Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Quality Improvement Study

Surgical activity during the Covid-19 pandemic: Results for 112 patients in a French tertiary care center, a quality improvement study

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ABSTRACT

Background: After the emergence of Covid-19 in China, Hubei Province, the epidemic quickly spread to Europe. France was quickly hit and our institution was one of the first French university to receive patients infected with Sars-COV2. The predicted massive influx of patients motivated the cancellation of all elective surgical procedures planned to free hospitalization beds and to free intensive care beds. Nevertheless, we should properly select patients who will be canceled to avoid life-threatening. The retained surgical indications are surgical emergencies, oncologic surgery, and organ transplantation.

Material and methods: We describe the organization of our institution which allows the continuation of these surgical activities while limiting the exposure of our patients to the Sars Cov2.

Results: After 4 weeks of implementation of intra-hospital protocols for the control of the Covid-19 epidemic, 112 patients were operated on (104 oncology or emergency surgeries and 8 liver transplants). Only one case of post-operative contamination was observed. No mortality related to Covid-19 was noted. No cases of contamination of surgical care personnel have been reported.

Conclusion: We found that the performance of oncological or emergency surgery is possible, safe for both patients and caregivers.

1. Introduction

After the emergence of Covid-19 in China, France was quickly hit and our institution was one of the first French University Hospitals to receive patients infected with Sars-COV2. To date, the number of infected patients in France is 122577 including 86657 hospitalized patients and 4870 in intensive care, of which 22245 patients have died. The experience acquired in China and neighboring countries has shown rapid development of the pandemic and the need for rapid implementation of a specific organization within our institution [1,2]. The predicted massive influx of patients motivated the cancellation of all elective surgical procedures planned in an attempt to free standard and intensive care unit beds. The anesthesiology and intensive care teams usually dedicated to the operating rooms were gradually reassigned to the new intensive care units. The number of active operating theatres was reduced from 20 to 5.

Nevertheless, proper patient selection is mandatory to avoid any loss of chance among patients with life-threatening conditions. The retained surgical indications were surgical emergencies, oncologic surgery, and vital organ transplantation. One major challenge is to reorganize the hospital system to limit the risk of exposure to Sars-COV2 in surgical patients more prone to develop serious forms of Covid-19 [3] while keeping enough acute care resources for managing both COVID + and COVID-.

Our institution combines 2 specificities: firstly, it consists of one of the leading infectious disease departments in France and Europe, and

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Abbreviations

COVID +	COVID positive
COVID -	COVID negative
CT	Computed tomography
ICU	Intensive Care Unit
NMBA	Neuromuscular blocking agents
PPE	Personal protective equipment
RT PCR	Reverse transcriptase-polymerase chain reaction

the principal investigator of the large-scale European DISCOVERY study (NCT04315948) belongs to the institution. Second, it represents a tertiary referral center for several surgical specialties, including general surgery, head and neck surgery, gynecologic surgery, and liver transplantation.

The present work aimed to describe the reorganization of the anesthesiology and surgical departments in a tertiary university hospital at the frontline of the management of both COVID+ and surgical patients and to report the outcome of patients admitted to the institution for surgery during the first month after implementing the described reorganization.

2. Methods

This retrospective quality improvement study has been registered in a publicly accessible database: Clinical Trials (NCT04379232). The work has been reported in line with the STROCSS criteria [4], and the work has been reported in line with the Standards for Quality Improvement Reporting Excellence (SQUIRE) criteria.

Patients were operated in our institution.

2.1. General organization of the surgical department

2.1.1. Postponement of non-urgent interventions

Only urgent surgeries and oncologic surgery with risk of loss of opportunity in the short or medium-term (4 weeks) are maintained.

2.1.2. Covid-19 detection

Standardized management is defined for patients hospitalized for urgent surgery or for whom an elective surgery cannot be delayed. A medical examination is carried out the day before surgery in the usual surgical department or by a phone call before admission to evaluate the risk of Covid-19.

Systematic screening tests are carried out even in the absence of symptoms. RT-PCR and a chest computed tomography (CT) scan without injection are performed. For elective surgery, results must be known before surgery.

Achieving these two tests is necessary to lower the rate of false-negative patients [5–7]. Pending the results, medical and paramedical teams should follow personal protective equipment adapted to the management of COVID + patients.

2.1.3. Creation of a COVID-negative surgical department

In COVID-negative (COVID-) surgical department each patient has to be tested negative before surgery. The paramedical team should not have any activity in COVID + units. In case of suspicion during hospitalization, the patient is tested and isolated during the time to get the result.

With the cancellation of many elective surgeries, some surgical departments are free and reserved to become COVID + departments if necessary.

2.1.4. Dedicated surgical COVID + unit

A dedicated surgical unit was created specifically for COVID + patients. Before integrating the unit, the entire medical and

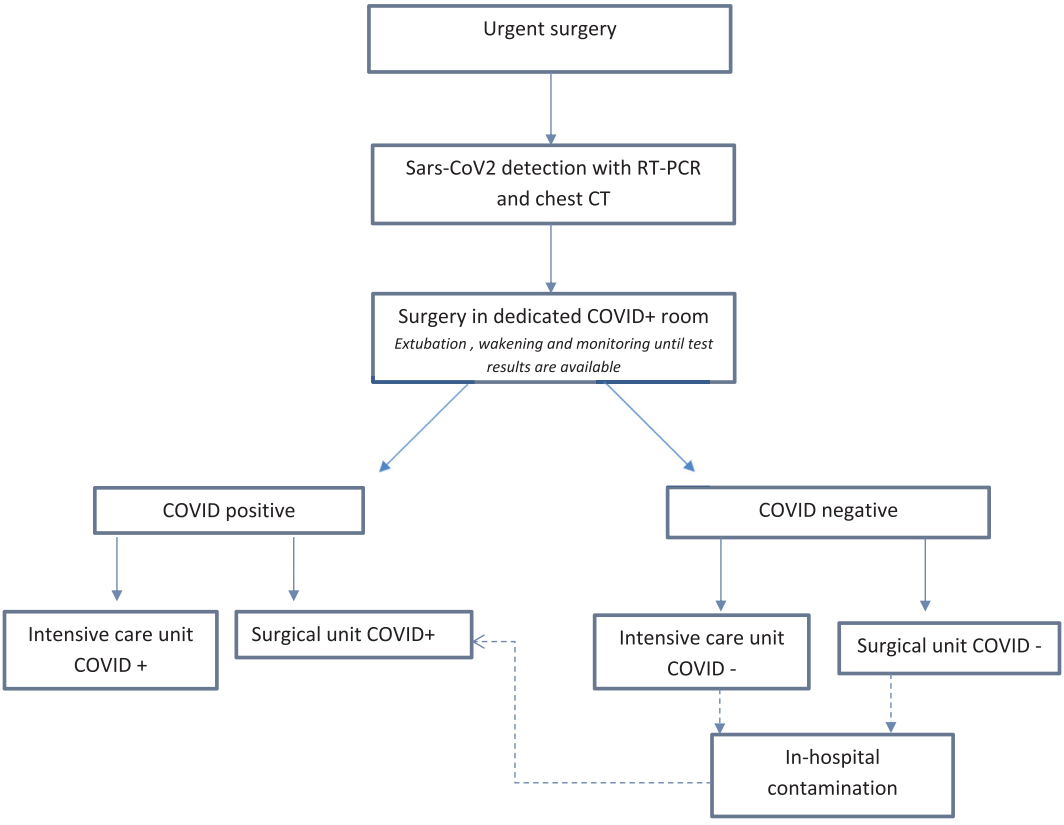

Fig. 1. Perioperative protocol.

paramedical staff benefitted from a theoretical course provided by the hospital's operational hygiene team. Drug and medical prescriptions are the responsibility of the surgeon in charge; however, daily ward rounds are limited to the strict minimum, and performed by a single surgeon, regardless of his specialty. Pictures of surgical wounds, drain fluid aspects and other clinical features are sent if necessary to the surgeon in charge, and physical examination is restricted. All medical care and nursing are performed using maximal individual protective measures, including the use of surgical or FFP2 masks depending on the type of gesture, disposable and protective aprons, gloves, protective headwear, and glasses.

2.1.5. Organization of the operating theater

For non-deferrable surgeries, patients are tested preoperatively and operated in conventional operating rooms and then hospitalized in COVID-units.

For urgent surgeries: an emergency room has been specially equipped for negative patients. A second room is reserved for COVID + patients or awaiting results. Fig. 1 shows the perioperative algorithm.

This dedicated operating room for COVID + patients is organized to contain the spread of infection: only the necessary materials should be placed in the room, traffic should be minimized, surgical approaches should be chosen to reduce the exposure … Every surgical team received appropriate information on the procedure to access into this operating room [8].

2.1.6. Department of anesthesia: perioperative organization

2.1.6.1. Preoperative evaluation. When possible, consultations are dematerialized and a preoperative evaluation is carried out. Each patient is thoroughly examined the day before the intervention by an anesthesiologist.

2.1.6.2. Screening. As explained before, preoperative screening must be systematic regardless of the urgency of the surgery and involves RT-PCR on a nasopharyngeal swab and a chest CT scan. Performing a lower respiratory sample after induction of anesthesia improves the sensitivity of preoperative screening [9]. Endotracheal aspirate or plugged telescopic catheter specimen with or without mini-bronchoalveolar lavage should be preferred to bronchoalveolar lavage which increases the risk of contamination.

A lower respiratory sample must, therefore, be systematically performed if:

- preoperative screening in progress
- negative preoperative screening (both NP swab and CT scan) but high-risk factors for COVID-19:
  - COVID+ "contact patients"
  - symptomatic patient: fever ≥ 38°, cough, dyspnea, respiratory rate > 22/min, deterioration of the general condition, and digestive symptoms in the elderly patient.

2.1.6.3. Management. In case of screening in progress or discrepancy between the two tests (negative swab positive CT scan), patients should be considered COVID+. In the case of negative screening, patients at high risk for COVID-19 (symptomatic patients or COVID + contact), should also be considered COVID+.

The use of alternative molecules for the induction and maintenance of anesthesia is strongly encouraged. Balanced or inhaled anesthesia should be preferred to total intravenous anesthesia (TIVA), and neuromuscular blocking agents (NMBA) different from what is commonly needed in ICU should be used. Succinylcholine or rocuronium are alternatives to cisatracurium and atracurium for example.

- COVID-patients: to avoid contamination from a falsely negative tested patient, FFP2 type protective mask, protective glasses, and gloves should be used for management of upper airways, because of the known risk of transmission by this pathway. Standard anesthesia procedures are then performed.
- COVID + confirmed or suspected patients: The patient should wear a face mask during transport to the procedure room. Anesthesia team should wear complete personal protective equipment (PPE) and an FFP2 type protective mask. The operating room is put under negative pressure (if possible).

Anesthesia is then performed according to the French Society of Anesthesia & Intensive Care Medicine's recommendations [10]:

- Use of a high-efficiency hydrophobic filter between the face mask and breathing circuit or between the face mask and airway bag. A filter on the expiratory branch of the respirator is also added.
- Airway management reserved for the most experienced anesthetist.
- Preoxygenation with 100% oxygen: sealed mask connected to the respirator with spontaneous breathing or continuous positive airway pressure.
- Rapid sequence induction (RSI) to avoid patient ventilation.
- Tracheal intubation with the use of video laryngoscopy
- No ventilation is started until the respiratory circuit is connected to the intubation probe
- Circuit connection with closed suction system
- Extubation and wakening in the operation room. A face mask is quickly given to the patient after extubation.

2.2. Management of COVID – patients (if beds still available)

2.2.1. Emergencies

2.2.1.1. Head and neck surgery. Head and neck surgery particularly exposes the surgeon to contamination. Thus for any surgical procedure on the upper airways (including tracheotomy), the surgeon must wear an FFP2 mask and personal protective equipment. Given the rate of false negatives and the risk of exposure during upper airways management, these precautions must be taken even if the test is negative.

Whenever possible, prolonged endotracheal intubation should be preferred to emergency tracheotomy.

2.2.1.2. Gynecological, general and digestive surgery. Contrary to head and neck surgery, intraabdominal surgical procedures are not supposedly associated with a major risk of exposure to the virus. Therefore, no additional recommendations were provided in addition to the usual ones. However, due to the theoretical risk of aerosol release, all surgical staff present in the operative theatre during laparoscopic procedures are asked to wear FFP2 masks, although the level of evidence regarding the latter risk remains low.

2.2.2. Oncologic surgery

2.2.2.1. Head and neck surgery. Only patients with a risk of loss of opportunity in the short or medium-term (4 weeks) are operated. In case of surgery affecting the pharyngeal-laryngeal mucosa, oral cavity, or nasosinusal mucosa, the surgical team must wear an FFP2 mask and personal protective equipment. If tracheotomy is necessary after extensive oncologic resection, a non-surgical treatment alternative should be preferred.

2.2.2.2. Gynecological surgery. All oncological surgical records have been the subject of a multidisciplinary meeting. The surgical procedures have been simplified to limit the risk of surgical complications as much as possible. Heavy pelvic oncological surgery, which might require hospitalization in continuous care, is postponed when possible, and chemotherapy is carried out when possible and without loss of opportunity for ovarian cancer [11]. Surgical management of endometrial and cervical cancers in patients without

risk factors is maintained. Surgery for breast cancer is maintained in patients without other risk factors. In elderly or frail patients, hormone therapy is introduced to avoid surgical management and hospitalization during the pandemic period [12].

2.2.2.3. Digestive and hepatobiliary surgery. All patient files are discussed in a dedicated multidisciplinary team meeting. Various factors are taken into account: (i) oncological impact and risk of decreased survival in case of delayed surgery; (ii) existence of an alternative bridging therapy (such as chemotherapy, percutaneous minimally invasive ablation or radiation therapy) that could allow to safely delay the surgery; (iii) requirement for postoperative heavy ICU management; We also took into consideration some recent National French recommendations issued by experts regarding the management of digestive and hepatobiliary cancers [13]. Most surgeries could be delayed depending on the histology and organ involved. For pre-malignant colonic lesions and those with a good predicted prognosis (T1 or T2, N0), delaying the procedure is recommended. For more advanced colonic lesions, the possibility of neoadjuvant therapy has been suggested despite the lack of validity for such a strategy. For most pancreatic cancers, experts have recommended delaying the surgical procedure since pancreatic cancer surgery is associated with an important rate of severe postoperative morbidity, usually requiring intensive postoperative resuscitation. When malignancy has been proven by histology, it is suggested to perform neoadjuvant chemotherapy to decrease the risk of tumor progression. For oesogastric tumors, neoadjuvant chemotherapy alone or chemoradiation therapy is widely proposed, since such therapies have proven to be very effective in controlling the tumor locally. Finally, for primary liver tumors, due to the moderate risk of local progression during the epidemic combined to the existence of effective percutaneous therapies, including radiofrequency or microwave ablations, experts advised delaying the surgical procedures, except for patients requiring a limited gesture, such as wedge resections or monosegmentecomies that could be performed through a laparoscopic approach.

2.2.3. Liver transplant surgery

Contrary to kidney transplant, which could be delayed (thanks to the existence of renal replacement therapy), liver transplantation is a vital procedure that is offered to patients with more or less urgent medical conditions such as acute liver failure or primary liver tumors. Without transplantation, such diseases result in death within days, weeks, or months because of the current lack of effective hepatic replacement therapy. Therefore, and according to the recommendations by the French National Authority for organ transplant [14] and the French hepatobiliary and transplant surgical association [15], we decided to maintain our liver transplant program during the pandemic outbreak. However, due to the lack of knowledge regarding the true impact of COVID-19 on liver transplant recipients, and the possible increased risk of severe respiratory distress syndrome, we decided to limit our indications to the most severe patients who would otherwise be exposed to the risk of death. In addition to recipient testing for COVID-19, all donors also undergo a combined COVID testing including RT-PCR and chest CT, and those with suspected or proven COVID-19 were excluded for organ procurement.

2.3. Management of COVID + patients

2.3.1. Emergencies

Patients requiring emergency surgical management are treated in the dedicated operating room dedicated to these patients. Isolation precautions are taken. In COVID + patients, the risk of contamination of personnel is major because of exposure to the upper airways. For respiratory emergencies, prolonged intubation should be preferred to tracheotomy whenever possible. Personal protective equipment and FFP2 masks are mandatory. Patients are then hospitalized in the COVID + unit.

2.3.2. Oncologic surgery

Oncologic surgeries in COVID + patients are postponed for 2–4 weeks to await recovery and reduction of the patient's contagiousness.

2.3.3. Liver transplant surgery

Despite the absence of strong evidence suggesting a risk of more severe disease in immunosuppressed patients [16], we decided to contra-indicate liver transplant in recipients with a positive COVID test.

3. Results

3.1. General data of the institution

The medical units have been adapted to accommodate a total of 195 COVID + beds in the institution (97 in conventional hospitalization and 98 in rehabilitation care).

We organized 6 COVID + intensive care units with a total of 54 beds and 2 COVID-intensive care units with a total of 15 beds. At the time of writing, 510 COVID + patients have been hospitalized and 90 patients in intensive care units.

3.2. Surgical departments

Data from patients undergoing surgery were collected during the first 4 weeks (23rd March to 19th April) after the opening of the dedicated units and diffusion of the institutional protocols for intra-hospital screening. Each surgical procedure has been classified according to the POSSUM scale, which has been adapted to head and neck procedures [17,18]. Briefly, this classification makes it possible to classify the interventions from minor to major plus according to the degree of severity and surgical technicality.

The total number of patients operated on was 112 patients for the three specialties described in this article (Table 1). Among the patients

Table 1
Total number of patients operated on for the three specialties with POSSUM scale classification and Sars-Cov2 related outcome.

	General surgery	Gynaecoloical surgery	Head and neck surgery	Liver transplant	Total
Total No. of procedures	39	37	28	8	112
Operative severity					
Minor (%)	3 (8)	21 (57)	7 (25)	0 (0)	31 (27.7)
Moderate (%)	13 (33)	16 (43)	7 (25)	0 (0)	36 (32.1)
Major (%)	14 (36)	0 (0)	7 (25)	0 (0)	21 (18.8)
Major plus (%)	9 (23)	0 (0)	7 (25)	8 (100)	24 (14.3)
COVID + status at the time of surgery (%)	0 (0)	1 (3)	0 (0)	0 (0)	1 (0.9)
No. ambulatory procedures (%)	0 (0)	22 (59)	3 (11)	0 (0)	25 (22.3)
Postoperative ICU stay (%)	6 (15)	0 (0)	8 (29)	8 (100)	22 (19.6)
Contamination of medical or paramedical staff (%)	0	0	0	0	0 (0)

operated on, 28 (27%) were hospitalized in the dedicated COVID + unit, either because it was urgent surgery awaiting screening results or because the screening was positive (5 patients (4.9%)).

8 liver transplants have been performed with 100% survival at the time of writing this article.

No mortality related to Covid-19 was noted.

No postoperative contamination was observed in the COVID-patients. Follow-up with RT-PCR was not routinely performed, only if the patient had symptoms compatible with COVID post-operatively. No contamination of nursing staff, surgeons, or anesthesiologists caring for these surgical patients was observed.

3.2.1. Digestive surgery

In digestive surgery (Table 2), 39 patients were operated on from March 23 to April 19. None of the patients were COVID+. One patient (2%) had post-operative contamination discovered on CT. This patient was asymptomatic. According to the POSSUM scale, all types of minor to major plus surgeries were performed, 6 patients (15%) were hospitalized in the intensive care unit after complex surgery.

No cases of contamination of the caregivers were reported in the follow-up of these patients.

3.2.2. Liver transplantation

8 liver transplants have been performed.

All of these procedures were a major plus on the POSSUM scale, all patients were hospitalized in intensive care and the survival is 100% at the time of writing this article.

No cases of postoperative contamination of transplanted patients have been described (Table 1).

3.2.3. Gynecological surgery

In gynecological surgery (Table 3), 37 patients were operated on. One patient (3%) had a positive preoperative COVID screening. 57% of the procedures were minor surgery on the POSSUM scale and 43% were moderate surgery. 22 (59%) surgeries were performed as ambulatory surgeries.

3.2.4. Head and neck surgery

In head and neck surgery (Table 4), 28 patients were operated on. No patients tested positive in pre-operative care. According to the POSSUM scale adapted to head and neck surgery, minor to major plus surgeries were performed. 29% of patients were admitted to the intensive care unit postoperatively. 11% of the procedures were performed in outpatient surgery. No cases of postoperative contamination

Table 2
Digestive surgeries with POSSUM scale classification and Covid status.

	Age (Years)	Indication	Indication type (malignancy/ emergency/other)	Procedure	Surgical Approach	Operative severity (POSSUM scale)	COVID Test (PCR + CT Chest)
1	47	Acute cholecystitis	emergency	Cholecystectomy	Laparoscopy	moderate	negative
2	90	Acute cholecystitis	emergency	Cholecystectomy	Laparoscopy	moderate	negative
3	62	Acute cholecystitis	emergency	Cholecystectomy	Laparoscopy	moderate	negative
4	46	Acute cholecystitis	emergency	Cholecystectomy	Laparoscopy	moderate	negative
5	36	Anal Abscess	emergency	Drainage	Perineal	minor	negative
6	91	Biliary Peritonitis	emergency	Laparoscopic drainage	Laparoscopy	moderate	negative
7	68	Cholangiocarcinoma	malignancy	Bi-segmentectomy	Laparotomy	major plus	negative
8	62	Cholangiocarcinoma	malignancy	No resection	Conversion to Laparotomy	major	negative
9	63	Cholangiocarcinoma	malignancy	Non-anatomical Liver Resection	Laparotomy	major plus	negative
10	64	Colorectal Adenocarcinoma	malignancy	Right Colectomy	Laparotomy	major	negative
11	55	Colorectal Adenocarcinoma	malignancy	Left Colectomy	Laparoscopy	major	negative
12	61	Colorectal Adenocarcinoma	malignancy	Transvers Colectomy	Laparoscopy	major	negative
13	66	Colorectal Adenocarcinoma	malignancy	Colostomy	Laparotomy	major	negative
14	66	Colorectal Adenocarcinoma	malignancy	Left Colectomy	Conversion to Laparotomy	major	negative
15	67	Colorectal Adenocarcinoma	malignancy	Left colectomy	Conversion to Laparotomy	major	negative
16	57	Colorectal Adenocarcinoma	malignancy	Total Coloprotectomy	Laparotomy	major	negative
17	72	Colostomy	malignancy	Left colectomy	Laparoscopy	moderate	negative
18	63	Congenital Bie Dilatation (Todani IV)		Main Bile Duct Resection	Laparotomy	major	negative
19	53	Colorectal Liver Metasteses	malignancy	Laparoscopy and focal destruction	Laparoscopy	moderate	negative
20	72	Gallbladder Tumor	malignancy	Bi-segmentectomy	Conversion to Laparotomy	major plus	negative
21	59	Gallbladder Tumor	malignancy	Cholecystectomy	Laparotomy	major	negative
22	69	Gastric Adenocarcinoma	malignancy	Gastrectomy	Laparotomy	major plus	negative
23	71	Hepatocellular Carcinoma	malignancy	Bi-segmentectomy	Laparotomy	major plus	negative
24	58	Hepatocellular Carcinoma	malignancy	Cholecystectomy-Focal Ablation	Laparoscopy	moderate	negative
25	61	Umbilical Hernia	emergency	Umbilical Hernia Repair	Laparotomy	minor	negative
26	84	Inguinal Hernia	emergency	Inguinal Hernia Repair	Laparotomy	minor	negative
27	37	Liver Adenoma	other	Segmentectomy	Laparoscopy	major plus	negative
28	69	Liver Adenoma	other	Segmentectomy	Laparoscopy	major plus	negative
29	73	Common Bile Duct Stone	emergency	Cholecystectomy	Laparoscopy	major	negative
30	70	Common Bile Duct Stone	emergency	Cholecystectomy	Laparoscopy	major	negative
31	65	undetermined malignancy	malignancy	exploratory thoracoscopy	Thoracoscopy	moderate	negative
32	60	Hepatocellular Carcinoma	malignancy	Uni-segmentectomy	Laparotomy	major plus	negative
33	64	Hepatocellular Carcinoma	malignancy	right hemihepatectomy	Laparotomy	major	negative
34	63	Acute cholecystitis	emergency	Cholecystectomy	Laparoscopy	moderate	negative
35	65	Acute cholecystitis	emergency	Cholecystectomy	Laparoscopy	moderate	negative
36	34	Acute cholecystitis	emergency	Cholecystectomy	Laparoscopy	moderate	negative
37	64	Pancreatic adenocarcinoma	malignancy	Pancreaticoduodenectomy	Laparotomy	major plus	negative
38	67	Inflammatory colic stricture	emergency	Colostomy	Laparotomy	major	negative
39	56	Common Bile Duct Stone	emergency	Cholecystectomy	Laparoscopy	moderate	negative

Table 3
Gynaecological surgeries with POSSUM scale classification and Covid status.

	Age (Years)	Indication	Indication type (malignancy/ emergency/other)	Procedure	Surgical Approach	Operative severity (POSSUM scale)	Ambulatory surgery	COVID Test (PCR + CT Chest)	Clinical screening for COVID
1	28	Miscarriage	emergency	Aspiration-curettage	vaginal	Minor	yes		negative
2	37	Miscarriage	emergency	Hysteroscopy	vaginal	Minor	yes		negative
3	36	Miscarriage	emergency	Aspiration-curettage	vaginal	Minor	yes		negative
4	54	postmenopausal metrorragia	malignancy	Hysteroscopy	vaginal	Minor	yes		negative
5	58	breast neoplasm	malignancy	Mastectomy	direct	Moderate	yes		negative
6	78	breast neoplasm	malignancy	Mastectomy	direct	Moderate	no		negative
7	73	breast neoplasm	malignancy	Tumorectomy	direct	Minor	yes		negative
8	34	Miscarriage	emergency	Aspiration-curettage	vaginal	Minor	yes		negative
9	53	breast neoplasm	malignancy	Tumorectomy + AD	direct	Moderate	yes		negative
10	55	breast neoplasm	malignancy	Tumorectomy	direct	Minor	yes		negative
11	51	breast neoplasm	malignancy	Tumorectomy + AD	direct	Moderate	yes		negative
12	71	breast neoplasm	malignancy	Tumorectomy	direct	Minor	no		negative
13	52	breast neoplasm	malignancy	axillary dissection	direct	Moderate	yes		negative
14	30	cervical intraepithelial neoplasia	malignancy	Cone biopsy	vaginal	Minor	yes		negative
15	30	Adnexal torsion	emergency	laparoscopy	laparoscopy	Moderate	no	negative	negative
16	47	breast neoplasm	malignancy	Tumorectomy	direct	Minor	yes		negative
17	39	breast neoplasm	malignancy	Tumorectomy	direct	Minor	yes		negative
18	51	Cancer	malignancy	Port-a-cath placement	direct	Minor	yes		negative
19	77	breast neoplasm	malignancy	Tumorectomy	direct	Minor	yes		negative
20	43	breast neoplasm	malignancy	Tumorectomy	direct	Minor	yes		negative
21	40	Miscarriage	emergency	Aspiration-curettage	vaginal	Minor	no	negative	negative
22	32	Ovarian cyst	malignancy	laparoscopy	laparoscopy	Moderate	no	negative	negative
23	39	ectopic pregnancy	emergency	salpingotomy	laparoscopy	Moderate	no	negative	negative
24	39	ectopic pregnancy	emergency	salpingectmoy	laparoscopy	Moderate	no	negative	negative
25	29	Miscarriage	emergency	Aspiration-curettage	vaginal	Minor	no	negative	negative
26	36	Miscarriage	emergency	Aspiration-curettage	vaginal	Minor	yes		negative
27	35	Adnexal torsion	emergency	laparoscopy	laparoscopy	Moderate	no	negative	negative
28	27	pregnancy	emergency	Cerclage	vaginal	Minor	no	positive	positive
29	30	Unexplained pelvic pain	emergency	laparoscopy	laparoscopy	Moderate	no	negative	negative
30	29	ectopic pregnancy	emergency	Salpingectomy	laparoscopy	Moderate	no	negative	negative
31	27	ectopic pregnancy	emergency	salpingectomy	laparoscopy	Moderate	no	negative	negative
32	35	pregnancy	emergency	cerclage Benson	vaginal	Moderate	yes		negative
33	38	Miscarriage	emergency	Aspiration-curettage	vaginal	Minor	yes		negative
34	63	breast neoplasm	malignancy	Tumorectomy	direct	Minor	yes		negative
35	29	Adnexal torsion	emergency	laparoscopy	laparoscopy	Moderate	no	negative	negative
36	36	breast neoplasm	malignancy	Tumorectomy	direct	Minor	yes		negative
37	33	Adnexal torsion	emergency	laparoscopy	laparoscopy	Moderate	no	negative	negative

were described in any of the patients.

4. Discussion

The Covid-19 pandemic exposes all the world's health care institutions to management challenges and the need for a major reorganization. All elective surgeries are being deprogrammed and medical departments must free up as many beds as possible to accommodate the wave of patients affected by Covid-19.

Nevertheless, certain surgical indications in patients not affected by Covid-19 must be maintained with the risk of perioperative contamination.

Our article, therefore, describes the results of surgical management in 3 different specialties that have decided to continue their oncology and emergency surgery activity. Our results show that an organization adapted to the pandemic context with strict compliance with protective measures makes it possible to continue a surgical activity without contamination of the most fragile patients. No mortality related to Covid-19 was noted.

We, therefore, believe that these surgical activities must be maintained so that our patients do not suffer a loss of opportunity in their care.

On the other hand, during these 4 weeks after the implementation of intra-hospital screening protocols and after the creation of dedicated surgical COVID + units, we have not noted any cases of contamination of the nursing staff in the surgical departments, even among anaesthesiologists or in endoscopic airway surgery, which are highly exposed to contamination by Sars Cov-2. Nevertheless, our article has some limitations such as its retrospective nature and the absence of post-operative systematic screening for Covid-19 in all surgeons, anesthesiologists, residents, and nursing staff in charge of the patients.

5. Conclusion

After 4 weeks of implementation of intra-hospital protocols during the Covid-19 pandemic, we find that the performance of oncological or emergency surgery is possible, safe for both patients and caregivers.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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No funding.

Table 4
Head and Neck surgeries with POSSUM scale classification and Covid status.

	Age (Years)	Indication	Indication type (malignancy/ emergency/other)	Procedure	Operative severity (POSSUM scale)	Ambulatory surgery	ICU after surgery	COVID test (PCR + CT chest)	Clinical screening for COVID
1	57	laryngeal cancer	malignancy	endoscopy + laser	minor	yes	no		negative
2	57	hemorragae	emergency	cervicotomy	moderate	no	no	negative	negative
3	79	oral cavity cancer	malignancy	endoscopy	minor	yes	no		negative
4	65	pharyngeal cancer	malignancy	endoscopy	minor	yes	no		negative
5	89	parotid cancer	malignancy	radical parotidectomy	major	no	no	negative	negative
6	82	cutaneaous cancer	malignancy	resection and local reconstruction	moderate	no	no	negative	negative
7	51	nodal recurrnce of nasopharyngeal cancer	malignancy	neck dissection	moderate	no	no	negative	negative
8	54	laryngeal cancer	malignancy	endoscopy	major	no	no	negative	negative
9	63	oral cavity cancer	malignancy	pelviglossectomy, neck disection, free flap	major plus	no	yes	negative	negative
10	64	oral cavity cancer	malignancy	glossectomy, neck dissection	major	no	no	negative	negative
11	66	parotid cancer	malignancy	radical parotidectomy, free flap for facial reinnervation	major plus	no	yes	negative	negative
12	47	tracheal stenosis	other	endoscopy + laser	moderate	no	no	negative	negative
13	74	sinus cancer	malignancy	endoscopy	minor	no	no	negative	negative
14	63	maxillary sinus cancer	malignancy	endoscopy	minor	no	no	negative	negative
15	78	oral cavity cancer	malignancy	pelviglossectomy, neck disection, free flap	major plus	no	yes	negative	negative
16	60	laryngeal cancer	malignancy	endoscopy + laser	moderate	no	no	negative	negative
17	61	oral cavity cancer	malignancy	pelviglossectomy, neck disection, locoregional flap	major	no	no	negative	negative
18	51	oral cavity cancer	malignancy	pelviglossectomy	moderate	no	no	negative	negative
19	55	oral cavity cancer	malignancy	total glossectomy, neck dissection, free flap	major plus	no	yes	negative	negative
20	83	ethmoidal sinus cancer	malignancy	bicoronal approach	major	no	no	negative	negative
21	62	maxillary sinus cancer	malignancy	maxillectomy, neck dissection, free flap	major plus	no	yes	negative	negative
22	60	laryngeal cancer	malignancy	endoscopy	minor	no	no	negative	negative
23	58	laryngeal stenosis	other	endoscopy + laser	moderate	no	no	negative	negative
24	70	oral cavity cancer	malignancy	glossectomy, neck dissection	major	no	no	negative	negative
25	88	maxillary sinus cancer	malignancy	maxillectomy, neck dissection, free flap	major plus	no	yes	negative	negative
26	65	pharyngeal cancer	malignancy	endoscopy + laser	major	no	no	negative	negative
27	82	oral cavity cancer	malignancy	cheek resection, neck dissection, free flap	major plus	no	yes	negative	negative
28	88	dyspnea	emergency	tracheotomy	minor	no	yes	negative	negative
29	42	laryngeal cancer	malignancy	post poned			no	positive	positive

Data statement

All the data is available.

CRediT authorship contribution statement

P. Philouze: Conceptualization, Funding acquisition, Formal analysis, Writing - original draft. **M. Cortet:** Conceptualization, Funding acquisition, Formal analysis, Writing - original draft. **D. Quattrone:** Conceptualization, Funding acquisition, Formal analysis, Writing - original draft. **P. Céruse:** Conceptualization, Funding acquisition, Formal analysis, Writing - original draft. **F. Aubrun:** Conceptualization, Funding acquisition, Formal analysis, Writing - original draft. **G. Dubernard:** Conceptualization, Funding acquisition, Formal analysis, Writing - original draft. **J.Y. Mabrut:** Conceptualization, Funding acquisition, Formal analysis, Writing - original draft. **M.C. Delignette:** Conceptualization, Funding acquisition, Formal analysis, Writing - original draft. **K. Mohkam:** Conceptualization, Funding acquisition, Formal analysis, Writing - original draft.

Declaration of competing interest

None.

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