

COVID-19 response by New Zealand general surgical departments in tertiary metropolitan hospitals

Karen Hui Qi Toh ,[‡] Ahmed Barazanchi ,[‡] Nigel S. Rajaretnam ,[§] Jeffrey Tan,^{||} Tara Linton,[†] Mark Murray,[¶] Paul Fagan * and Jonathan Koea [‡]

*Auckland City Hospital, Auckland District Health Board, Auckland, New Zealand

†Middlemore Hospital, Counties Manukau District Health Board, Auckland, New Zealand

‡North Shore Hospital, Waitemata District Health Board, Auckland, New Zealand

§Waikato Hospital, Waikato District Health Board, Auckland, New Zealand

¶Wellington Hospital, Capital and Coast District Health Board, Auckland, New Zealand and

||Christchurch Hospital, Canterbury District Health Board, Auckland, New Zealand

Key words

COVID-19, delivery of health care, New Zealand, patient care team, resource allocation.

Correspondence

Dr Karen Toh Hui Qi, Department of General Surgery, Level 8, North Shore Hospital, 124 Shakespeare Road, Takapuna, Auckland 0620, New Zealand.

Email: karen.thq@gmail.com

K. H. Q. Toh MBChB; **A. Barazanchi** FRACS,

MBChB; **N. S. Rajaretnam** FRACS, MBChB;

J. Tan MBChB; **T. Linton** MBChB;

M. Murray MBChB; **P. Fagan** FRACS, MBChB;

J. Koea MD, FACS, FRACS.

Accepted for publication 14 June 2021.

doi: 10.1111/ans.17044

Abstract

Background: Worldwide, coronavirus disease 2019 (COVID-19) has significantly challenged the delivery of healthcare. New Zealand (NZ) faced similar potential challenges despite being geographically isolated. Given the rapid change in the COVID-19 pandemic, hospitals in NZ were tasked with formulating their own COVID-19 responses based on the Ministry of Health's (MoH) recommendations.

Methods: This paper evaluates how six metropolitan general surgical departments in NZ had responded to COVID-19 in terms of changes made to rosters, theatres, clinics, acute admissions as well as additional measures taken to reduce the risk of staff exposure. It also explores how NZ fared in comparison with international guidelines and recommendations. Data from each centre were provided by an appointed clinician.

Results: All centres had adapted new rosters and a restructuring of teams. Handovers, multidisciplinary team meetings and educational sessions were held virtually. Different strategies were implemented to ration hospital resources and reduce the risk of staff exposure. Non-urgent operations, endoscopies and clinics were deferred with allocation of dedicated COVID-19 operating theatres. Potential COVID-19 suspects were screened prior to admission and treated separately. Various admission and imaging pathways were utilised to increase efficiency.

Conclusion: General surgical departments in NZ had implemented a comprehensive COVID-19 response but there is room to work towards a more unified national response. Our analysis shows that these centres across NZ had taken a similar approach which was aligned with international practices.

Introduction

The COVID-19 pandemic has created a unique strain on health resources where established methods of healthcare provision had to be adapted. NZ had pursued an elimination strategy to minimise COVID-19 cases to a level that is manageable by the health system.¹ On 28 February 2020, NZ had its first confirmed case. Cases continued to climb exponentially over the next month which necessitated the country to go into 'lock-down' on 25 March 2020. During the height of the pandemic, hospitals around NZ continued to provide essential patient

care. The Ministry of Health (MoH) was elected as the lead agency by the government to coordinate the health sector's response towards COVID-19.² Therefore, each district health board (DHB) or region formulated an independent response based on recommendations by the MoH. This is demonstrated in NZ's surgical care where surgical departments had adopted their own response to the pandemic.

In this study, we aim to describe and compare the COVID-19 responses in various general surgical departments across the country comparing it to published international practice recommendations.

Methods

The six largest DHBs based on catchment size were: Auckland, Counties Manukau, Waitemata, Waikato, Capital & Coast (C&C) and Canterbury. Information about the size of each catchment area as well as acute and elective admissions per year for each DHB was obtained from the MoH website.³ A main point of contact was identified within each centre for the data collection. This individual was a clinician in the General Surgery department who had worked in the department prior to and during the COVID-19 crisis. Their position ranged from junior registrars to fellows and each is a named author. On 22 April 2020, a structured data spreadsheet (see Data S1) was electronically mailed to each clinician. Over the next 3 months, the spreadsheet was then completed by each clinician. The clinician from each centre reviewed COVID-19 response at their own department from written policy and current practice. Where the requested data were not available in written form, we contacted the appointed COVID-19 response team in that DHB.

We collected data on five main categories: roster and staffing; measures to decrease risk to staff; acute admission pathways; acute and elective theatre utilisation; and outpatient clinics structure and implementation. Published guidelines from Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and European Association of Endoscopic Surgery (EAES) were used as a standard to compare each department's response.⁴ The authors (K.T.H.Q. and A.B.) reviewed the data collected. Due to heterogeneity of data sources, only descriptive qualitative analysis was employed in this review of practice via content analysis. The study is declared 'out of scope' by Health and Disability Ethics Committees and has locality approval at the host institution Waitemata DHB.

Results

The surgical departments in the six largest DHBs in NZ responded in a variety of ways to the pandemic. The team composition of each surgical centre prior to COVID-19 is shown (Table 1) and based on this, the new roster was developed (Table 2).

Roster and staffing

All centres had formed new teams consisting of clinicians of all ranks to allow separation of clinicians. Members of each team were expected to avoid in-person interactions with other teams. Auckland, Waitemata, Waikato, C&C and Canterbury DHBs had allocated clinicians to a fixed team throughout the duration of the new

roster. Conversely, clinicians at Counties Manukau DHB were rostered based on availability. Clinicians could be working with different teams in part to allow for subspecialised provision of care.

Measures to decrease risk to staff

The formation of distinct teams had enabled all centres to have the same approach in managing the 'contaminated' teams. A team that was exposed to a patient or staff with confirmed or suspected COVID-19 was immediately stood down with contact tracing. Ability to rotate staff and separation of teams was the cornerstone of all the examined rosters.

Most centres had seen a reduction in the number of days worked per week. However, the exact hours worked per day were not documented. While Auckland and Canterbury DHBs did not expect junior clinicians (registrars who are not trainees and house officers) to work during off days, remaining DHBs had encouraged junior clinicians to work from home.

Handover method had to be adapted to ensure continuity of care while avoiding gathering of clinicians. Teleconferencing was largely utilised to decrease the risk of staff exposure. Zoom video communication was a popular choice with Auckland, Counties Manukau, Waitemata and C&C DHBs using it as a platform for either handover or multidisciplinary (MDT) sessions or both. Waikato and Canterbury DHBs both opted for different platforms, WebEx and Microsoft Teams, respectively.

Waikato and Canterbury DHBs did not allow COVID-19 to disrupt educational sessions and had utilised the above videoconferencing applications to carry out departmental teachings. The remaining DHBs had put educational sessions on hold whereas Auckland DHB re-instituted teaching shortly after lockdown. All administrative staff were required to work from home where possible. Conscious effort was made to reduce size of the team during rounds. Social distancing of 2 m was also expected. Mask wearing was recommended but not enforced.

Acute admission pathways

Different admission strategies had been implemented to identify potential COVID-19 suspects while reducing both admission rates and length of stay (Table S1). All centres had adopted a COVID-19 questionnaire based on epidemiological risks and signs or symptoms of COVID-19. Once suspects were identified, these individuals were then admitted with the necessary precautions and isolation. Auckland, Counties Manukau, Waitemata and Canterbury

Table 1 Background and demographics of included district health boards

	Auckland	Counties	Waitemata	Waikato	C&C	Canterbury
Population of catchment area	545 640	563 210	628 970	426 300	318 040	567 870
Number of acute admissions 2017/2018	7370	9614	7934	5623	3000	7547
Number of elective admissions 2017/2018	2813	2992	4197	2541	1723	3054
Number of consultants	24	16	16	14	12	24
Number of fellows	5	1	2	4	2	4
Number of senior registrars	5	9	7	8	4	8
Number of junior registrars	9	15	12	10	12	13
Number of house officers	15	22	22	15	8	10

Table 2 Description of surgical rostering at the included district health boards

	Auckland	Counties	Waitemata	Waikato	C&C	Canterbury
Total number of teams Each team's composition	2 Each pre-existing team split into two	No fixed teams Not applicable	4 SMO = 4 SNR = 2-3 JNR = 2-3 HO = 5-6 Every 4 days	3 SMO = 5 REG = 6 HO = 5	3 SMO = 4 SNR = 2 JNR = 3 HO = 2 Every Friday	8 SMO = 3 SNR = 1 JNR = 2 HO = 1 Every 4 days
Day of changeover	Every Monday, Wednesday and Friday	Varies	Every 4 days	Every Monday and Friday	Every Friday	Every 4 days
Method of handover	Morning = Zoom Remaining 10:00 AM, 2:00 PM and 4:30 PM = Face-to-face	JNR email summary to next team ± phone call pm Essential staff at morning handover with social distancing	7:30 AM in meeting room 7:30 PM incoming pod joins via Zoom Handover document on drive	8:00 AM daily using Webex	Zoom	Clinical summary tab on cortex
Night roster	7 nights—JNR + HO			Rotates every Monday and Friday	7 nights (Public)	4 nights
Days on	No fixed days on or days off		4	No fixed days on or days off		Senior = 4 Junior = 2
Days off			12			Senior = 4 Junior = 4 Junior = 2
Average days worked per week	3.5 and every 2nd weekend	2	2	3.5	Acute = 6 Elective = 6 Private = Varies	4
Days off utilisation	Stay at home	Paperwork/establishing HO protocol	Phone clinic/paperwork/audit		Rest/audit	Stay at home
Roster difference between seniors and juniors	✓		x		✓	
Contingency plan	Contaminated team gets stood down along with contact tracing of each member of the team					

HO, house officer; JNR, junior registrar; SMO, senior medical officer; SNR, senior registrar.

DHBs had also enforced outpatient management of common surgical conditions. Acute uncomplicated cholecystitis and diverticulitis were managed with antibiotics in the outpatient setting. If appropriate, abscesses were drained under local anaesthesia with early discharge. Consultants across Waitemata, Waikato and Canterbury DHBs also elected to hold the general practitioner (GP) and emergency department (ED) referrals phones. In addition, some centres had introduced pathways for imaging to expedite discharge. For instance, Counties Manukau and Waikato DHBs had a dedicated computed tomography (CT) scanner for COVID-19 suspects. Waitemata DHB had a similar approach coined the 'level 4 alert rapid access' for both CT and ultrasound scan (USS) abdomen whereas Canterbury DHB focused on CT abdomen only.

Outpatient clinics structure and implementation

A sustained delivery of healthcare is required in the management of COVID-19.⁵ Therefore, rationing of healthcare resources is crucial. Table S2 describes the different approaches to achieve this. All centres in NZ had deferred elective surgeries that were not cancer surgery or life-saving surgery. Endoscopy was extremely limited and reserved for life-threatening acute cases or urgent diagnostic cases, such as high suspicion of cancer. Outpatient clinics were significantly reduced. Waitemata DHB had limited clinics to priority one patients (patients with confirmed or high suspicion of cancer). Counties Manukau and Waikato DHBs extended virtual clinic consultations to include all patients triaged as priority two or three whereas Auckland DHB only offered virtual consultations for priority two or three patients attending breast clinics. Outpatient clinics were also mostly converted from in-person to virtual clinics except for breast clinics at Counties Manukau and Waikato DHBs which remained face-to-face. Routine postoperative follow-up remained for all breast operations but for the other subspecialties, it was only offered to select patients. In some DHBs such as Waikato, C&C and Canterbury, clinics on demand were carried out occasionally whereas this was consultant dependent in Counties Manukau DHB.

Acute and elective theatre utilisation

All DHBs had at least one dedicated operating theatre for suspected or confirmed COVID-19 patients. Acute theatre continued as usual whereas elective theatres operated on an as required basis. Waikato DHB had a separate COVID-19 nursing and intubation team. In other DHBs, COVID-19 theatre teams were formed as needed from current staff with stringent personal protective equipment (PPE) protocols and contact precautions. There was also a shift of the location of obtaining patient consent and where post-operative recovery takes place. Most centres had elected to have these done either on the ward or theatre. At Counties Manukau DHB, verbal consent was obtained from patients with suspected or confirmed COVID-19 and subsequently documented by staff to reduce risk of virus transmission.

Discussion

Centres in NZ had restructured teams using different approaches but essentially it was to create more robust teams. Teams were made compact with a strong emphasis on social distancing between members of different teams. Changes carried out related to patient admissions and outpatient clinics were made to manage patient flow and hospital capacity. Theatres and the peri-operative process were adapted to allow operating on COVID-19 patients. In addition, there had been a shift to telehealth where possible for all departmental activities. All these changes aimed to reduce risk of virus transmission.

Comparison with practices in other countries

In China, there was an emphasis on strict separation between teams providing clinical and inpatient care. Front-line health workers working in COVID-19 isolation areas were expected to remain in self-quarantine at the end of their duty rotation in addition to undergoing compulsory testing for COVID-19.⁶ Singapore had opted for segregation of team within each subspecialty.⁷ The University of Wisconsin had opted to rotate teams every 5 days with the rationale that there was no difference between weekdays and weekends given lockdowns. This allowed a similar burden of care across all clinicians while minimising handover of care.⁵

It is worth noting, however, that the creation of teams is not a fool-proof strategy. General surgery departments are not standalones. They function alongside other specialties and allied health staff daily. Therefore, there is a possibility of cross-contamination by interacting with nursing and allied health staff.

Contrary to how centres in NZ had taken a similar approach in team restructuring, there was a wide variation between rosters of each NZ centre. However, this variation was only seen in the day roster. The night roster was mostly unchanged from pre-COVID-19. This is likely due to less staff movements overnight in hospital in addition to the night team usually working in isolation and not encountering other staff members.

The large reduction in non-essential services, for example, elective operations and outpatient clinics were seen in the USA, China, Australia and Singapore.⁵⁻⁸ In China and Australia, there had also been a shift towards alternative non-surgical management where possible.^{6,9} For instance, neoadjuvant chemoradiotherapy was considered where appropriate for cancer patients whose operations had been delayed. In New South Wales (NSW), Australia, common surgical conditions such as appendicitis, cholecystitis and abscess were medically managed with antibiotics in suitable patients. Uncomplicated diverticulitis was discharged with oral antibiotics instead of being admitted for intravenous antibiotics.⁹

The importance of a dedicated COVID-19 operating theatres to reduce risk of exposure to staff is undeniable. Centres in NZ, China and Australia had dedicated theatres for confirmed or suspected COVID-19 patients along with the implementation of similar peri-operative guidelines. All patients were screened with health questionnaires and had temperature checks performed prior to proceeding for the operating theatre. In addition, all staff present in the

operating theatre must don full PPE. Surgical teams were not to be present during intubation and extubation.

Education and training within surgical departments around the world had also been impacted. In particular, the disruption in surgical training caused by COVID-19 is undeniable. Cancellation of elective operations means fewer opportunities for trainees to operate as the primary surgeon. Trainees also had less face-to-face interactions with patients as most outpatient clinics were held virtually resulting in a reduction of real-life clinical assessments and physical examinations. Continuing medical education was made more difficult as all face-to-face organised teaching sessions were cancelled. In some places such as Wisconsin and Australia, this was replaced with online teaching. Unfortunately, some centres in NZ did not have the resources to facilitate online teaching.

Strength and limitations

One of the main limitations of this paper is that data were only collected from the six largest urban DHBs. Ideally, an NZ-wide approach would provide a more comprehensive assessment of how NZ's health system responded to the pandemic. Given that most general surgical patients in NZ would have been managed at the six largest DHBs, the analysis of these DHBs would still provide a reliable snapshot. However, challenges unique to rural or small DHBs should be considered during the formulation of a unified response. This is especially relevant now that all DHBs in NZ are set to merge.

In addition, this paper has not explored how the general surgical departments' COVID-19 responses had affected staff's morale and wellbeing. It is unclear if the new roster had led to staff fatigue or promoted staff recuperation. Furthermore, this paper has not delved into staff's perception of departmental support during this trying time. All these rapid changes associated with the pandemic can be very isolating for staff members.

Comparison with existing guidelines

The Royal Australasian College of Surgeons (RACS), ACS, World Society of Emergency Surgery (WSES), SAGES and EAES had developed guidelines for the management of patients during the COVID-19 pandemic.

The RACS, ACS and WSES guidelines emphasised on the importance of measures which will reduce transmission. All three guidelines recommended testing all patients pre-operatively.^{8,10,11} However, in our centres, all patients were screened for COVID-19 symptoms and had epidemiological risks examined. Only individuals with a significant pre-test probability of having COVID-19 were tested. All centres had also adhered to the main principles guiding surgical management that were outlined in the RACS guideline.

The SAGES and EAES guidelines have been divided into five main components which aimed to reduce risk of transmission to patients and staff.⁴ All hospitals had: dedicated COVID-19 operating rooms, postponed elective surgery/endoscopy and non-urgent clinics, reduced attendance of non-essential staff and held virtual meetings.

Due to the limited number of community and hospital cases of COVID-19, practical measures for surgery, laparoscopy and endoscopy suggested by SAGES and EAES were not examined for our participating hospital. NZ centres did not have specific guidelines prohibiting the use of laparoscopy but aimed to reduce aerosolisation were possible. This was consistent with RACS recommendation.⁸

Interestingly, Benítez *et al.* who had examined documents published by the World Health Organization, Centers for Disease Control and Prevention (CDC) and clinical guideline from the Royal College of Surgeons (RCS) had also described similar changes adopted globally.¹²

Implications for practice

It is evident that telemedicine had played an important role in this pandemic. All centres adopted it as the main mode of communication between clinicians and for clinician-patient encounters. This raises the question of the applicability of telemedicine in the future of healthcare delivery. Despite the benefits of time efficiency, cost savings to both patients and providers and improving access to healthcare, there are still certain limitations. These include the lack of infrastructure required for continuous and consistent access; concerns with cybersecurity and clinical uncertainties related to virtual consultations.¹³

This paper also allows hospitals in NZ to gain insight into how each general surgery department in major centres had responded to COVID-19. This may allow a unified response to be formulated in the future. This will hopefully create a sense of national camaraderie within the healthcare sector, allowing the best possible patient care in trying times. In conclusion, NZ had taken largely similar approaches across all six DHBs. Each centre's approach was also comparable to other international centres and was aligned with international published recommendations.

Conflict of interest

None declared.

Author contributions

Karen Toh: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; validation; visualization; writing-original draft; writing-review & editing. **Ahmed Barazanchi:** Conceptualization; data curation; formal analysis; methodology; project administration; supervision; writing-review & editing. **Nigel Rajaretnam:** Data curation; validation. **Jeffrey Tan:** Data curation; validation. **Tara Linton:** Data curation; validation. **Mark Murray:** Data curation; validation. **Paul Fagan:** Data curation; validation. **Jonathan Koea:** Supervision; writing-review & editing.

References

1. Ministry of Health NZ. COVID-19: Elimination strategy for Aotearoa New Zealand. <https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-elimination-strategy-aotearoa-new-zealand>. Accessed 24 Mar 2021.

2. Ministry of Health NZ. COVID-19 health and disability system response plan. <https://www.health.govt.nz/publication/covid-19-health-and-disability-system-response-plan>. Accessed 24 Mar 2021.
3. Ministry of Health NZ. Services delivered: acute and elective patient discharge volumes. <https://www.health.govt.nz/publication/services-delivered-acute-and-elective-patient-discharge-volumes>. Accessed 24 Oct 2020.
4. Francis N, Dort J, Cho E, et al. SAGES and EAES recommendations for minimally invasive surgery during COVID-19 pandemic. *Surg Endosc*. 2020;**34**:2327–2331. <https://doi.org/10.1007/s00464-020-07565-w>.
5. Zarzaur BL, Stahl CC, Greenberg JA, Savage SA, Minter RM. Blueprint for restructuring a Department of Surgery in concert with the health care system during a pandemic: the University of Wisconsin experience. *JAMA Surg*. 2020;**155**:628–35.
6. Liu Z, Ding Z, Guan X, Zhang Y, Wang X, Khan JS. 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. 2020.
7. Ahmed S, Tan WLG, Chong Y-L. Surgical response to COVID-19 pandemic: a Singapore perspective. *J Am Coll Surg*. 2020;**230**:1074–7.
8. Royal Australian College of Surgeons. RACS guidelines for the management of surgical patients during the COVID-19 pandemic. 2020; 17–19. <https://umbraco.surgeons.org/media/5137/racs-guidelines-for-the-management-of-surgical-patients-during-the-covid-19-pandemic.pdf>. Accessed date 8 June 2021.
9. McBride KE, Brown KGM, Fisher OM, Steffens D, Yeo DA, Koh CE. Impact of the COVID-19 pandemic on surgical services: early experiences at a nominated COVID-19 Centre. *ANZ J Surg*. 2020;**90**:663–5.
10. De Simone B, Chouillard E, Sartelli M, Biffi WL, Di Saverio S, Moore EE, et al. The management of surgical patients in the emergency setting during COVID-19 pandemic: the WSES position paper. *World J Emerg Surg*. 2021;**16**:1–34.
11. American College of Surgeons. ACS guidelines for triage and management of elective cancer surgery cases during the acute and recovery phases of coronavirus disease 2019 (COVID-19) pandemic. *Am Coll Surg*. 2020;**2019**:45.
12. Benítez CY, Pedival AN, Talal I, Cros B, Ribeiro Junior MF, Azfar M, et al. Adapting to an unprecedented scenario: surgery during the COVID-19 outbreak. *Rev Col Bras Cir*. 2020;**47**:1–5.
13. McMaster T, Wright T, Mori K, Stelmach W, To H. Current and future use of telemedicine in surgical clinics during and beyond COVID-19: a narrative review. *Ann Med Surg*. 2021;**66**:102378. <https://doi.org/10.1016/j.amsu.2021.102378>.

Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1. Elective Operating & Clinic Allocations at the included district health boards.

Table S2. Admission Protocol at the included District Health Board.

Data S1. Structured Excel spreadsheet used for data collection.