

**Full Title:** Impact of the COVID-19 pandemic on surgical services: early experiences at a nominated COVID-19 centre

**Category:** Perspective

**Authors:** KE McBride,<sup>1,2</sup> KGM Brown,<sup>1,2,3</sup> OM Fisher,<sup>1,4</sup> D Steffens,<sup>3,5</sup> D. Yeo,<sup>1,3,4</sup> CE Koh<sup>1,2,3,5</sup>

**Affiliations:**

<sup>1</sup> RPA Institute of Academic Surgery (IAS), Royal Prince Alfred Hospital and University of Sydney, Sydney, New South Wales

<sup>2</sup> Surgical Outcomes Research Centre (SOuRCe), Sydney, New South Wales, Australia

<sup>3</sup> Department of Colorectal Surgery, Royal Prince Alfred Hospital, Sydney, Australia

<sup>4</sup> Department of Upper Gastrointestinal & Hepatobiliary Surgery, Royal Prince Alfred Hospital, Sydney, Australia

<sup>5</sup> Faculty of Medicine and Health, University of Sydney, Sydney, New South Wales, Australia

**Acknowledgements:** No relevant disclosures

**Corresponding Author** Kate E. McBride  
RPA Institute of Academic Surgery  
PO Box M40  
Tel: +61 2 9515 1958 Fax: +61 2 9515 1989  
Email: kate.mcbride@health.nsw.gov.au

**Keywords:** surgery, COVID-19, pandemic, surgical outcomes

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/ans.15900

## Introduction

The evolving COVID-19 pandemic represents an unprecedented and largely unanticipated challenge to the delivery of surgical care in Australia and New Zealand. The first confirmed COVID-19 case in Australia occurred on 25 January 2020. Since then, 2675 patients have been diagnosed nationally, resulting in 12 deaths (at the time of writing). New South Wales (NSW) has been the most affected state based on case volume, with 1219 documented cases. During the initial response in NSW, all patients with confirmed COVID-19 requiring hospitalisation were managed at a nominated COVID-19 centre (Westmead Hospital). As the pandemic evolved and the confirmed cases increased, a second COVID-19 centre was established at Royal Prince Alfred (RPA) Hospital on 4 March 2020. RPA is a 900 bed teaching hospital located in metropolitan Sydney, which provides surgical care for the local community but also serves as a quaternary referral centre for complex surgical services including advanced gastrointestinal (GI) malignancy, complex cardiovascular and neurosurgery, and renal and liver transplantation. As the third week of the response period at RPA comes to an end, this article aims to share our initial experience as a dedicated COVID-19 centre by describing the issues faced in providing acute and elective surgical care, the broad impacts on staff and the early strategies adopted to address these challenges.

## Early impact on surgical services

The aim of the initial response was to prepare the hospital to provide care for a high volume of COVID-19 patients, while maintaining the limited delivery of surgical care to emergency and high priority elective cases. All non-essential surgical services were reduced with immediate effect (9 March 2020), including all category C patients (within 365 days) and most category B patients (90 days). This involved the conversion of the perioperative and day stay units as well as the co-located endoscopy suite into a dedicated COVID-19 screening clinic. This reduced the demand for postoperative intensive care unit (ICU) beds, which was a known resource required to be available in the event of a surge in COVID-19 patients. Notwithstanding this, the competing demands for ICU beds necessarily meant that many of the complex surgical services offered at RPA needed to be

rationed with careful liaison between services to ensure that patients underwent surgery within an appropriate timeframe.

In line with the curtailing of surgical workload, theatre sessions continue to be scheduled week by week, often with twice weekly teleconferences within individual surgical departments. Instead of having routine designated lists for individual surgeons, lists have become communal within each department, with surgeons listing urgent patients with the understanding the procedure may be performed by a trusted colleague. This temporary change in culture and collegiality has been important and allowed the patients needs to be prioritised. Weekly scheduling has presented a challenge to planning patient care, particularly for those with cancer and who reside in regional and remote areas. Nursing Coordinators have played a vital role in organising and communicating schedule changes as well as reassuring patients.

#### **Management of COVID-19 patients requiring surgery**

To date, no COVID-19 positive patient has required surgery at RPA. However, material efforts have been put into planning for this occurrence. A specific operating theatre has been designated to accommodate any COVID-19 positive patients, which contains laminar airflow with minimal distance between the operating theatre and re-designed COVID-19 clinic. Protocols regarding intubation and extubation have been developed by anaesthetics, as concerns exist regarding aerosolization of SARS-CoV2 particles which can survive up to three hours in aerosols[1]. Patients will be recovered in theatre after surgery. Equally, all patients undergoing elective surgery are currently being screened with health questionnaires and temperature checks at entry onto hospital grounds. If patients fail to pass screening, then elective surgery is being postponed if clinically justifiable. Additionally, protocols regarding the cleaning and disinfection of the operating theatre are being developed in accordance with available instructions, which is critical given that SARS-CoV2 particles can survive up to 72-hours on surfaces[1].

Attention has also turned towards the potential risk of staff exposure during specific surgical procedures based on data showing that HIV, human papilloma virus and activated corynebacterium can be detected in surgical smoke[2-7]. In particular, the use of laparoscopy in COVID-19 patients is concerning, as particle concentration in smoke generated during laparoscopy is higher than at open surgery [1, 2]. Accordingly, the sudden release of trocar valves for venting, instrument exchanges, or extraction incisions resulting in the brisk release of pneumoperitoneum could result in the exposure of operating theatre staff. These issues pose a significant challenge to the safe delivery of common minimally-invasive general surgical procedures such as appendicectomy and cholecystectomy. Preliminary advice for the management of such scenarios is being provided[1, 6], but requires constant updating as the evidence grows.

### **Alternate Treatment Decisions**

With reduced capacity, staff redeployment and rising concerns about safety, many alternative management options are being considered to accommodate the necessary changes to surgical care. For complex cancer patients, surgeons have commenced the difficult task of using alternative therapies such as systemic chemotherapy and radiation therapy where appropriate to buy more time until the patients can be scheduled for their procedure. The longer term impacts of this delay to surgical treatment will be monitored, however it is also the delays to assessment that may be putting patients at risk and is more difficult to measure.

Acute general surgical problems, such as appendicitis, diverticulitis and abscesses are conditions that are continuing to require acute management during this period. Traditionally, appendicitis is treated surgically, however medical management of acute uncomplicated appendicitis has been shown to be safe and effective in certain patients, and is currently being considered locally as an appropriate strategy in this climate. Similarly, routine outpatient management of acute uncomplicated diverticulitis has been proposed as compared to a short period (1-3 days) of inpatient antibiotic therapy which has been the usual practice at RPA until now. Likewise, abscesses are usually drained in the operating theatres. With reduced surgical services, these changes allow the surgical workforce

to be effectively reallocated to manage these acute surgical presentations while minimizing the need for admissions or theatre based interventions.

Finally, restricted access to face-to-face meetings in itself has posed decision making challenges for surgeons in clinically relevant forums such as multidisciplinary team (MDT) meetings and for effective inter and intra-departmental communication. Multiple online conferencing platforms have bridged the gap for now allowing staff to work at home and in keeping with appropriate social distancing recommendations.

### **Surgical Education and Training**

Further to the clinical and operational effects of COVID-19, the crisis also presents a challenge to the ongoing provision of education and training for all staffing groups, but in particular our trainees within the Surgical and Education Training (SET) program and those in non-accredited positions. Their exposure to adequate case numbers will be severely limited for a sustained period of time and redeployment to directly assist in the COVID-19 response has already taken priority. This has largely been within the COVID-19 clinic but future demand may necessitate additional immediate training to participate in ICU and ED shifts. In addition, cancellation of face-to-face organised teaching sessions occurred within the first week of the response efforts. It is currently unclear what the longer term impact will be upon their career progression but it seems likely it will set all groups back by six to 12 months, and will have flow on effects to medical students.

Local efforts are being made to shift face-to-face education and training toward online platforms to minimize the disruption where possible. Although this mode of delivery may not be as effective[8], it does present an opportunity for innovative approaches to be utilised. This has included the provision of take-home suturing packs for self-directed learning, the compilation of online teaching modules, and the delivery of tutorials using various applications.

### **Surgical Research**

The impact of COVID-19 on surgical research is inevitable, representing an unprecedented challenge to the strong academic program established at RPA.[9] A priority for the active surgical studies has been to ensure the safety and well-being of patients, research participants, clinicians and researchers. Discontinuation or temporary suspension of current surgical research has been implemented where appropriate. Changes in the way interventions are being delivered along with alternative methods for patient recruitment, assessment, and follow-up are also being applied, including a reduction in face-to-face contact and the introduction of remote communication. Limitation of surgical services presents a significant research challenge as it may introduce bias into surgical studies, affect recruitment rates and periods, and compromise budgets. Guidance on how to manage this during the pandemic has been released.[10]

To contribute to the limited global evidence, efforts are being implemented to collect information on altered clinical decision-making and surgical and patient reported outcomes, to allow us to comprehensively measure the effects of COVID-19. At RPA, existing prospective cohort studies and surgical trials are being amended to capture the COVID-19 status of patients where possible and this is recommended to take place in all centres to enhance our collective understanding. The CovidSurg Cohort Study is an international, multi-centre, prospective cohort study investigating outcomes of surgery in patients with COVID-19 and will be key to improving their surgical outcomes. Hospitals across Australia and New Zealand are encouraged to participate[11].

### **Staff Wellbeing**

The disruption caused by COVID-19 extends to having a detrimental impact on the wellbeing of surgical staff at all levels and across all disciplines. This includes widespread distress and heightened anxiety being felt for a range of personal and organisational related reasons. Larger surgical units, such as upper GI and colorectal surgery, have subdivided medical staff into smaller and strictly isolated teams in order to reduce the risk of an entire department becoming unwell or requiring home isolation at once, which whilst prudent has been difficult on staff. Local efforts to boost staff

morale and encourage solidarity are being made through numerous innovative activities and close monitoring of staff welfare will need to continue throughout the crisis.

## **Conclusion**

The response to the COVID-19 pandemic at RPA is evolving rapidly and the number of confirmed cases is expected to continue rising. Strategies to address the challenges outlined above are being implemented quickly in an attempt to minimise the impact of COVID-19 on surgical services, however we are sailing in 'uncharted waters' with minimal data or past experiences on which to base decisions. Future post-pandemic evaluations will likely demonstrate ineffective or unnecessary actions or missed opportunities. Lessons will be learned in retrospect and the impact of COVID-19 is likely to have a lasting effect on how surgical services are delivered in Australia and New Zealand.

## REFERENCES

1. van Doremalen, N., T. Bushmaker, D.H. Morris, M.G. Holbrook, A. Gamble, B.N. Williamson, et al., *Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1*. N Engl J Med, 2020.
2. Min Hua Zheng, L.B., Abe Fingerhut, *Minimally invasive surgery and the novel coronavirus outbreak: lessons learned in China and Italy*. Ann Surg, 2020.
3. (SAGES), S.o.A.G.a.E.S. *SAGES RECOMMENDATIONS REGARDING SURGICAL RESPONSE TO COVID-19 CRISIS*. 2020 [cited 2020 24/03/2020].
4. Capizzi, P.J., R.P. Clay, and M.J. Battey, *Microbiologic activity in laser resurfacing plume and debris*. Lasers Surg Med, 1998. **23**(3): p. 172-4.
5. Hensman, C., D. Baty, R.G. Willis, and A. Cuschieri, *Chemical composition of smoke produced by high-frequency electrosurgery in a closed gaseous environment. An in vitro study*. Surg Endosc, 1998. **12**(8): p. 1017-9.
6. Johnson, G.K. and W.S. Robinson, *Human immunodeficiency virus-1 (HIV-1) in the vapors of surgical power instruments*. J Med Virol, 1991. **33**(1): p. 47-50.
7. Gloster, H.M., Jr. and R.K. Roenigk, *Risk of acquiring human papillomavirus from the plume produced by the carbon dioxide laser in the treatment of warts*. J Am Acad Dermatol, 1995. **32**(3): p. 436-41.
8. McGaghie WC, Issenberg SB, Cohen ER, Barsuk JH, Wayne DB. Medical education featuring mastery learning with deliberate practice can lead to better health for individuals and populations. Academic Medicine. 2011;86(11):e8-e9.
9. McBride KE, Solomon MJ, Bannon PG, Young JM. Enhancing surgical research at the hospital level: a new model. ANZ journal of surgery. 2017 Jun;87(6):431-2.
10. <https://www1.health.gov.au/internet/main/publishing.nsf/Content/Clinical-Trials>
11. <https://globalsurg.org/covidsurgcohortstudy/>