

# Creating COVID-19 surge capacity at an elective surgical centre: a model for perioperative care

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## ABSTRACT

We provide an initial, brief description of safe relocation of our emergency surgical services from a tertiary teaching hospital to a satellite secondary hospital during the COVID-19 pandemic. The reconfiguration created increased theatre and critical care bed capacity at the tertiary site, while enabling lower acuity emergency services in a repurposed, designated COVID free hospital. The described model can be applied to situations mandating surge capacity at tertiary hospitals, in high income countries.

**Keywords:** COVID-19, elective surgical centre, health services management, health services research, perioperative medicine, surge capacity.

## Introduction

As the coronavirus disease 2019 (COVID-19) became a global pandemic, there was uncertainty about the disease and clinical management, grave concerns about critical care surge capacity and global shortages in personal protective equipment (PPE).<sup>1</sup> Here we provide an initial, brief descriptive report of how our organisation pivoted to address these challenges in a time critical fashion in order to protect vulnerable healthcare workers and patients. Sanitation services at the site were augmented, but will not be further discussed in this brief report.

## Objectives

To achieve this, we reconfigured our perioperative services to a two-site model to separate COVID-19 from non-COVID-19 exposed staff and patients, minimising transmission risks, within a 2 week timeframe.

## Setting

Fremantle and Fiona Stanley Hospital Group delivers care to more than 647 000 people, providing over 50 000 procedures per year. Our tertiary centre (TC) has 17 theatres, which offer a 24-h operating service. Fremantle Hospital, our satellite specialist hospital (SSH) is situated 9.4 km from the TC and comprises seven elective theatres, three endoscopy suites and an electroconvulsive therapy suite, with a bed capacity of 300. It offers weekday, daytime perioperative services supported by a 4-bed monitored Perioperative Care Unit staffed by Anaesthetists, in addition to sub-acute medical and rehabilitation services.

## Methods

### Leadership

Following designation as the primary COVID-19 centre for our state, a department COVID-19 committee was developed, comprising the Head of Department and 16 sub-specialty leads. Initial surge capacity was achieved with a nationally mandated cessation of

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non-urgent surgeries. Further capacity was achieved by repurposing our SSH to accommodate emergency surgery for low-risk COVID-19 patients. Anaesthetists were site-segregated for the duration of the emergency response period. Most orthopaedic trauma and acute general surgical lists were relocated, being the largest contributors to the emergency caseload. Furthermore, these teams operated across sites in an elective capacity pre-COVID, and mostly did not require intensive care support. Perioperative clinical and auxiliary services were augmented at SSH to accommodate higher acuity patients.

### Staffing

Staff at risk of severe illness were self-identified via a hospital executive administered questionnaire, and were segregated to the SSH. Additional perioperative staff were selected to support service provision. Site separation was a coordinated effort across all perioperative staff, including surgeons, anaesthetists, nurses and anaesthetic technicians.

Changes to support emergency surgical services at SSH included: instating an on-site anaesthetic registrar overnight to triage incoming referrals and transfer critically ill patients between sites; reallocation of staff from elective to emergency lists; and establishing two weekend daytime theatres. Auxiliary services were augmented to support these changes, including extended hours for onsite radiology, pathology and blood bank.

### Post-operative care

Careful screening of high-risk patients likely to require high dependency or intensive care services occurred at the TC. High-risk patients were retained at the TC. The pre-existing Perioperative Care Unit at the SSH was augmented by extending its operating hours to include weekend and overnight cover. An orthogeriatrician provided perioperative medical management of elderly orthopaedic trauma patients.

### Education, training and PPE supplies

Education was delivered to upskill SSH staff in the care of higher acuity emergency surgical patients, and COVID-19 specific infection control procedures. Social distancing was maintained by moving to online delivery. Clinical pathways and management guidelines were modified to support high standards of care.

State and Australian and New Zealand College of Anaesthetists guidelines were updated to reflect methods available to protect staff while conserving PPE.<sup>2</sup> N95 masks were stored at theatre reception with a log book of staff utilisation. A single mask was dispensed for the day and intended for extended use, provided patients treated were low risk. Staff in theatre were limited during aerosol generating procedures, to conserve mask supply. Internally generated clinical guidelines were updated to reflect changes in best practice and local epidemiology.

### Hospital-wide screening

COVID-19 screening was implemented at all entry points into the hospital. The screening tool was updated periodically in keeping with health department guidelines. Outpatient appointments that necessitated in-person attendance were screened for COVID-19 exposure or symptoms at the registration desk. Nurses were positioned at a single hospital entrance to screen visitors. All other hospital entrances were sealed off temporarily.

On the day of surgery, pre-anaesthetic clinic nurses screened patients prior to attendance. Upon arrival, patients were re-screened and had temperature measurements. At risk patients were flagged to surgical teams, who evaluated risk and, if necessary, relocated the procedure and instituted COVID-19 testing after discussion with the COVID Infectious Disease consultant on-call. Low risk patients proceeded to theatre. Post-operative inpatients underwent screening for fever and respiratory symptoms twice daily as part of the nursing vitals sign observations.

### Pathway for the unexpected COVID-19 suspect inpatient

COVID-19 suspect inpatients had a pathway designed for transfer to the TC for management. Patients who required a medical escort for transfer utilised the TC on-call COVID-19 team.

### Case to resource matching

The SSH had limitations to the patient or case mix that it could accept. Pre-existing exclusions (see [Table 1](#) for exclusion criteria) for this hospital were retained, as they were based on services that had limited capacity for upgrade.

### Theatre preparedness

Drug trolleys were upgraded, with the addition of some uncommonly used resuscitation drugs. An intracardiac device interrogator with remote access reporting was placed in the theatre recovery room for urgent access, given there were no on-site cardiac technicians.

### Ethics approval

Fiona Stanley Hospital Ethics committee granted approval for the research to be done – GEKO Activity 35637.

## Results

### Leadership, communication and change management

Decisive leadership was provided with early establishment of a COVID-19 response team within the Department of

**Table 1.** Patient exclusion criteria for Fremantle Hospital.

Infection	<ul style="list-style-type: none"> <li>• Suspect or confirmed case of COVID-19</li> </ul>
Weight and girth	<ul style="list-style-type: none"> <li>• Weight &gt; 230 kg</li> <li>• Shoulder or hip girth &gt; 68 cm</li> </ul>
Cardiac comorbidities	<ul style="list-style-type: none"> <li>• Reversible or unstable coronary artery disease</li> <li>• Severe dilated or obstructive cardiomyopathy</li> <li>• Severe pulmonary hypertension</li> <li>• Severe cardiac failure, including patients on domiciliary oxygen</li> </ul>
Airway and respiratory comorbidities	<ul style="list-style-type: none"> <li>• Patients with a long term tracheostomy requiring multi-day stay</li> <li>• Severe respiratory distress carrying a possible risk of requiring postoperative ventilation</li> <li>• Lung transplant recipients</li> <li>• Patients on domiciliary oxygen</li> </ul>
Renal comorbidities	<ul style="list-style-type: none"> <li>• Dialysis patients requiring multi-day stay</li> </ul>

Anaesthesia, with clear role designation and escalation pathway. Initially offsite leadership and management was provided from the TC. However, due to the need for rapid executive level decision making, on-site leadership was established, enabling establishment of site-specific protocols, education provision and staffing adjustments. This was maintained after the service reverted to the previous model due to a disease free period in our state, as it remained essential for project delivery and rapid resolution of operational matters.

Across sites staff were acutely aware of the dire state of health systems overseas and were motivated by altruism in wanting to preserve public hospital capacity for COVID-19 care. Many staff segregated to the SSH were at high risk of COVID-19 complications. This provided intrinsic motivation to work at the site and contribute to processes that minimised disease transmission. Additionally, staff at the site were accustomed to change, as the SSH was previously a tertiary site, which was downgraded in 2015. Established perioperative communication pathways with other specialties were maintained using preexisting referral pathways via an on-site Duty Anaesthetist at the SSH.

Due to the time-critical nature of the pandemic, formal change methodologies were not applied, change processes were not evaluated, and patients were excluded from the change process. In addition, there were limitations of using patient questionnaires to screen for COVID-19 infection, with some patients making it to theatre areas with upper respiratory tract infection symptoms.

### Bed and theatre capacity

Two trauma theatres were moved to the SSH, which resulted in a 50% increase in emergency theatre capacity. A total of 120 general surgical and 183 orthopaedic patients had their surgeries completed over 5 and 6 weeks, respectively. Two extra surgical wards were re-opened at SSH, thereby increasing bed capacity at the TC. Concurrently, the elective surgical caseload at SSH reduced dramatically. The proportion of emergency cases increased by 61% for general surgery and 98% for orthopaedic surgery.

### Patient selection and appropriateness of screening criteria

Emergency cases were pre-screened via a staff administered questionnaire at the TC and then again at SSH by the Day of Surgery centre nursing staff using site-specific criteria designed to screen out COVID-19 susceptible patients (Table 1). Despite these measures, a small number of suspect COVID-19 patients were inadvertently seen at SSH. These patients were successfully managed in accordance with site specific protocols and were transferred back to the TC for further perioperative care. No suspect or COVID-19-positive patients were operated on in theatres at SSH.

The appropriateness of patients for SSH were assessed against site specific criteria, by the referring team and Duty Anaesthetist. All 306 patients that were assessed as COVID-19-negative, successfully underwent their procedures at SSH. Our patient preselection meant that there was minimal additional critical care support required at SSH. Over 6 weeks, only five orthopaedic patients required assistance from the ward Medical Emergency team and nine patients required Perioperative Care Unit beds. In total, five patients were transferred back to the TC. Of these, two required Endoscopic Retrograde Cholangio-Pancreatography for suspected biliary leak and two were transferred for Intensive Care admission.

### Staff availability, education, training and PPE supplies

A total of 37 Consultant staff Anaesthetists and 18 Anaesthetic Registrars were allocated to SSH. There were six combined departmental teaching sessions held weekly on COVID-19 specific topics, during protected time. Topics included COVID-19 updates, intensive care upskilling, and a staff mental health and wellbeing talk.

On-site practical training was offered for three key areas. PPE training included completing a hospital wide e-Learning package, a donning and doffing practical session, led by a site-specific Simulation Team. The COVID Airway training comprised of familiarisation with COVID-19 specific guidelines,

and rapid drug access from automated drug stations. Ventilator training was provided via a practical session regarding the implications of COVID for their use. A total of 85% of staff completed PPE training, 71% completed COVID airway training, and 76% completed Hamilton Transport Ventilator training.

## Discussion

We successfully enabled expansion of emergency surgery at our SSH, in our two highest demand surgical specialties with minimal additional resource requirement. This was achieved through strong perioperative leadership and multidisciplinary engagement, leading to rapid reallocation and upskilling of existing staff and services. Our screening criteria ensured minimal additional requirement for critical care support at SSH, despite a dramatic increase in emergency cases. Although we would recommend using preoperative rapid antigen testing, which is now readily available, instead of less reliable patient screening questionnaires.

Instituting COVID-19 protocols ensured minimal risk to vulnerable staff and patients and maintained our status as a COVID-negative surgical centre. Additionally, we would recommend instituting objective N95 fit testing for all staff. Key to our success was excellent communication and cooperation

between perioperative teams, and having pre-COVID experience across sites, while rapidly establishing on-site leadership at the SSH. This resulted in the continued provision of safe and high-quality emergency perioperative care, despite the pandemic.

## Conclusion

This reconfiguration was undertaken for the purpose of surge capacity creation in the setting of a global pandemic. However, this model can be applied for creating surge capacity in other settings, and can further be applied to safely and efficiently conduct emergency surgery at 'elective' surgical centres to relieve constraints on operating space at tertiary hospitals.

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**Data availability.** The data that support this study cannot be publicly shared due to ethical or privacy reasons and may be shared upon reasonable request to the corresponding author if appropriate.

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