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Documenting COVID-19 screening before surgery during lockdown (COVID Screen): an audit with routinely collected health data

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Abstract.

Objective. This study analysed screening for COVID-19 before surgery and outcomes of any perioperative testing for SARS-CoV-2 infection during pandemic-restricted surgery.

Methods. An audit was conducted with routinely collected health data before both elective and non-elective surgery at two large Melbourne hospitals during April and early May 2020. We looked for documented systematic screening for COVID-19 disease and fever ($>38^{\circ}\text{C}$) and results of SARS-CoV-2 testing, and proposed a minimum acceptable documenting rate of 85%.

Results. The study included 2197 consecutive patients (1279 (58%) undergoing elective surgery, 917 (42%) undergoing non-elective surgery) across most specialities. Although 926 (72%) patients undergoing elective surgery had both systematic screening and temperature documented, approximately half that percentage undergoing non-elective surgery ($n = 347$; 38%) had both documented. However, 871 (95%) of non-elective surgery patients had temperature documented. Acknowledging limited screening, 85 (9.3%) non-elective surgery patients had positive screening, compared with 39 (3.0%) elective surgery patients. All 152 (7%) patients who were tested for SARS-CoV-2 were negative, and no cases were reported from external contact tracing.

Conclusions. Although 'not documented' does not necessarily equal 'not done', we found that documenting of COVID-19 screening could be improved. Better understanding of implementing screening practices in pandemics and other crises, particularly for non-elective surgery patients, is warranted.

What is known about the topic? Little is known about routine screening for SARS-CoV-2 infection among surgical patients. However, it is well established that implementing effective uptake of safety and quality initiatives can be difficult.

What does this paper add? We found that although most patients had documented temperature, fewer than 75% had a documented systematic questionnaire screen for COVID, particularly patients undergoing non-elective surgery.

What are the implications for practitioners? Clear documenting is important in managing patients. Pandemics and other crises can require rapid changes in practice. Implementing such measures may be less complete than anticipated and may require greater use of evidence-based implementation strategies, particularly in the less predictable care of non-elective surgery patients.

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Introduction

Compared with many developed countries, Australia has had a low incidence of SARS-CoV-2 infection and COVID-19 disease.¹ However, early in the pandemic the Australian Health Protection Principal Committee recommended restricting surgery to non-elective and more urgent elective surgery as part of the national lockdown strategy to reduce viral spread and manage the possible demands of the pandemic.² Most hospitals introduced evidence-based screening for COVID-19 for patients before surgery. This screening is important for several reasons, including patient safety, staff safety, public health and hospital resources.³

Little is known about the efficacy and results of these screening programs. However, a major concern is patients undergoing surgery with unrecognised concurrent SARS-CoV-2 infection. The most appropriate screening in Australia is likely to be systematic questionnaires about COVID-19 combined with measuring temperature without quarantine or testing for SARS-CoV-2 infection.³ One aspect of escalating surgical care after lockdown is continuing to minimise the risk of SARS-CoV-2 being brought in to the hospital.^{3,4} We propose that analysing screening during the lockdown of the first wave in 2020 may inform ongoing and future screening.

As part of this study, we asked several questions: (1) what proportion of patients had a documented systematic questionnaire for COVID-19 and temperature measured before surgery; (2) were there important differences between surgical subgroups; (3) of patients screened before surgery for COVID-19, what proportion screened negative for COVID-19; (4) of patients screening positive, what items were positive; and (5) did infection control detect any patients, particularly those who screened negative, who tested positive to SARS-CoV-2 during their first 14 postoperative days?

Methods

This study was a retrospective observational audit using routinely collected health data at two large geographically separated Melbourne hospitals. These hospitals perform most types of adult surgery and interventional and diagnostic procedures, but neither has an obstetric service. We called this work the COVID Screen audit.

The human research ethics committees (HREC) of each hospital approved this project as a low-risk audit-type activity that did not require formal HREC review or informed consent from patients.

We searched the medical records of all consecutive patients undergoing procedures that were surgical, diagnostic and interventional listed with the operating suites. At one hospital this was between 1 April and 10 May 2020, whereas at the other this was 1–30 April 2020; therefore, data were collected at both hospital for all of April 2020, but we included the May data for overall analysis. These differences in collection periods were due to varying research staff availability. Investigators enquired with hospital infection control or infectious diseases departments to see whether any of the sample patients had tested positive or had been reported to the hospital through the Victorian Department of Health and Human Services contact tracing up to 14 days postoperatively. The search strategies differed between hospitals because one hospital has an

Box 1. Systematic COVID-19 screening questionnaire

Any recent overseas travel in the past 2 weeks?
Recent contact with known or suspected COVID-19 case in the past 2 weeks?
Reside in or visited a known high-risk area with a cluster of cases?
Recently tested for COVID-19? If yes: Date: Result:
Does the patient have:

- A fever or a temperature of 38°C or above?
- A cough that is not usual for them or has got worse within the last 2 weeks?
- Shortness of breath that is not usual for them or has got worse within the last 2 weeks?
- A sore throat?
- Other respiratory symptoms?
- A recent loss of the sense of smell?

electronic health record (Cerner, Kansas City, MO, USA) and the other has a scanned medical record. Patients were identified from stored electronic surgical lists and included those undergoing elective or non-elective surgery. We anticipated data on approximately 2000 patients.

Files were searched for documented specific preoperative COVID-19 questionnaires (Box 1) and temperature recordings. The questionnaires were consistent with the Australian definitions for COVID-19.^{3,5} Both hospitals had specific COVID-19 questionnaires as part of the electronic or scanned medical record. In the absence of questionnaires, admission, medical and nursing notes were searched for evidence of COVID-19-related history, usually questions around flu-like symptoms. We did not test interrater reliability on interpreting these notes.

Data recording and storage

Data were stored on in database (Excel; Microsoft, Bellevue, WA, USA) files with security access. Each patient was allocated a unique identifier based on the hospital and a four-digit number (e.g. AA1012 or BB0033). We did not collect potentially identifying data, such as patient name, hospital record number, date of birth or specific operation.

The following information was collected: patient age, patient sex, surgical speciality, date of surgery and elective versus non-elective surgery. We noted whether the patient was febrile (>38°C), afebrile or temperature not recorded. Where there was a COVID-19 questionnaire, we noted whether the patient had answered 'no' or 'yes' and, if 'yes', to which questions. We noted any preoperative or postoperative SARS-CoV-2 testing and the results with viral RNA testing (sensitivity 70%).⁶

Data cleaning

For patients undergoing multiple procedures during one in-patient stay, only the first procedure was included. This applied to 60 patients. Surgical and procedural diagnostic and interventional specialities (surgical specialities) were bundled together into: cardiothoracic; ear nose and throat (ENT), incorporating facio-maxillary; endoscopy; general, incorporating breast, upper

Table 1. Documenting COVID-19 screening using a questionnaire or temperature check before surgery in subgroups

Unless indicated otherwise, data are given as the number of patients in each group, with percentages of that surgical subgroup given in parentheses. ENT, ear nose and throat

	No. patients (% of total)	Any question	Specific questions	Temperature check	Any question or temperature check	Full screen ^A	No. with symptoms or febrile
Overall	2197 (100)	1406 (64)	1303 (59)	1978 (90)	2037 (93)	1273 (58)	124 (5.7)
Elective	1279 (58)	994 (78)	949 (74)	1137 (89)	1166 (91)	926 (72)	39 (3.1)
Non-elective	917 (42)	466 (51)	355 (39)	841 (92)	871 (95)	347 (38)	85 (9.3)
Hospital A	735 (33)	420 (57)	420 (57)	734 (99)	734 (99)	420 (57)	85 (11.5)
Hospital B	1461 (66)	1043 (71)	886 (61)	1244 (85)	1306 (89)	853 (58)	39 (2.7)
April Week 1	409 (17)	278 (68)	223 (55)	384 (94)	386 (94)	221 (54)	28 (6.8)
April Week 4	478 (22)	306 (64)	292 (61)	433 (91)	432 (90)	287 (60)	28 (5.9)
Surgical group							
Cardiothoracic	97 (4.4)	58 (60)	51 (53)	90 (93)	93 (96)	50 (52)	10 (9.9)
ENT/Faciomaxillary	73 (3.3)	65 (89)	53 (73)	70 (96)	72 (99)	50 (68)	11 (15.1)
Endoscopy	466 (21)	360 (77)	337 (72)	433 (93)	456 (98)	326 (70)	16 (3.4)
General ^B	380 (17)	266 (70)	230 (61)	362 (95)	367 (97)	225 (59)	37 (9.7)
Neurosurgery	101 (4.6)	37 (37)	29 (29)	90 (89)	94 (93)	28 (28)	7 (6.9)
Orthopaedics	166 (7.6)	103 (60)	89 (54)	163 (98)	163 (98)	89 (54)	10 (6.0)
Other	143 (6.5)	85 (59)	62 (43)	108 (76)	125 (87)	57 (40)	8 (5.6)
Plastics	334 (15)	237 (71)	220 (66)	328 (98)	331 (99)	218 (65)	9 (2.7)
Urology	331 (15)	202 (61)	185 (56)	229 (69)	232 (70)	182 (55)	8 (2.4)
Vascular	105 (4.8)	59 (56)	48 (46)	95 (90)	69 (66)	48 (46)	9 (8.6)

^ABoth systematic COVID-19 screening using a questionnaire and temperature documented.

^BThis group includes general, breast, upper gastrointestinal, colorectal and hepatobiliary surgery.

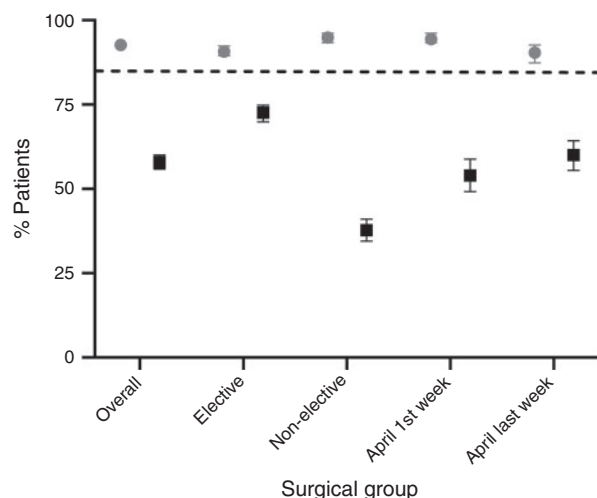


Fig. 1. Percentage of patients who had either any COVID-19-related questions or temperature documented (grey circles) and those who had a recorded systematic COVID-19 questionnaire and temperature documented (black squares) before surgery; whiskers indicate 95% confidence intervals. The dashed line is the 85% minimum acceptable documenting rate.

gastrointestinal, colorectal and hepatobiliary; neurosurgery; orthopaedics; plastics; urology; and vascular. The category of 'other' included interventional radiology, interventional cardiology, gynaecology, ophthalmology and psychiatry (electroconvulsive therapy).

Data analysis

A proposed minimum acceptable screening rate of >85% was used, consistent with other audits in perioperative medicine.⁷

Because we were not testing hypotheses, we did not have a systematic statistical plan. Rather, we planned summary statistics and then used post hoc analyses to examine the absolute difference and 95% confidence intervals (CIs) to indicate the precision of estimates for important differences using online software (VassarStats; Website for Statistical Computation; www.vassarstats.net, accessed 20 June 2020). In particular, we analysed differences between elective and non-elective surgery patients, as well as patients in the first and last weeks of April 2020.

We used the REporting of studies Conducted using the Observational Routinely-collected health Data (RECORD) Statement,⁸ which is an extension of the STROBE reporting statement for observational studies, and the Standards for Quality Improvement Reporting Excellence guidelines (SQUIRE 2.0).⁹

Results

Data were collected on 2197 consecutive patients (Table 1; Fig. 1) between 1 April and 10 May 2020. Patients were spread across surgical specialities, with 58% undergoing elective surgery. The median age was 60 years (interquartile range (IQR) 45–72 years; range 1–98 years). Of these patients, 912 (42%) were women, 1283 (58%) were men and one (<1%) was other.

We found that 2037 (93%) patient histories had some documented evidence of questions about COVID-19 history and symptoms (usually flu-like symptoms) and/or a recorded temperature before surgery (Table 1; Fig. 1). Most patients ($n = 1303$; 59%) had documented answers to a systematic questionnaire, and most of these patients also had temperature measured ($n = 1273$; 58% of total). Some patients ($n = 156$; 7%) had no record of any questions about COVID-19 or temperature measured before surgery.

In all, 152 patients (7%) had 159 tests for SARS-CoV-2; all were negative. Of 1364 patients (62%) who had a record of no apparent COVID-19 symptoms and were afebrile before surgery, 38 were tested for SARS-CoV-2 infection within 2 weeks of surgery and all were negative.

Of those with documented screening, 125 reported potential COVID-19 symptoms or related problems or were febrile before surgery; the most common problems were fever ($n = 60$; 48%), cough ($n = 33$; 26%) and/or sore throat ($n = 11$; 9%). Of these 125 patients, 67 (54%) were tested before surgery and all were negative; this included 20 of 33 who were both symptomatic and febrile. No patient reported having had COVID-19, and only one patient reported having been a close contact of someone with COVID-19; that patient tested negative.

Infection control units at both hospitals did not have any of the patients in this audit cohort reported to them by the Victorian Department of Health and Human Services as developing SARS-CoV-2 infection within 2 weeks of surgery.

Although most patients had a documented temperature, there was marked variation between groups in the percentage of patients who had both a COVID-19 screening questionnaire and temperature documented (Table 1; Fig. 1). The most marked difference was between patients undergoing elective (72%) and non-elective (38%) surgery. This was an absolute (rounded) decrease of 35% (95% CI 31–38%; relative risk (RR) 49%). The documented percentage of patients with a positive questionnaire or febrile was 3.1% and 9.3% among the elective and non-elective surgery groups respectively, even with less screening. This was an absolute difference of 6.2% (95% CI 4.2–8.4%; RR 3.0%). We found that screening may have improved from Week 1 to Week 4 of April (Table 1; Fig. 1) by 6.0% (95% CI –0.5%, 12.5%). This was a relative increase of 11% from Week 1 to Week 4.

Discussion

We undertook an audit of documenting screening for COVID-19 using routine clinical records at two large Melbourne hospitals. We recognise that we cannot assume that ‘not documented’ necessarily meant ‘not measured’. We found that documenting screening varied markedly across surgical groups. In particular, we found that non-elective surgical patients had the lowest rate of documenting and the highest rate of COVID-19-related history and signs. Approximately two-thirds of patients had documented negative screening. No patient returned a positive test for SARS-CoV-2.

Although there are many guidelines, there has been limited study of surgical patients during the COVID-19 crisis and previous respiratory pandemics.¹⁰ Identifying surgical patients with SARS-CoV-2 and COVID-19 disease is important for several reasons.^{3,4} First, patients with moderate to severe COVID-19 may have more complications and greater mortality after surgery.¹¹ COVID-19 may further increase the already increased risks for complications and mortality among non-elective surgical patients.^{7,11,12} Second, patients with undetected SARS-CoV-2 infection may infect both patients and staff if admitted to hospital. Third, in Australia, patients with known or suspected SARS-CoV-2 require different levels of personal protective equipment (PPE) for perioperative care than those not suspected of SARS-CoV-2 infection.¹³ Not only is exposure

without appropriate PPE a staff health risk, but it also means that staff have to consequently self-isolate and are often tested for SARS-CoV-2. Along with community prevalence, screening is important to help determine prior probability when interpreting a subsequent SARS-CoV-2 test.⁶ A patient who screens positive but is undergoing elective surgery should have surgery delayed and be tested, whereas a patient who requires non-elective surgery could be tested if time allows or if more urgent surgery proceeds with high (aerosol)-level precautions and PPE^{3,13} with subsequent follow-up. During both first and subsequent pandemic waves, documenting COVID-19 screening facilitates the management of patients, particularly during handovers and preoperative assessment, both universal within perioperative care. This is true even in states with mandatory preoperative SARS-CoV-2 testing, and is particularly important for areas with low prevalence, as well as when high prevalence decreases and surgery is escalating.

This audit was undertaken during government-mandated restricted surgery that was part of the national lockdown to manage the SARS-CoV-2 pandemic. Despite this national imperative, documented COVID-19 screening fell short of our proposed lower acceptable limit of 85%⁷ in almost all surgical groups. There was an 11% relative increase in documented screening between the first and last weeks of April, but the CI ranged from substantially improved to slightly worse. There are likely to be many overlapping reasons for limited documenting of COVID-19 screening. Possibly the most important reason is that both hospitals had several stages of screening, including before admission, telephone calls and at hospital entrances. Clinical staff may have assumed that these screens were adequate. However, this other screening was not routinely documented in patient records. However, non-elective surgical patients often do not undergo these walk-in screens and instead are likely to be screened if they come through the emergency department. Unlike elective surgery, non-elective admissions occur around the clock, come from a variety of sources, are admitted to wards rather than surgery admission units and range from life-threatening emergencies to less urgent but still non-elective problems. These factors may also affect screening. Another factor may be that the Australian pandemic response during April 2020 was very successful compared with other countries and by the end of April 2020 the Australian Health Protection Principal Committee² recommended a gradual increase in the availability of elective surgery. This success may have reduced the perceived importance of the screening.

The strength of this audit is that it includes over 2000 consecutive patients across a broad range of procedural specialities at two large public hospitals that are geographically separated, belong to different health services and have limited staff and patient overlaps. The COVID-19 questionnaires were consistent with the recommendations of the Australian Commission on Safety and Quality in Health Care³ using Australian definitions for COVID-19⁵ with clinical and epidemiological criteria. We suspect that our results are likely to apply to other Australian hospitals.

Limitations of our audit include that data were collected retrospectively and that we did not investigate other COVID-19 screening or the implementation approaches¹⁴ for COVID-19 screening or the enablers and barriers to routine screening.

Without antibody testing, we could not confirm that no patient with SARS-CoV-2 received surgical care because we were unable to determine whether any patients who had completely asymptomatic infection and did not undergo testing received surgical care. Further, we cannot exclude that all patients were fully screened but only some had this documented.

Conclusions

Although we found that most surgical patients had a documented preoperative temperature, far fewer had a documented systematic COVID-19 screening before surgery. In particular, non-elective patients had a low documented screening rate. However, no patient was found to have SARS-CoV-2 infection within 2 weeks of surgery. Future research could examine how to apply implementation science¹⁴ to new but urgent measures, such as screening during a pandemic across elective and non-elective admissions.

Competing interests

The authors report no potential competing interests.

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