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Clinical Opinion

Surgical and Clinical Reactivation for Elective Procedures during the COVID-19 Era: A Global Perspective

Marie Fidela R. Paraiso, MD, Jubilee Brown, MD, Mauricio S. Abrão, MD, Humberto Dionisi, MD, Richard B. Rosenfield, MD, Ted T.M. Lee, MD, and Nucelio Lemos, MD, PhD

From the Department of Subspecialty Care for Women's Health, OB/GYN and Women's Health Institute, Cleveland Clinic, Cleveland, Ohio (Dr. Paraiso), Department of Obstetrics and Gynecology and Levine Cancer Institute, Atrium Health, Charlotte, North Carolina (Dr. Brown), Gynecologic Division, BP - A Beneficencia Portuguesa de Sao Paulo and Department of Obstetrics and Gynecology, Faculdade de Medicina FMUSP, Universidade de Sao Paulo, Sao Paulo, Brazil (Dr. Abrão), Center for the Study of Women, Córdoba, Argentina (Dr. Dionisi), Pearl Women's Center, Pearl Surgicenter, Portland, Oregon (Dr. Rosenfield), Department of Obstetrics, Gynecology & Reproductive Sciences, Magee Women's Hospital, Pittsburgh, Pennsylvania (Dr. Lee), and Department of Obstetrics and Gynecology, Mount Sinai Hospital and Women's College Hospital, University of Toronto, Toronto, Ontario (Dr Lemos).

The coronavirus disease (COVID-19) pandemic has certainly been an unprecedented time. We have had to halt and modify our lives on a local, national, and international level and cooperate in fighting with this "invisible enemy" in every sector (medical, governmental, industrial, economic, educational, and social). Our immediate action in American Association of Gynecologic Laparoscopists has been to organize weekly webinars on subjects related to the pandemic and unite with 8 other professional women's healthcare societies to provide joint statements that guide our membership and others to expand their knowledge and optimize patient care during the COVID-19 crisis. This international and multidisciplinary collaboration with surgeons and medical specialists at the leading edge of the pandemic course has been an invaluable resource for global healthcare providers who are at earlier points on the COVID-19 curve.

COVID-19 preparedness has required flexibility because of a lack of diagnostic tools to accurately detect all viral carriers and the absence of effective viral therapy. Most gynecologists have halted most of the "nonessential" office and surgical procedures to protect and mitigate risk for all patients and caregivers, preserve personal protective equipment (PPE), and maintain facility capacity for a surge in COVID-19 cases. Joint statements from the American College of Surgeons and the consortium of 9 women's healthcare societies have provided guidance for resuming surgical practice and reintroducing elective procedures [1,2]. This special article provides further detailed information necessary for successful surgical and clinical reactivation for elective procedures during the COVID-19 Era, while severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) remains a viable threat.

Economic Impact of COVID-19 in Healthcare

Financial issues impact the reopening of elective surgical services during the COVID-19 pandemic. Decreased surgical volume has led to a widespread and immediate revenue loss on physicians and surgeons in private practice. The loss of volume has a projected longer-term impact on physicians employed by larger groups or institutions and on the facilities themselves.

Disruption of the supply chain also limits return to normalcy. PPE is in high demand, and some small centers are unable to order supplies because of the allocation of PPE to large hospitals and areas with higher infection density. Long-term ventilator use has created a national shortage of medications such as opiates and paralytic agents. While hospitals and ambulatory surgical centers are slowly booking surgical cases, the limited supplies, longer room turnover times, and backlogs of cases are projected to lead to salary reductions, layoffs, and financial distress.

Outside of the submitted work Dr. Rosenfield has received honoraria for proctorship from Acessa Health. Outside of the submitted work Dr. Lemos has received teaching honoraria from Promedon Inc. and Medtronic Inc. and research support from Medtronic Inc. The other authors declare that they have no conflict of interest.

Corresponding author: Marie Fidela R. Paraiso, MD, Professor and Vice Chair, OB/GYN and Women's Health Institute, Cleveland Clinic, Desk A-81, 9500 Euclid Ave, Cleveland, OH 44195.
E-mail: paraism13@gmail.com

Submitted May 4, 2020, Accepted for publication May 5, 2020.
Available at www.sciencedirect.com and www.jmig.org

1553-4650/$ — see front matter
https://doi.org/10.1016/j.jmig.2020.05.012

Timing for Reactivation of Nonessential Office and Surgical Procedures

Multiple factors influence the timing of reactivation for non-essential surgery. The burden on the healthcare system and reserve capacity limit reactivation of nonessential office and surgical procedures. Chinese data suggest that an appropriate level of hospital resources must be preserved to care for patients with COVID-19 related illnesses. The mortality of COVID-19 in Wuhan, where preparedness was not feasible for obvious reasons, was 5 times higher than in the rest of continental China, where advanced planning made resources more widely available, and the hospital systems were not overwhelmed [3].

Social distancing of patients and healthcare workers to limit viral transmission is another factor in determining the timing of re-entry. Primary care consults increase the proximity and circulation of healthcare professionals and patients, which in turn facilitates viral spread. So far, such visits have been deferred for being seen as nonessential in the short term to decrease the dissemination of the virus [4]. Conversely, empty hospitals risk bankruptcy before demand comes; furloughed healthcare professionals are already the second most in need of unemployment insurance in some areas [4]. Therefore, a precise modeling method for the pandemic progression is urgently needed. Real-time modeling of the COVID-19 instantaneous reproduction rate [3] is essential to predict the curve in the short term, and anticipate the need for healthcare resources, preparing for a likely second wave [5]. Adequate modeling and widespread testing allowed for Germany to minimize COVID-19 mortality rates and its impact on the economy [6]. Likewise, with good strategy, institutions can increase non−COVID-19 care and reactivate elective surgical practice and office procedures. In that sense, the timing for resuming elective surgical and clinical care should be determined and monitored by a committee of local authorities, clinical leaders, and hospital administration to assess the local viral prevalence, regional success of "flattening the curve," testing capability, non−COVID-19 care capacity, and PPE supply chain.

Experience in continental China shows that a second wave is almost inevitable [3,5]. Consequently, careful planning of healthcare resources should take into account a good safety margin for institutional functional reserve. Therefore, local medical and governmental authorities must collaborate to continuously monitor the pandemic's local reproduction rate, determine the hospital's reserve capacity, and develop modeling strategies to continually guide opening, closing, accelerating, or reducing elective clinical and surgical activity.

Case Prioritization and Scheduling

Surgery is considered "elective" or "non-essential" in patients with chronic problems when the procedure can be delayed without significant harm to the patient and without significant change in the prognosis. Although the need for surgery is debatable when pain or functional impairment detracts from the quality of life, the determining principle for nonessential surgery is that delay of treatment does not significantly impact clinical outcomes [7]. With this in mind, successful reactivation requires clear prioritization criteria aimed to ensure resource optimization and service to the most patients possible. Therefore, during re-entry, outpatient or same-day procedures should be favored over more complex cases to preserve hospital resources and decrease the risk of patient exposure. Table 1 summarizes our suggested prioritization scoring system, adapted from Prachand et al [8]. In this system, the lower the score, the higher the priority.

Surgical expertise also contributes to the mitigation of risk, with shorter operating times, fewer complications, and fewer readmissions observed in high volume centers [9−11]. Therefore, the ideal prioritization for the allocation of operating room resources involves high volume surgical teams with limited learners performing primarily minimally invasive outpatient procedures [12]. Conservative management and postponement of surgery, when applicable, should be mandatory during the reactivation process, to allow for prioritized surgical treatment of those who have already failed nonsurgical alternatives.

Recommendations for Phases of Surgical Care

All caregivers and healthcare systems will have to learn how to coexist with COVID-19 once the decision is made to resume clinical and surgical practice. Therefore, specific considerations apply to each phase of perioperative care.

Preoperative Phase

All patients who decide to proceed with surgery must be informed that there is a risk of contracting COVID-19 as a nosocomial infection, resulting in greater morbidity and mortality (see Section on Recommended COVID-19 Testing). Advanced directives and postsurgery rehabilitation should be discussed virtually so that the appropriate forms, paperwork, and preauthorizations are completed. Institutions can consider electronic signatures and verbal consents, and all details should be documented in the electronic medical record. In institutions that require a signature by written paper consent, signatures should be obtained on admission to avoid nonessential in-person visits.

Processes to minimize interpersonal contact are essential during preoperative care. Only strictly essential in-person interactions should be permitted to mitigate risks for both patients and caregivers. Preoperative requirements should be streamlined so that mostof the steps are accomplished by physician extenders using distance healthcare or online tools. Preoperative education should not require face-to-face interaction. Although local guidelines may vary, U.S.

Table 1

Suggested prioritization criteria (Adapted from Prachand et al, 2020)

Allocated Prioritization Score	1	2	3	4	5
Procedure factors					
Score	1	2	3	4	5
OR time (min)	<30	31−30	61−120	121−180	≥180
Estimated LOS	Outpatient	<24h	24−48h	2−3d	≥4d
Risk of postoperative ICU	Very unlikely	<5%	5%−10%	>10%−25%	>25%
Anticipated blood loss (mL)	<100	100−250	250−500	500−750	>750
Surgical team size (n)	1	2	3	4	>4
Intubation probability (%)	<1	1−5	6−10	11−25	>25
Surgical site/access	None of the following	Abdominopelvic MIS	Abdominopelvic open surgery, infraumbilical	Abdominopelvic open surgery, supraumbilical	OHNS/upper GI/thoracic
Disease factors					
Nonoperative option effectiveness	None available	Available, <40% as effective as surgery	Available, 40%−60% as effective as surgery	Available, 61%−95% as effective as surgery.	Available, 96% to ass effective as surgery
Nonoperative treatment option resource/ exposure risk	Significantly worse/not applicable	Somewhat worse	Equivalent	Somewhat better	Significantly better
Impact of 2-wk delay in treatment outcome	Significantly worse	Worse	Moderately worse	Slightly worse	No worse
Impact of 2-wk delay in surgical difficulty/risk	Significantly worse	Worse	Moderately worse	Slightly worse	No worse
Impact of 6-wk delay in treatment outcome	Significantly worse	Worse	Moderately worse	Slightly worse	No worse
Impact of 6-wk delay in surgical difficulty/risk	Significantly worse	Worse	Moderately worse	Slightly worse	No worse
Patient factors					
Age (yrs)	≤20	21−40	41−50	51−65	>65
Lung disease (asthma, COPD, CF)	None	−	−	Minimal (rare inhaler)	>Minimal
Obstructive sleep apnea	Not present	−	−	Mild/Moderate (no CPAP)	On CPAP
CV Disease (HTN, CHF, CAD)	None	Minimal (no meds)	Mild (1 med)	Moderate (2 meds)	Severe (≥3 meds)
Diabetes	None	−	Mild (no meds)	Moderate (PO meds only)	> Moderate (insulin)
Immunocompromised*	No	−	−	Moderate	Severe
ILI symptoms (fever, cough, sore throat, body aches, diarrhea)	None (Asymptomatic)	−	−	−	Yes
Exposure to known COVID-19 positive person in past 14 days	No	Probably not	Possibly	Probably	Yes

CAD = coronary artery disease; CF = cystic fibrosis; CHF = congestive heart failure; COPD = Chronic obstructive pulmonary disease; COVID-19 = coronavirus disease; CPAP = continuous positive airway pressure; CV = cardiovascular; GI = gastrointestinal; HTN = hypertension; ICU = intensive care unit; ILI = influenza-like illness; LOS = length of stay; med = medication; MIS = minimally invasive surgery; OHNS = otolaryngology, head & neck surgery; OR = operating room PO = by mouth.

* Hematologic malignancy, stem cell transplant, solid organ transplant, active/recent cytotoxic chemotherapy, anti-TNFα or other immunosuppressants, >20 mg prednisone equivalent/day, congenital immunodeficiency, hypogammaglobulinemia on intravenous immunoglobulin, AIDS.

federal guidelines allow the preoperative history to be performed virtually within 30 days of a procedure, and an updated physical examination can be performed at the time of preanesthesia care unit admission.

When in-person consultations are unavoidable, patient care areas should be disinfected immediately after use. Thorough disinfection is important because the SARS-CoV-2 virus can be transmitted by respiratory aerosol droplets, close contact, and fecal-oral transmission. Therefore, extra time should be allotted per visit to allow for sanitizing work areas and patient rooms after each patient visit. The facility waiting rooms and examination rooms should be reorganized to optimize social distancing. Patient check-in should be done by smartphone, smart devices, or kiosks that are far from the person assisting at the front desk, and appropriate PPE and/or aerosolization barriers should be used to separate healthcare personnel and patients. Screening questions should be routinely used to identify COVID-19 symptoms.

If a patient screens positive for COVID-19 symptoms, she is directed to local COVID-19−specific clinics (see the section on recommended testing). Laboratory testing should be consolidated to decrease unnecessary patient exposure during lab visits, and preoperative laboratory tests can be drawn at the time of COVID-19−specific testing. If available, patient-administered tests to rule out COVID-19 can be obtained at home so that the patient's COVID-19 status is known before obtaining preoperative labs [13]. A useful algorithm for preoperative decision making is demonstrated in Fig. 1 [14].

Immediate Preoperative and Intraoperative Phases

After preoperative procedures have ruled out COVID-19 just before surgery (see below), the patient may proceed to scheduled surgery. The number of support people accompanying the patient should be limited to 1 individual if the institutional policy allows. This support individual is required to wear a mask and maintain social distancing etiquette. In certain hospitals where patient support people are forbidden, patient status updates are reported by phone or another telecommunication process.

Enhanced recovery after surgery [15] protocols should be used to optimize intraoperative and postoperative courses. Preoperative and intraoperative surgical checklists should be modified using COVID-19 precautions.

Providers should employ the equipment deemed appropriate by their respective institutions. It is recommended that anyone working in the operating room use full PPE, which includes shoe covers, impermeable gowns, surgical or N-95 masks, protective head covering, gloves, and eye protection [16].

In the operating room and during surgery, considerations should include airflow and containment or reduction of personnel exposure to respiratory droplets during intubation and extubation. Considerations include using the "intubation box" originally designed by Dr. Hsien Yung Lai in Taiwan [17]; the design is now available in the United States [18] and was recently shown to be a viable solution for the reduction of respiratory droplet exposure [19].

In addition, the movement of personnel in and out of the operating room should be strictly limited, with efforts made to limit staff breaks midcase when possible. Trainee participation should be limited and include only personnel essential to the safe performance of the operation to avoid exposure and preserve PPE resources [12].

Theoretical concerns pertain to the operative technique and relate to viral contamination in the operative field from the smoke plume generated by electrosurgery. Viral particles have been reported in the aerosolized smoke plume created in electrosurgery, and the tools and techniques used in surgery can create particles of various sizes [20−23]. Although smoke filtration and evacuation are highly recommended during surgery as part of the risk mitigation technique, most smoke evacuators remove up to 88% of small particles. To further reduce the aerosolization risk of viral particles (20−360 nm), the use of active suction is recommended before tissue removal, port exchange, and for desufflation after laparoscopic surgery. In addition, electrostatic charging of the peritoneal cavity can precipitate over 99% of particulate matter ranging from 7 nm to 10 μm in diameter. Such systems deliver a negative electrostatic charge from an ion wand to generate precipitation (e.g., Ultravision, Alesi Surgical). This combination of techniques may be considered for maximum risk mitigation.

Postoperative and Postdischarge Phases

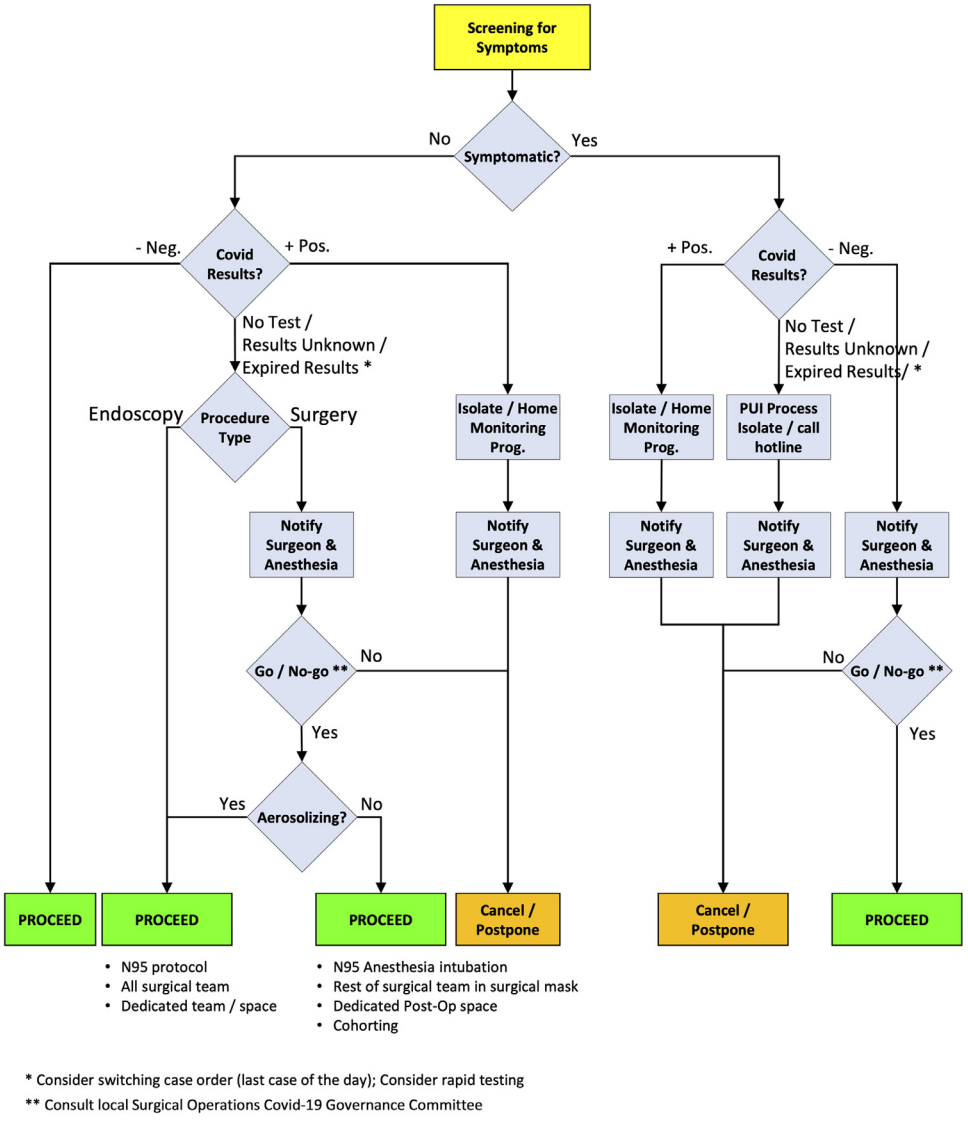
Optimal facility design incorporates separation of recovery areas for patients who are COVID-19 positive and COVID-19 negative. Enhanced recovery after surgery protocols should be carried out to optimize same-day discharge. A follow-up plan should include standardized surveillance and use of distance health, or telemedicine. Patients should not require a face-to-face visit unless there are complications that require a physical examination. COVID-19 home monitoring programs should be used as deemed appropriate; these include automated thermometers, blood pressure monitors, oximeters, and/or smart device innovations [24]. Patients who have COVID-19−positive family members should quarantine themselves in local facilities. Some institutions provide such housing opportunities for patients and/or caregivers.

Recommended COVID 19 Testing Within Various Facilities Based on Timing of Procedures

Data from patients who are apparently COVID-19 negative after elective surgery suggests that advanced age, comorbidities, surgical time, and surgical complexity may be risk factors for poor prognosis in the event of postoperative

Fig. 1

COVID-19 Preoperative Surgery Decision Tree. COVID-19 = coronavirus disease; Neg = negative; Pos = positive; post-op = postoperative. Courtesy of Cleveland Clinic Reactivation Task Force [14].



development of SARS-CoV-2 infection. Such patients are at greater risk of intensive care unit admission (44% vs 26%) than paired patients who did not undergo surgery [25]. Therefore, adequate preoperative screening and diagnosis of COVID-19 infection are essential for the success of any surgical reactivation program.

In areas with more than 40 active cases per 100000 inhabitants (see observation at the end of chapter), we suggest that all patients planning to undergo surgery should have a diagnostic test for COVID-19 up to 72 hours before surgery and be quarantined until the time of hospital admission.

The reverse transcription-polymerase chain reaction (RT-PCR) test is considered the gold standard for the diagnosis of COVID-19. In clinical practice, its specificity varies between 93% and 98%, but sensitivity can vary significantly from 63% to almost 100%, depending on the prevalence, onset of symptoms, viral dynamics, collection method of the clinical specimen, and transport media [26,27]. Therefore, the positive and negative predictive value of RT-PCR is high for patients who are symptomatic, but its accuracy may be limited in patients who are asymptomatic.

Other methods that can be used for the diagnosis of COVID-19 include the detection of IgA, IgG, and IgM antibodies by enzyme-linked immunosorbent assay and immunochromatography. Initial validation demonstrates a high positive predictive value. The presence of IgG antibodies confirms previous COVID-19 disease [28], suggesting that serological IgG testing may be useful for screening, but not triage

for surgery. To date, no data exist to support that positive IgG antibodies confer lasting immunity against SARS-CoV-2.

There is no formal indication for chest computed tomography (CT) as a screening method in patients who are asymptomatic. However, some COVID-19−free institutions in Europe and China recommend its use in exceptional situations in high prevalence areas, on the basis of its capability for diagnosis in 54% of asymptomatic cases [29]. Chest CT performed up to 24 hours before hospitalization is therefore considered an option when more accurate tests are not available.

If surgery is considered mandatory and diagnostic tests are neither available nor reliable, the patient may be quarantined for 14 days before surgery (if possible). This recommendation is based on the Centers for Disease Control and Prevention statement that the incubation period of SARS-CoV-2 and other coronaviruses ranges from 2 to 14 days [30]. For this strategy to work, patients need to comply with self-isolation and be instructed regarding the development of symptoms.

If the patient is asymptomatic and tests negative for COVID-19, surgery can be performed with the use of conventional PPE by the surgical team [16]. Guidelines for protection should follow individual, institutional standards developed in conjunction with the infection control team. If the patient is symptomatic or has a positive RT-PCR, IgM antibody, or chest CT findings consistent with COVID-19, the procedure must be postponed, and the patient should be referred based on institutional COVID-19 diagnostic and treatment protocols. Surgical rescheduling should require clinical improvement, normalization of chest CT scans, and 2 negative RT-PCR tests to confirm resolution [31]. Finally, if RT-PCR, rapid serological testing, or chest CT are not available, elective surgery should only be considered if regional prevalence is <40 active cases per 100000 inhabitants. In this case, guidelines for the use of PPE should be the same as those for patients who are COVID-19 positive.

Regarding concerns about a resurgence of COVID-19, it is imperative that a centralized monitoring system collects data on the number of patients who are COVID-19 positive, who are asymptomatic in a large healthcare system or defined geographical area. Any rise in the number of asymptomatic COVID-19−positive individuals among elective surgery patients could be a sign of an impending second wave of COVID-19. It is well known that asymptomatic and presymptomatic patients are a major source of community transmission [32−34]. According to Robert Redfield, the director of the Centers for Disease Control and Prevention, 25% of people infected with SARS-CoV-2 are asymptomatic; however, they can still transmit the illness to others [35].

Control of COVID-19 is a dynamic and fluid process. Institutions must be flexible in responding and implementing changes in strategies based on the most current assessment of disease prevalence in the community. As we resume nonessential surgeries, we must be cognizant of the need to adjust and adapt according to the disease burden in the community. As the prevalence of COVID-19 decreases in the community, a standardized epidemiologic screening questionnaire should be conducted at a minimum. If the epidemiologic questionnaire is positive, an RT-PCR and a chest CT can be performed [16,29]. Some countries are employing novel population-based techniques, such as Quick Response code scanning, to facilitate detection of patient exposure to COVID-19 and contact tracing [36].

Financial Support to Mitigate the Impact of Reduced Surgical Volumes

Despite the strategies summarized above, the revenue generated by healthcare systems is anticipated to remain at much lower levels than usual because of the mandated halting of nonessential procedures. While reactivation will achieve some normalcy, a second or third wave of viral infection may further decrease revenue generation. Therefore, knowledge of available financial support programs is paramount to ensuring the survival of surgical services.

In the United States, the Coronavirus Aid, Relief, and Economic Securities Act includes multiple lending programs for physicians and businesses treating patients. These lending programs include the Small Business Association Payroll Protection Plan, Economic Injury Disaster Loans, and Department of Health and Human Services relief. These programs are summarized on the American Medical Association's website [37].

Businesses with under 500 employees can apply for relief in a forgivable interest-free loan when the funds are used per Small Business Association guidelines. Many physicians in private practice, small group settings, and large group settings qualify for such relief [38].

As surgeons and facilities move toward the "new normal" of pandemic recovery, the number of unemployed workers in the United States and abroad will undoubtedly have an impact on insurance coverage. Insurance companies and hospitals will be looking for relief and will be forced to find ways to offset the profound economic implications brought on by the costs associated with COVID-19. It is imperative for physicians everywhere to gain an awareness of these issues and prepare for potential impact on revenue, salary, and job security.

Conclusion

In our lifetime, the practice of medicine has never been altered to the extent imposed by the COVID-19 pandemic. We, as surgeons, have had to rise to many challenges to meet the needs of our patients while mitigating risk to all those involved in their care. The postponement of nonessential surgical procedures to preserve resources has

created backlogs in our practices that we must address as we coexist with COVID-19. The American Association of Gynecologic Laparoscopists has forged important collaborations among national and international experts and societies to educate caregivers worldwide during this unprecedented time. This article should serve as a supplemental guide for effective reactivation to clinical and surgical practice to optimize care for the women whom we serve.

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