Trauma Services B.C.

CLINICAL GUIDELINE
Recommendations for Major Trauma Management During the COVID-19 Pandemic

April 16, 2020

These recommendations have been developed to provide rapid guidance on major trauma management to trauma receiving hospitals in the B.C. during the COVID-19 pandemic. As new knowledge and updated guidelines, procedures and protocols from authoritative sources become available, it is anticipated that recommendations for major trauma care may evolve. In this event, these guidelines will be updated accordingly.

B.C. Trauma Medical Directors Group
4-16-2020

TABLE OF CONTENTS

ACKNOWLEDGMENTS 2

PREAMBLE 3

PRINCIPLES 3

SUMMARY OF RECOMMENDATIONS (ABBREVIATED) 4

ALGORTHM – INITIAL MANAGEMENT OF MAJOR TRAUMA 6

ALGORITHM – APPROACH TO MAJOR TRAUMA AFTER EMERGENCY ROOM MANAGEMENT OR SURGERY 7

COVID-19 TRANSMISSION 8

RECOMMENDATIONS 9

REFERENCES 16

APPENDICES

1. Major Trauma Definition 18
2. Aerosol Generating Medical Procedures 19
3. BC CDC Protocol for Surgical Patients 20
4. Adult CPR Protocol for Suspect and Confirmed COVID-19 Cases 22
5. Intubation Checklist for Suspect and Confirmed COVID-19 Cases 24
6. National Emergency Blood Management Guidelines 26
7. Chest CT findings related to COVID-19 28

ACKNOWLEDGEMENTS

GUIDELINE DEVELOPMENT GROUP

David Evans, MD, Provincial Medical Trauma Director, Trauma Services B.C. (Lead)

Trauma Services B.C. Regional Trauma Medical Directors Group
Hazel Park, MD, Regional Trauma Medical Director, Vancouver Coastal Health
Hans Cunningham, MD, Trauma Medical Director, Island Health
Heather Wilson, MD Trauma Medical Director, Interior Health
Naisan Garraway, MD, Trauma Medical Director, Vancouver General Hospital
Gen Ernst, MD, Trauma Medical Co-Director, B.C. Children's Hospital

CONTRIBUTORS

Micheline Wiebe, Provincial Director, Trauma Services, B.C.
Jo Ann, Hnatiuk, RN, BScN, Lead, Clinical Initiatives and Programs, Trauma Services B.C.

Titus Wong, MD
Regional Medical Director, Infection Prevention and Control, Vancouver Coastal Health

Andrew Shih, MD, FRCPC, DRCPSC, HRM MSc
Medical Director/Regional Medical Leader, Transfusion Medicine, Vancouver Acute/Vancouver Coastal Health Authority

Dr. Savvas Nicolaou, MD
Professor of Radiology / Vice Chair of CPD & Education, Director of Emergency / Trauma Imaging, VGH

Philip Yoon, MD, MBA, CCFP (EM), FCFP
Medical Director, EMS Physicians Online Support (EPOS) BC Emergency Health Services

Don Griesdale, MD MPH
Critical Care Medicine, Associate Vice President, Medicine, Quality & Safety, Vancouver Coastal Health

Vancouver General Hospital Trauma Surgery
Philip Dawe, MD
Emilie Joos, MD
Harvey Hawes, MD

Vancouver General Hospital Emergency Medicine
Jan Trojanowski, MD
Wilson Wan, MD
Robert Gooch, MD

VGH Trauma Nursing
Nasira Lakha, RN, Trauma Program Manager, Vancouver General Hospital
Angie Brisson, RN, Trauma Program Coordinator, Vancouver General Hospital

PREAMBLE

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic currently threatening communities around the world is reasonably expected to infect 30-70% of affected populations, cause severe respiratory illness requiring hospitalization in up to 10%, and result in death in approximately 1%. In these early days, the trajectory of pandemic's impact cannot be predicted and mindful caution must be exercised as the health system adjusts to manage the influx of new patients while maintaining continued services, particularly for urgent conditions. While the trauma system should continue to function as usual in providing optimal care to severely injured patients[1,2], it is important that providers make every reasonable effort to mitigate risk to themselves, their colleagues, their patients and the system in which they work during trauma team activations.

These recommendations are advanced by the Regional Trauma Medical Directors Group of Trauma Services B.C. to outline preferred practice of trauma teams in the initial assessment and management of major trauma presenting in trauma referral centres across British Columbia during the Covid-19 pandemic. **These guidelines are predicated on the assumption that all trauma patients potentially pose a risk of COVID-19 transmission.** The aim of these recommendations is to minimize the risk of unnecessary COVID-19 exposure, preserve workforce, resources, supplies and equipment, and maintain acceptable standards of care for major trauma patients. These guidelines focus on the provision of emergent clinical care to adult and pediatric trauma presenting for emergency care and are intended to complement existing institution-based practice changes enacted in response to the coronavirus pandemic. A number of existing guidelines and protocols have been considered in the creation of these recommendations.

PRINCIPLES

1. Protect the patient
2. Maintain an acceptable standard of care
3. Manage the risk of COVID-19 transmission
4. Protect workforce
5. Minimize contamination of shared spaces
6. Minimize contamination of equipment
7. Preserve critical supplies
8. Anticipate the need for surge response planning
9. Ethical approach to rationing

SUMMARY OF RECOMMENDATIONS (ABBREVIATED)

1. The provincial trauma system should continue to function by usual processes.

2. Major trauma patients arriving in the emergency department who will likely require AGMP should be directed to a negative pressure isolation area if available and if appropriate for care, otherwise use a private resuscitation room/area. Initial management should be by an attending trauma team observing PPE appropriate for AGMPs. Gloves, gown, N95 respirator and face shield/goggles must be worn.

3. All providers involved in the care of major trauma must be familiar with institutional infection control practices and successfully complete N95 respirator fit testing.

4. Where access to a negative pressure isolation area is limited or PPE for airborne transmission is rationed, major trauma patients arriving to ED should be immediately triaged by an emergency physician or similarly qualified provider to a low risk or high risk response for initial assessment and management.

5. A low risk response directs patients who are stable, alert and cooperative with no clear need for AGMP (intubation, chest tube) to initial management with contact and droplet precautions in an appropriate assessment area. Negative pressure isolation is not required.

6. A high risk response directs patients who are unstable, agitated, uncooperative, have a potential lung injury open to the environment, have high oxygen requirements, demonstrate altered LOC, or are likely to need an urgent high-risk AGMP (intubation, chest tube) to initial management in a negative pressure isolation area (if available) with a minimized trauma team of experienced personnel. Appropriate PPE must be worn, specifically gloves, gown, N95 respirator and face shield/goggles.

7. Strategies to preserve and protect supplies, equipment and personnel should be implemented.

8. Diagnostic and other procedures unlikely to direct decision making should not be performed.

9. Acceptable standards of care should be pursued, although consideration should be given to modifying procedures (as per established guidelines) that pose a high risk for airborne transmission (CPR[7], intubation[8]) and/or forgoing those that offer negligible benefit (ED thoracotomy in blunt trauma).

10. Blood conservation strategies should be pursued and platelets and O-negative red cells used sparingly. Fibrinogen concentrate is preferred to cryoprecipitate when required and where available.

11. During periods of constrained blood product, triage exclusion criteria for the initiation of massive transfusion based on negligible likelihood of favourable outcome should be applied.

12. Trauma receiving sites should remain up to date on advisories from the National Emergency Blood Management Committee and Canadian Blood Services.

13. If CT imaging will be performed in the assessment of adult major trauma, whole body CT is recommended to simplify and expedite diagnostic work up and disposition planning. In pediatric patients, usual imaging practices aimed at minimizing radiation exposure should pertain.

14. Reporting on chest CT, if performed, should include comment on whether findings are compatible with COVID-19 pneumonia using standard language.

15. Usual definitive care should continue to be provided to major trauma patients managed within the trauma system. Operative care should be conducted respecting institutional operating room policies regarding COVID-19 risk management which currently includes gloves, gown, N95 respirator and face shield/goggles for all surgical procedures.

16. Once stabilized and controlled, with or without intubation, disposition to inpatient care after initial management and/or surgery should be determined by risk assessment for COVID-19 (if able). **Admitted major trauma patients should continue to be managed under contact and droplet precautions with relocation to a private room wherever possible.** As for surgical procedures, further AGMP's in any patient, if required, should ideally be performed in a negative pressure room or as per health authority procedure with appropriate PPE, namely gloves, gown, N95 respirator and face shield/goggles.

17. In the event of a need for resource rationing, hospitalized high-risk major trauma patients should undergo re-assessment to determine risk for COVID-19 transmission and need for isolation and PPE based on institutionally approved guidelines involving clinical screening, laboratory testing (NP swab on admission), chest CT imaging, etc.

18. Authoritative guidelines on the ethical restriction of usual care should be consulted in the event of a need for resource rationing that impacts importantly on patient outcomes, particularly survival.

19. Structured on-site team-based interdisciplinary simulation exercises should be planned and undertaken regularly to consolidate COVID-19 modified approaches to trauma management.

20. Coordinated surge capacity planning to support emergency trauma care should be undertaken and implemented if demand for clinical care will exceed the availability of resources.

The Initial Management of Major Trauma
COVID-19 Response

TRAUMA SERVICES BC
Provincial Health Services Authority

Practice Guideline Recommendations
Initial Management of Major Trauma

All major trauma patients presenting to ED

- assumed to be COVID-19 carriers
- rapid triage at entry to a **LOW** or **HIGH RISK** tiered management response based on risk of transmission by assessing:
  - community prevalence of COVID-19
  - likelihood of aerosolization during initial management
  - clinical screening, if feasible
- **HIGH RISK** patients to negative pressure isolation
- Consider COVID-19 testing after initial management if results will direct approach to ongoing care.

Two-Tiered Response for Initial Management of Major Trauma	
Low Risk of Aerosolization • Physiologically stable • Controllable and cooperative • Low probability of AGMP	**Contact + Droplet precautions** • Gown, gloves, eye/face protection • Surgical mask • Patient masked if able, especially if coughing
High Risk of Aerosolization • Physiologically unstable • Uncontrollable or agitated • Altered level of consciousness (GCS<15) • High probability of AGMP	**Contact + Airborne Precautions** **Negative pressure Isolation** • Scrubs • Gown, gloves, eye/face protection • N95 respirator (with confirmed fit test) • AGMP by most experienced • Essential personnel only • Essential procedures only

- **High risk response**: smallest, most experienced team possible
- All providers familiar with PPE and local infection control policies
- Forgo procedures and tests unlikely to inform decision making
- Preserve and protect critical supplies
- Minimize unnecessary contamination of equipment
- Maintain a reasonable standard of care consistent with system need

The Initial Management of Major Trauma
COVID-19 Response

TRAUMA SERVICES BC
Provincial Health Services Authority

Practice Guideline Recommendations

Approach to Major Trauma after ED Management or Surgery

To determine appropriate disposition following initial management in ED and/or surgery

If COVID-19 risk for transmission is KNOWN

High Risk for transmission → Isolation + contact and droplet precautions
- Confirmed case (positive test result)
- Suspected case (symptomatic for COVID-19, close contact of a confirmed case, or returning traveller)

Low Risk for transmission → Usual non COVID-19 care area + precautions based on individual patient considerations
- Not a suspected case (asymptomatic, not a close contact of a confirmed case, not a returning traveller; with or without a negative test result)

If COVID-19 risk for transmission is UNKNOWN

- Assess COVID-19 risk based on available information
  - symptomatic for COVID-19, suspect or confirmed case, close contact of a confirmed case, or returning traveller
  - CT chest findings
  - Negative test result is insufficient to consider low risk if risk features are unable to be assessed
- **If remains Unknown → isolation + contact and droplet precautions**

<table>
<tr><th colspan="4">Recommended Approach to Major Trauma Care after ED Management or Surgery</th></tr>
<tr><th rowspan="2">RISK OF COVID-19 TRANSMISSION</th><th rowspan="2">COVI9-19 TEST RESULT</th><th colspan="2">DISPOSITION TO APPROPRIATE INPATIENT UNIT</th></tr>
<tr><th>ISOLATION REQUIRED</th><th>HEALTH CARE WORKER PPE</th></tr>
<tr><td><u>HIGH RISK</u>
• CONFIRMED CASE</td><td>POSITIVE</td><td rowspan="3">YES</td><td rowspan="3">DROPLET AND CONTACT</td></tr>
<tr><td><u>HIGH RISK</u>
• SYMPTOMATIC
• RETURNING TRAVELLER
• CLOSE CONTACT
• CT CHEST SUSPICIOUS</td><td rowspan="3">UNAVAILABLE OR NEGATIVE</td></tr>
<tr><td><u>UNKNOWN RISK</u>
• UNABLE TO ASSESS</td></tr>
<tr><td><u>LOW RISK</u>
• ABOVE HIGH RISK FEATURES ARE ABSENT</td><td></td><td>NO</td><td>ROUTINE PRECAUTIONS</td></tr>
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COVID-19 TRANSMISSION

COVID-19 is transmissible by **droplet spread** of secretions from the lungs and airways of infected patients, and via direct and indirect contact with surfaces contaminated by droplets from infected patients, notably by inadvertent hand-to-face transmission. Contact and droplet precautions are therefore sufficient to prevent transmission in these instances.

Transmission can also occur via **airborne spread** of aerosolized secretions. A natural cough is not an AGMP. If the cough is assisted by a manual thrust (manual cough assist) or using a cough assist machine (MI-E), it then becomes an AGMP. Infected patients undergoing **aerosol generating medical procedures (AGMP)**[3] present a high risk of transmission. Precautions using gloves, gown, face shield/goggles and an **N95 respirator** or other appropriate device are required to minimize the chance of transmission. Major trauma patients frequently present an urgent need for AGMP during initial management. Common at-risk procedures include: intubation/extubation, laryngoscopy/bronchoscopy, chest tube insertion or emergency thoracotomy (particularly with open lung laceration) and cardiopulmonary resuscitation (CPR).

COVID-19 is not spread through contact with blood or urine. While SARS-CoV-2 is possibly shed in feces, the risk of transmission by this route is unknown. It is also not known whether SARS-CoV-2 is shed in CSF. It is known that there is significant environmental contamination with SARS-Cov-2 for both symptomatic and asymptomatic COVID-19 patients, therefore the use of additional precautions including hand washing with soap and water or an alcohol-based hand rub (ABHR) is essential to prevent transmission.

A rapid assessment of the risk of COVID-19 transmission should be made before initial management of the major trauma patient so that appropriate protective measures can be instituted prior to direct contact, namely directing the patient to a negative pressure isolation area if available. Otherwise patients should be managed using contact and droplet precautions. The risk of COVID-19 transmission is determined by:

1. The probability that the patient is infected or contaminated (community prevalence); and
2. The probability that the patient will liberate aerosolized viral particles through laboured breathing, open exposure of injured lung, or the need for an urgent AGMP.

Because routine screening for COVID-19 is not feasible at initial presentation, it is presently prudent to consider major trauma patients COVID-19 positive on arrival in emergency. Consequently, because they require inter-facility transfer in 40-50% of cases, interface with many consulting teams, access multiple hospital areas (ED, OR, ICU, radiology), need urgent AGMP's (intubation, suctioning, NIPPV), and commonly require one or more planned surgical or radiologic procedures[4], major trauma patients pose an elevated transmission risk if carriers prior to injury. For this reason, sound strategies are needed to determine when to rescind maximal precautions against viral transmission. This will be based on institutionally recognized expert consensus around algorithms assimilating information on community prevalence, screening effectiveness, test availability, test characteristics (eg. sensitivity, specificity and pre/post-test probability) and, most importantly, the need to ration services due to overwhelming

demand for care. At the time of release, it should be stated that a negative result of COVID-19 laboratory testing is not sufficient to assure providers that the risk of exposure is negligible, especially if AGMP's are to be undertaken. As testing tools evolve, this consideration may change.

RECOMMENDATIONS

1. The provincial **trauma system should continue to function according to established processes** and protocols (triage, transport[5], referral patterns, care standards) with local modifications implemented to reduce COVID-19 transmission as recommended by appropriate authorities.

2. It is recognized that trauma teams may struggle with a difficult choice of an enhanced location for infection control (a negative pressure room) which may have limitations for trauma resuscitations, versus a trauma resuscitation space which better serves patient acuity. Major trauma patients arriving in the emergency department who will likely require AGMP should be directed to a negative pressure isolation area if available and if appropriate for care, otherwise use a private resuscitation room/area. Initial management should be by an attending trauma team observing PPE appropriate for AGMPs which comprises gloves, gown, face shield/goggles and a **N95 respirator** or other appropriate device must be worn.

3. All **Trauma Team members must be familiar with institutional infection prevention and control practices** [6], including risk assessment, implementation of appropriate protection, and proper personal protective equipment (PPE) donning/doffing procedures. Also, providers should successfully complete N95 respirator fit testing prior to participating in the initial management of major trauma.

4. Where access to a negative pressure isolation area is limited or PPE for airborne transmission is rationed, major trauma patients arriving to ED should be immediately triaged by an emergency physician or similarly qualified provider to a **low risk or high risk response** for initial assessment and management.

5. A **low risk** response directs patients who are stable, alert and cooperative with no clear need for AGMP (intubation, chest tube) to initial management with contact and droplet precautions in an appropriate assessment area. Negative pressure treatment area is not required.

6. A **high risk** response directs patients who are unstable, agitated, uncooperative, have a potential lung injury open to the environment, have high oxygen requirements, demonstrate altered LOC, or are likely to need an urgent high-risk AGMP (intubation, chest tube) to initial management in a negative pressure isolation area (if available) with a minimized trauma team of experienced personnel. Appropriate PPE must be worn, specifically gloves, gown, N95 respirator and face shield/goggles.

The following additional measures are recommended during a **High Risk** response:

a. Only a small group of highly experienced providers should initiate initial management; the initially responding trauma team should include:

   - Trauma team leader (Emergency physician)
   - Trauma surgeon (if available) or second emergency physician
   - Trauma nursing staff (lead and bedside)
   - Respiratory therapist

b. Clear leadership by the Trauma Team Leadership (TTL) is paramount
c. Consultation should be limited to immediately essential specialists
d. The role of trainees or inexperienced personnel should be minimized

Two-Tiered Response for Initial Management of Major Trauma	
Low Risk Response • Physiologically stable • Controllable and cooperative • Low probability of AGMP	**Contact + Droplet precautions** • Gown, gloves, eye/face protection • Surgical mask • Patient masked if able, especially if coughing
High Risk Response • Physiologically unstable • Uncontrollable or agitated • Altered level of consciousness (GCS<15) • High probability of AGMP	**Droplet + Contact + Airborne Precautions; Minimize exposure** • Scrubs • Gown, gloves, eye/face protection • N95 respirator (with confirmed fit test) • Negative pressure isolation • AGMP by most experienced • Essential personnel only • Essential procedures only

7. **Efforts should be made to preserve and protect supplies**. In order to prevent potential contamination of unused supplies, consideration should be given to the use of a mobile dispensing cart staffed by a single 'runner' to hand off supplies needed by the Trauma Team, particularly in high risk cases.

8. In an effort to limit the use and cleaning of equipment, diagnostic and other procedures unlikely to direct decision making should not be performed. In particular, if CT imaging is to be undertaken promptly**, commonly performed bedside diagnostic tests (eFAST, CXR, pelvic XR) should be omitted** at the discretion of the TTL.

9. **Procedures during trauma resuscitation:** Every effort should be made to maintain a reasonable standard of care in the conduct of major trauma resuscitations. In order to mitigate the risk of COVID-19 transmission and limit wasted resources, however, strong consideration should be given to modifying procedures that are high risk and forgoing those that offer negligible benefit during the initial management of major trauma.

    a. Cardiopulmonary Resuscitation (CPR) [7]

        i. CPR should not be performed in acute major trauma (blunt or penetrating), unless a medical event such as dysrhythmia, myocardial infarction or pulmonary embolism may have directly preceded or precipitated the injury.

        ii. If undertaken, CPR should be conducted according to modified guidelines which include the following:

            - Do not manually ventilate or commence chest compressions until responding providers are protected with contact and airborne PPE.
            - Position a BVM with high efficiency hydrophobic filter or other clear plastic cover over the airway to passively oxygenate, but do not ventilate before starting chest compressions.
            - Intubation should be performed by the most experienced provider using video laryngoscopy if available.
            - Gloves, gown, face shield/goggles and a **N95 respirator** or other appropriate device must be worn
            - Clamp ETT if circuit if disconnect is required (ie. for suctioning, transport).

    http://www.bccdc.ca/Health-Info-Site/Documents/COVID_Adult_CPR_Protocol.pdf

    b. **Intubation / Extubation** [8,9]

        i. Adopt a lower threshold for early intubation in patients likely to require it (elderly with multiple rib fractures) in order to promote early containment of aerosolization.

        ii. Considerations regarding indications for intubation include:
            - Obvious airway compromise
            - Respiratory distress with a moderate-high probability of intubation or need for extensive supportive pulmonary care (eg. rib fractures) utilizing non-invasive positive-pressure ventilation (NIPPV).

- Agitation impeding care or posing a high risk of aerosolization
- Severe uncontrollable pain

iii. Intubation should be performed by the most skilled operator available with the following recommendations when COVID-19 infection is proven or suspected:

- Gloves, gown, face shield/goggles and a **N95 respirator** or other appropriate device must be worn
- Negative pressure isolation room
- Rapid sequence intubation (full dose paralytic)
- Video laryngoscopy
- Avoid high-flow 02 (BIPAP, nebulizers, high-flow nasal 02 (>6L/min))
- Non-critical staff excluded
- Avoid bagging
- Avoid prolonged intubation attempt
- Avoid open circuit
- PPE not to be worn outside room

http://www.bccdc.ca/Health-Info-Site/Documents/Intubation-Checklist-COVID-19.pdf

c. Emergency room thoracotomy (ERT)

i. **Adopt the higher acceptable threshold** for emergency room thoracotomy to limit exposure for procedures with very low probability of benefit
   - Penetrating trauma - loss of vital signs within 15 minutes
   - Blunt trauma – no indication

d. Surgical airway

i. As for intubation, emergent or planned surgical airway access should be performed by the **most experienced operator** available with gloves, gown, face shield/goggles and a **N95 respirator** or other appropriate device worn.

e. Chest tube insertion

i. Thoracostomy drain insertion should be considered an AGMP, especially if associated with open lung injury. Positive pressure ventilation further elevates this risk.

ii. All chest drains should connect to a closed system, with brief tube clamping if the circuit is temporarily interrupted.

iii. Pigtail chest drainage is preferred for management of pneumothoraces without hemothorax in stable patients.

f. Wound management
   i. Open and bleeding wounds do not require airborne precautions when actively managed.

g. Procedural sedation
   i. Procedural sedation in suspect or confirmed COVID-19 patients should be managed anticipating potential need to intubate and appropriate precautions taken as noted above.

10. Because of the reduced availability of blood products, **blood conservation strategies** should be pursued aggressively. A group and screen should be obtained as soon as possible, even after transfusion. O-negative red blood cells should only be used for women of childbearing potential with an unknown blood group and/or known O-negative patients. Platelet transfusion should be goal directed as soon as possible. Fibrinogen concentrate is preferred to cryoprecipitate when required and where available.

11. It is strongly recommended that during periods of constrained blood product availability (especially Red Advisory Phase for Blood Products), **triage exclusion criteria for the initiation of massive transfusion** based on negligible likelihood of favourable outcome should be applied in collaboration with the local blood bank which can redirect provincial blood supply.

12. Trauma receiving sites should **remain up to date on advisories** from the National Emergency Blood Management Committee and Canadian Blood Services through regional transfusion services. [10]

13. If CT imaging will be performed in the assessment of adult major trauma, **whole body CT (WBCT) is recommended** to simplify and expedite diagnostic work up and disposition planning. In pediatric patients, usual imaging practices aimed at minimizing radiation exposure should pertain.

14. If CT imaging will be performed, it is recommended that any included **CT chest be evaluated for radiologic findings compatible with COVID-19 pneumonia** [11,12]. While major trauma patients frequently present with pulmonary consolidation of numerous causes, recent information suggests that typical findings increase the probability of accurately discerning the presence of COVID-19 infection when taken in clinical context. Radiologists are urged to report on the appearance of pulmonary findings in terms of their specificity for COVID-19 pneumonia using standard language recommended by the Radiologic Society of North America (see references)

which describes findings as typical, atypical, indeterminate and negative for COVID-19 pneumonia.

15. Usual definitive care should continue to be provided to major trauma patients managed within the trauma system. Non-urgent care should be deferred where there will be minimal impact to patient outcomes in accordance with institutional policies. Operative care should otherwise continue as required respecting institutional operating room policies regarding COVID-19 management. At present, it is strongly recommended that intubation, all surgical procedure and extubation follow *the IPC Algorithm for Operative Management of Adult and Older Adult Surgical Patients during COVID-19 Pandemic* [13]. Currently, this includes the use of gloves, gown, N95 respirator and face shield/goggles for all surgical procedures.

    Thoracic, tracheobronchial, oropharyngeal and craniofacial procedures should be considered highest risk for airborne viral transmission. Operative bleeding in and of itself should be considered a negligible risk for viral transmission. Exposure to the open gastrointestinal tract poses an uncharacterized risk of transmission given reports of viral shedding into feces. As there exist concerns about pneumoperitoneum-induced aerosolization, laparoscopic surgery with any possibility of enteric breach should also be considered an elevated risk for transmission that warrants the use gloves, gown, face shield/goggles and a N95 respirator or other appropriate device.

16. Once stabilized and controlled, with or without intubation, disposition to inpatient care after initial management and/or surgery should be determined by risk assessment for COVID-19 (if able). Admitted major trauma patients should ideally continue to be managed under contact and droplet precautions with relocation to a private room wherever possible. Patients considered high likelihood for COVID-19 are those who are a suspect or confirmed COVID-19 (if previously tested positive) case, a close contact with a confirmed case, a returning traveler, those patients with recent respiratory or gastrointestinal symptoms suggestive of COVID-19, however mild, and patients with CT chest findings consistent with COVID-19 pneumonia. These patients, and those unable to be risk assessed, should be managed with droplet and contact precautions in an isolation room or private room.

    Patients considered low likelihood to have COVID-19 do not require isolation nor testing and can be transferred to an appropriate non COVID -19 inpatient unit. They do not require isolation if unavailable and may be managed using routine precautions as judged appropriate for clinical condition (see p 7). Routine COVID-1 9 testing should only be carried out as directed by institutional policy. Negative testing should never be considered definitive without correlative risk assessment. If testing is done it should not delay treatment or transfer to an inpatient unit.

    As for all surgical procedures, further AGMP's in any patient, if required, should ideally be performed in a negative pressure room or as per health authority procedure with appropriate PPE, namely gloves, gown, N95 respirator and face shield/goggles.In low-risk patients, an AGMP

conducted under high-risk precautions does not require ongoing isolation and N95 respirator use once the procedure is safely completed, nor is COVID-19 testing required to determine subsequent disposition.

17. **In the event of a need for resource rationing**, hospitalized high-risk major trauma patients should undergo re-assessment to determine risk for COVID-19 transmission and need for isolation and PPE based on institutionally approved guidelines involving clinical screening, laboratory testing (NP swab on admission), chest CT imaging, etc.

18. In the event of severe resource rationing likely to impact clinical outcomes, and particularly patient survival, authoritative **guidelines on the ethical restriction of usual care** should be consulted.

19. Structured team-based **interdisciplinary simulation exercises** should be planned and undertaken regularly on site to consolidate COVID-19 modified approaches to trauma management.

20. **Coordinated surge capacity planning** to support emergency trauma care should be undertaken and implemented if clinical demand for care is anticipated to severely exceed resource availability and overwhelm the health care workforce. At the direction of local emergency departments, contingency measures to offload trauma team leadership responsibility to appropriately skilled physicians (surgeons, anesthetists, intensivists, etc.) should be implemented. Planning should include measures to update or upgrade skills, support performance, facilitate credentialing and manage liability.

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13. IPC Algorithm for Operative Management of Adult and Older Adult Surgical Patients during COVID-19 Pandemic April 5, 2020

APPENDIX 1 MAJOR TRAUMA DEFINITION

Physiologic Criteria

- Adult
  - GCS ≤ 13; SBP < 90; RR < 10 or > 30
- Pediatric
  - Abnormal vital signs for age; need for ventilatory support

Anatomic Criteria

- Open or depressed skull fracture
- New paralysis or neurological deficits
- Major penetrating injury (head, neck, torso and extremities proximal to elbow or knee)
- Facial injury with potential airway compromise
- Chest wall instability or deformity (e.g. flail chest)
- Two or more proximal long-bone fractures
- Crushed, de-gloved, mangled or pulseless extremity
- Amputation proximal to wrist or ankle
- Mechanically unstable pelvic fractures
- Major burn

Mechanism Criteria

- High fall
  - Adults (6 metres)
  - Pediatric (3 metres)
- High risk automobile crash
  - Compartment intrusion; Ejection; Occupant death
- Auto vs Pedestrian/Cyclist
- Motorcycle crash

Special considerations

- Age
  - Adult > 55
  - Children
- Anticoagulation
- Pregnancy > 20 weeks
- Clinical judgment

http://www.phsa.ca/our-services-site/Documents/Pre-hospital%20Triage%20and%20Transport%20Guidlines.pdf

APPENDIX 2 AEROSOL GENERATING MEDICAL PROCEDURES

Aerosol Generating Medical Procedures include:

High risk

1. Bag mask ventilation
2. Endotracheal intubation and extubation
3. Surgical airway (cricothyrotomy)
4. Laryngoscopy
5. Bronchoscopy
6. Positive pressure ventilation (BiPAP & CPAP)
7. Chest drain insertion
8. Thoracotomy

Other

9. Airway suctioning
10. High-flow oxygen (including single and double O2 set ups, Optiflow and Airvo)
11. Breaking closed ventilation system, intentionally (e.g., open suctioning), unintentionally (e.g., patient movement)
12. Cardio-pulmonary resuscitation (CPR)
13. Tracheostomy care
14. Chest physiotherapy (manual and mechanical cough assist device (MI-E))
15. Administration of aerosolizing or nebulizing medications
16. Naso/orogastric tube insertion

From

Vancouver Coastal Health Infection Prevention and Control Committee Best Practice Guideline / Aerosol Generating Medical Procedures
http://ipac.vch.ca/Documents/Acute%20Resource%20manual/Aerosol%20Generating%20Medical%20Procedures.pdf

APPENDIX 3 BC CDC ADULT CPR PROTOCOL FOR SUSPECT AND CONFIRMED COVID-19 CASES

Adult CPR Protocol for Suspect and Confirmed Cases of COVID-19

March 31, 2020

***For Critical Care Managed Codes (local practice may differ – refer to your local protocol)**

General Principles:

- The charts of **suspect** and **confirmed** cases of COVID-19 should be clearly labelled.
- If CPR is deemed appropriate, **immediately consult ICU team** for all suspect and confirmed cases of COVID-19 with clinical deterioration.
- Perform Advanced Cardiac Life Support (ACLS) with modifications as outlined below.
- Procedures such as **intubation, bag mask ventilation and chest compression** are considered aerosol generating medical procedures (AGMP) and as such require appropriate airborne precautions and PPE. (http://www.bccdc.ca/Health-Info-Site/Documents/Respiratory-protection-COVID19.pdf).
- If a patient suffers a **cardiac arrest during intubation,** secure the airway **prior** to initiating chest compressions and rapid identification of VT/VF.

Assessment	
Initial exam to confirm if a code blue should be activated	• DON appropriate PPE **prior to patient contact** • Visually inspect for absence of signs of life (respiratory effort/chest rise) • Do **not** auscultate for breath sounds or listen/feel for breath sounds • Palpate femoral or brachial pulse to confirm cessation of cardiac activity • Do **not** bag mask ventilate patient • Cover airway with BVM plus high efficiency hydrophobic filter or clear plastic cover or facemask **THEN** initiate chest compressions • Communicate CODE status and COVID-19 status to code team
Code Team	
Team Members/Role	• 1 RT, 2 Code RN, Physician team leader, airway expert (where available) • Airway to be managed by best possible operator (staff anesthetist - first choice; ICU staff, ERP, fellow, or clinical associate if anesthetist unavailable) • Code team to don airborne PPE prior to entering room • If available, one additional physician or RN to be outside the room donned in PPE as backup if needed

APPENDIX 3 BC CDC ADULT CPR PROTOCOL FOR SUSPECT AND CONFIRMED COVID-19 CASES (CONT)

	• Minimize code team personnel
ACLS Management	
Considerations to protect against virus transmission	• Early defibrillation may prevent need for airway and ventilator support • Team to consider **not initiating resuscitation if concern of futility** • Place BVM with high efficiency hydrophobic filter interposed between mask and Ambu bag on patient ASAP→ **do not ventilate patient** • Airway management by expert, video laryngoscopy preferred • **Pause** CPR for intubation • Consider **early application of LUCAS device** to limit staff exposure if available • Clamp ETT prior to circuit disconnect/connecting to ventilator
Transport/Return of Spontaneous Circulation (ROSC)	
Post ROSC care	• Communication with ICU regarding disposition and timing of transfer • Avoid CXR/ECG until ICU • Team to DOFF, then DON new PPE prior to transfer of patient as assumed to be heavily contaminated following resuscitation • Ensure all contaminated equipment disposed of or cleaned • Ensure a clear path to ICU destination

Authors: Sonny Thiara, Ruth MacRedmond, George Isac, Mypinder Sekhon, Erik Vu, Craig Fava, Kali Romano, Adam Thomas, Adam Peets

APPENDIX 4 BC CDC INTUBATION CHECKLIST FOR SUSPECT AND CONFIRMED COVID-19 CASES

Coronavirus COVID-19

BC Centre for Disease Control | BC Ministry of Health

BRITISH COLUMBIA Ministry of Health

Intubation Checklist for Suspect and Confirmed Cases of COVID-19

Safety of the health care team is paramount and during a pandemic, health care worker safety is prioritised over the patient. Effective communication is key.

Drs K Romano, N Chima, E Watson, J Atherstone, J Lohser on behalf of Departments of Anesthesia and Critical Care VGH

Intubation Goals

1. **Minimise Aerosol Exposure:**
   - RSI (avoid BMV)
   - Inflate Cuff Prior to Ventilation
   - Clamp ETT Before Circuit Disconnection
2. **Minimise Waste:**
   - Rationalise Kit

Equipment

Intubation Bag:
- ETT (EVAC) w/ Stylet
- Syringe & Gel
- Videolaryngoscope + Blade
- Anchorfast or Tie
- ETT Clamp
- Flex-Tube
- In-Line Suction

Drugs:
- Ketamine 200mg
- Rocuronium 200mg
- Phenylephine 100mcg/ml - 2 syringes
- Propofol infusion
- Norepinepherine Infusion
- *Additional drugs available on request*

Crash Bag:
- Bougie
- ETT 6.5, 7.0, 7.5, 8.0
- Alternate VL Blades
- X Mcgrath Blade
- LMA 3 & 4 & 5
- DL MAC 3 & 4
- Cricothyroidotomy Set
- ACLS Drug Box + Defibrillator

Anteroom Bag:
- Plan B Kit (Assembled during brief from Crash Bag)

Team Brief (Lead by Anesthesia)

1. Team Introduction & Assign Roles
2. Patient Allergies/Consent/Code Status
3. Empty Pocket Check
4. Review Intubation Plan & Prepare Kit
   - Plan A/B/C
   - RSI Sequence & Drug Dosing Recommend 1-2mg/kg Ketamine, 1.5 mg/kg Rocuronium
   - Prepare Intubation Bag & Drugs
   - Prepare Anteroom Bag from Crash Bag
   - Surgeon notified if Necessary for FONA
   - Review Communication Prompts
5. Room Check
   - Ambu-Bag /OPA/HEPA Filter
   - Capnography
   - Suction + Yankauer
   - > 2 IV Pumps
   - IV Access
   - Ventilator + Closed Suction
   - Plastic Drape
6. Cardiac Arrest: **AIRWAY THEN COMPRESSION!**

OUTSIDE ROOM

Team Roles:

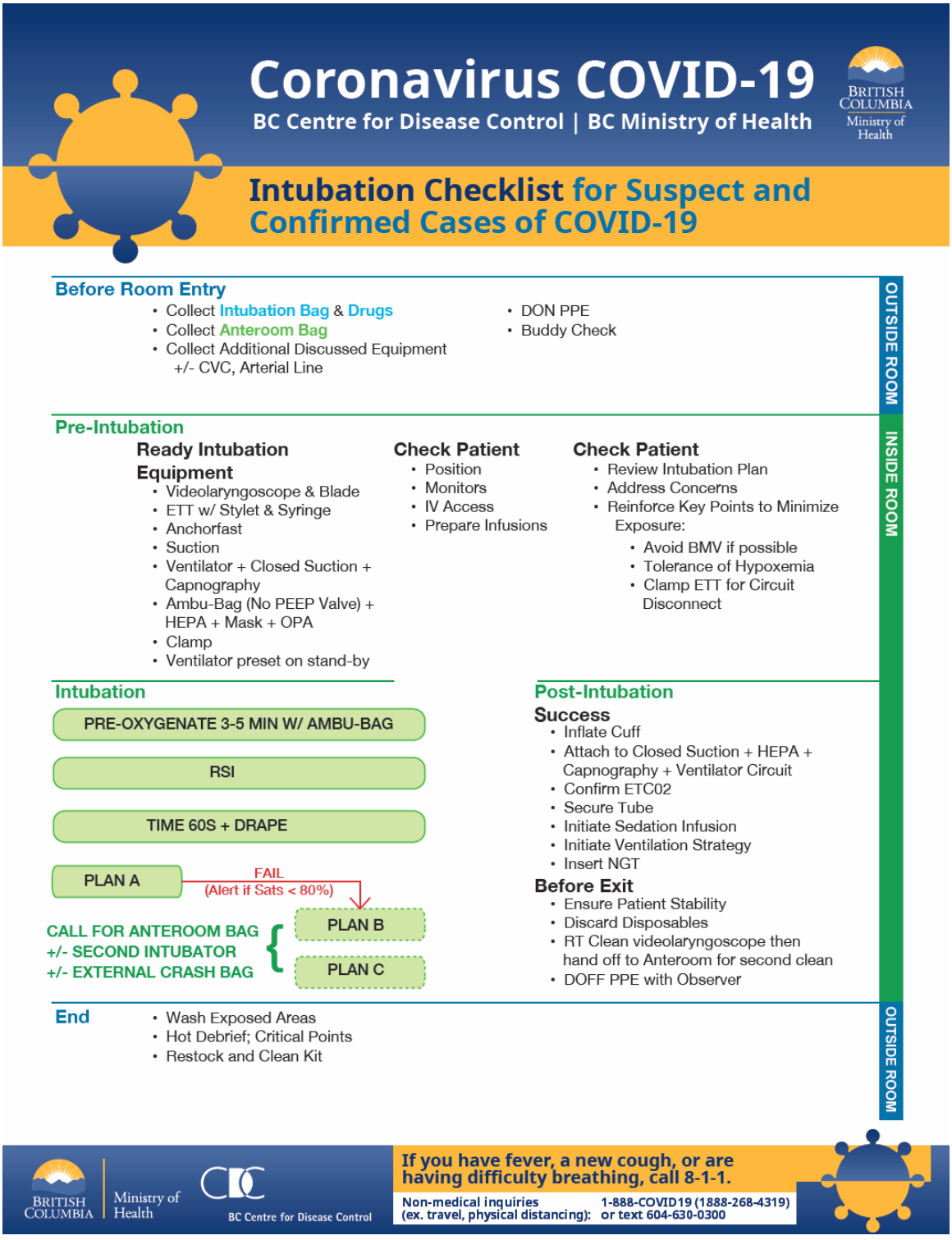
- **Intubator/Room Lead** ANESTHESIOLOGIST
- **Drug Administration** RN
- **Airway Assistant** RT
- **Anteroom Runner (PPE ON)** RT or RN
- **Second RN (External, Observer/Chart)**
- **Second Intubator**
- **Intensivist (External)**

BRITISH COLUMBIA Ministry of Health | BC Centre for Disease Control

If you have fever, a new cough, or are having difficulty breathing, call 8-1-1.

Non-medical inquiries (ex. travel, physical distancing): 1-888-COVID19 (1888-268-4319) or text 604-630-0300

APPENDIX 4 BC CDC INTUBATION CHECKLIST FOR SUSPECT AND CONFIRMED COVID-19 CASES



APPENDIX 5 BC CDC PROTOCOL FOR SURGICAL PATIENTS DURING THE COVID-19 PANDEMIC

Infection Prevention and Control (IPC) Protocol for Surgical Patients During the COVID-19 Pandemic: Adults and Older Adults

April 3, 2020

Guiding Principles:

- Provider Safety
- Patient Safety

Approach to IPC Includes

- Pre-surgical Risk Assessment
- Point of Care PPE Assessment

PCR, NAT, or serologic SARS-CoV2 tests are not **recommended for screening asymptomatic patients** due to the low clinical sensitivity and low positive predictive value in lower acuity patients, particularly in low prevalence contexts.

All patients arriving to surgical admission unit **must be assessed for symptoms.** Symptoms for which COVID-19 testing should be considered:

- ☐ fever ≥ 38 degrees AND one of the following
- ☐ one or more of the following: ○ cough ○ shortness of breath ○ diarrhea

Providers should follow the **Emergency Prioritization in a Pandemic: Personal Protective Equipment Allocation Framework** for negative, asymptomatic, suspect, and confirmed cases of COVID-19 which considers clinical setting. For Aerosol Generating Medical Procedures (AGMPs) this includes **a fit-tested N95 respirator, eye protection, gloves and gown**. OR personnel who participate in AGMPs should be limited to essential staff only. The use of **negative pressure OR suite is not required for all cases**, and as such we recommend prioritizing negative pressure OR suites to COVID-19 positive patients where available.

Based on suspect or confirmed COVID-19 status, **the following IPC algorithm should be followed for adult and older patients** requiring surgical intervention. Implementation of this algorithm may vary based on regional or local standard operating procedures. This algorithm does not apply to maternity or pediatric patient populations.

As more information becomes available and the epidemiology of BC cases of COVID-19 evolves, or in the context of a significant shortage of one or more components of PPE, alternative protocols and algorithms may be considered, adapted and updated accordingly.

APPENDIX 5 BC CDC PROTOCOL FOR SURGICAL PATIENTS DURING THE COVID-19 PANDEMIC (CONT)

IPC Algorithm for Operative Management of Adult and Older Adult Surgical Patients during COVID-19 Pandemic

	KNOWN COVID-19 POSITIVE	UNKNOWN COVID-19 STATUS	
		ASYMPTOMATIC	SYMPTOMATIC (or if symptoms cannot be assessed)
Decision	• Surgery to proceed at discretion of anesthesiologist and surgeon. • Negative pressure OR if available.	• Surgery to proceed at discretion of anesthesiologist and surgeon.	• Surgery to proceed at discretion of anesthesiologist and surgeon. • If surgery is delayed, discharge patient and patient to self-isolate as per Medical Health Officer protocol.
Testing	• Not required	• Not indicated	• Test for COVID-19 using institutional protocol and proceed with surgery.

Intubation and extubation	• Limit personnel in the OR to anesthesiologist, RN +/- AA
	• All staff in the OR don:
	  • Fit-tested N95 Respirator
	  • Face shield or goggles
	  • Gown & gloves
	Note: extubate in the OR suite
		• Limit personnel in the OR to anesthesiologist, RN +/- AA
		• All staff in the OR don:
		  • Fit-tested N95 Respirator
		  • Face shield or goggles
		  • Gown & gloves
		Note: extubate in the OR suite
			• Limit personnel in the OR to anesthesiologist, RN +/- AA
			• All staff in the OR don:
			  • Fit-tested N95 Respirator
			  • Face shield or goggles
			  • Gown & gloves
			Note: extubate in the OR suite

PPE During Procedure	• Fit-tested N95 Respirator • Eye Protection • Gown & gloves	• Fit-tested N95 Respirator • Eye Protection • Gown & gloves	• Fit-tested N95 Respirator • Eye Protection • Gown & gloves
Phase 1 Recovery	• Recover in the OR suite until ready to move to designated unit • Next patient can be taken to OR suite 30 minutes after preceding extubation Note: time may be different depending on rate of air exchange in the OR.	• Recover in the PAR using Droplet/Contact Precautions • Next patient can be taken to OR suite 30 minutes after preceding extubation Note: time may be different depending on rate of air exchange in the OR.	• Recover in the PAR using Droplet/Contact Precautions • Next patient can be taken to OR 30 minutes after preceding extubation Note: time may be different depending on rate of air exchange in the OR.
Cleaning and Disinfection	• Cleaning staff to clean and disinfect OR suite wearing N95 respirator, Face Shield or goggles, gown and housekeeping gloves	• Cleaning staff to clean and disinfect OR suite wearing N95 respirator, Face Shield or goggles, gown and housekeeping gloves	• Cleaning staff to clean and disinfect OR suite wearing N95 respirator, Face Shield or goggles, gown and housekeeping gloves
Disposition	• Return to isolation room on inpatient unit	• Patient to return to appropriate inpatient unit	• Return to isolation room on inpatient unit

Abbreviations: OR (Operation Room); AA (Anesthesia assistant); RN (Registered Nurse); PPE (Personal Protective Equipment); PAR (Post-Anesthetic Recovery Area)

Supply chain: In the context of a significant shortage of one or more components of PPE, alternative strategies or protocols will be considered.

Source document: Managing Surgical Patients during COVID-19 Pandemic is based on the University Health Network Algorithm for Managing COVID-19 Surgical Patients

APPENDIX 6 NATIONAL EMERGENCY BLOOD MANAGEMENT GUIDELINES

National Advisory Committee on Blood and Blood Products | Comité consultatif national sur le sang et les produits sanguins

Canadian Blood Services

URGENT: IMMEDIATE ACTION REQUIRED

To: **ALL HOSPITAL SITES**
From: **National Emergency Blood Management Committee***
Subject: **GREEN PHASE ADVISORY**

National Inventory Advisory

Date and time of issue	2020-03-31 0600 (EST)
Inventory Availability Phase	**GREEN PHASE ADVISORY**
Product(s)	**ALL Fresh Blood Components and Plasma Protein Products**
Description	This is a notice of continuation of the Green Phase Advisory declared March 17, 2020. The impacts of COVID-19 continue to affect blood supply planning at Canadian Blood Services. Inventory of all blood components and products are at Green Phase levels. However, Canadian Blood Services forecasting predicts a potential for shortages given the current pandemic situation. Multi-week forecasting indicates a specific concern regarding the availability of platelets by the week of April 13th. In consideration of these impacts on the blood supply and the experience of other blood operators pertaining to the COVID-19 pandemic, **this Green Phase Advisory applies to ALL blood components and products. Due to the dynamic and evolving nature of this situation, the advisory status may be escalated quickly if demand outpaces supply.** The NEBMC wants to emphasize the importance of healthy individuals continuing to donate. Canadian Blood Services continues to liaise with senior officials in the Public Health Agency of Canada and Ministries of Health in this regard.
Impact on hospitals	**Action Required:** **Fresh blood components**: Hospitals are asked to ensure the utilization of all blood components follow best practice, with particular attention paid to platelets and O Rh negative red blood cells. It is recommended that all hospitals review and consider strict platelet transfusion criteria and awareness of platelet alternative product options. To decrease demand on cryoprecipitate, the use of fibrinogen concentrate is recommended for treatment of acquired hypofibrinogenemia. All hospitals must provide inventory levels for all blood groups of red blood cells and platelets by 1200 noon EST each day, until further notice. Hospital inventory is to be reported via the Blood Component and Product Disposition system: https://www.blood.ca/en/hospitals/blood-component-and-product-disposition-system, or in accordance with usual provincial practices (British Columbia and Manitoba). **Plasma protein products:** Provincial and hospital emergency blood management committees are asked to ensure that infusion of IVIg to patients in a hospital setting is considered within essential service

APPENDIX 6 NATIONAL EMERGENCY BLOOD MANAGEMENT GUIDELINES (CONT)

	guidance and provisions. Hospitals are asked to evaluate protocols for home infusion patients picking up product to minimize patient or designate exposure to the hospital environment. Current Canadian Blood Services inventory will allow for **a maximum refill volume of 3-months of product to individuals on home infusion therapies.** The capacity for blood banks to accommodate these order refills and for patients to store these volumes in their homes must be reviewed within local blood bank facilities. Patients should contact their local blood bank for a product refill when they have 1-month of product remaining. The demand for plasma protein products has increased and the opportunity for the increased volume of product pick-up may not be sustainable over the long term (8-9 months). The plasma protein product inventory is being closely monitored, and this NEBMC directive may require adjustment if demand outpaces supply. **For information:** The NEBMC has released a statement on convalescent plasma and IVIg for treatment of COVID-19 infection (Attachment 1) A fact sheet on convalescent plasma and IVIg for treatment of COVID-19 in Canada will be available on the the National Advisory Committee on Blood and Blood Products website: www.nacblood.ca
For more information	For additional info, contact: 1. Your Hospital Liaison Specialist, Canadian Blood Services 2. Your representative to the Provincial Emergency Blood Management Committee 3. Your representative to your Hospital Emergency Blood Management Committee

*The National Emergency Blood Management Committee is comprised of the National Advisory Committee on Blood and Blood Products, Provincial Territorial Blood Liaison representatives and key Canadian Blood Services personnel. This group will develop recommendations and provide advice to the P/T Ministries of Health, hospitals and regional health authorities, and Canadian Blood Services to support a consistent and coordinated response to critical blood shortages in Canada.

For information about the National Blood Shortages Plan, please see: http://www.nacblood.ca/resources/shortages-plan/index.html

If you require this advisory in an accessible format, please contact your local Canadian Blood Services Hospital Liaison Specialist.

APPENDIX 7 CT CHEST FINDINGS RELATED TO COVID-19

Proposed reporting language for CT findings related to COVID-19

Proposed reporting language for CT findings related to COVID-19, including rationale, CT findings and suggested reporting language for each category. Suggested reporting language includes coding of CT findings for data mining. Associated CT findings fir each category are based on available literature at the time of writing in March 2020, noting the retrospective nature of many reports, including biases related to patient selection in cohort studies, examination timing, and other potential confounders.

From: Simpson S, Kay FU, Abbara S, et a. Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. Radiology: Cardiothoracic Imaging 2020 2:2 (open access)

https://pubs.rsna.org/doi/10.1148/ryct.2020200152

Proposed Reporting Language for CT Findings Related to COVID-19

Routine screening CT for diagnosis or exclusion of COVID-19 is currently not recommended by most professional organizations or the US Centers for Disease Control and Prevention

COVID-19 pneumonia imaging classification	Rationale (6-11)	CT Findings*	Suggested Reporting Language
Typical appearance	Commonly reported imaging features of greater specificity for COVID-19 pneumonia.	Peripheral, bilateral , GGO* with or without consolidation or visible intralobular lines ("crazy-paving") Multifocal GGO of rounded morphology with or without consolidation or visible intralobular lines ("crazy-paving") Reverse halo sign or other findings of organizing pneumonia (seen later in the disease)	"Commonly reported imaging features of (COVID-19) pneumonia are present. Other processes such as influenza pneumonia and organizing pneumonia, as can be seen with drug toxicity and connective tissue disease, can cause a similar imaging pattern." [Cov19Typ]^
Indeterminate appearance	Nonspecific imaging features of COVID-19 pneumonia.	**Absence of typical features AND** **Presence of:** Multifocal, diffuse, perihilar, or unilateral GGO with or without consolidation lacking a specific distribution and are non-rounded or non-peripheral. Few very small GGO with a non-rounded and non-peripheral distribution	"Imaging features can be seen with (COVID-19) pneumonia, though are nonspecific and can occur with a variety of infectious and noninfectious processes." [Cov19Ind]^
Atypical appearance	Uncommonly or not reported features of COVID-19 pneumonia.	**Absence of typical or indeterminate features AND** **Presence of:** Isolated lobar or segmental consolidation without GGO Discrete small nodules (centrilobular, "tree-in-bud") Lung cavitation Smooth interlobular septal thickening with pleural effusion	"Imaging features are atypical or uncommonly reported for (COVID-19) pneumonia. Alternative diagnoses should be considered." [Cov19Aty]^
Negative for pneumonia	No features of pneumonia	No CT features to suggest pneumonia.	"No CT findings present to indicate pneumonia. (Note: CT may be negative in the early stages of COVID-19.) [Cov19Neg]^

Notes:

1. Inclusion in a report of items noted in parenthesis in the Suggested Reporting Language column may depend upon clinical suspicion, local prevalence, patient status as a PUI, and local procedures regarding reporting.
2. CT is not a substitute for RT-PCR, consider testing according to local recommendations and procedures for and availability of RT-PCR

+Please see (36) for specific definitions of CT findings
*GGO = ground glass opacity.
^Suggested coding for future data mining