

Peer Review File

Article information: 10.21037/jhmhp-22-137

Reviewer A:

- 1. Comment 1:** Every healthcare system during the pandemic. What is new about this?.....So what is new here?

Reply 1: The reviewer is correct every health care system around the world has been stressed during the COVID-19 pandemic. However, **not** all healthcare systems are capable of establishing a critical care ground transport team within a hospital setting, specifically in Canada as a whole and in some parts of United States. The Canadian healthcare system is funded through a shared funding matrix via the federal and provincial coffer but it is administered through the provincial health ministry. The interfacility transport of critical and non-critical patients is the responsibility of the municipality Emergency Medical Services (EMS) and the provincially supported private company Ornge Air and Ground Ambulance Services in Ontario. The only exception is the neonatal critical care transport funded by the provincial health ministry to the hospital which provides the appropriate governance, platform, personnel and resources to transport of critically ill neonates between hospitals. This is the first time since the establishment of Canada Health Act enacted in Parliament in 1984 that an official request from the publicly funded transport services were unable to fulfill all the requests for to offload the over-burdened ICUs to those with available capacity during the COVID-19 pandemic.

The request from Ornge went to numerous tertiary-hospital in the Province of Ontario and London Health Sciences Centre (LHSC) with a referral base for approximately 1.2 million Ontarians in the Southwest and Northwest regions at Province of Ontario was one of hospital able to set up a Critical Care Ground Transport Team to assist Ornge with the patient decanting process. The other hospitals were The Ottawa General Hospital and the Hamilton General Hospital. There were also few community hospitals set-up ad hoc transport team and were not under the operational command of Ornge command centre which Ornge do not have any data on the ad hoc transporting hospital.

LHSC was one of the hospitals under tremendous amount strain with over-burdened ICUs with COVID-19 patients. However, through strong leadership support, clear mission goal and organizational accountability, coupled with the SWOT analysis identified potential resources, institutional impact and program feasibility provided in less than one week of two highly skilled team without impacting the operational capability of the hospital. The process developed at LHSC in developing the CCGT can be quickly adapted and utilized by any hospital when the needs arise to help to relief the burden of overwhelmed health system.

Changes in the text: None

- 2. Comment 2:** Line 38- The European reader is not familiar with the structure of the Canadian/US system....an RRT is generally unknown. It maybe helpful to explain the qualification of these professionals for a foreign audience.....

Reply 2: The reviewer is correct the Registered Respiratory Therapist (RRT) is a health care provider primarily rooted in North America. I am attaching a

website to the College of Respiratory Therapist of Ontario for your interest, <https://www.crto.on.ca>. We agree in most European countries critically ill patients is carried out by an intensivist/anesthesiologist and an intensive care nurse (CCRN). In North America we have found that the addition of RRT to the transport team in support of the Intensivist/emergency physician/anesthesiologist during transport provides not only an extra hand of medical support but also the in-depth knowledge of managing the mechanical ventilator en-route.

Changes in the text: We have added additional description of qualification of RRT in the manuscript, see page 4, line 106-110.

3. Comment 3:

- a. Line 109- Patient were accepted for transport determined by inclusion and exclusion criteria? So, was it believe that physiological parameters would not change?
- b. That's rather tricky. Especially, with mechanical ventilated COVID-19 patients you should expect surprises. Actually, it did change as it was experienced in line 152?
- c. Was a score used to quantify the degree of disease, for example using a scoring system such as NACA or mSOFA? One of the exclusion criteria was FiO₂ of >70%. However, if you depend on 50-60% oxygen and you are mechanically ventilated, then you are really sick. For example, what was the lower limit for the arterial oxygen saturation?

Reply 3a:

- a. The initial acceptance of a patient for transport came from the operational centre of Ornge. The inclusion criteria to be included into the manuscript. Exclusion criteria mirrored the Ornge operational criteria since the CCGT is under the authority of ORNGE operational command. Patient's physiological parameters is dynamic and the expectation of the parameters prone to instability or changes during intra-hospital or inter-hospital transportation. However, it is the responsibility of the operational command and the transport team to establish reasonable prior safe physiological parameters to ensure the safest possible transport of patient to destination.

Changes in the text 3a: The inclusion criteria inserted into the manuscript, see page 5, line129-130: age>18 years old, COVID-19 positive and mechanically ventilated. See page 5, line 132-134, exclusion criteria mirrored the ORNGE operational criteria since the CCGT is under the authority of ORNGE operational command of FiO₂≥70%, PEEP≥15 cm H₂O and oxygen flow rate≥15 liter/min, patient prone in the last 24-hours, on inhaled nitric oxide, patient greater than 84cm wide and 272kg and hemodynamic instability that could not be stabilized by medications.

Reply 3b:

- b. The CCGT expects and understands the physiological parameters prone to change during inter-hospital transfers and understands this change may have detrimental clinical effect on the patient. Thus, the CCGT continuously monitoring the patient with both cardiac and oxygen

saturation monitors and carries an iSTAT to further evaluate the arterial blood parameters so to modify the ventilator parameters accordingly. The reviewer mentioned line 152 which 5 patients required FIO₂ increase by 5-25% from baseline; 1 patient need to increase the FIO₂ from 60% to 90% and 2 patients decreased FIO₂ from 60%-50%. Fortunately, those patients had no adverse outcome occurred during and post transport and the ground transport time was less than 2-hours to destination hospital.

Changes in the text 3b: None

Reply 3C:

- c. The CCGT team did not use ICU score such as NACA, qSOFA or MODS to quantify the degree of the disease. The authors agree with the reviewer that any of the score mentioned would be very helpful to provide to the team the probability of increasing morbidity and/or mortality of a patient transported. Due to the expeditious formation of establishing this CCGT and restricted Ornge operational requirement, the CCTG were required to followed the inclusion and exclusion criteria as outlined by Ornge. Table 1, the median P/F ratio pre-transport 192.5(86.67-425) and the median P/F ratio post-transport 180.18(100.83-454.29) which indicate critical respiratory failure for patient with COVID-19 and signifies the severity of the patient's illness. We re-checked our data the lower limit of oxygen saturation for pre-transport was 94% and post transport was 86% in one patient and the next lowest was 93%.

Changes in the text 3C: None

4. **Comment 4:** Line 139- What does it add to repeat part of all patient characteristics if it is already in a table?

Reply 4: The authors agree with the reviewer. The repeated parts of patient characteristics deleted as it is already in Table 1.

Changes in text: The repeat part of all patient characteristics removed from main text, see page 7, line 175-177.

5. **Comment 5:** Line 145-

- a. Please define what threshold was taken for hypotension and for how long?
- b. What physiological parameters was used for this definition (SBP/DBP/MAP)?
- c. How was this measured and how often? Was a a-line present, how was it calibrated and at what position of the transducer during transport? Or was NIBP measurement used only? How often was it measured?
- d. Was the time interval always the same and how did the data registration take place?

Reply 5a:

- a. The threshold hypotension taken were systolic BP < 90 mmHg and/or MAP < 65 mmHg for more than 5-minutes.

Change in the text: Hypotension threshold added to the manuscript line, see page 7, 179-180.

Reply 5b:

- b. The physiological parameters used for this definition are SBP<90mmHg and/or MAP <65mmHg.

Change in the text: The physiological parameters for hypotension definition added to the manuscript, see page 7, line 179-180.

Reply 5c:

- c. The BP was measured by an arterial line for each of the patient transported and monitored continuously and the BP is recorded once pre-transport, every 30-minutes during transport and once post-transport. The arterial line is calibrated or zeroed after the line is flushed with saline solution and the transducer line is under pressure of at least 300mmHg. The transducer position is secured along the vertical pole of the stretcher and aligned at the level of the right atrium. NIBP was not used but applied to the patients' arm to be used when needed it, such as to correlate with the arterial line BP.

Change in the text: None

Reply 5d:

- d. Both team's CCRN for ease of operation during transport in a space limited platform decided to register the hemodynamic parameters on a separate piece of document which is not part of the enroute document, Figure 5. The enroute document is completed by the transport physician. The frequency to register the parameter were pre-transport at the sending hospital ICU, then every 30 minutes during transport (all the transport time was < 2 hours) and post-transport at receiving hospital ICU. Since the number of parameter registration was limited, the final copy of the parameter registration was given to the receiving ICU nurse to be attached to the patient's chart.

Change in the text 5d: None

6. Comment 6:

- a. No critical incidents occurred during patient transportation. Since there is not fixed definition for this term, this sentence is short sighted.
- b. The term adverse event is often used in the literature to qualify an incident. Actually only an equipment failure is described.
- c. However, in one case it was necessary to drastically increase the oxygen fraction from 60% to 90% (Line 152). How would you qualify that?

Reply 6a:

- a. The authors agree with the reviewer a fixed definition is needed to qualify critical incidence. There is no standard recommended definition for critical or adverse events in the literature. We reviewed the literature and developed a Table 2, based on Parmentier-Decrucq et al. Annals of Intensive care 2013, 3:10

<http://www.annalsofintensivecare.com/content/3/1/10> for adverse events that can occur during a short critical care transport.

Changes in the text: We have deleted the words critical incidents and replaced with adverse events and included Table 2, see page 8, line 195-202.

Reply 6b:

- b. The authors agree with the reviewer the term adverse event is added to the manuscript Line 183. Also adopted adverse definition from Parmentier-Decrucq et al. in Table 2. Line 195.

Changes in the text: We have deleted the words critical incidents and replaced with adverse events and included Table 2, see page 8, line 195-202.

Reply 6c:

- c. The author agrees with the reviewer. Utilizing the definition as outlined by Parmentier-Decrucq et al. the oxygen fraction went from 60% to 90% (line 152) was classified as major patient related adverse events during transport, line 199.

Changes in the text: See page 8, line 199-201 the oxygen fraction from 60% to 90% was classified as a major adverse event.

- 7. **Comment 7:** Line 39 & 164 I would clearly state here that it concerns interfacility transport

Reply 7: The authors with the reviewer to clearly state that it concerns interfacility transport.

Changes in the text: Interfacility transport added. See page 2, line 51 and page 8, line 202.

- 8. **Comment 8:** Line 229:

- a. How significant is significant?
- b. How big was the problem?
- c. How many transports were carried out by others or was Ornge the only means of transport used?

Reply 8a:

- a. In the manuscript line 89-90 indicated Ornge was operating at 300% capacity during COVID-19 wave 3. Dr. Michael Lewell, the Ornge, associate medical director of Ornge informed the authors that Ornge needed to double their ground crew capacity in the Greater Area of Toronto and their crews were all working overtime and their ground transport ambulances were at capacity and they required to borrow ambulances from other municipalities.

Change in the text: None

Reply 8b:

- b. The problem was large enough that the various tertiary and community hospitals were not able to admit patients with severe COVID-19 pneumonia to their ICUs. This is coupled with Ornge, the only and main air and ground ambulances for the province of Ontario unable to keep up with the increase demand for patient transport. While the municipalities have their own EMS paramedics and ground ambulances but only for local transfers. With the

demand for further decanting of ICUs, Ornge requested went to the various hospitals in the province to assist with off-loading the over-capacity hospitals.

Change to the text: None

Reply 8c:

- c. After the request came through from Ornge only three tertiary hospital were able to set up CCGT. Ottawa and Hamilton general hospitals each transferred approximately 10 patients each and LHSC transferred twenty-two patients. Several community hospital involved in the transfer of patients but those hospital created an ad hoc transport team and were not under the operational command of Ornge but under their own accord and arrangements and no data is available to Ornge.

Change in the text: None

9. **Comment 9:** The reference list lacks balance. Of the 20 cited sources, 7 refer to a website.

Reply: The authors agree with the reviewer and more references added. Now 24 cited source, 7 refer to a website and 17 cited references.

Changes in the text: 4 References added. See page 13-15, line 313-388.

Reviewer B:

1. **Comment 1:** Grammar edits to improved readability of certain sentences, for example lines 113-114 page 4 are not complete sentences.

Replay 1: The authors agree with the reviewer. and

Changes in the text: See page 5, line 135-137. The authors have reviewed the manuscript and made the appropriate grammar corrections.

2. **Comment 2:** Page 3 Line 84 to page 4 line 125-this section is clearly written and highlights key consideration in the rapid deployment of a novel CCGT for a region.

Reply 2: The authors thanks the reviewer for the supportive comment.

Changes in the text: None

3. **Comment 3:** Page 3, line 83-86 and page 5, line 181-182 consider adding a citation describes the SWOT analysis

Reply 3: The authors agree with the reviewer.

Changes in the text: Citation for SWOT added (reference 8), see page 14, line 345.

4. **Comment 4:** Line 68-70- The timeline here is confusing as the May 7, 2021 date fall'

Reply 4: The author apologizes to the reviewer it was an error on our part the date should read April 7, 2021.

Changes in the text: This is corrected. See page 3, line 90.

5. **Comment 5:** Page 4, line 120-124-consider presenting a summary of some of the lessons learned from these debriefs if possible.

Reply 5: The authors agree with the reviewer. A summary of the lessons learned from these debriefs in the manuscript.

Changes in the text: See page 6, Line 149-161a summary of lessons learned during the debrief.

6. **Comment 6:**

- a. Table 1- on the top row, consider adding N=22 under value so that readers know the number of total patients in the series.
- b. The time to transport row is confusing due to double parentheses. Consider edits to something like 'minutes of transport, median (IQR)'.

Reply 6a:

- a. The authors agree with the reviewer to add N=22 under value as recommended.

Changes in the text: See Table 1, N=22 added under value cell.

Reply 6b:

- b. The authors agree with the reviewer to edit the time to transport as recommended.

Changes in the text: See Table 1: Change 'Time to transport (minutes), median (IQR)' to 'Minutes of transport (minutes), median (IQR)'