EVIDENCE SYNTHESIS BRIEFING NOTE

TOPIC: PRE-OPERATIVE COVID-19 TESTING AND VACCINATION ACROSS JURISDICTIONS

Information finalized as of June 25, 2021.[a] This Briefing Note was completed by the Research, Analysis, and Evaluation Branch (Ministry of Health). Refer to the Methods section for further information.

Purpose: This report summarizes the scientific evidence and jurisdictional policies and guidance regarding pre-operative COVID-19 testing and vaccination.

Key Findings:

- **Pre-Operative COVID-19 Testing**: Pre-operative and surgical COVID-19 testing strategies are in place in multiple jurisdictions (British Columbia [BC], Saskatchewan, United States, United Kingdom, Italy, Germany, Israel, South Korea, and India).
  - Testing Methods: The most commonly used and evaluated testing method is the nasopharyngeal swab for reverse transcriptase-polymerase chain reaction (RT-PCR) testing, while others also include antibody screening and point-of-care PCR testing. Timing of pre-operative screenings varies from 12 hours to five days prior to surgery.
  - Health Outcomes: A 2021 study reported that swab testing was beneficial before major pulmonary surgery, as well as in areas with a high 14-day SARS-CoV-2 case notification rate, but not in low-risk areas.
  - Costs: A 2021 study on pre-operative screening strategies in a South Korean hospital reported that a total of 10,645 pre-operative RT-PCR tests were performed during the study period, costing the hospital approximately CAD $900,000. This was compared to the expected loss of CAD $15,000,000 that would have occurred had the operating rooms been closed for two weeks due to the nosocomial spread of COVID-19.
- **COVID-19 Vaccination and Elective Surgery**: A review (May 2021) on COVID-19 vaccination and elective surgery reported that expert consensus from international professional societies generally recommend vaccinating patients against SARS-CoV-2 before elective surgery, as this may reduce the risk of COVID-19 complications and transmission of the virus during procedures. Most guidance documents on COVID-19 vaccination from Australia and England recommend pre-operative vaccination, though differ about suggested timings.
  - Timing for Pre-Operative Vaccination: Recommended timings for pre-operative COVID-19 vaccination are variable, ranging from a few days to weeks. Recommendations on time of vaccination before surgery by specialty groups varied as follows:
    - *General Surgery*: A few days to one week; one week; and several weeks.
    - *Kidney Transplant*: Three to four weeks.
    - *Plastic or Cosmetic Surgery*: At least one week.
    - *Immunology*: One week.

Analysis for Ontario: An Ontario Health guidance document (June 8, 2020) recommends that pre-surgical (non-emergent) and pre-procedural COVID-19 testing should be conducted as close as possible to the date of the surgery or procedure, given local testing capacity.

[a] This briefing note includes current available evidence as of the noted date. It is not intended to be an exhaustive analysis, and other relevant findings may have been reported since completion.

Supporting Evidence

Table 1 summarizes the identified scientific evidence and jurisdictional guidance on pre-operative COVID-19 testing and vaccination. Table 2 summarizes the guidance and Table 3 summarizes the scientific evidence on pre-operative COVID-19 testing during 2020-21. Table 4 summarizes the guidance and Table 5 summarizes the scientific evidence on COVID-19 vaccination and elective surgery in 2021.

The following limitations should be noted:

- Evidence on pre-operative guidelines for fully vaccinated individuals is of low quality and only a small number of peer-reviewed publications are available.

Table 1: Summary of the Scientific Evidence and Jurisdictional Policies on Pre-Operative COVID-19 Testing and Vaccination Requirements

Scientific Evidence	**Research on Pre-Operative and Surgical COVID-19 Testing** • Five identified single studies evaluated institutional pre-operative and surgical COVID-19 testing strategies across the United States (US), Italy, South Korea, and India.[1–5] ○ Testing Methods: Reverse transcriptase-polymerase chain reaction (RT-PCR) testing of nasopharyngeal swabs was the most commonly evaluated pre-operative testing method.[1,2,3,4] In particular, a study (January 2020) comparing accuracy of COVID-19 screening protocols for elective surgery reported that two different screening protocols for SARS-CoV-2 infection were effective for pre-operative screening surgery candidates: 1) pharyngeal swab alone; or 2) a combination of symptom evaluation, generic blood tests, and computed tomography (CT) of the chest.[1] ○ Timing of Tests: Required timeframes for obtaining tests before surgery in 10 US health care institutions varied from one to five days before surgery. Following a positive test result, nine sites required postponement of surgery for at least 10 days.[5] ○ Health Outcomes: A study (January 2021) on the association between pre-operative SARS-CoV-2 testing and post-operative pulmonary complications reported that swab testing was beneficial before major surgery, and in areas with a high 14-day SARS-CoV-2 case notification rate, but not in low-risk areas. To prevent one pulmonary complication, the number of patients needed to be swab-tested prior to major or minor surgery was 18 and 48, respectively, in high-risk areas, and 73 and 387 in low-risk areas.[4] ○ Costs: A study (April 2021) on pre-operative screening strategies in a South Korean hospital reported that a total of 10,645 pre-operative RT-PCR tests were performed during the study period, costing the hospital approximately CAD $900,000. This was compared to the expected loss of CAD $15,000,000 that would have occurred had the operating rooms been closed for two weeks due to the nosocomial spread of COVID-19.[2,b]

[b] The commentary reported figures of USD $70, $100, $750,000, and $12,500,000. All Canadian Dollar (CAD) amounts were calculated using Purchasing Power Parities (PPPs) as published by the Organisation for Economic Co-operation and Development (OECD) for 2019 (1 US Dollar [USD] = 1.20 CAD). PPPs are the rates of currency conversion that eliminate the differences in price levels between countries (OECD, 2019).

	Research on Pre-Operative and Surgical COVID-19 Testing • COVID-19 Vaccine and Mortality Prevention: A modelling study (March 2021) based on data from almost 60,000 patients internationally reported that fewer people need to be vaccinated to prevent one death in surgical patients compared with the general population; the study estimated that globally, prioritizing all surgical patients for pre-operative vaccination ahead of the general population is projected to prevent an additional 58,687 COVID-19-related deaths in one year.[6]
International Scan	**Screening Hospitalized and At-Home Pre-Operative Patients** • Reports from the United Kingdom, Italy, Germany, and Italy state that early in the pandemic, COVID-19 testing was used to conduct pre-operative screening of asymptomatic and pre-symptomatic surgical patients.[7–12] For example, pre-operative COVID-19 testing was used at the University Hospital (Wuerzburg, Germany) to screen and transfer patients to spaces that were separated into SARS-CoV2 or non-SARS-CoV-2 areas (e.g., operation room).[7] ○ Testing Method: The most common test used was the nasopharyngeal swab for PCR testing;[8,9] antibody screening was also used to screen surgical patients in the United Kingdom.[10] ○ Timing of Tests: The timings of pre-operative screenings varied from 12 hours to five days prior to surgery, and two to five days prior to hospital admission (at-home patients).[10,8,11,12] Guidance (June 2021) from the United Kingdom reports that self-administered pharyngeal swab tests must be taken exactly three days before the day of the patient's procedure(s).[13] **COVID-19 Vaccination and Elective Surgery** • A review (May 2021) on COVID-19 vaccination and elective surgery reported that expert consensus from international professional societies generally recommend vaccinating patients against SARS-CoV-2 before elective surgery, as this may reduce the risk of COVID-19 complications and transmission of the virus during procedures.[6,14,15] • Most guidance documents on COVID-19 vaccination from Australia and England recommend pre-operative vaccination, though differ about suggested timings. One exception is the Royal College of Surgeons of England, which recommends that emergency surgery take place irrespective of COVID-19 immunization status.[16] ○ Timing for Pre-Operative Vaccination: Recommendations on the timing for pre-operative COVID-19 vaccination is variable, ranging from a few days to weeks due to the unknown vaccine immunogenicity. No information was provided on whether partial or full vaccination is required/recommended before surgery. Recommendations on time of vaccination before surgery by specialty groups varied as follows: ▪ *General Surgery*: A few days to one week;[16] one week;[17,18] and several weeks;[14,19] ▪ *Kidney Transplant*: Three to four weeks;[20] ▪ *Plastic or Cosmetic Surgery*: At least one week;[21] and ▪ *Immunology*: One week.[22]
Canadian Scan	**Screening Pre-Operative Patients** • A modelling study (June 2021) on the impacts of conducting surgery without pre-operative testing in Canada (excluding Quebec) reported that, at the time of writing, no

	province has a mandate to routinely test elective surgical patients for COVID-19 pre-operatively.[23] • British Columbia and Saskatchewan recommend pre-operative COVID-19 testing under specific circumstances, while Alberta does not recommend testing.[9,27] In particular: ○ An Alberta Health Services (AHS) guidance document (June 2021) on infection prevention and control does not recommend routine pre-operative COVID-19 testing at this time since the burden of the virus in the nasopharynx may be below the detection threshold at the time of the swab, and there may be false reassurance from a negative test result. As an alternative, the AHS uses the following point-of-care assessment tools: AHS Acute Care COVID-19 Expanded Testing Algorithm; and/or Form #21615 Communicable Disease (Respiratory) Initial Screening; and/or Form #21666 Ambulatory Care Communicable Disease (Respiratory) Screening.[24] • A Saskatchewan Health Authority guidance document (April 2021) reported that point-of-care (POC) PCR testing was in place effective March 17, 2021. POC-PCR tests are used for patients, including those vaccinated, who have screened negative and are asymptomatic, presenting for all-day surgeries, same-day surgeries, and inpatient procedures.[9]
Ontario Scan	• An Ontario Health guidance document (June 2020) recommends that pre-surgical (non-emergent) and pre-procedural COVID-19 testing should be conducted as close as possible to the date of the surgery or procedure, given local testing capacity.[28]

Methods

The COVID-19 Evidence Synthesis Network is comprised of groups specializing in evidence synthesis and knowledge translation. The group has committed to provide their expertise to provide high-quality, relevant, and timely synthesized research evidence about COVID-19 to inform decision makers as the pandemic continues. The following members of the Network provided information for this Evidence Synthesis Briefing Note:

- Evidence Synthesis Unit, Research Analysis and Evaluation Branch, Ontario Ministry of Health; and
- Ontario Health (Cancer Care Ontario). (June 22, 2021). Email Communications.

For more information, please contact the Research, Analysis and Evaluation Branch (Ministry of Health).

APPENDIX

Table 2: Guidance for Pre-Operative COVID-19 Testing Across Jurisdictions (2020-21)

Jurisdiction	Purpose, Patient Details, Surgery Type	Advised Pre-Operative Investigation	Timing	Outcomes & Recommendations
Canada				
British Columbia BC Centers for Disease Control (BC CDC)	• Purpose: A 2021 BC CDC guidance document is intended as the minimum requirement for facilities performing surgical procedures during the COVID-19 pandemic. • Patient Details: These pre-operative patients should be tested: ○ Patients with any sign or symptom consistent with COVID-19 infection; or ○ Asymptomatic patients/residents from units or facilities with an active COVID-19 outbreak; or ○ Asymptomatic patients who have been instructed by public health to self-isolate as a result of close contact with a positive COVID-19 case or someone with symptoms consistent with COVID-19; or ○ Asymptomatic patients who reside in an area with a high prevalence of COVID-19.	• None reported.	• None reported.	• Health care teams should consider the addition of test-based screening when the following criteria are met: ○ Test positivity rate exceeds 5% for a sustained period of time; ○ Incidence rate is greater than 10.1/100,000; and ○ Two or more COVID-19 acute care outbreaks. • The final decision to proceed with test-based screening should be based on local criteria that meet the needs of patient care, providers, infection prevention and control (IPC), and public health.[27]
Alberta Alberta Health Services (AHS)	• Purpose: A June 2021 AHS guidance document reports on IPC recommendations for suspected or confirmed COVID-19 patients who require surgery	• Reasons for No COVID-19 Testing: The document cites key reasons for not using pre-operative COVID-19 testing: ○ The burden of virus in the nasopharynx may be below	• None reported.	• Routine pre-operative COVID-19 testing is not recommended at this time (June 2021). • Routine pre-operative COVID-19 testing of

Jurisdiction	Purpose, Patient Details, Surgery Type	Advised Pre-Operative Investigation	Timing	Outcomes & Recommendations
	reports on pre-operative COVID-19 testing.	the detection threshold at the time of the swab; any test is a snapshot of what is occurring at the time of specimen collection. This is true regardless of the turnaround time between swabbing and reporting of the test. ○ There is a significant risk of false reassurance from a negative test, which may in turn lead to less stringent adherence to the symptom and risk factor assessment and any required additional precautions and personal protective equipment. ○ With the increased availability of COVID-19 point-of-care (POC) testing, it is important to note that a negative POC test is not adequate. • Assessment Tools: The AHS use the following point-of-care assessment tools: ○ AHS Acute Care COVID-19 Expanded Testing Algorithm; and/or ○ Form# 21615 Communicable Disease (Respiratory) Initial Screening; and/or ○ Form #21666 Ambulatory Care Communicable Disease (Respiratory) Screening.		previously positive COVID-19 patients within 90 days of the initial positive COVID-19 test is not recommended.[24]
Saskatchewan Saskatchewan Health Authority (SHA)	• Purpose: SHA guidance document (April 2021) reports on point-of-care polymerase	• Tests: POC-PCR will be used for all day surgery, same day surgery and inpatient procedures.	• POC-PCR must be performed just prior (within 24 hrs.) of the surgery.	• None reported.[9]

Jurisdiction	Purpose, Patient Details, Surgery Type	Advised Pre-Operative Investigation	Timing	Outcomes & Recommendations
	chain reaction (PCR) testing in place effective March 17, 2021. • Patient Details: Point-of-care PCR tests are used for patients who have screened negative and are asymptomatic, presenting for all-day surgeries, same-day surgeries and inpatient procedures (includes vaccinated patients). • Patients who meet all three of the following criteria can be treated using routine precautions during aerosol generating medical procedures (AGMPs) in and outside of the operating room (OR) environment: ○ Asymptomatic; ○ Screen negative; and ○ Have a negative POC-PCR.	• POC-PCR has been validated to have similar accuracy to polymerase chain reaction (PCR) testing and will allow rapid testing of all surgical patients just prior (within 24 hrs.) to their surgical or other procedure.		
Ontario Ontario Health	• Purpose: A 2020 Ontario Health guidance document provides recommendations for pre-surgical (non-emergent) and pre-procedural COVID-19 testing.	• Low Transmission Rates: For areas with low community transmission of COVID-19, testing before a scheduled surgery or procedure is not required. • High Transmission Rates: In areas where community transmission of COVID-19 is not low, any patient with a scheduled surgery or procedure should be tested as close as possible to the date of the surgery or procedure, given local testing capacity.	• Tests should be conducted as close as possible to the date of the surgery or procedure, given local testing capacity.	• A regional or sub-regional approach to testing before scheduled surgeries or procedures should be adopted after review of local epidemiology and risk assessment by the COVID-19 Regional or Sub-Regional Steering Committee/Response Table. This approach will take into consideration where the patient has been living as well as the location of the hospital.[28]

Jurisdiction	Purpose, Patient Details, Surgery Type	Advised Pre-Operative Investigation	Timing	Outcomes & Recommendations
International				
United Kingdom National Health Service (NHS)	• Purpose: A 2021 NHS guidance document reports on testing for COVID-19 before a hospital procedure. • Patient Details: The test is suitable for the following people: ○ *Adults aged 18 and over*: Self-test (unless unable to do so); ○ *Teenagers aged 12 to 17*: Self-test with adult supervision; and ○ *Children 11 and under*: Adult to test.	• Tests: Pharyngeal swab (self test).	• Tests must be taken exactly three days before the day of the patient's procedure(s).	• None reported.[29]
United Kingdom	• Purpose: An editorial (2020) in the British Journal of Oral and Maxillofacial Surgery provides recommendations for pre-operative COVID-19 testing in patients planned for surgery.	• Screening Strategy: Before surgery, patients are screened using: ○ PCR test; and ○ Antibody screen. • Patient Management: In case of a positive result in the PCR test: ○ Patients are isolated; ○ National COVID-19 public health protocols are followed (including protocols for exposed staff); and ○ Surgery is postponed.	• 24 hrs. before the surgery.	• Patients who are scheduled for surgery should always be assumed to be potential carriers of the virus throughout the duration of their hospital stay, even if they pass the pre-assessment triage including normal temperature, no history of exposure or travel, and no respiratory symptoms.[10]
Italy San Paolo Hospital, Milan	• Purpose: A 2020 report describes changing surgical unit activity and modifies surgical strategies during the early phase of the pandemic. • Patent Details: All patients undergoing surgery from both	• Screening Strategy: ○ Hospitalized patients were tested with a nasopharyngeal swab and not accepted in the surgical ward before negative results were returned (about 12 hrs).	• Hospitalized patients: 12 hrs. before surgery. • At-home patients: five days before surgery.	• None reported.[8]

Jurisdiction	Purpose, Patient Details, Surgery Type	Advised Pre-Operative Investigation	Timing	Outcomes & Recommendations
	planned list and emergency room access.	○ Patients from home had a nasopharyngeal swab taken about five days before surgery. ○ Before admission, each patient also subscribed a survey to investigate eventual symptoms or contacts with COVID-19 infected, or suspected to be, in the previous 14 days.		
Italy Surgical Department of Academic Hospital of Udine	• Purpose: A 2020 review examined management recommendations for pre-operative, operative, and postoperative surgical activities published in the early phase of the pandemic. • Patient Details: All surgical patients. • Type of Surgery: Testing is recommended in both elective and emergency settings, when possible.	• Screening Strategy: Abdominal CT scans in the emergency setting should be extended to the chest, with an additional COVID-19 nasal swab test.	• Timing and Location of Screening: Screening tests should be performed before admission to prevent viral spread and protect patients from possibly a worse postoperative outcome as a result of concurrent infection.	• None reported.[9]
Italy Reggio Emilia Local Health Authority (LHA) in Emilia-Romagna	• Purpose: A 2020 commentary reported on pre- and post-operative strategies to screen asymptomatic/pre-symptomatic positive patients at pre-hospitalization and patients who become positive in the course of hospitalization. • Patient Details: Cancer surgery patients. • Type of surgery: Non-deferrable elective cancer surgery.	• Screening Strategy: ○ *Five days before admission*: Accurate family and personal history for SARS-CoV-2 infection (e.g., symptoms and signs, contacts with positive persons in the previous 14 days) and physical examination; ○ *Two days before admission*: RT-PCR test, chest x-ray, and laboratory tests. ○ *12 to 14 days after discharge*: RT-PCR test and fecal test.	• See previous column.	• None reported.[11]

Jurisdiction	Purpose, Patient Details, Surgery Type	Advised Pre-Operative Investigation	Timing	Outcomes & Recommendations
		• In case of longer hospitalizations, due to subsequent medical or surgical complications or other reasons, tests would be performed during hospitalization at the discretion or availability by the Surgery Unit or local health authority.		
Germany University Hospital (Wuerzburg)	• Purpose: A 2020 report detailed guidelines to accommodate SARS-CoV-2 infected patients in emergency surgery during early phases of the COVID-19 pandemic. • Guidance: The University Hospital (Wuerzburg) established SARS-CoV-2 and non-SARS-CoV-2 emergency rooms (ERs), a SARS-CoV-2 surgical non-intensive care ward, and a SARS-CoV-2 operating area.	• Screening Strategy: Checkpoints at the entrance of the ER are set up to assess patients for symptoms, provide them with surgical masks before entering the hospital and guide them to COVID or non-COVID areas. • COVID Area: Every patient in the COVID area must be swabbed for SARS-CoV-2 PCR testing. Depending on the test result and further medical/surgical treatment, the patient will then be transferred to spaces that are also separated into SARS-CoV2 or non-SARS-CoV-2 areas: ○ An operation room; ○ Intensive care unit; or ○ Hospital ward. • Assessment: Includes a short questionnaire about: ○ Typical symptoms for COVID-19; ○ Potential contact to SARS-CoV-2 positive tested persons;	• None reported.	• None reported.[7]

Jurisdiction	Purpose, Patient Details, Surgery Type	Advised Pre-Operative Investigation	Timing	Outcomes & Recommendations
		○ Residence in a nursing/senior-citizen home with evidenced outbreak of COVID-19; and ○ Wireless body temperature monitoring.		
Israel				
Israel Ministry of Health	• Purpose: A Ministry of Health document (December 2020) reported that COVID-19 testing is required before elective procedures and surgeries.	• No isolation is required.	• Testing is required 72 hrs. prior to procedure.	• None reported.[12]

Table 3: Scientific Evidence on Pre-Operative COVID-19 Testing (2020-21)

Jurisdiction	Study Purpose, Patient Details	Results	Advised Pre-Operative Investigation	Outcomes: Care Experiences / Costs / Provider Experiences
United States	• Purpose: Summarize institutional protocols for pre-operative COVID-19 testing in elective gynecologic surgery across 10 health care institutions. • Patient Details: Gynecology patients.	• Not reported.	• Timing of Tests: Required time frames for obtaining tests, identified for eight sites, varied: ○ *Time frame for obtaining test*: One to five days before surgery; or ○ *Expiration time for a given test*: Three to five days. • Postponement: Following a positive test result, nine sites required postponement for at least 10 days • Two institutions distinguished between the severity of illness, allowing the surgeries of asymptomatic patients to be rescheduled after 14 days and requiring patients with lower respiratory symptoms to postpone elective surgery for at least 30 to 90 days.	• Potential Outcomes: Repeat COVID-19 testing has potential benefits, including reducing nosocomial transmission or operative complications. However, obtaining persistently positive test results in the absence of symptoms or infective viral shedding may delay needed surgeries and lead to complications from the underlying disease.[30]
Italy University of Padua & National Cancer Institute (University of Milan)	• Purpose: Study (2020) evaluated accuracy of COVID-19 screening protocols for pre-operative assessment for elective surgery. • Patient Details: Head and neck cancer (HNC) patients who were candidates for elective surgery. • COVID-19 Tests: Two patient groups were screened using these tools: ○ *Padua*: Pharyngeal swab (n=41); and ○ *Milan*: Assessment of symptoms	• Padua: The entire sample (100%) was admitted to surgery, diagnostic accuracy was 100%. • Milan: Twenty patients (87%) were negative and were directly admitted to surgery. In the remaining three (13%), a pharyngeal swab was performed. The screening was repeated until a negative chest CT was found. Diagnostic accuracy was 85%.	• None reported.	• Different screening protocols for SARS-CoV-2 infection were effective for pre-operative screening of HNC patients who were candidates for surgery, apparently including only those without COVID-19: ○ Pharyngeal swab alone; or ○ A combination of symptom evaluation, generic blood tests, and chest CT.[1]

Jurisdiction	Study Purpose, Patient Details	Results	Advised Pre-Operative Investigation	Outcomes: Care Experiences / Costs / Provider Experiences
	(i.e., telephone interview), blood test, and chest CT (n=23).			
South Korea Asan Medical Centre (Seoul)	• Purpose: Review both the implementation of a pre-operative screening strategy and the records of patients who had undergone elective or emergency surgery during the first peak of the COVID-19 outbreak (February 23 to May 5, 2020). • Patient Details: Surgical patients.	• Comprehensive pre-operative screening for COVID-19 allowed for safe performance of about 14,000 operations, both elective and emergency, during the peak of the outbreak. • Postponements: 140 patients had their operations postponed following the pre-operative screening process. ○ 116 patients (82.9%) had fever; ○ 16 (11.4%) had other symptoms (cough and sputum); ○ Two patients (1.4%) had suspected pneumonia on chest X-ray; ○ 14 (10.0%) had suspected epidemiological exposures to known cases of COVID-19; ○ 19 (13.6%) had their operation postponed until their RT-PCR results had been made available. • Of the 140 patients with postponed operations, one patient (0.7%) with mild fever and a negative initial RT-PCR result underwent repeated	• Patients were screened by chest X-ray and use of a questionnaire on COVID-19-related symptoms and possible epidemiological links. • Reverse transcriptase–polymerase chain reaction (RT-PCR) testing for SARS-CoV-2 genes in nasopharyngeal swabs was performed in those with symptoms or epidemiological links.	• Costs: The cost of a RT-PCR test for SARS-CoV-2 ranges from CAD $84 to $120 in South Korea. ○ A total of 10,645 pre-operative RT-PCR tests were performed during the study period, costing the hospital approximately CAD $900,000. ○ However, this cost is much lower than the expected loss of CAD $15,000,000 that would have occurred if the operating rooms were to be closed for two weeks due to the nosocomial spread of COVID-19.[2,c]

[c] The commentary reported figures of USD $70, $100, $750,000, and $12,500,000. All Canadian Dollar (CAD) amounts were calculated using Purchasing Power Parities (PPPs) as published by the Organisation for Economic Co-operation and Development (OECD) for 2019 (1 US Dollar [USD] = 1.20 CAD). PPPs are the rates of currency conversion that eliminate the differences in price levels between countries (OECD, 2019).

Jurisdiction	Study Purpose, Patient Details	Results	Advised Pre-Operative Investigation	Outcomes: Care Experiences / Costs / Provider Experiences
		screening due to epidemiological links with a cluster of COVID-19 cases and was later confirmed with COVID-19.		
India Tata Memorial Center	• Purpose: This study analyzed Tata Memorial Center's pre-operative COVID-19 testing strategy, and its impact on staff, patient safety, and the outcomes after definitive cancer surgery. • Patient Details: Asymptomatic cancer patients (n=262).	• Pre-Operative Testing: The final COVID-19 status before surgery was negative in 241 (92.0%) and positive in 21 (8.0%). Of the 241 COVID-19 negative patients: ○ 237 (98.3%) were admitted within 24 hrs. after the results were available (within 48 hrs. after swabbing), and they underwent the pre-planned cancer surgery during the same admission.	• Standard RT-PCR test; • Nasal and oropharyngeal swabbing collected samples.	• Routine pre-operative COVID-19 testing was successful in identifying asymptomatic viral carriers. • There was no incidence of symptomatic COVID-19 disease in the postoperative period, and there was no incidence of morbidity attributable to COVID-19. • These data suggested a beneficial role for mandatory pre-operative COVID-19 testing.[3]
International	• Purpose: Evaluate the association between pre-operative SARS-CoV-2 testing and post-operative pulmonary complications. • Patient Details: Adult patients undergoing elective surgery for cancer.	• Of 8,784 patients (432 hospitals, 53 countries), 2,303 patients (26.2%) underwent pre-operative testing: ○ 1,458 (16.6%) had a swab test; ○ 521 (5.9%) CT only; and ○ 324 (3.7%) swab and CT. • Having at least one negative pre-operative nasopharyngeal swab test was associated with a lower rate of pulmonary complications.	• Nasopharyngeal swab.	• Swab testing was beneficial before major surgery and in areas with a high 14-day SARS-CoV-2 case notification rate, but not before minor surgery or in low-risk areas. • To prevent one pulmonary complication, the number needed to swab test before major or minor surgery was 18 and 48 respectively in high-risk areas, and 73 and 387 in low-risk areas.[4]

Table 4: Guidance for COVID-19 Vaccination and Elective Surgery Across Jurisdictions (2021)[d]

Source	Document Type	Summary
Grey Literature		
• Royal Australasian College of Surgeons. (March 25, 2021). Australian patients should receive COVID-19 vaccine before surgery to reduce risk of postoperative death – study.	• Media release	• Research news based on the recommendations from the COVIDSurg collaborative research team. • Recommends pre-operative vaccination as it may prevent thousands of post-operative deaths linked to SARS-CoV-2, but exact timing of vaccination is not stated. • Vaccination is likely to reduce post-operative pulmonary complications and intensive care interventions.[14]
• Hospital for Special Surgery. COVID-19 Vaccine Webinar FAQs.	• Website	• Patients are advised to get first vaccination at least seven days before surgery and wait until at least seven days post-operatively before getting the second vaccine dose. • Patients need to discuss with surgeons any queries about the timing of pre-surgery vaccination.[18]
• Australasian Society of Clinical Immunology and Allergy. (March 2021). Allergy, Immunodeficiency, Autoimmunity and COVID19 Vaccination Position Statement.	• Position statement	• Patients should be vaccinated one week before major surgery because surgery and vaccination can both cause a fever. • Limited information about whether COVID-19 vaccination can reduce transmission rate of infection. • Vaccinated patients are advised to continue practicing precautionary measures.[22]
• Australasian Society of Aesthetic Plastic Surgeons. (February 2021). COVID vaccination and elective cosmetic surgery – timing is everything.	• Website	• Guidelines from the Australasian Society of Aesthetic Plastic Surgeons recommend: ○ Vaccination should occur at least one week before cosmetic surgery so that vaccine-related symptoms can be identified. ○ Vaccination should be delayed post-operatively until an individual is fully recovered.[21]
• Royal College of Surgeons of England. (January 22, 2021). Vaccinated patients guidance.	• Endorsed statement	• Strongly recommends pre-operative vaccination though there is no policy for prioritizing pre-operative vaccination. • Emergency surgery should occur irrespective of COVID-19 immunization status. • Elective surgery can take place soon after vaccination, by a few days or at most one week, so that any vaccine-related adverse symptoms may be identified.[16]
• Balzer, D. (February 2021). Common Questions About COVID-19 Vaccinations Answered. *Mayo Clinic.*	• Website	• Recommends patients to get vaccination one week before surgery. This is particularly important after the second vaccine administration because approximately 15% of people will experience a fever after the second dose of vaccines. • Vaccinated patients are advised to continue practicing safety precautions due to the unknown efficacy of vaccine.[17]

[d] This table was reproduced, in full, from: COVID-19 Critical Intelligence Unit. (May 2021). COVID-19 Vaccine and Elective Surgery. NSW Government.

Table 5: Scientific Evidence on COVID-19 Vaccination and Elective Surgery[e]

Source	Document Type	Summary
Peer Reviewed Sources		
• El-Boghdadly, et al. (2021). SARS-CoV-2 infection, COVID-19 and Timing of Elective Surgery. *Anaesthesia, 76*, 940-946.	• A consensus statement from multiple medical associations and colleges in United Kingdom: anaesthetists, surgical and perioperative care	• Patients with persistent COVID-19 symptoms are at risk of post-operative morbidity and mortality even after seven weeks. • Recommendations for timing of surgery in people with COVID-19 symptoms: ○ Patients with SARS-CoV-2 infection should not be scheduled to receive surgery within seven weeks, unless deferring surgery outweighs the risk of postoperative morbidity or mortality. ○ Patients who may be infectious should have their surgeries deferred for 10 days after mild or moderate disease, and 15-20 days after severe disease. ○ Severely immunosuppressed patients should seek specialist advice before elective surgery. • Shared decision-making regarding timing for surgery after COVID-19 infection should consider each individual's clinical context and complexity of surgery. • Vaccinating patients several weeks before surgery will reduce risk to both patients and health care professionals.[19]
• COVIDSurg Collaborate and GlobalSurg Collaborate, (2021). SARS-CoV-2 Vaccination Modelling for Safe Surgery to Save Lives: Data from An International Prospective Cohort Study. *British Journal of Surgery*.	• Study	• This study informed prioritization of allocation of COVID-19 vaccine by modelling the impact of vaccination on mortality in patients undergoing elective surgery. • Data from 56,589 patients were analysed based on their postoperative COVID-19 infection and related mortality. • Results: Global prioritization of pre-operative vaccination for elective surgical patients could prevent an additional 58,687 COVID-19-related deaths in one year. • Patients who develop COVID-19 infection are at four to eight times higher risk of death in the 30 days after surgery. • Fewer people need to be vaccinated to prevent one death in surgical patients than in the general population. • Findings support the prioritization of vaccinating patients aged ≥70 years and other high-risk groups before elective surgery.[6]
• Lentine, et al. (2021). Practicing with Uncertainty: Kidney Transplantation During the COVID-19 Pandemic. *American Journal of Kidney Disease, 77* (5), 777-785.	• Commentary	• Kidney donors and transplant recipients are recommended for COVID-19 vaccination three to four weeks before surgery. • The risk of vaccine-induced 'allosensitization' is unknown, and impact on the final crossmatch should be monitored.[20,f]

[e] This table was reproduced, in full, from: COVID-19 Critical Intelligence Unit. (May 2021). COVID-19 Vaccine and Elective Surgery. NSW Government.
[f] Allosensitization typically results from exposure to 'nonself' human proteins through transfusion of cellular blood products, pregnancy, or prior organ transplantation.[31]

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