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 website.

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Testing the Asymptomatic Pre-Surgical Population for Severe Acute Respiratory Syndrome Coronavirus 2

To the Editor:

IN RESPONSE to the coronavirus disease 2019 (COVID-19) pandemic, healthcare facilities deferred all but emergency surgeries for ≥12 weeks to minimize/reduce risk to patients and healthcare workers.[1-6] However, by April 2020, increased mortality for delaying necessary cardiac and thoracic procedures prompted multidisciplinary teams to determine how to restart surgical cases safely, balancing the urgent needs of patients, the reported increased morbidity and mortality of COVID-19–positive patients undergoing surgical procedures,[2,3,7,8] and the risk of spreading COVID-19 infection among healthcare workers.[4,6,7,9-11]

Donning of personal protective equipment (PPE) by healthcare workers and screening of patients for COVID-19 infection are necessary for the success of surgery during the pandemic.[10,12] Screening includes a questionnaire regarding signs and symptoms of COVID-19, exposure to an infected person, and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) reverse transcriptase polymerase chain reaction (PCR) testing with or without thoracic computed tomography (CT).[4,5,10-15] Whereas screening should be universal, PCR testing and CT imaging may not be available or, in low-prevalence areas, may not be necessary.[10,12] Furthermore, universal PCR testing for healthcare workers has not been advocated, except for those with signs, symptoms, and/or exposure.[16]

Herein, the results of preoperative screening and PCR SARS-CoV-2 testing (cobas 6800 System; Roche Diagnostics, Basel, Switzerland [approved by the US Food and Drug Administration on March 2020]) at our institution during the time of the restart and ramping up of surgical cases are reported.

After approval by the Lifespan Medical Systems Institutional Review Board, 14 weeks of SARS-CoV-2 PCR testing data were collected beginning at the restart of elective surgical cases in April 2020. For comparison, data also included non-surgical patients with suspicion of infection. All patients underwent a nasopharyngeal SARS-CoV-2 PCR test (Cobas 6800 System), with the surgical group being tested within 72 hours of their procedure. Forehead temperatures were assessed, and all patients reviewed and answered a questionnaire regarding possible COVID-19 exposure and related symptoms for the 10 days before the test.[15] Patients who were afebrile and without symptoms of COVID-19 or exposure were considered asymptomatic.

After the initial 11 weeks, the medical center policy changed, and outpatient surgical patients were screened with a questionnaire and temperature recording. If asymptomatic, afebrile, and without record of exposure to a COVID-19–positive or suspected patient for 10 days before surgery, then PCR testing was not performed. This 10-day period is in line with the likelihood of developing a COVID-19 infection syndrome after exposure and/or the unlikely recovery of replicant SARS-CoV-2 virus 10 days after presenting with symptoms of COVID-19.[10,15,17-20]

Healthcare workers were not tested routinely. Policy relied on personal monitoring and reporting of symptoms, signs, and/or fever, all of which are in line with Centers for Disease Control and Prevention recommendations.[14] Healthcare workers donned PPE during aerosol-generating procedures (eg, intubation).[12]

Although the actual perioperative care of surgical patients is not described, the general practice care was in line with the principle of enhanced recovery to facilitate extubation, ambulation, pulmonary care, and discharge.[9]

Surgical follow-up included phone calls for outpatients and chart review for inpatients. Reports of infection syndromes among healthcare workers were recorded. Patients and healthcare workers were not tested or retested unless they became symptomatic. The data were analyzed with the Fisher exact test and the Cochran-Armitage test to assess trends of positive tests over time.

A total of 36,939 patients were tested over 14 weeks, and 29,655 presented with symptoms and/or suspicion of COVID-19 infection, of whom 2,081 (7.0%) tested positive (Table 1). The percent who tested positive significantly declined from the first to the last week (15.4% *v* 3.3%; $p < 0.001$), between weeks 3 and 4 (14.1% *v* 10.9%; $p < 0.01$), and between weeks 7 and 8 (9.0% *v* 4.4% $p < 0.0001$) (Fig. 1 and 2).

Furthermore, 7,284 consecutive asymptomatic patients were tested before surgery during the 14-week period, of whom 30 (0.4%) tested positive for SARS-CoV-2 (see Table 1). From the first week to the last week, there was a significant decline in the percent of positive tests (2.8% *v* ≤0.5%; $p < 0.001$) (see Fig. 1 and 2). In the final 6 weeks, the percent of positive tests ranged between 0.0% and 0.4%. Of the 30 positive patients, all were verified as asymptomatic at the time of screening before surgery and all resided in densely populated areas in the state where the prevalence of infection was higher.[15] Among these patients, there had been no report of an infection syndrome.

Table 1
Lifespan Coronavirus (Covid-19) Testing.

Week	Date	Symptomatic Patients				Asymptomatic Surgical Patients			
		Negative Test	Positive Test	Percent Positive	Total	Negative Test	Positive Test	Percent Positive	Total
1	April 13–19	1,307	238	15.4	1,545	137	4	2.8	141
2	April 20–26	1,280	230	15.2	1,510	201	2	1	203
3	April 27–May 3	1,368	225	14.1	1,593	229	2	0.9	231
4	May 4–10	1,830	224	10.9	2,054	314	0	0	314
5	May 11–17	1,956	197	9.2	2,163	540	4	0.7	544
6	May 18–24	1,947	214	9.9	2,161	766	5	0.7	771
7	May 25–31	1,915	189	9	2,104	687	2	0.3	689
8	June 1–7	1,981	90	4.4	2,061	844	4	0.5	848
9	June 8–14	2,081	91	4.2	2,172	828	0	0	828
10	June 15–21	2,074	81	3.8	2,155	810	3	0.4	813
11	June 22–28	2,255	56	2.4	2,311	870	2	0.2	872
12	June 29–July 5	2,262	63	2.7	2,325	381	0	0	381
13	July 6–12	1,985	91	3.4	2,706	351	1	0.3	352
14	July 13–19	2,703	92	3.3	2,795	296	1	0.3	297

NOTE. Symptomatic patients presented for suspicion of COVID-19, and symptomatic patients presented for nonemergency surgery. Data include negative and positive tests, the percent of total tests that were positive, and the total for each group.

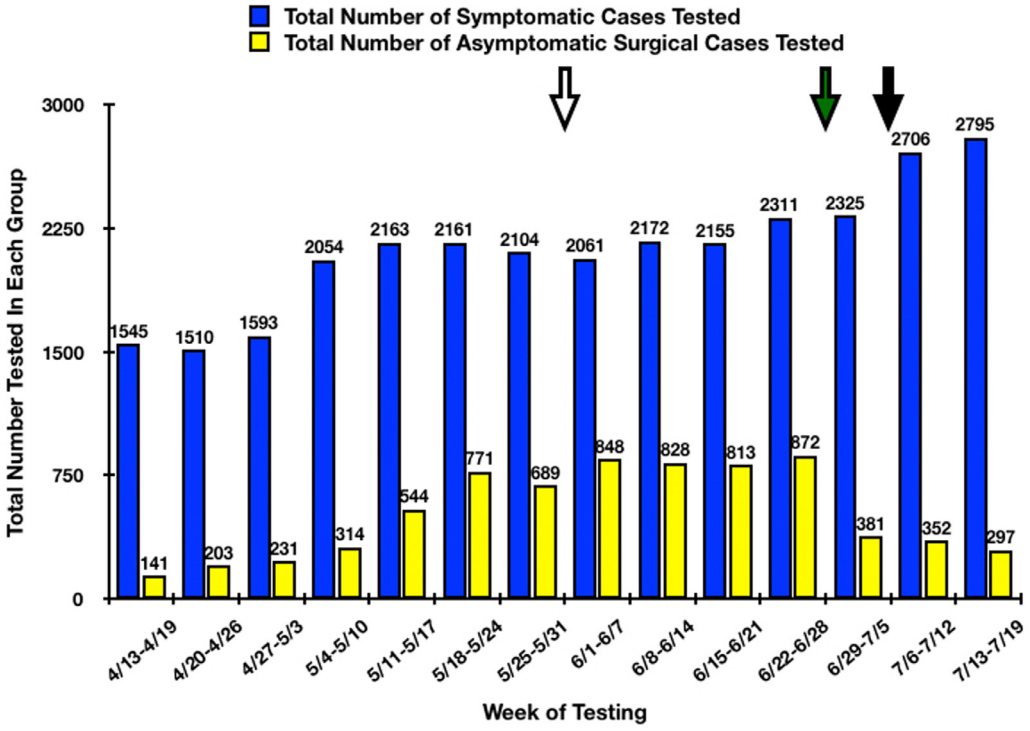

Fig 1. Total number of symptomatic and asymptomatic cases for each of the 14 weeks during this data collection. The *red arrow* and *dotted line* mark the time of policy change after which there was a decrease in number of asymptomatic cases tested. The *white* and *black arrows* mark the start of Rhode Island reopening phases 2 and 3. By contrast, the number of symptomatic cases tested increased during this period.

After 11 weeks, based on the low number of PCR-positive cases and declining prevalence of COVID-19 infection in the region, testing of asymptomatic surgical outpatients was stopped. Over the following 3 weeks, 2,743 adult elective asymptomatic and afebrile outpatient surgical cases were performed on patients who were not tested for SARS-CoV-2. During the 11 weeks of universal testing and the following 3 weeks of selective testing, there were no reports of COVID-19 infection among surgical patients or involved healthcare workers.

From April 13 to July 17, 2020, 168 cardiothoracic patients—all of whom tested negative for SARS-CoV-2, underwent surgery/procedures. There were 35 thoracic surgical cases performed, including lobectomy and wedge resection (15 via thoracoscopy and 13 via thoracotomy) and 6 rib plating for rib fractures. Fifty-two structural heart cases were performed, including 48 transcatheter aortic valves and 4 MitraClip (Abbott, Chicago, IL) procedures. Eighty-one cardiac surgical cases were performed, including emergency cases. Of the cardiac surgical cases, 51 were isolated coronary artery

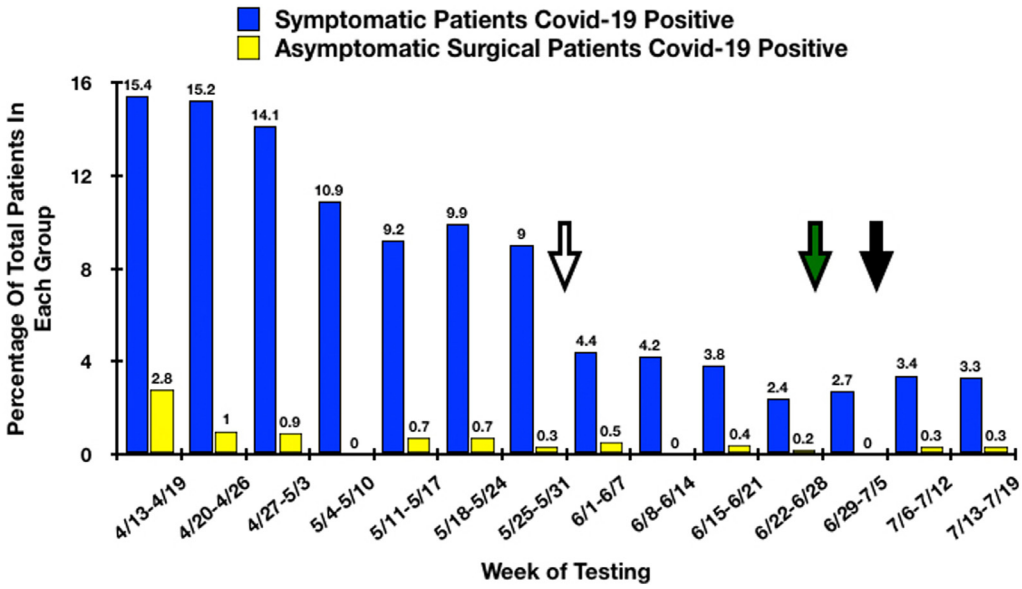

Fig 2. Percentage of total patients in symptomatic and asymptomatic groups for each of the 14 weeks during this data collection. The *red arrow* and *dotted line* mark the time of policy change. The *white* and *black arrows* mark the start of Rhode Island reopening phases 2 and 3. Over the time period there was a significant decline in the percentage of positive tests for both groups. Over the latter 8 weeks the number of asymptomatic patients testing positive was 0.5% or less. Over this period, there was no significant change in percentage of asymptomatic persons testing positive despite a change in policy.

bypass graft procedures, 9 were mitral valve repair/replacement procedures, 12 were aortic valve replacement (AVR) procedures, 1 was an AVR + mitral valve repair/replacement procedure, 1 was an AVR + coronary artery bypass graft procedure, and 7 were ascending aortic replacements with or without AVR. There were 4 cardiac surgical deaths related to cardiovascular dysfunction. There was no evidence of SARS-CoV-2 infection in the perioperative period or during the 16-plus day follow-up, and there was no reporting of infection among surgeons, anesthesiologists, or other health careworkers involved in the care of these patients.

Recognizing the greater adverse outcome data of COVID-19–positive patients undergoing surgery[7,8] and the risk of infection spread from asymptomatic or presymptomatic COVID-19 patients,[6] preoperative screening has been important for the restart and ramping up of surgical cases.[9,10,12] Excellent outcomes continued even after a policy change that shifted from universal to selective PCR testing. Adjustments of the screening algorithm were guided by outcome data and pretest probability, the latter based on questionnaire, temperature measurement, and the regional prevalence of the COVID-19 infection.[5,10,12,21]

Preoperative screening and testing for COVID-19 varies among institutions, regions, and among patient types, with greater concern for higher-risk patients and procedures. Questionnaires regarding signs, symptoms, and exposure and temperature recording are universal.[1,9-11] PCR testing has been recommended before all surgical procedures when possible, but especially cardiothoracic procedures in which lung dysfunction and possible prolonged hospitals stays are anticipated.[8-10,12,22-26] Both upper respiratory tract PCR testing and CT were considered necessary by UK cardiac surgeons to screen for COVID-19 before performing "non-salvage" cardiac surgical cases during this pandemic.[13,14]

PCR tests were developed to detect infection in symptomatic patients. Before Food and Drug Administration approval, through serial dilutions, PCR tests, including the Cobas 6800 test, were evaluated and found to detect minute amounts of the virus. Although the sensitivity and specificity of the Cobas 6800 in a laboratory were reported as excellent,[27] these results may not translate to the larger clinical realm in which the sensitivity and specificity are affected by variables, such as sampling technique and timing.[15,24-26,28] Testing immediately after exposure has a lower sensitivity than 4 days later.[5,15] Two sequential negative tests separated by 3-to-4 days have a higher sensitivity then a single negative test.[15,24-26] One can envision an unlimited number of testing scenarios to reduce the occurrence of false negatives. For cardiothoracic patients, many of these scenarios are not practical when considering patient availability, healthcare resources, delays in surgery, and cost. Others view negative tests cautiously because of the limitations of testing to the point of treating all patients as if they are positive for COVID-19.[10,12] A practical preprocedural assessment, relying on signs, symptoms, and exposure and selective testing, can be implemented safely in a region of low prevalence and low pretest probability.[5] Although a 10-day absence of signs, symptoms, and exposure was chosen,[10,15,17-20] a more conservative policy might use 14 days.[16] For the present time, given the greater morbidity of COVID-19–positive surgical patients, screening will continue to include PCR testing until outcome data determine otherwise.

Adherence to policies and procedures is crucial to the successful restart and ramping up of surgical cases. Guided by outcome data, availability of resources, and determination of pretest probability, screening procedures and policies can be reassessed and redesigned to improve resource utilization without compromising the patient or increasing the exposure of healthcare workers to SARS-CoV-2. Together with

healthcare worker vigilance, continued ramping up of surgical procedures can continue.

Conflict of Interest

None.

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Preoperative Universal SARS-CoV-2 Screening for Asymptomatic Patients: A Report From Tokyo, Japan

To the Editor:

Coronavirus disease 2019 (COVID-19) is associated with considerable perioperative mortality.[1] Preoperative COVID-19 screening is recommended for all patients before elective surgery to decrease perioperative mortality and avoid secondary infection from asymptomatic patients.[2,3] The evidence of routine preoperative screening, however, is unclear and available data are scarce. Herein, we report the results of universal screening of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) before elective surgery.