impact on the number of surgical procedures, which got postponed. Unfortunately, despite the preparation, the number of responders who presume being infected with SARS-CoV-2 during present crisis is over 60%.

Acknowledgments

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Conflict of interest

None declared.

List of abbreviations

IQR — Interquartile range
PPE — Personal protective equipment
SD — Standard deviation
TChP — The Association of Polish Surgeons
WHO — World Health Organization

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Appendix 1. Questionnaire.

Questions	Answers
BASIC CHARACTERISTICS	
Age	[Number]
Sex	Male/Female
Specialist/resident	Specialist/resident
Type of hospital	Academic/State/Municipal/Other
Is it a COVID-19-dedicated hospital?	Yes/No
Number of specialists on the ward	[Number]
Number of residents on the ward	[Number]
STATUS OF SURGICAL WARDS DURING THE PANDEMIC	
Are you currently working institutions hospitalizing patients with COVID-19?	Yes/No/I do not know
Current number of patients on the ward:	Smaller than usual/As usual/Occupancy full/Exceeds the availability of beds/Significantly exceeds the availability of beds/Triage of patients requiring intensive care/ I do not know
Deficits of medical staff:	Yes/No/I do not know
IMPACT OF THE PANDEMIC ON CONDUCTING SURGERY	
What is a mean number of elective surgeries performed weekly prior to the pandemic in your institution?	[Number]
What is a mean number of elective surgeries performed weekly during the pandemic in your institution?	[Number]
What is a mean number of emergency surgeries performed weekly prior to the pandemic in your institution?	[Number]
What is a mean number of elective surgeries performed weekly during the pandemic in your institution?	[Number]
Have you postponed general surgery operations?	Yes/No
Have you postponed oncological surgery operations?	Yes/No
Have you postponed bariatric surgery operations?	Yes/No
Have you postponed vascular surgery operations?	Yes/No
Have you postponed plastic surgery operations?	Yes/No
What percentage of the norm, in terms of general surgery operations, is performed during the COVID-19 pandemic in your institution?	[Number]

What percentage of the norm, in terms of oncological surgery operations, is performed during the COVID-19 pandemic in your institution?	[Number]
What percentage of the norm, in terms of bariatric surgery operations, is performed during the COVID-19 pandemic in your institution?	[Number]
What percentage of the norm, in terms of vascular surgery operations, is performed during the COVID-19 pandemic in your institution?	[Number]
What percentage of the norm, in terms of plastic surgery operations, is performed during the COVID-19 pandemic in your institution?	[Number]
Are you currently working in an institution, which has performed surgical operations on patients infected with SARS-CoV-2?	Yes/No
What type of surgeries were performed on on patients infected with SARS-CoV-2 in your institution?	[Fill in]
Which access do you prefer during COVID-19 pandemic:	Laparoscopy/Laparotomy/No difference/I do not know
In your opinion, laparoscopic surgery on patient diagnosed with COVID-19 is safe?	Yes/No/I do not know
SARS-COV-2 PREVENTION	
My institution introduced measures to prevent SARS-CoV-2 staff infection:	Before admitting first SARS-CoV-2 positive patients/ After admitting first SARS-CoV-2 positive patients/I do not know
Was there a training of staff concerning COVID-19 pandemic in your institution?	Yes/No
Assess your level of knowledge (on a scale from 1 to 10) concerning COVID-19 pandemic:	[Number]
Assess your level of knowledge (on a scale from 1 to 10) concerning treatment of patients diagnosed with COVID-19:	[Number]
Assess your level of knowledge (on a scale from 1 to 10) concerning preparation for surgery on a patient with suspected / confirmed COVID-19 and provision of appropriate PPE during the procedure:	[Number]
Assess the level of preparedness (on a scale from 1 to 10) in your institution in terms of	[Number]
Assess the level of preparedness (on a scale from 1 to 10) in your institution in terms of theoretical training of the staff:	[Number]
Assess the level of preparedness (on a scale from 1 to 10) in your institution in terms of equipping staff with appropriate PPE:	[Number]

Appendix 1. Cont.

Assess the level of preparedness (on a scale from 1 to 10) in your institution in terms of adapting the operating theater to safely perform procedures in patients with suspected / confirmed COVID-19:	[Number]
My institution introduced changes in the protocol of conduct in the operating theater:	Yes/No/I do not know
What type of changes were introduced in the protocol of conduct in the operating theater:	[Fill in]
My institution introduced changes in the perioperative care protocol:	Yes/No/I do not know
What type of changes were introduced in the perioperative care protocol in my institution:	[Fill in]
My institution introduced changes in the protocol of conduct on the surgical ward:	Yes/No/I do not know
What type of changes were introduced in the protocol of conduct on the surgical ward in my institution?	[Fill in]
I presume being infected with SARS-CoV-2 during my work:	Yes/No/I do not know

* To assess the level of knowledge, we used a 10-point scale (from 1 to 10), where 1 meant absolute lack of knowledge and 10 meant total knowledge of the subject.

** To assess the level of preparedness, we used a 10-point scale (from to 10), where 1 meant complete lack of preparedness and 10 meant total preparedness in particular area.

Appendix 2. Impact of the pandemic on conducting surgery.

Parameter	Total	Group 1 (COVID-19-dedicated)	Group 2 (non-COVID-19-dedicated)	p
N (%)	323 (100%)	52 (16.10%)	271 (83.90%)	—
Number of respondents that postponed general surgery operations	304 (94.12%)	50 (96.15%)	254 (93.73%)	0.496*
Number of respondents that postponed oncological surgery operations	52 (16.1%)	29 (55.75%)	23 (8.49%)	<0.001*
Number of respondents that postponed bariatric surgery operations	112 (34.67%)	33 (63.46%)	79 (29.15%)	<0.001*
Number of respondents that postponed vascular surgery operations	84 (26.01%)	15 (28.85%)	69 (25.46%)	0.610*
Number of respondents that postponed plastic surgery operations	80 (24.77%)	19 (36.54%)	61 (22.51%)	0.032*
Number of respondents that work in ward which performed surgery on SARS-CoV-2 infected patients, n (%)	77 (23.84%)	35 (67.31%)	42 (15.5%)	<0.001*

*χ^2 — test

Appendix 3. Laparoscopic surgery during the COVID-19 pandemic.

Parameter	Total	Group 1 (COVID-19-dedicated)	Group 2 (non-COVID-19-dedicated)	p
N (%)	323 (100%)	52 (16.10%)	271 (83.90%)	—
Which access is preferred during COVID-19 pandemic:				0.551*
Laparoscopy, n (%)	157 (48.61%)	26 (50%)	131 (48.34%)	
Laparotomy, n (%)	93 (28.79%)	17 (32.69%)	76 (28.04%)	
No difference, n (%)	52 (16.1%)	5 (9.62%)	47 (17.34%)	
I do not know, n (%)	21 (6.5%)	4 (7.69%)	17 (6.27%)	
Laparoscopic surgery on patient diagnosed with COVID-19 is safe:				0.154*
Yes, n (%)	160 (49.54%)	32 (61.54%)	128 (47.23%)	
No, n (%)	90 (27.86%)	12 (23.08%)	78 (28.78%)	
I do no know, n (%)	73 (22.6%)	8 (15.38%)	65 (23.99%)	

*χ^2 — test

Appendix 4. SARS-CoV-2 prevention.

Parameter	Total	Group 1 (COVID-19-dedicated)	Group 2 (non-COVID-19-dedicated)	p
	323 (100%)	52 (16.10%)	271 (83.90%)	—
Measures to prevent SARS-CoV-2 staff infection were introduced: before admitting first SARS-CoV-2 positive patients, n (%) after admitting first SARS-CoV-2 positive patients, n (%) I do not know, n (%)	 182 (56.35%) 32 (9.91%) 21 (6.5%)	 34 (65.38%) 10 (19.23%) 4 (7.69%)	 148 (54.61%) 22 (8.12%) 17 (6.27%)	0.263*
There was a training of staff concerning COVID-19 pandemic in my institution, n (%)	211 (65.33%)	45 (86.54%)	166 (61.25%)	<0.001*
Mean level of knowledge (on a scale from 1 to 10) concerning:				
COVID-19 pandemic ± SD	6.05 ± 1.73	5.92 ± 1.71	6.07 ± 1.73	0.565**
Treatment of patients diagnosed with COVID-19 ± SD	4.4 ± 2.14	4.71 ± 2.24	4.34 ± 2.12	0.247**
Preparation for surgery on a patient with suspected / confirmed COVID-19 and provision of appropriate PPE during the procedure ± SD	5.54 ± 2.5	6.62 ± 2.35	5.33 ± 2.48	<0.001**
The level (on a scale from 1 to 10) of preparedness in my institution in terms of:				
Theoretical training of the staff ± SD	3.59 ± 2.47	4.77 ± 2.26	3.36 ± 2.46	<0.001**
Equipping staff with appropriate PPE ± SD	3.42 ± 2.42	5.21 ± 2.66	3.07 ± 2.21	<0.001**
Adapting the operating theater to safely perform procedures in patients with suspected / confirmed COVID-19 ± SD	3.47 ± 2.58	5.85 ± 2.57	3.02 ± 2.32	<0.001**
My institution introduced changes in the protocol of conduct in the operating theater: Yes, n (%) No, n (%) I do not know, n (%)	 95 (29.41%) 171 (52.94%) 57 (17.65%)	 31 (59.62%) 12 (23.08%) 9 (17.31%)	 64 (23.62%) 159 (58.67%) 57 (21.03%)	<0.001*
My institution introduced changes in the perioperative care protocol: Yes, n (%) No, n (%) I do not know, n (%)	 6 (20.43%) 193 (59.75%) 64 (19.81%)	 21 (40.38%) 14 (26.92%) 17 (32.69%)	 45 (16.61%) 179 (66.05%) 64 (23.62%)	<0.001*

Parameter	Total	Group 1 (COVID-19-dedicated)	Group 2 (non-COVID-19-dedicated)	p
My institution introduced changes in the protocol of conduct on the surgical ward:				0.002*
Yes, n (%)	236 (73.07%)	48 (92.31%)	188 (69.37%)	
No, n (%)	80 (24.77%)	4 (7.69%)	76 (28.04%)	
I do not know, n (%)	7 (2.17%)	0	7 (2.58%)	
I presume being infected with SARS-CoV-2 during my work:				0.317*
Yes, n (%)	201 (62.23%)	27 (51.92%)	174 (64.21%)	
No, n (%)	21 (6.5%)	5 (9.62%)	16 (5.9%)	
I do not know, n (%)	99 (30.65%)	18 (34.62%)	81 (29.89%)	

*χ^2 — test; ** Student's t-test