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Ebola preparedness: A rapid needs assessment of critical care in a tertiary hospital.

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Abstract

Background The current outbreak of Ebola has been declared a Public Health Emergency of International Concern, with greater than 13 000 reported cases and reported deaths approaching 5000, across 8 countries. Occupational human-to-human transmission of Ebola is a significant concern. Hospital preparedness is of paramount importance. Our objectives were to perform a rapid, rigorous needs assessment to identify the desired results, gaps, barriers and facilitators to developing solutions, in the provision of critical care with suspected or confirmed cases of Ebola.

Methods An emergent, qualitative design was employed at a tertiary hospital in Ontario, Canada recently designated as an Ebola patient care center, from October 21 to November 7, 2014. Participants included physicians, nurses, respiratory therapists, infection control, housekeeping, waste management, administration, facility and occupational health and safety. Data collection included document analysis (international, national, provincial and local guidelines and protocols), focus groups, interviews and walk-throughs of critical care areas with key stakeholders. Iterative data analysis was employed with two cycles of coding.

Results Fifteen themes and 73 desired results were identified, of which 55 had gaps. During the study period, solutions were implemented to fully address 8 gaps, and partially address 18 gaps. Solutions were not implemented for the remaining 29 gaps. Themes identified included: screening; response team activation; personal protective equipment; post-exposure to virus through body fluids; patient placement, room set up, logging and signage; intra-hospital patient movement; inter-hospital patient movement; critical care management; Ebola specific diagnosis and treatment, critical care staffing issues;; visitation and contacts; waste management, environmental cleaning and management of linens; post mortem; conflict resolution; communication.

Interpretation This investigation identified widespread gaps across numerous themes, as such we have been able to develop a set of credible and measureable set of results. All hospitals need to be prepared for contact with a patient with Ebola and the preparedness plan will need to vary based on the local context, resources and site designation.

Introduction

The current outbreak of Ebola began in Guinea, West Africa, with the first cases identified in March 2014.(1) Since then, it has spread across borders to Liberia and Sierra Leone. These three countries have faced the most widespread and intense transmission. On August 8, 2014 the World Health Organization (WHO) Director General-declared the outbreak to be a Public Health Emergency of International Concern. The WHO released statistics on November 7, 2014 reporting that there have been 13 268 reported cases of Ebola in eight countries, with reported deaths approaching 5000.(2)

On October 6th 2014, occupational human-to-human transmission of Ebola virus disease (EVD) was confirmed in Spain, after a hospital team member (HTM) tested positive for EVD after caring for a patient repatriated from West Africa.(1) On September 30th, 2014 the first case of EVD was confirmed in the United States. Localized transmission also occurred in the United States, where 3 HTMs tested positive for EVD after treating a patient with EVD.

Caring for a patient with Ebola leaves little margin for error. The risk of transmission may be even greater in critically ill patients given the heightened potential for contact with body fluids (diarrhea, vomiting, hemorrhage, need for invasive procedures, etc). It is essential that systems, processes, knowledge and skills be in place to safely care for these patients. In a recent publication on Ebola preparedness, Gostin et. al. raised significant concerns regarding health system preparedness for public health emergencies.(3) The need for research on identifying system-level gaps and weaknesses was highlighted, stating that “insufficient funding in a

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3 research and data infrastructure limits the ability to identify weaknesses and learn from
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5 mistakes.”(3)
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10 On October 18th, 2014, the Ministry of Health and Long Term Care (MOHLTC) designated 12
11 centers across the province of Ontario, Canada as an Ebola patient care sites, including The
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13 Ottawa Hospital (TOH). TOH is an academic tertiary center in Ottawa, the capital of Canada.
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15 Upon receiving this designation, it was quickly recognized that the current system and practices
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17 of providing critical care were likely insufficient to meet the demands of caring for these
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19 patients. Past experiences with caring for patients with SARS and H1N1, have revealed
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21 numerous challenges in the provision of critical care and highlighted the importance of planning
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23 and preparedness.(4,5) We therefore decided to embark on a needs assessment (NA). A NA
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25 compares “what should be” done to “what is” done. A need or gap is defined as a discrepancy
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27 between what is and should be done.(6)
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In this article, we present the results of a rigorous and rapid interdisciplinary NA conducted at a
tertiary hospital, to clearly identify the desired results (“what should be done”), gaps in current
practice, and the barriers and facilitators to the development of solutions. The scope of the NA
was bounded to include any aspects of critical care related to suspected or confirmed cases of
Ebola. This needs assessment was performed under the assumption that we would only have a
small number of suspected or confirmed cases of Ebola. If the number of cases were to be
greater, the plan would require re-assessment and revision.

Methods

A qualitative research model with an emergent design was employed in this study.

With emergent design, the research plan cannot be tightly prescribed, and the data collection process may shift and change as the researcher begins to collect data.(7) As such, the NA was designed to be flexible and allow for data collection methods to be selected as needed throughout the study and also to be responsive to the availability of key stakeholders, recognizing the very tight timeline to complete the assessment and the many demands on these participants. An interdisciplinary needs assessment team was formed and key stakeholder groups were identified. Data collection and analysis was ongoing throughout the study in an iterative process (Table 1).

<Insert Table 1 about here>

Data collection

Data collection occurred from October 21 to November 7, 2014. Multiple sources of data were collected including document analysis, walk-throughs, focus groups and interviews.(8-10)

International, national and local documents were collected and analyzed. International documents included guidelines, protocols and standards released by the World Health Organization (WHO), Centre for Disease Control (CDC) and Emory Healthcare.(11-26) Guidelines from the Canadian Critical Care Society (CCCS) / Canadian Association of Emergency Physicians (CAEP) / Association of Medical Microbiology and Infectious Diseases Canada (AMMICanada), Public Health, Ministry of Health and Long Term Care (MOHLTC), and hospital documents were included in the analysis.(27-31) It was anticipated that these

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3 documents would change rapidly throughout the study period, hence the research team checked
4 frequently for updates and incorporated new information as it was released.
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10 Walk-throughs, focus groups and interviews were performed with key stakeholder groups.

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12 During this process, we sought to gain a comprehensive understanding of “what should be” done,
13 identify gaps, contextual factors, barriers and facilitators to implementation of solutions.
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16 Participants were purposively selected to capture different perspectives.(7) Walk-throughs were
17 performed in the intensive care unit, emergency department, and medicine wards. The line of
18 inquiry initially began open ended and progressively became semi-structured. Mental simulation
19 / low fidelity simulation / flow mapping techniques were utilized to help participants describe
20 and then visualize various patient scenarios. Raw data was captured in field notes and then
21 reviewed and processed. Through the needs assessment time period, there was also an ‘open
22 door’ policy, whereby anyone (e.g. nurses, physicians, respiratory therapists, housekeeping,
23 infection control, etc.) were encouraged to approach the needs assessment team at any time.
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25 Raw data from these informal encounters was also captured and reviewed.
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41 *Data Analysis*

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43 The data was analyzed using an inductive approach. In the first cycle of data analysis, raw data
44 was coded. This data was organized directly into a matrix to facilitate analysis, which evolved
45 throughout the investigation. (10) In the second cycle of coding two of the investigators
46 performed pattern coding in order to group the codes into categories. During this process, codes
47 were aggregated and collapsed. Codes were also explored for consistency and plausibility.
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49 Disagreements were resolved through discussion to reach consensus. Finally, codes/themes were
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3 summarized as “desired results” / “what should be done” or as factors to be considered in the
4 development and implementation of solutions (related to a desired result). Three members of the
5 research team rated each result and assigned either “yes” for gap present or “no” for gap absent.
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7 A gap was defined as a result that was not fully addressed.(8) For each gap, the team also
8 identified specific solutions introduced during the conduct of the needs assessment. Solutions
9 were defined as either completed (solution fully achieved the desired results): in-progress
10 (solutions partially achieved the desired result): no solution initiated to achieve the desired result.
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12 Discrepancies were resolved through group discussion. There was ongoing work to rapidly
13 address high priority gaps, both systemic and educational.
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27 **Results**

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29 A summary of the findings is presented in Table 2. In total, 15 themes and 73 desired results
30 were identified, of which 55 were considered to be gaps. For the gaps identified, at the end of
31 the study period 8 were fully addressed with solutions, 18 had solutions in progress and 29 had
32 not yet had solutions initiated. Given the vast amount of data it is not possible to present the
33 entirety of our findings in this paper. The complete data set is available online (eTable 1). We
34 present three results as illustrative examples:
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46 *1. Theme: Personal Protective Equipment (PPE) - There will be a clear process of donning and*
47 *doffing appropriate PPE that will protect HTMs while caring for patients with potential or*
48 *confirmed Ebola. In keeping with provincial standards, the initial PPE training for caring for*
49 *patients with suspected or proven Ebola included a fluid resistant gown, one pair of gloves (two*
50 *if drawing blood), surgical mask, goggles and a face shield. Later, neck and boot covers were*
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3 added. Participants felt that this equipment and process were inadequate and did not offer
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5 sufficient protection. In addition, participants identified errors in the videos that were provided to
6
7 enhance training and the quality of the face-to-face training was also questioned. Furthermore,
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9 many participants described feeling that their concerns were not being acknowledged or taken
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11 seriously by the infection control staff, which contributed to a lack of trust. The infection control
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13 staff were also concerned that the education provided would not be well received and described
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15 experiencing much anxiety and worry at that time.
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22 HTMs wanted to ensure that proper procedures were in place for decontamination to remove
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24 bodily fluid on their PPE before doffing. For example, they proposed to use Clorox to
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26 decontaminate any soiled surfaces before exiting the patient room. Suggestions were also made
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28 to use dedicated footwear, a decontamination mat to clean footwear prior to exiting the
29
30 anteroom, and an apron to be removed in the patient room before entering the anteroom. The
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32 apron was noted to be particularly important for use when caring for critically ill patients.
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39 On October 18th, the MOHLTC released new directives to enhance the PPE measures used by
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41 HTMs. Following this release, ID and Infection control sourced equipment and rapidly
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43 developed curriculum on PPE donning and doffing with the new equipment. Interviews with
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45 HTMs following their training session demonstrated increased satisfaction with the training and
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47 equipment. HTMs were impressed with the speed with which the program was put together and
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49 also described a positive and receptive learning environment; the infection control professionals
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51 appearing more open and engaged in listening to their comments and suggestions. However,
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53 participants noted that removing the hooded coveralls was very difficult and noted that they
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3 would need more practice to attain proficiency. They suggested that certification should reflect
4 proficiency and not only participation in the training session.
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10 It was noted that MOHLTC recommended the use of PAPR suit when performing aerosol
11 generating procedures (intubation). This equipment had not been acquired and participants did
12 not know whether the PAPR suit should only be used with intubation or also during other aerosol
13 generating procedures.
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22 *2. Theme: Patient placement and room set up - The most suitable rooms to manage patients with*
23 *suspected or proven Ebola will be selected and then redesigned and reequipped if required.*
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27 Participants were concerned that the room designated as the Ebola room in the ICU was less than
28 ideal. Multiple questions were raised pertaining to the room layout, storage of equipment,
29 identification of contaminated versus clean areas, impact on the provision of care, and
30 interference with family visitation for other ICU patients. HTMs suggested that we should
31 consider a different location for the room.
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41 Iterative data was gathered from HTMs to identify criteria for selection of an ebola patient room,
42 which included considering the safest route of entry in the ICU, sufficient space outside the
43 anteroom for equipment, isolation from other traffic including visitors and staff, ability to use
44 adjacent rooms if more than one case, and ability to perform simulations. These criteria were
45 then applied in the selection of a new Ebola room. Subsequently, after numerous interviews and
46 walk-throughs, a new room was identified that met the selection criteria. The room was also
47 redesigned and reequipped to minimize the risk of transmission while optimizing patient care. In
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3 collaboration with the facility team, the computer, shelves and built-in desk were removed and
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5 the room repainted. Hazard tape was trialed in various configurations to best define clean and
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7 contaminated areas to optimize usage of the room by all key stakeholders (i.e., doffing practices
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9 and waste removal) (see eDocument 1).

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15 *3. Theme: Intra-hospital transport - The transport process will be clearly defined and will only*
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17 *include essential staff.* Participants were concerned that a process to ensure patient and staff
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19 safety during transport to and from the ICU was not in place. The ED was identified as the most
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21 important source of patient transfers to the ICU, and it was decided to first develop the transport
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23 process from the ED to the ICU. Numerous suggestions were made to improve safety during
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25 transfer: Performing interventions (e.g. intubation, NG, foley) before transfer; ensuring that the
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27 path is not cluttered and that people not wearing PPE are kept at a safe distance; defining roles
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29 and responsibilities of the staff both inside and outside of the ED Ebola room; identification and
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31 cleaning of contaminated surfaces and spills that might occur during transport; using a minimal
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33 number of staff (including spotters) while maintaining patient safety. A transport process was
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35 iteratively developed through many walk-throughs with key stakeholders. Each step was
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37 carefully explored. For example, it was decided that the process would include an initial
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39 readiness assessment by the ICU team conducted before entering the ED Ebola room to
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41 determine whether additional measures should be taken before transport to manage bodily fluid.
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43 (eDocument 2).

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Interpretation

This investigation has revealed widespread gaps in the provision of critical care for suspected or confirmed cases of Ebola across fifteen themes. The identification of gaps is not surprising given that this center has never planned for or cared for patients with Ebola or viral hemorrhagic fever (VHF) and the hospital structures, systems and processes have not been built to handle these cases. These results, however, are concerning and highlight significant deficits in preparedness, which we suspect exist in many other hospitals.

In our investigation we have defined what “should be.” This is an essential first step in a needs assessment.(8) It also initiates the process for setting standards in caring for patients with suspected or confirmed Ebola. It is imperative that we be clear on our terminology in terms of actions. That is, it is essential to differentiate between standards, guidelines, and recommendations. The term standard represents any definitive rule, principle or measure established by authority and may not be subjected to individual changes, therapeutic or diagnostic modifications. In contrast to standards, guidelines define the present quality of treatment, but are sufficiently flexible to allow rapid changes if these are required. Recommendations are still further removed from a rigid set of standards to be referred to for advice on a course of treatment.(32)

Of the many standard-setting processes reviewed, we found the National Aeronautics and Space Administration (NASA’s) Space Flight Health Standards-Setting Process (2007) exemplary and closest the approach taken here.(33) NASA hallmarks of exemplary standard-setting processes include an approach that is evidence-based, open and transparent (all interested parties have

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3 input into the process), well documented (trail of decision-making process), well informed
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5 (experts, decision & policy makers), and dynamic (iterative and ongoing).(33,34) A thorough
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7 literature review is the starting point of any standards-setting process and should encompass the
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9 relevant literature. Our process included a compilation of existing standards (e.g., guidelines and
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11 protocols released by the WHO, CDC and Emory Healthcare). Guidelines from the
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13 CCCS/CAEP/AMMI Canada, MOHLTC of Ontario, and relevant local-level hospital documents
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15 were collated and refined into a single document (see eTable 1). We found having a single point
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17 of reference enhances communication and knowledge transfer to key individuals and throughout
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19 the organization.
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27 Similarly, a collaborative, open and transparent focus with substantial opportunities for revision
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29 and improvement are an inherent parts of a high-quality standards-setting process.(33,35)
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31 Adopting an “open door policy”, bringing together a broader interdisciplinary team, and
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33 involving front line staff were key components of our study. The term hospital team member
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35 (HTM) was used in order to recognize the vital roles of the many individuals from various
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37 backgrounds who contribute to the care of patients with potential or confirmed Ebola. At the
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39 onset of the study, front line HTMs felt they were either misinformed or poorly informed
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41 regarding the preparedness planning. They described feeling that no information was being
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43 provided and some participants believed that lack of information might have added to HTMs
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45 anxiety. The NA highlighted that multiple groups were working on identifying problems and
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47 solutions, but communication between the groups and a shared understanding was initially
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49 lacking. Literature has highlighted in previous pandemics, that front-line staff have perceived
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51 that information was not always available.(5) Nahn et al., described how a top-down
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3 management approach to the influenza A (H1N1) pandemic in Canada was criticized and caused
4 much frustration.(36) They surveyed 102 physicians and identified two core themes with respect
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6 to problems with pandemic management: coordination and resource-related difficulties. Their
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8 qualitative analysis suggested that "most difficulties experienced during pH1N1 were related to
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10 coordination of response between stakeholders." The Roundtable on Healthcare and Emergency
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12 Service Sector Pandemic Preparedness reported that "a top-down approach is essential in
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14 emergencies management, but that a bottom up method of feedback is also needed to allow
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16 adaptation to varying circumstances."(36,37) By performing a comprehensive NA involving all
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18 key stakeholder groups, we merged these two approaches, facilitating communication and
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20 collaboration between leaders and front-line HTMs, strengthening the overall result, enhancing
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22 buy-in to solutions and producing a transparent result.
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32 Many lessons were learned from H1N1 and SARS. Standard operating procedures in the event
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34 of an influenza epidemic have been drafted (38-40) and centers should have procedures in place
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36 to respond.(4,5) Recent events, in the developed world with the occupational transmission of
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38 Ebola to HTMs has brought attention to concerns that hospitals may not be prepared to respond
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40 to these cases. Recent literature has questioned the strength of preparedness plans and raised
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42 concerns about the system and processes in place to care for and contain these patients.(3,41)
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44 Many countries are not equipped with hospitals with special containment clinical units.
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46 Strategies are required to rapidly identify and bridge these gaps recognizing the constraints to
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48 strengthen preparedness in every country.(42)
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3 The results of our investigation clearly demonstrate the need to contextualize practices to the
4 local environment and explore practical consideration. This is well aligned with the CDC
5 standard-setting consultations processes, which indicate that solutions are being developed at
6 state and local levels to meet gaps that are driven by local needs.(35) Many guidelines and
7 resources exist to guide us in caring for these patients, but practices must be contextualized to the
8 local environment with consideration to human, physical and social capital.(43) For example, at
9 the time of this study, international and provincial guidelines, made clear recommendations on
10 requirements for patient placement, such as ensuring single room with negative pressure, a
11 dedicated toilet, and ensuring that space and layout allow for clear separation between clean and
12 potentially contaminated areas. However, at the local level, ensuring adequate separation was
13 constrained by the physical layout of the rooms, as the facilities were not originally designed to
14 meet this requirement. Solutions had to take into consideration local barriers to optimize the
15 situation and find inventive solutions.

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36 This NA was performed with a focus on the results.(8) Many different solutions may lead to the
37 desired result. In some cases, solutions were rapidly implemented to address high priority gaps
38 (e.g. obtaining PPE and preparing the ICU room). However, in other cases solutions have not
39 yet been identified. This approach may in fact facilitate collaboration by enhancing buy in.(8)
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46 At this centre, an iterative process will continue, with prioritization of gaps, development and
47 implementation of solutions, ensuring that effective solutions are in place and that all gaps are
48 addressed. Hence, our matrix will continue to evolve. Once the “should be” conditions are
49 clearly defined, simulations using various modalities (e.g. technical skills, patient actors, theatre
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3 based) of cases of possible Ebola can be performed to test the system and to detect any additional
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5 gaps.
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10 The immediate next step is to share this matrix (see eTable1) with other hospitals (community)
11 to facilitate preparedness and practice change. Based on their situation they can delete sections
12 and add local information. Transferability of an educational intervention from one site to
13 another requires a compromise between the ideal of the intervention's original design and the
14 contextual realities of the adoption site.(44) It is our hope that through collaboration we may be
15 in a better position to learn from ongoing local solutions.
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27 **Limitations**

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29 Several limitations of this needs assessment should be noted. Due to an extremely tight
30 timeframe, we began with our center, and thus are not, at this point in time, able to generalize our
31 findings to other tertiary and community hospitals. Although we have attempted to include all
32 key stakeholders in our needs assessment, it was not feasible to obtain a wider sample to include
33 other stakeholders such as security, social work, and the wider public. Additionally, it was a
34 practical decision to begin with the critical care unit as this is where our expertise lies. As many
35 solutions involve multiple players, finding solutions will become a collaborative effort involving
36 other departments and stakeholders.
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50 **Conclusions**

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52 Ebola has been described as a 'Black Swan' as it is a far outlier from the usual expectations and
53 carries an extreme impact.(45) Although the risk of an Ebola outbreak in Canada remains low,
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3 isolated cases would not be unexpected.(3) Preparedness depends on the strength of health
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5 systems and processes, which have been called into question. This investigation identified
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7 widespread gaps across numerous themes and has provided a credible and measureable set of
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9 results, which have aligned key stakeholders toward a unified goal.(46) The process, tools and
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11 results may be of interest to other acute care hospitals and could potentially be adapted to their
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13 local context, resources and site designation.
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20 A systematic approach to identifying gaps is an essential step in health delivery research aimed
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22 at ensuring that safe practices are in place to care for patients with Ebola. With extensive
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24 international travel across countries and a variety of highly infectious agents spread through
25
26 direct contact, it is important to also think beyond Ebola to be prepared for future possibilities,
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28 and to be proactive in preparation rather than reactive.(41)
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3 **Author Contributions:** Drs Sarti and Cardinal had full access to all of the data in the study and take
4 responsibility for the integrity of the data and the accuracy of the data analysis.
5

6 *Study concept and design:* Sarti, Sutherland, Kim, Cardinal
7

8 *Acquisition, analysis, or interpretation of data:* Sarti, Sutherland, Robillard, Kim, Dupuis, Thornton,
9 Mansour, Cardinal
10

11 *Drafting of the manuscript:* Sarti and Sutherland
12

13 *Critical revision of the manuscript for important intellectual content:* Sarti, Sutherland, Robillard, Kim,
14 Dupuis, Thornton, Mansour, Cardinal
15

16 *Administrative, technical, or material support:* Kim, Dupuis, Thornton, Cardinal
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18 *Study supervision:* Sarti, Sutherland, Kim, Cardinal,
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24 **Ethics:** This study was granted an official exemption by the Chair of The Ottawa Hospital Research
25 Ethics Board
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List of Tables:

Table 1. Time-Ordered Matrix: Tracking Needs Assessment Activities

Table 2. Summary of themes and desired results

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Table 1. Time-Ordered Matrix: Tracking Needs Assessment Activities

Date	Activity/Data Collection	Key Stakeholders							
		Physician	Nursing/CF	Respiratory Therapy	Housekeeping/Waste Management	Infection Control	Administration	Occ. Health & Safety	Facility Staff
21-10-2014	Walk-through of ER and ICU areas	1	2	1			3		
	Walk-through of ICU areas	1			4				
	Interview RT lead			1					
	Interview with nurse CF		1						
	Interview with MD	1							
22-10-2014	Interdisciplinary focus group	3	5	1			2		
	Walk-through of ICU	1	1				2		
	Interview with nurses		2						
	Walk-through of ER and ICU areas	1					2	3	
23-10-2014	Focus group with MDs	15							
	Walk-through of ward and ICU	1	1	1	2		3		1
	Interview MD	1							
	Interviews with nurses		7						
24-10-2014	Interview with pharmacist								1
	Walk-through of simulation lab (might remove this)						2		
	Focus group with Nurses	2							
	Walk-through of ICU (am)	1	1				2		3
	Walk-through of ICU (pm)	1	1		2		1		
	Nursing focus group		10						
	Interview with porter								1
27-10-2014	Interview with dietician								1
	Walk-through of ED and ICU	1	2	1	2	2	3		1
04-11-2014	Review of elements/results	2	2						
	Focus group	2				2			
05-11-2014	Interview					1			
	Interviews – Post PPE training	2	2	1					
06-11-2014	Focus group with RTs			9					
	Interviews			1	2				
07-11-2014	Data validation – Review in detail completed by numerous key stakeholders	4	3	1	1	1	2		

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Table 2: Summary of themes and desired results

Themes	Desired Results	Number of results	Number of gaps	Solutions Implemented for gaps (Y=yes, N=no I/P=in progress)
Screening before entry to ICU (or with any ICU team contact) with regards to transfer from ER, wards, OR, RR, and other hospitals)	<ul style="list-style-type: none"> A screening tool will be developed and kept up to date HTMs responsible for screening will always use the most current version of the tool to screen potential cases of Ebola All HTMs performing screening will be appropriately trained to use the most secure screening process All potential cases of Ebola will be screened with the up to date tool and critical care HTMs will be informed of the screening test result before any physical contact occurs. All patients admitted to ICU who are from a high-risk area or have had potential contact with Ebola will receive appropriate ongoing screening. The screening result will be readily accessible to HTMs. 	6	5	Y = 1 N = 4
Response team activation	<ul style="list-style-type: none"> There should be an easy and rapid way to activate a response that would not overburden HTMs who are also called upon to provide care and manage the patient. The activation will ensure that only essential personnel are notified and expected to respond. Dedicated response teams will be available to secure and manage any individual who is screen + for Ebola. The team will be immediately available regardless of patient location or time of day. 	3	3	I/P = 3
PPE	<ul style="list-style-type: none"> HTMs will perform a risk assessment prior to donning PPE. There will be a clear process of donning and doffing appropriate PPE that will protect HTMs while caring for patients with potential or confirmed Ebola. All equipment used in the process of donning and doffing will be available and easily accessible. HTMs will be proficient with the donning and doffing of PPE before any patient encounter or entering an Ebola precaution room. HTMs will recognize when the clinical scenario changes and they must escalate their level of PPE 	5	5	N = 1 I/P = 4
Managing Post-Exposure to Virus through Body Fluids	<ul style="list-style-type: none"> There will be clear definition of an unprotected exposure HTMs will recognize when exposure has occurred HTMs will be proficient in taking immediate actions if exposure to body fluids occurs There will be appropriate facilities available to decontaminate HTMs if exposed HTMs exposed to bodily fluids will be informed of the procedure to follow over the ensuing days All HTMs who help manage a patient with Ebola complete monitoring, even if there was no unprotected exposure 	6	5	N = 3 I/P = 2
Patient Placement, Room Set up, Logging and Signage	<ul style="list-style-type: none"> The most suitable rooms to manage patients with suspected or proven Ebola will be selected and then redesigned and equipped if required. Appropriate signage will be posted in the event of a suspected or confirmed case. Entries and exists of all HTMs and visitors will be logged. 	3	2	Y = 1 N = 1
Intra-hospital Patient Movement	<ul style="list-style-type: none"> HTMs will be able to determine the most suitable room placement for any patient with suspected or confirmed Ebola Measures will be in place to optimize early recognition of patient deterioration in order to ensure safe transfer The transport process will be clearly defined and will only include essential staff There will be a clear and simple process to assemble the team required to transport the patient. Team members involved in the transport will be readily available at all times. Team members will be proficient, given their respective roles and responsibilities during the transport 	5	5	N = 2 I/P = 3

1 2 3 4 5 6	Inter-hospital Patient Movement	<ul style="list-style-type: none"> The critical care team will be informed of any patient(s) with suspected or proven Ebola who might require ICU admission There will be a clear process in place to ensure that the community hospitals receive all necessary information to initiate safe transport There will be a plan of transport from entry point at our hospital to the ICU, which will minimize the risk of contamination There will be a clear process in place to ensure that the transfer of care in the ICU occurs safely for both the patient and staff 	4	2	N = 2
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	Critical Care Management	<ul style="list-style-type: none"> HTMs will be supported in their decisions to withhold interventions in order to minimize the risk of spreading infection HTMs will modify their clinical assessment to provide the best possible patient care while minimizing the risk of contamination. HTMs will modify non-invasive and invasive monitoring to provide the best possible patient care while minimizing the risk of contamination There will be a clear process in place to perform CXRs and EKGs HTMs will take appropriate measures to decrease the risk of exposure to body fluids HTMs will avoid using aerosol generating procedures whenever possible HTMs will take measures to safely obtain central access when required HTMs will safely draw blood Critical care staff will be aware of any lab testing which cannot be obtained for patients with suspected or proven Ebola Sharps will be safely handled and disposed of HTMs will consider cardiopulmonary resuscitation in the appropriate setting. HTMs will not perform cardiopulmonary resuscitation in end-stage EVD HTM will consider dialysis in the appropriate setting and measures will be taken to minimize the contamination risk ECMO will not be offered in patients with proven Ebola HTM will consider using nasogastric (NG) and feeding tube in the appropriate clinical setting and the insertion procedures will minimize the risk of contamination The procedure used to handle food will minimize the risk of contamination HTMs will be proficient in the management of sudden terminal events There will be a plan detailing the management of obstetrical patients and newborns. Policies and procedures for transfusion of blood products will be clearly documented. There will be a clear process to decide and plan discharge from hospital 	19	11	Y = 5 N = 5 I/P = 1
25 26	Ebola Specific Diagnosis and Treatment	<ul style="list-style-type: none"> HTMs will order the most suitable test to diagnose Ebola Physicians will order and have access to the most appropriate therapy to target EVD 	2	0	
27 28 29 30 31	Critical Care Staffing Issues	<ul style="list-style-type: none"> There will be sufficient staff available at all times with the required expertise and PPE training to provide patient care and maintain the patient area The roles and responsibilities of HTMs directly or indirectly involved in the care of patients with suspected or proven Ebola will be clearly defined HTMs who have cared for patients with Ebola will monitor themselves for signs of infection 	3	3	N = 2 I/P = 1
32 33 34 35 36	Visitation and Contacts	<ul style="list-style-type: none"> Visitation rights will be clearly defined Support will be provided to patients and their family members There will be a clear process on how to manage anyone who has had unprotected contact with a patient with suspected or confirmed Ebola There will be a clear process on how to screen visitors to the ICU and manage any visitor who is found to be positive. There will be a clear process on how to manage any visitor who is screen positive 	5	4	N = 4
37 38 39 40 41	Waste management, Environmental Cleaning, Management of Linens (overlap)	<ul style="list-style-type: none"> Waste will be safely removed from the room Processes will be in place to handle spills. Processes will be in place to clean and disinfect surface areas Measures will be taken to avoid contamination and facilitate cleaning. There will be a clear process in place to handle and clean used linen Processes will be in place to clean and disinfect non disposable equipment 	6	5	Y = 1 N = 3 I/P = 1
42 43 44 45 46 47 48 49	Post mortem	<ul style="list-style-type: none"> There will be a clear process in place to handle a deceased patient 	1	1	I/P = 1

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Conflict resolution	<ul style="list-style-type: none"> • There will be a clear process in place to respond to family members/visitors who refuses to cooperate with the established policies • There will be a clear process in place to respond to patients who are uncooperative and/or aggressive. 	2	2	N = 2
Communication	<ul style="list-style-type: none"> • There will be a clear process of communication to ensure that hospital and departmental leaders collaborate • There will be a clear process of communication, which ensures that HTMs are well informed and up to date • Communication will be established with other institutions designated as Ebola Centers 	3	2	I/P = 2
	Totals	73	55	Y = 8 N = 29 I/P = 18

* Note – Gaps were only assigned a yes (Y) or in progress (I/P) if a concrete plan or solution was identified and in place and an individual/team was clearly tasked to complete. Gaps were assigned a no (N) solution implemented if the research team had not identified a specific solution, which had been or was being implemented, during the study period. As the team works to implement solutions following the study period, completed solutions may be uncovered, which were implemented and/or have been completed by other groups.

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3 List of Online-Only Supplements:
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6 eTable 1. Descriptive meta-matrix: Results of the critical care Ebola readiness needs assessment.
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9 eDocument 1: Critical Care Ebola Room Assignment and Set up

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11 eDocument 2: Critical Care Response to Suspected/Confirmed Ebola patient in Emergency Department
12 Requiring Intensive Care Unit Admission
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eTable 1. Descriptive meta-matrix: Results of the critical care Ebola readiness needs assessment.

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eDocument 1: Critical Care Ebola Room Assignment and Set up

Room walk-throughs performed with nurses, MDs, RTs, housekeeping, occupational health and safety, facility staff, and infection control

1. An environmental survey was performed with input from multiple disciplines, including physicians, nurses, and care facilitators. Key measures considered:
 - a. Required characteristics of the room – Negative pressure with anteroom, dedicated toilet
 - b. Safe route of travel from outside to inside ICU
 - c. Space outside room for equipment, to put on PPE and for nursing desk to constantly observe patients
 - d. Isolation of room from other traffic, including visitors and staff
 - e. Ability to cohort patients if multiple cases
 - f. Ability to perform simulations
2. Characteristics for room set up
 - a. Minimal equipment in the room
 - i. All unnecessary equipment was removed including regular garbage pails, chairs, etc.
 - ii. Removed hose for washing toilet (has potential to aerosolize particles)
 - iii. Removed nitrile gloves and the wall holder for the gloves as they are contaminated in the room.
 - b. Disposable equipment placed and changed including:
 - i. BP cuff
 - ii. Tubing
 - iii. Blinds removed and disposable curtains
 - c. Dedicated equipment
 - i. Cleaning equipment
 - ii. Stethoscope – discussed – Currently we have not put a stethoscope in the room - need to weigh benefit / risk
 - d. Hazardous waste
 - i. Red containers
 - ii. Sharps containers
 - e. Decontamination
 - i. Virox, Clorox
 - ii. Hazard tape – at the exit door to the anteroom to signal to start decontamination
3. Anteroom set up
 - a. All equipment removed including computer, desk, wall hangings, shelves and supplies then room was repainted
 - b. Mirror beside doffing area installed
 - c. Intercom in anteroom room – installed to allow for communication with doffing procedure
 - d. Hazard tape - Taped off clean/dirty transition
 - e. Clorox bleach cloths for decontamination
 - f. Nitrile gloves
 - g. Decontamination mat – to be determined with Infection Control
4. Outside of the room
 - a. Nursing desk
 - b. Cart with PPE supplies

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- c. Shoes dedicated for in patient room only
- 5. In event of a case will need to add
 - a. Supplies specific to patient management

** Note at this time: NO WASTE CAN GO DOWN TOILET OR DRAIN ***

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3 **eDocument 2: Critical Care Response to Suspected/Confirmed Ebola patient in Emergency**
4 **Department Requiring Intensive Care Unit Admission**
5

6 For all transport – need to contact security and housekeeping as well
7 While preparing for transport security will ensure route is clutter free
8

9 Patient suspected with Ebola needs ICU

- 10 1. Emergency Department (ED) Care Facilitator (CF) calls Intensive Care Unit (ICU) CF and ED
- 11 physician call ICU physician
- 12 2. ICU CF
- 13 a. Checks ICU room is ready, red board is brought in
- 14 b. Activates staff - 2 nurses, porter, +/- RT
- 15 3. 2 ICU nurses go to ED and bring: MMS, portable monitor, portable vent if needed
- 16 4. **Risk Assessment performed** – completed with team - ICU nurse and physician
- 17 a. Determine minimum number of staff required to transfer and stabilize safely
- 18 b. Do they need to be transferred on monitor or can they be safely transported off of the
- 19 monitor (there are many small spaces on the monitor that could be difficult to
- 20 decontaminate, if monitor used remove all pressure modules if not needed)
- 21 c. Patient stability for transport and body fluid management
- 22 1. Respiratory distress – assess need for intubation prior to transfer or use a mask
- 23 2. Nausea/vomiting- assess need for nasogastric (NG) tube
- 24 3. Diarrhea- insert fecal management system
- 25 4. Incontinent of urine - Foley catheter
- 26 5. Open wounds covered and dressed
- 27 5. Patient ready for transport- Two ICU nurses don personal protective equipment (PPE), remain
- 28 outside the door
- 29 a. Note – if ICU nurses or physicians were in the room with the patient to assess or assist
- 30 with stabilization they will need to follow doffing procedures and then don clean PPE to
- 31 accept the patient outside of the room door
- 32 6. MMS, monitor, vent handed in to the room ED staff hook patient up, patient masked if non
- 33 vented
- 34 7. Patient moved on stretcher out of the resus room
- 35 a. **Security** - leads ensures that route is clutter free and to open door (Note: security must be
- 36 careful not to be too far ahead as they press the automatic door open disks – otherwise
- 37 risk that the doors will automatically close on the transport team and get contaminated)
- 38 b. **ICU Nurse 1** - and ICU MD/RT transfer patient to the ICU
- 39 c. **ICU Nurse 2** – follows behind and remains clean and observes the team transport actions
- 40 to identify any contamination
- 41 d. **Housekeeping** – follow behind prepared to clean any contaminated surfaces
- 42 8. Patient transferred to ICU bed with the red board
- 43 9. ICU Nurse 2 pushing the bed and the ICU MD/RT will get the patient settled in bed
- 44 10. ICU Nurse 1 does not go in the room and becomes the observation nurse for everyone on the
- 45 room

46 Note:

- 47 A. If Nurse 1 remains clean then on arrival to the ICU room, Nurse 1 can stay outside of the
- 48 room and remove PPE without full doffing procedures, Nurse 1 will continue to serve as the
- 49 observer monitoring the team.
- 50 B. If Nurse 1 comes in contact with the patient or equipment during transport OR if Nurse 1 is
- 51 required to stabilize the patient in the room, Nurse 1 will enter the room with the team and
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complete full doffing procedure. In this case a trained observer must still be in place outside of the room – team suggested the CF

Need to decide what to do with the stretcher – this will require further exploration. Numerous suggestions have been made to cover in plastic prior to transferring patient onto stretcher.

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eTable1: Descriptive meta-matrix of critical care Ebola readiness needs assessment results

This section outlines the elements/results, which must be achieved in caring for potential or confirmed cases of Ebola, with respect to critical care. The goal of the matrix is to provide information from many different sources in a manner that makes pragmatic sense to every hospital team player. The first column displays the results that we are trying to achieve. The second and third columns present recommendations/evidence to achieve the desired result, obtained from international organizations and national/provincial/local organizations, respectively. The fourth column represents a summary of our qualitative data (interviews, focus groups, walk-throughs) that will help find local solutions. The qualitative data may help other organizations (not only The Ottawa Hospital (TOH)) as they are likely to encounter very similar challenges when attempting to put in place pragmatic local solutions that are still congruent with international and national recommendations. Note that the document analysis was last updated on November 07, 2014. . The proposed solutions column is not complete. Interprofessional teams at TOH are developing local solutions.

In this document, the term hospital team member (HTM) has been used in order to recognize the vital role that many individuals from various backgrounds contribute to the care of patients with potential or confirmed ebola. The interdisciplinary team of HTMs includes physicians, nurses, respiratory therapists, infection control specialists, housekeeping staff, porters, security staff, facility staff, occupational health and safety, etc. A complete list of acronyms is available at the end of the matrix.

A. Screening before entry to ICU (or with any ICU team contact) with regards to transfer from ER, wards, OR, RR, and other hospitals)

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap identified	Solution Implement	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
A screening tool will be developed and kept up to date	N	N	<p>CDC¹ - CDC has developed a screening checklist. Based on this checklist, Emory has developed protocols to screen individuals encountered in different milieus</p> <p>CDC² – CDC has an algorithm for returning travelers.</p> <p>CDC³ – Screening algorithm available on CDC website (see reference)</p> <p>CDC³ – “Early recognition is critical to controlling the spread of Ebola virus. Healthcare providers</p>	<p>PHO⁶ – The department of Public Health Ontario provides a screening tool for primary care providers. It consists of questions related to prior travel and presence of EVD symptoms. (See reference for URL link)</p> <p>TOH – Ebola triage screening tool (Nov. 7, 2014)</p> <p>TOH – Algorithm for assessment of potential Ebola virus disease in the Emergency Department (Sept 4, 2014)</p>	<p>HCPs in the ICU had the following questions:</p> <ul style="list-style-type: none"> Which source will be used to define the criteria? Who maintains the tool as new data emerges? How often is the tool reviewed? <p>A tool has been developed and is being used in the ED. Infection control has clarified that this tool is from Public Health Ontario (PHO). It is reviewed when mandated by PHO and also through internal review with infection control. There is no set time for frequency of review.</p>	Solution – None required at this time

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		<p>should evaluate the patient's epidemiologic risk including a history of travel to a country with widespread Ebola virus transmission or contact within the preceding 21 days with a person with Ebola while the person was symptomatic."</p> <p>EMORY⁴ p.4-5 – Protocols have been developed to screen individuals. They have established criteria for high, low and intermediate risk of EVD.</p> <p>WHO⁵ – Screening based on patient history:</p> <ul style="list-style-type: none"> - Any contact with someone in the previous 3 weeks who was ill with fever +/- bleeding or who died from an unexplained illness with fever +/- bleeding? - Any contact with other family members who are sick or have died from a disease with similar symptoms and signs? - Unexplained death of wild animals in the area? - History of contact with blood and body fluids of wild animals (especially monkeys, bats, rats, etc.)? - History of visiting/exploring caves or working in mines infested with bats? - Received a tick bite or crushed a tick with their bare hands? - Home infested with rats? <p>WHO⁵ – Case identification and detection is based on 3 components:</p> <p>1- History of exposure: Within 2-21 days prior to the patient's onset of symptoms (within the potential incubation period). Exposures include</p>			
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			<p>any blood or other body fluid including sweat, vomit, breast milk, contaminated items, animal contact (bush meat, apes or bats) and/or semen (up to 3 months after clinical recovery) from a known or suspected case of VHF (dead or alive)</p> <p>2- Detailed clinical assessment: flu-like symptoms (fever, profound weakness, arthralgia, myalgia, headache, anorexia, and hiccups followed by gastrointestinal symptoms and in late stages, minor or major bleeding and shock)</p> <p>3- Laboratory investigations</p>			
HTMs responsible for screening will always use the most current version of the tool to screen potential cases of Ebola	Y	N			<p>Participants questioned where the tool would be displayed and who would notify the group of the changes?</p> <p>Suggestions were made for screening cards, online access and posters. However, barriers with posters and cards were identified given the challenges of keeping material up to date and removing outdated material. They suggested sending emails to all employees who are expected to screen potential cases whenever the tool is updated. The ED tool is available on the TOH website. During NA however, difficulties were encountered with opening and viewing the PDF.</p>	
All HTMs performing screening will be appropriately trained to use the most secure screening process.	Y	N	<p>WHO – When screening, shaking hands should be avoided, a distance of more than one meter should be maintained between interviewer and interviewee, PPE is not required when interviewing an asymptomatic patient and the above mentioned distance and provided there will be no contact with the potentially contaminated environment, perform appropriate hand hygiene with alcohol-based hand rub solutions.</p>		<p>Currently, HTMs in critical care have not been trained on how to screen patients. Participants had the following questions:</p> <ul style="list-style-type: none"> Who should receive training to screen? How are they trained to screen? Who will provide the training? How frequently? 	

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<p>All potential cases of Ebola will be screened with the up to date tool and critical care HTMs will be informed of the screening test result before any physical contact occurs.</p>	<p>Y</p>	<p>N</p>	<p>WHO – If there is a suspected case of VHF, the person screening will call for help from a doctor within the facility for further evaluation. After further evaluation, contact the hospital/district surveillance focal person and/or district health officer. Keep the patient in the holding room/area.</p>		<p>Critical care HTMs are currently not using a screening tool and a spot audit in the ICU revealed that numerous cases admitted from the ED and other areas had not been screened.</p> <p>Critical care HTMs identified a gap in knowing who is responsible for performing or confirming screening at specific points of contact. Points of contact were identified and explored:</p> <ul style="list-style-type: none"> • ICU consults from the ED and OR could be screened by the Care Facilitator (CF). • ICU consults from referring hospitals could be screened by both the attending MD and the CF. • With RACE there are many potential points of contact including, ED for admitted patients, ward, Rehab, PACU, out patient clinics and others (such as hallways and parking lots). Given that some referrals might not have been screened, it has been suggested that RACE should screen all referrals. 	
<p>All patients admitted to ICU who are from a high-risk area or have had potential contact with Ebola will receive appropriate ongoing screening.</p>	<p>Y</p>	<p>N</p>			<p>Asymptomatic infected patients from high-risk area could initially be screen-negative but could become infectious during their stay in the ICU.</p> <p>If a patient is from a high-risk area has had a recent contact but is asymptomatic, infection control will ensure twice daily temperature checks.</p> <p>In order for infection control to be aware of these patients the screening staff would need to contact and notify them. Currently, critical care staff have not been trained on how to use the tool and hence would not know to notify infection control.</p> <p>It was also unclear if other</p>	

					symptoms need to be monitored during this time.	
The screening result will be readily accessible to HTMs.	Y	Y			The NA identified that there was not a consistent location for the screening result. Therefore, HTMs were having difficulty finding the screening result in the chart. The recommendation was made that it be consistently placed in at the front of the chart beside the category of care document. It was further recommended to consider printing the tool on a distinct colored page.	Solution – The suggestions were brought forth to the executive committee and the screening tool is now placed with the category of care document.

B. Response team activation

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap Identified	Solution Implemented	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
There should be an easy and rapid way to activate a response that would not overburden HTMs who are also called upon to provide care and manage the patient.	Y	I/P	<p>WHO⁷ – Make every effort to reduce the waiting time between initially seeing the patient and notification/referral. Develop a system to move patients quickly and reduce the time that others are exposed.</p> <p>EMORY⁴ p.17-19 – A complete protocol of activation of their Serious Communicable Disease Unit is available (but may not be applicable to the reality of TOH's ICUs)</p>	<p>TOH – Once patient has screened positive according to the TOH ER algorithm, the infectious disease physician on call, IPAC, Ottawa Public Health, Administration on call (if off hours) CAOs must be notified by the most responsible person in ER. If Ebola testing is indicated, the ID physician is responsible for contacting the microbiologist on call before blood work (including Ebola testing) can be drawn. If the patient is admitted, and being transferred out of the ER: CAOs or CF must notify the receiving unit, and communications on call of the transfer. Housekeeping and Logistics must be notified of Ebola Droplet/contact precautions by the unit. Bed management/bed flow must be notified of this coded "C".</p>	<p>Ideally a designated person who is not providing patient care should make contacts and phone calls. An email has been sent to ICU physicians notifying them that it is their responsibility to then notify Infectious Disease (ID)/Occupational Health/Infection Control. Need to verify if the MD must call all three or if a single call to ID is required to activate the system. Concerns were raised about delays in the provision of care if the activation process was too cumbersome (i.e. need to notify many individuals)</p> <p>Activation process may depend on the point of contact.</p> <p>In the ED for direct consult to the ICU the patient will have been screened and then the system activated by the ER screening nurse. The CF will be called from the ER and will be required to immediately inform the critical care Ebola</p>	Infection control is currently developing the process.

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					response team. For the unanticipated patient (e.g. outpatients, visitors), it is unclear how the system will be activated. It was suggested to develop a "Code E", which could utilize either a pager already in use or a dedicated pager.	
The activation will ensure that only essential personnel are notified and expected to respond.	Y	I/P		CCCS ⁸ p.13 – "The team may vary from institution but should include a senior nurse, senior physician, infection prevention and control (IPAC) officer, and employee safety officer as well as a communications officer"	HTMs identified that the composition of the team may vary depending on the point of contact and the severity of illness of the patient. While ID, infection control and occupational health and safety will always be part of the response team; other team members may vary. For example, it would be inappropriate to call the critical care Ebola response team to assess a stable patient seen in ED who is screen positive. Participants suggested that the person responsible for activating the response should follow a well-defined and simple process in order to only contact essential team member. Housekeeping and waste management wanted to ensure that they were notified early and were concerned that they could be overlooked.	Infection control is currently developing the process.
Dedicated response teams will be available to secure and manage any individual who is screen + for Ebola. The team will be immediately available regardless of patient location or time of day.	Y	I/P		CCCS ⁸ p.18 – "It is suggested hospitals, especially in the ED and Critical Care Unit, train small teams well rather than attempting to train all employees, in advanced PPE. At least 1-2 members of the advanced PPE teams should be present on each shift, to assist staff as needed, and call for the full team if necessary."	At present, the composition of the Ebola response teams is unclear. Depending on the clinical situations the composition of the team may vary. Participants identified different scenarios: 1. The critically ill patient in the ED who requires ICU care - The participants suggested that members of the critical care Ebola response team should be identified before each shift to ensure that they are readily available if called upon. 2. The unanticipated screen + patient who is not critically ill (not meeting RACE calling criteria, for example outpatients) – Concerns have	Solution – Infection control is currently developing the process.

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					<p>been expressed that the RACE team should not be called to manage these patients. There may be a large volume of cases that present with screen + who are not critically ill (especially with flu season approaching). RACE's mandate is to care for critically ill patients. In addition, the RACE team may not always be available.</p> <p>3. RACE call during the day – If a patient screens + on a RACE call, more staff will be required to manage the patient. It was suggested that the RACE MD and nurse would don PPE and remain with the patient until other critical care team members arrive.</p> <p>4. RACE call during the night – There is no ICU staff physician in house at night. Should a patient screen + at night during a RACE call, it was suggested that another trained MD in house (e.g. emergency physician) be called upon to immediately attend to the patient until the ICU staff physician's arrival.</p>	
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C. PPE

		Document Analysis		Qualitative Data	Proposed solutions
Result	Gap Identified	Solution Implemented	International Documents - WHO / CDC / Emory National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
HTMs will perform a risk assessment prior to donning PPE.	Y	I/P	WHO ⁷ – Standard precautions include point-of-care risk assessment for appropriate selection of PPE to avoid direct contact with the patient's body fluids (blood, stool, amniotic fluid, urine and respiratory secretions)	Participants suggest that the risk assessment be incorporated into the PPE training.	Solution – Have discussed adding this to the simulation training with infection control

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				<p>appropriate safe work practices. Health sector employers should ensure that health workers are incorporating the latest in Infection Prevention and Control (IPAC) recommendations from the MOHLTC for EVD into their point of care risk assessments, including any enhancements or modifications to PPE controls.”</p> <p>PHAC¹⁰ – “HCWs should have sufficient knowledge, skills and resources to perform point of contact risk assessment (PCRA) before every interaction with a patient to apply appropriate control measures.</p> <p>Patients with symptoms should be assessed in a timely manner for EVD and for other alternative or co-existing potential communicable infections (e.g., EVD, malaria, dysentery, typhoid fever, tuberculosis, measles, gastroenteritis)</p> <p>Assess for travel within 21 days to Ebola-affected areas, or contact with an individual with onset of symptoms within 21 days of travel to an Ebola-affected area.</p> <p>Assess for symptoms of EVD: presenting with a fever of $\geq 38.6^{\circ}\text{C}$ (101.5°F) and at least one of the following additional symptoms: malaise, myalgia, severe headache, conjunctival injection, pharyngitis, abdominal pain, vomiting, diarrhea that can be bloody, bleeding not related to injury, unexplained hemorrhage, and erythematous maculopapular rash on the trunk”</p>		
There will be a clear process of donning and doffing appropriate PPE that will protect HTMs while caring for patients with potential	Y	I/P	CDC ¹¹ – “Use trained observers to monitor for correct PPE use and adherence to protocols for donning and doffing PPE, and guide healthcare workers at each point of use using a checklist for every donning and doffing procedure”	MOHLTC (Oct 30th) ⁹ p.6 – Trained observer required to inspect donning and doffing of PPE to ensure inadvertent contamination of eyes, mucous membranes, skin or clothing does not occur. As possible, the	In keeping with provincial standards, the initial PPE training for caring for patients with suspected or proven Ebola included a fluid resistant gown, one pair of gloves (two if drawing blood), surgical mask, goggles and a face shield. Later	On October 18 th , the MOHLTC released new directives to enhance the PPE measures used by HTMs. Following this release, ID and Infection control sourced equipment

<p>or confirmed Ebola.</p>		<p>CDC¹¹ – “The trained observer is a dedicated individual with the sole responsibility of ensuring adherence to the entire donning and doffing process”</p> <p>CDC¹¹ – Ensure adequate time for donning and doffing of PPE by HCP without interruptions and distractions</p> <p>CDC¹¹ – Guidelines for required PPE for trained observers if they enter the contaminated area (anteroom) to help with the doffing of HCP’s PPE. (Refer to web site)</p> <p>CDC¹¹– Stepwise guidelines for donning and doffing equipment available on CDC website</p> <p>EMORY⁴ p.40 – See Appendix 6 (SCDU PPE: Donning and Doffing Protocols) Very detailed instructions on how to don and doff PPE.</p> <p>CDC¹¹ – Recommended equipment: 1) Respiratory protection: Powered air-purifying respirator (PAPR) or N95 respirator 2) Gowns: “Single-use (disposable) fluid-resistant or impermeable gown that extends to at least mid-calf or coverall without integrated hood. Coveralls with or without integrated socks are acceptable” 3) Gloves: two pairs minimum / nitrile 4) Shoe covers: “Single-use (disposable), fluid-resistant or impermeable boot covers that extend to at least mid-calf or single-use (disposable) shoe covers. Single-use (disposable) fluid-resistant or impermeable shoe covers are acceptable only if</p>	<p>observer should watch HCW activities in the patient room.”</p> <p>PHAC¹⁰ – “PPE should be provided outside the patient’s room or in the anteroom.</p> <p>Consider assignment of trained individual to monitor appropriate selection and application, removal and disposal of PPE, to observe and ensure HCW not contaminating self and to monitor entry to room (i.e., limit entry to only essential HCWs). The need for enhanced PPE (e.g. double gloving, leg and shoe coverings), is determined by assessing the risk of heavy exposure to blood and body fluids). Note: In late stages of EVD, there may be copious secretions and excretions.</p> <p>Gloves</p> <ul style="list-style-type: none"> • Should fit securely over gown cuff and should be worn to enter the patient room • Should be removed and discarded into a no-touch waste receptacle and HH should be performed on exit from the patient room <p>Gowns:</p> <ul style="list-style-type: none"> • A long-sleeved, cuffed, fluid-resistant or impermeable gown should be put on prior to entry to the room. • Reusable gowns should be removed and placed into a no-touch used linen receptacle immediately after use 	<p>neck and boot covers were added. Participants felt that this equipment and process was inadequate and did not offer sufficient protection. In addition, participants identified errors in the videos that were provided to enhance training and the quality of the face-to-face training was also questioned. Furthermore, many participants, described feeling that their concerns were not being acknowledged or taken seriously by the infection control staff, which contributed to a lack of trust. In contrast, infection control staff described experiencing much anxiety and worry about providing the education during this time, fearing that they would not be well received.</p> <p>HTMs wanted to ensure that proper procedures were in place for decontamination and to remove bodily fluid on their PPE before doffing. For example, use of Clorox prior to exiting the patient room to wipe of any soiled surfaces.</p> <p>A new training program was developed and implemented. Interviews with HTMs following their training session identified that overall they felt the educational session went well and the equipment and process were much improved. HTMs were impressed with the speed with which the program had been put together and also described a positive learning environment: the infection control professionals being much more open and engaged in listening to their comments and suggestions.</p> <p>Questions still remained about various aspects of doffing. Concerns were expressed about the difficulty with removing the hooded coveralls and the need for more</p>	<p>and rapidly developed curriculum on PPE donning and doffing with the new equipment. Still to need to determine if PAPR equipment will be acquired and if so, the process. Also need to discuss addition of an apron.</p>
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		<p>they will be used in combination with a coverall with integrated socks”</p> <p>5) Apron: “Single-use (disposable), fluid-resistant or impermeable apron that covers the torso to the level of the mid-calf should be used if Ebola patients have vomiting or diarrhea.”</p> <p>WHO⁵ p. 46-47 – HCW will use standard precautions consistently when providing care to all patients. Regardless of their diagnosis. Their rigorous implementation is crucial for the control of outbreak situations. This is key since early symptoms are non-specific.</p> <p>WHO⁷ – The dressing and undressing of PPE should be supervised by another trained member of the team.</p> <p>WHO p.52-58⁵p.6⁷ – Perform hand hygiene: with alcohol-based hand rub or soap and running water, especially if the hands are visibly soiled (technique Annex 3)</p> <ul style="list-style-type: none"> - Before donning gloves and wearing PPE on entry to the isolation room - Before any procedure - After any exposure (risk or actual) to patient’s body fluids or blood - After touching (even potentially) contaminated objects/surfaces - After removal of PPE, leaving the care area <p>WHO⁵ – <u>Glove change between patients</u>: disinfect using an alcohol based hand rub, the outer gloves before removing them safely then disinfect the inner gloves before putting on another fresh outer pair</p>	<p>and HH should be performed before leaving the patient room.</p> <ul style="list-style-type: none"> • Disposable gowns should be discarded into a no-touch waste receptacle immediately after use and HH should be performed before leaving the patient room. <p>Facial Protection:</p> <ul style="list-style-type: none"> • Facial protection (i.e., masks and eye protection, or mask and face shield) should be worn on entry to the room. <p>Note: Masks with visors are not suitable; face shields should be long enough to prevent splashing underneath; eye glasses are not suitable eye protection.”</p> <p>TOH – Donning and Doffing sequence of PPE (Oct 22, 2014): A spotter must be present at all times of donning and doffing PPE</p> <p>TOH – Personal protective equipment for Ebola Virus Disease Narrative Checklist: Putting on PPE (Nov. 5, 2014)</p> <p>TOH – Personal protective equipment for Ebola Virus Disease Narrative Checklist: Removing PPE (Nov. 5, 2014)</p>	<p>practice required to attain proficiency. Suggestions were also made to have dedicated footwear and an apron to be removed in the patient room before entering the anteroom. The apron was noted to be particularly important when caring for critically ill patients.</p> <p>At the time of the investigation, it was recommended by the MOHLTC that HTMs wear a PAPR suit when performing aerosol-generating procedures. This equipment had not been acquired and participants were unclear whether the PAPR suit should only be used with intubation or also with other aerosol generating procedures.</p>	
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			mouth protection are worn. Fluid-resistant particulate respirator; use when doing procedures that generate aerosols of body fluids by cough or nebulized medications (diagnostic sputum inductions, bronchoscopy, airway suctioning, endotracheal intubation, PPV via face mask)			
All equipment used in the process of donning and doffing will be available and easily accessible.	Y	I/P		<p>TOH – Checklist to determine environmental readiness for an Ebola patient (Oct. 31, 2014) Hallway: Identify Ebola cart location, have a log list ready to post, have stool in the hallway for HCP to sit when putting on PPE, confirm PPE sequencing checklist is located in the hallway Anteroom: post PPE sequencing checklist, cover computer with plastic bag, identify soiled and clean floor space in the anteroom: using tape and have safe trial doffing in the anteroom to confirm location of soiled area, have garbage bin lined with red bag to dispose of PPE, and test location to make sure its in arms length for the HCP, ensure mirror in the anteroom is in place to allow for ease of visualization of doffing PPE, identify location for the 3 bags to hold the clean gloves, ensure Clorox wipes are easily available for all steps in the sequencing of doffing , have stool/chair in the anteroom (soiled area) to allow for sitting during suit removal, ensure scissors are in place in the anteroom.</p>	<p>Participants wanted clarification of the following:</p> <ul style="list-style-type: none"> Where is the PPE equipment kept? ED, ICU, RACE, ward? Who stocks the equipment and how often is it checked / verified? Where to store equipment on the RACE cart? <p>It was suggested that RACE staff select appropriately sized and labeled PPE at the start of their shift and add individually packaged PPE with a checklist on the RACE cart.</p>	<p>Solution – equipment is now available in clear locations in the ICU and ED. There is no equipment on the RACE cart. Some sizes are not available yet and need to determine if will have the PAPER suit and aprons</p>
HTMs will be proficient with the donning and doffing of PPE before any patient encounter or entering an Ebola precaution room.	Y	I/P	<p>CDC¹¹ – “Train healthcare workers on all PPE recommended in the facility’s protocols. Healthcare workers should practice donning and doffing procedures and must demonstrate during the training process competency through testing and assessment before</p>	<p>CCCS⁸ p.22 – “specific training is required for those who are going to act as a safety officer (‘Buddy’) to direct the donning and doffing of PPE.”</p>	<p>Participants emphasized the importance and willingness to participate in ongoing training and suggestions were made to develop a quality assurance process whereby HTMs would be required to demonstrate their competency in order to obtain certification.</p>	<p>Solution – Simulation training has started at the simulation center. Plans are being developed for ongoing training</p>

			<p>caring for Ebola patients”</p> <p>CDC¹¹ – Documentation of Training for each HCP</p> <p>CDC¹¹ – “Training should be available in formats accessible to individuals with disabilities or limited English proficiency”</p> <p>WHO⁵ – A thorough mandatory training on the use of PPE followed by mentoring for all users before engaging in any clinical care is considered fundamental for preventing infection among HCWs.</p> <p>WHO⁵ – PPE for waste management is the same as the PPE used for patient care except that the employee will wear heavy duty/rubber gloves when handling infectious waste (e.g. solid waste or any secretion or excretion with visible blood). Goggles provide greater protection than visors from splashes that may come from below when pouring liquid waste from a bucket. Avoid splashing.</p>		<p>HTMs emphasized the importance of donning PPE prior to any physical contact with the patient, even if the patient is at risk of imminent death. This approach, where personal protection takes precedence over patient rescue, was identified by some HTMs as a potential source of stress. Being unable to assist the patient in distress will not only cause anguish but might also lead to error with donning PPE if performed hastily. HTMs suggested cueing one another to take the time to follow the proper procedures.</p>
HTMs will recognize when the clinical scenario changes and they must escalate their level of PPE	Y	N	<p>EMORY⁴ p. 38 – See Appendix 5 (PPE Guidance Matrix for PPE). Describes the different equipment required according to the level of suspicion of EVD + presence of symptoms and according to the responsibility of the HCW (e.g., nursing, MD, waste management,)</p>	<p>MOHLTC (Oct 30th)⁹ p.5,7-8 –</p> <p>Recommended PPE for HCW conducting screening/triage in the ED:</p> <p>When protected by a suitable structural barrier HCWs conducting screening/triage must have ready access to the following PPE:</p> <ol style="list-style-type: none"> 1) A fit-tested N95 respirator 2) Full face shield 3) Gloves with extended cuffs⁴) <p>Fluid-resistant gown</p> <p>Recommended PPE when coming in contact with suspected or confirmed cases of Ebola:</p>	<p>Participants identified that during a patient encounter the situation may change and the HTM may need to escalate their level of PPE (i.e., to don a PAPR suit). It was suggested that this be incorporated into the PPE education.</p>

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			<p>1) Fit tested, seal-checked N95 respirator 2) Full face shield (+/- goggles) 3) Double gloves 4) Full body barrier protection (see document for description of equipment) 5) Single use impermeable apron</p> <p>Recommended PPE when performing aerosol-generating procedures:</p> <p>1) Powered air-purifying respirator (PAPR) with a hood or a fit-tested, seal-checked N95 respirator with a full face shield 2) Double gloves (one under and one over cuff) <input type="checkbox"/> 3) Full body barrier protection – the aim should be no exposure of skin, which for example can <input type="checkbox"/> be achieved by the use of the following components: <input type="checkbox"/> - Single use (disposable) impermeable gown that extends to at least mid-calf, single-use (disposable) impermeable boot covers that extend to at least mid-calf, and single-use (disposable) surgical hood OR - Single use (disposable) impermeable coveralls - with an integrated or separate hood and integrated or separate impermeable boot covers 4) Single-use (disposable) impermeable apron may be selected by the HCW based on the risk of exposure to blood or other body fluids</p>		
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D. Managing Post-Exposure to Virus through Body Fluids

		Document Analysis	Qualitative Data	Proposed solutions
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Result	Gap Identified	Solution Implemented	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
There will be clear definition of an unprotected exposure	N	N	<p>CDC¹² – Definition = “Not wearing recommended PPE at the time of patient contact or through direct contact to blood or body fluids”</p> <p>WHO⁵ p. 41 – The main route for acquisition of filovirus infection is through contact of infected blood or other body fluids with the mucous membranes of the mouth, nose and eyes. Transmission can occur through direct contact with these body fluids, or through contact with fomites (i.e. touching inanimate objects), such as the floor, utensils, and bed linens that have recently been contaminated with infected body fluids. Transmission through intact skin has not been documented. Infection can be transmitted through non-intact skin and through penetrating injuries of the skin, such as needle-stick injuries.</p> <p>WHO⁷ p. 13 – Percutaneous or muco-cutaneous exposure to blood, body fluids, secretions or excretions from a patient with suspected or confirmed VHF.</p>		HTMs are aware of the definition of unprotected exposure.	Solution – None required at this time
HTMs will recognize when exposure has occurred	Y	I/P	<p>CDC¹¹ – “Use trained observers to monitor for correct PPE use and adherence to protocols for donning and doffing PPE, and guide healthcare workers at each point of use using a checklist for every donning and doffing procedure”</p> <p>WHO⁷ – The dressing and undressing of PPE should be supervised by another trained</p>		A buddy system was of high importance to all team members. Participants identified that they have never performed the role of the buddy and would require training. Participants raised concerns about the effectiveness of the buddy system when multiple HTMs are active in the patient’s room (i.e., HTMs outnumbering buddies).	Solution – Training is in progress.

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			member of the team.			
HTMs will be proficient in taking immediate actions if exposure to body fluids occurs	Y	I/P	<p>CDC¹² – 1) stop working 2) wash skin surfaces with soap and water 3) contact occupational health/supervisor (post exposure protocol for other pathogens)</p> <p>EMORY⁴ p.45 – (Appendix 6: Additional Protocols – Needle stick or cut):</p> <ul style="list-style-type: none"> “Quickly sanitize gloves. Remove inner and outer gloves and expose wound. Express wound. Flush wound with water for five minutes. Cover wound by donning glove. Doff per patient room SOP. Report for medical assessment. Log and report incident and notify occupational injury management.” <p>WHO⁷ p. 13 – Persons including HCWs with exposure (as defined above), should immediately and safely stop any current tasks, leave the patient care area, and safely remove PPE. Remove PPE carefully according to the steps outlined in PPE. Immediately after leaving the patient care area, wash the affected skin surfaces or other percutaneous injury site with soap and water. Accordingly, irrigate mucous membranes (conjunctiva) with copious amounts of water or an eyewash solution, and not with chlorine solutions or other disinfectants.</p>	<p>MOHLTC (Oct 30th)⁹ p.10</p> <p>1) “Stop working immediately. Wash any affected skin surfaces with soap and water; for mucous membrane splashes (e.g., conjunctiva) irrigate with copious amounts of water or eyewash solution”</p> <p>2) “Immediately contact a supervisor and the OHS team for assessment and post-exposure management for blood-borne pathogens (e.g., hepatitis B virus, hepatitis C virus, and HIV) as per usual organizational policy”</p> <p>PHAC¹⁰ – “First aid should be performed immediately if there has been exposure to blood or body fluids.</p> <ul style="list-style-type: none"> The exposure should be reported immediately to employer and immediate medical attention should be obtained. The site of a percutaneous injury should be thoroughly rinsed with running water, and any wound should be gently cleansed with soap and water. Mucous membranes of the eyes, nose or mouth should be flushed with running water if contaminated with blood, body fluids, secretions or excretions. <p>Non-intact skin should be rinsed thoroughly with running water if contaminated with blood, body fluids, secretions or excretions.”</p> <p>TOH has general policy on needle stick injury</p>	<p>Participants raised numerous concerns with the decontamination procedures:</p> <ul style="list-style-type: none"> Should the HTM stay in the room? How to perform decontamination without worsening the situation? How to irrigate? Water could go down gown or suit or over the floor? Is there need for an absorbent barrier to be placed on the floor? Should they call a colleague to don and assist, which takes significant time? Is there a sink? Where is it? Can fluid go down the sink? <p>Suggestion made review Emory protocol and adapt to local context and environment.</p>	<p>Occupational health and safety noted that they will organize a meeting with infection control and key stakeholders to walk-through the step in our context and adapt current TOH protocols. Will include review of the Emory protocols.</p> <p>Then simulation and education</p>
There will be appropriate facilities available to	Y	N	<p>CDC¹¹ – Establish a facility exposure management plan that addresses decontamination and</p>		<p>Procedure may require a shower and currently there is not one readily available. Interim solution may</p>	

decontaminate HTMs if exposed			<p>follow-up of an affected healthcare worker in case of any unprotected exposure. Training on this plan and follow-up should be part of the healthcare worker training</p> <p>WHO⁵ – Immediately report the incident to the local coordinator. This is a time-sensitive task and should be performed as soon as the HCW leaves the patient care unit.</p>		<p>include going downstairs to use the shower in the locker room, however this is not ideal given the distance needed to travel and risk of contaminating other surfaces. Also, it was identified by facility staff that the men's shower currently has a leak into the basement, which could risk contaminating other surfaces. Consider adding a shower beside the ICU room dedicated to caring for these patients (especially given that this center is a dedicated Ebola/VHF site). There is a potential space outside the anteroom to add a shower.</p> <p>One participant also questioned if an eyewash station with a foot peddle is required.</p>	
HTMs exposed to bodily fluids will be informed of the procedure to follow over the ensuing days	Y	N	<p>CDC¹²</p> <p>A - Development of sudden onset fever, muscle pain, weakness, vomiting, diarrhea or any signs of hemorrhage after unprotected exposure:</p> <ol style="list-style-type: none"> 1) Not report or stop working 2) Notify supervisor 3) Seek medical assessment and testing 4) Notify regional health services 5) Comply with work exclusion until no longer infectious <p>B - Asymptomatic HCP with unprotected exposure</p> <ol style="list-style-type: none"> 1) Medical evaluation and follow-up ad 21 days after last exposure 2) Temperature taking twice daily <p>C – Asymptomatic personnel with protected exposure</p> <ol style="list-style-type: none"> 1) Develop policies to ensure twice daily checks (symptoms and fever) <p>CDC¹³ – CDC has summarized the “public health actions” to take according to the exposure category (high risk, some risk, low risk and no risk) and the presence or absence of symptoms</p>	<p>MOHLTC (Oct 30th)⁹ p.10 – <i>For asymptomatic HCWs who had an unprotected exposure to a patient with EVD:</i></p> <ul style="list-style-type: none"> - Should receive medical assessment and check temperature twice daily and monitor for symptoms of EVD - Report fever greater than 38 or other symptoms - Public health unit should advise on any restrictions regarding activities and travel for 21 days from the HCW's last exposure - No patient contact for 21 days from last exposure. <p><i>HCWs who have been caring for or exposed to EVD patients, and subsequently develop fever, should:</i></p> <ul style="list-style-type: none"> - Not report to work or immediately stop working - Notify their supervisor and Occupational Health Department - Seek prompt medical evaluation and testing as clinically indicated - Comply with work exclusion as per their OHS/local public health unit (PHU) until they are deemed no longer infectious to others 	<p>Occupational health and safety is available 24 hours a day for Ebola related issues. There is policy in place, however not all of the HTMs concerns are addressed in the policy.</p> <p>HTMs were unclear about what to do following unprotected exposure with regards to monitoring, work leave, contact with family, etc.</p> <p>Questions raised included: Who will do the monitoring? Will it be documented? If so, who calls and how will it be documented? What will be monitored? Only fever or other symptoms?</p> <p>The question was raised: what do we inform HTMs about their families? Given that it is deemed unsafe to manage patients once exposed, HTMs expressed concerns about the safety of returning home to their families. HTMs were also worried about returning home after managing a patient with Ebola even in the absence of unprotected exposure.</p> <p>If HTMs develop symptoms they</p>	

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			<p>WHO⁷ – Exposed persons should be medically evaluated including for other potential exposures (e.g. HIV, HCV) and receive follow-up care, including fever monitoring, twice daily for 21 days after the incident. Immediate consultation with an expert in infectious diseases is recommended for any exposed person who develops fever within 21 days of exposure.</p> <p>HCWs suspected of being infected should be cared for/isolated, and the same recommendations outlined in this document must be applied until a negative diagnosis is confirmed.</p> <p>Contact tracing and follow-up of family, friends, co-workers and other patients, who may have been exposed to the Ebola virus through close contact with the infected HCW is essential.</p>	<p>TOH - has a policy “Monitoring and Management of Health Care Providers Potentially Exposed to Ebola Virus Disease</p>	<p>raised questions about what do? HTMs clearly understand the need to report the symptoms and be assessed. However, the exact steps to be taken need clarification including where to go (the ED or another location) and what will happen to their family?</p> <p>A policy is available at TOH but it does not address all of HTMs concerns/questions. Suggestions were made to create an information pamphlet.</p>	
<p>All HTMs who help manage a patient with Ebola will be monitored, even if there was no unprotected exposure</p>	<p>Y</p>	<p>N</p>	<p>EMORY⁴ p.9 – “All employees involved in the direct care of a patient with EVD will be monitored for 21 days after the last direct care exposure with a confirmed EVD patient” (see appendices #1 and #2)</p> <p>EMORY⁴ p.25 – “All employees involved in direct or indirect patient care or waste management are also required to complete symptom surveys twice daily” (see appendix 2)</p> <p>EMORY⁴ p.29 – “Staff are also trained to self-monitor and record twice daily temperatures for a period of 21 days after the last exposure to EVD.”</p>	<p>MOHLTC (Oct 30th) p.10 – For asymptomatic HCWs who had protected exposure (e.g., wearing recommended PPE at all times) to a confirmed case of EVD and/or the case’s environment or waste: - Monitor for 21 days from last exposure</p>	<p>Participants were concerned that a missed exposure could occur and wanted HTMs to be appropriately monitored. HTMs were unclear of the monitoring process.</p>	

E. Patient Placement, Room Set up, Logging and Signage

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap identified	Solution Implemented	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
The most suitable rooms to manage patients with suspected or proven Ebola will be selected and then redesigned and equipped if required.	Y	Y	<p>CDC¹¹ – Single room / closed door / private bathroom</p> <p>CDC¹¹ – “Designate spaces so that PPE can be donned and doffed in separate areas”</p> <p>CDC¹⁴ – Inpatient care of patients with Ebola should be provided in a hospital with capacity to perform continuous renal replacement therapy (CRRT)</p> <p>WHO⁵ p.16, 21 – Isolate suspected or confirmed hemorrhagic fever cases in single isolation rooms with an adjoining dedicated toilet or latrine, showers, sink equipped with running water, soap, and single-use towels, alcohol based hand rub dispensers, stocks of PPE, stocks of medicines, good ventilation, screened windows, doors closed. Keep suspected and confirmed cases separate. If an isolated room is not available, cohort the patients in specific confined areas and ensure that there is at least 1-meter distance between patient beds.</p> <p>WHO⁵ – Patient charts and records should be kept outside the isolation rooms/areas.</p> <p>WHO⁷ p. 6 – Ideally, an isolation area should already be available to admit patients requiring isolation. If an isolation area is not available or if advance</p>	<p>CCCS⁸ – Considerations for potential areas for EBV care: - “Single patient room with private bathroom, door and anteroom. <u>Negative pressure isolation is only essential if aerosol generating procedures are to be conducted</u>” -“Ability to dispose of body fluids within the patient’s room” -“Infrastructure for patient to <u>communicate to staff/visitors outside of the room</u>” -“Ability to restrict access to the area as well as to the patient’s room” -“Ability to provide dedicated patient care equipment” -“Ability to provide critical care without having to move the patient should he/she deteriorate” (i.e., need for suction, monitors, sink [dialysis], electrical outlets [with emergency power supply], medical gas (O2 & other) connections, Space for life support equipment [ventilator, dialysis machine, pumps...]) -Overhead hoists if possible (reduce contact when moving patient) -... (See CCCS document for detailed description of other considerations) -“Close access to elevators or diagnostic suites to minimize transportation times”</p> <p>MOHLTC (Oct 30th)⁹ p.6 – “For</p>	<p>Participants expressed concerns that the room designated as the Ebola room in the ICU was less than ideal. Furthermore, it was unclear how to adapt the room given its physical layout. Questions raised by participants included:</p> <ul style="list-style-type: none"> • Is there sufficient space outside of the room to stock equipment? • How will visitors be affected by the current room placement? • What equipment should be kept in the patient room, anteroom and outside the anteroom? • How to define and clearly identify spaces that should be considered contaminated versus those that are clean? • How to ensure that the room set up does not negatively impact patient care? <p>HTMs suggested that we should consider a different location for the room.</p>	<p>Solution – Iterative data was gathered from HTMs to identify criteria for selection of an Ebola patient room. These criteria were applied in the selection of a new Ebola room. Subsequently numerous interviews and walk-throughs with HTMs were carried out to develop a contextualized guide for room setup and actions were taken to redesign and equip the room.</p>

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		<p>preparations have not been done, and VHF is suspected, immediately identify and set aside a single room.</p>	<p>designated hospitals providing care to a confirmed case, the patient must be placed in an AIIR with negative pressure, an anteroom and a dedicated washroom. »</p> <p>MOHLTC (Oct 30th)⁹ p.6 – “The patient care area must be monitored at all times. At minimum, hospitals must log the movement of all HCWs in and out of the patient’s room.”</p> <p>MOHLTC (Oct 30th)⁹ p.7 – “Hospitals must ensure that space and layout allow for clear separation between clean and potentially contaminated areas”</p> <p>PHAC¹⁰ – “Place suspected or confirmed EVD patient in single room with dedicated toilet or commode; keep the door closed. Advise the patient to perform HH and adhere to respiratory hygiene Place isolation sign on door Only essential personnel with appropriate PPE to enter; door should remain closed. Maintain a log of all persons entering room; only essential personnel to enter. Consider assignment of trained individual to monitor appropriate selection, application, removal and disposal of PPE, to avoid contamination of the HCW, and to monitor entry to room (i.e., limit entry to only essential HCWs). Patients with symptoms compatible with airborne infections (i.e., measles, tuberculosis) -as indicated by PCRA, should be placed in an airborne infection isolation room (AIIR) as soon as possible. Patients with a diarrheal illness should be placed into a single examining room with dedicated</p>		
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				<p>toilet or commode whenever possible and as soon as possible. The patient should be directed to perform HH after using the toilet.”</p> <p>TOH – Patient room log (suspected or confirmed EVD) Aug, 2014</p> <p>TOH – Remove unnecessary items and only necessary equipment, supplies, remains in the room; ensure red pails are in the room prior to occupancy. Ensure Ebola cart is located outside the room</p> <p>TOH – Ebola designated rooms (Oct 31, 2014)</p>		
Appropriate signage will be posted in the event of a suspected or confirmed case.	Y	N	<p>CDC¹¹ – Signage to identify key areas: (1) PPE storage and donning area, (2) Patient room and (3) PPE removal area</p> <p>Further signage for reminders: (1) clean vs soiled areas, (2) wait for trained observer, (3) remind to slow and deliberate nature of PPE removal and (4) remind HCP to disinfect gloved hands between steps of doffing</p>		<p>Participants described the procedure for notifying HTMs of the required precautions, which consisted of placing three standard posters (airborne, droplet and contact) on the entrance. They felt that a special poster should be developed to identify the special precautions for these patients.</p> <p>Participants further stated that the poster(s) would have to be strategically positioned to prevent any staff from accidentally entering the room.</p>	
Entries and exists of all HTMs and visitors will be logged.	N	N	<p>CDC¹¹ – Monitor isolation area. Log entries and exits of all HCP in the room</p> <p>WHO⁵ p. 46 – Maintain a log of persons entering the room.</p>	<p>TOH – has a document available online for logging</p>	<p>HTMs were aware that all persons entering the room must be logged. A document is available to log entries and exits.</p>	

F. Intra-hospital Patient Movement

			Document Analysis	Qualitative Data	Proposed solutions
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Result	Gap identified	Solution Implement	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
HTMs will be able to determine the most suitable room placement for any patient with suspected or confirmed Ebola	Y	N		<p>TOH – Intrahospital transfers should be restricted unless the patient needs increased level of care (critical care)</p> <p>TOH – Ebola designated rooms (Oct 31, 2014)</p>	Beds have been clearly designated in the hospital in the ER, medicine, OB GYN and ICU. Participants indicated that in certain circumstances it is unclear where the patient should be transported. For example, they noted that not all patients who are screen positive on a RACE call should go to the ICU. They further suggested that an algorithm be developed to assist their decision-making.	
Measures will be in place to optimize early recognition of patient deterioration in order to ensure safe transfer	Y	I/P			Resuscitation of a patient on the ward will be very challenging and participants agreed that it was essential to transport patients early before they deteriorate on the ward. Suggestions were made that all patients with confirmed Ebola who are admitted to the ward should be an automatic RACE consult. The RACE team would see the patient once or twice daily to assess their clinical status and vital signs (not required to enter room for assessment) in order to optimize early recognition.	To be discussed at next RACE meeting
The transport process will be clearly defined and will only include essential staff	Y	I/P	WHO – Only take a patient out of their room/care area if they are free of virus, or for essential, life-saving tests.	<p>MOHLTC (Oct 30th)⁹ p.9-10 – Internal transfer only for <u>essential medical procedures</u> that cannot be performed in the patient’s room.</p> <p>MOHLTC (Oct 30th)⁹ p.9-10 – Transport process: -Patient must wear a mask -Exclude all patients and visitors from transport pathway -Ensure new room is ready. -Transport team needs to wear full PPE. It must be discarded as they leave the initial room. New PPE must be put on before heading in the hallway. -For diagnostic tests, the receiving unit must be aware of the patient’s arrival. Use the most direct route.</p>	<p>Participants expressed concerns that no procedures were in place to ensure the safe transport of these patients to and from the ICU. Transport from various areas of the hospital added layers of complexity:</p> <ul style="list-style-type: none"> ED to ICU – numerous issues were identified including: the cluttered pathway; potential for people to get in the way; roles and responsibilities of the staff both inside and outside of the ED Ebola room; interventions required in advance of transport (e.g. intubation, NG, Foley); identification and cleaning of contaminated surfaces and spills during transport; minimizing staff but 	<p>ED to ICU - Many WTs performed with key stakeholders to define each step. Added a readiness assessment before entering room and transporting – minimize number of people in and to body fluid management strategy See Appendix for preliminary walk-through procedure</p> <p>Ward to ICU - 1st walk-through performed and gaps identified. Need to do many more.</p> <p>No walk-throughs yet to imaging or to morgue</p>

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				<p>Test immediately. Clean and decontaminate diagnostic equipment after procedure.</p>	<p>still ensuring enough for safe transport and observation of the team.</p> <ul style="list-style-type: none"> • Ward to ICU – given the location and space available, participants felt that it would be very difficult to avoid contaminating surfaces during transport. Participants identified that using the elevator was introducing additional risk in the transport process. <p>Participants identified that transport of other areas such as diagnostic imaging and the morgue would need to be examined more closely.</p> <p>It was recognized that HTMs in the patient room were contaminated and needed to doff PPE before transport. However, participants were unclear of the process during transport especially when leaving a contaminated area.</p> <ul style="list-style-type: none"> • Should the transport team enter the patient room? • If so, who manages the patient while the team is doffing then donning new PPE? • Where is the patient during that period of time? • Is it preferable for the transport team not to enter the room? 	
<p>There will be a clear and simple process to assemble the team required to transport the patient. Team members involved in the transport will be readily available at all times.</p>	<p>Y</p>	<p>N</p>			<p>Participants wanted to know who would be responsible for assembling the team. Participants also wanted to have clear information on how to reach the necessary transport team members. There were concerns that key members may not be called or may not be immediately available – such as housekeeping and security staff. Furthermore, they expressed concern that fully trained individuals may not be reachable or readily available. Housekeeping and waste management identified that they have designated individuals who are</p>	

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					on call 24 hours/day for Ebola related calls.	
Team members will be proficient, given their respective roles and responsibilities during the transport	Y	I/P			Participants envisioned many potential events during transport, such as patient vomiting or becoming unstable. They expressed the need to plan for these events and clearly identify the most appropriate response. It was further expressed that HTMs would require practice and in-situ simulation in order to become proficient and assess the process.	Solution – The roles and responsibilities are being defined (i.e., through the walk-throughs). However, a plan is not yet in place for a practice using in situ simulation. Person Responsible – Timeline -

G. Inter-hospital Patient Movement

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap identified	Solution Implement	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
The critical care team will be informed of any patient(s) with suspected or proven Ebola who might require ICU admission	N	N			On occasion, critically ill patients are admitted by other services without notifying the ICU. Participants emphasized the need to ensure that the CF and staff ICU physician be contacted prior to transport of any patient with suspected Ebola who may require ICU admission.	
There will be a clear process in place to ensure that the community hospitals receive all necessary information to initiate safe transport	N	N	EMORY ⁴ p.19-24 – Detailed Protocol for Biosafety Transport. Lists the level of precaution/PPE needed according to different infectious agents (including EVD). There is also a section on patient care during transport: <ul style="list-style-type: none"> If the patient was exposed to an infectious agent, the transport crew will ensure that the patient was decontaminated at the site, and may request that the patient wear a biohazard coverall as noted in the specific levels of 		Participants stated that multiple services (ID, infection control, occupational health and safety, critical care, etc.) would likely need to be involved in the communication with the community hospital. They suggested that the roles and responsibilities of each service be clearly defined to optimize communication. HTMs were not clear on the appropriate response for patients directly referred to the ICU but who	

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		<p>care above. If the patient cannot tolerate the biohazard coverall, or the coverall is likely to interfere with patient care activities, or the patient cannot assist in putting it on, the patient will be wrapped in an impervious sheet or similar barrier to prevent environmental contamination.</p> <ul style="list-style-type: none"> • A temperature is to be recorded on all patients. • A detailed History of Present Illness (HPI) to include history of fever, cough, vomiting, diarrhea, hemorrhage, rash, malaise and duration of symptoms is to be obtained. • <u>No IV is to be started on patients unless the patient is in emergent need of volume replacement</u> or reasonably expected to require IV medication. • No sharps are to be utilized in a moving vehicle. • Large volumes of bodily effluent are to be collected in leak proof containers that are either color coded as a biohazard or labeled with a biohazard sticker. • Any breach of infection control measures is to be reported immediately to the special operations supervisor and program medical director. • All transport personnel will comply with the surveillance policy as prescribed by EMS and the hospital infection control officer. • All medical control questions will be directly communicated with the program medical director, NOT the usual decentralized medical control system. <p>Also a section on waste management and decontamination after transport of patient (see p.23-24)</p>		<p>do not require ICU admission. What should be the process to ensure that the patient be transferred to the most appropriate location. At present, ICU physicians simply know to call ID.</p>	
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<p>There will be a plan of transport from entry point at our hospital to the ICU, which will minimize the risk of contamination</p>	<p>Y</p>	<p>N</p>			<p>Numerous questions were raised by participants including:</p> <ul style="list-style-type: none"> • How to accept the patient from the transport team? • Where the transport team will doff safely • If the transport team enters the hospital do they need to decontaminate their feet or add a layer to their boots before walking in? • If the patient is unstable or there is evidence of fluid contamination, does the transport team need to stop and decontaminate in ER before transporting the patient to the ICU? 	
<p>There will be a clear process in place to ensure that the transfer of care in the ICU occurs safely for both the patient and staff</p>	<p>Y</p>	<p>N</p>			<p>Participants questioned whether the transport team would continue to manage the patient in the ICU while the ICU team donned their PPE. They expressed that this would need to be clearly defined, as this is not usual practice.</p>	

H. Critical Care management

			Document Analysis		Qualitative Data	Proposed solutions
<p>Result</p>	<p>Cap identified</p>	<p>Solution Implement</p>	<p>International Documents - WHO / CDC / Emory</p>	<p>National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies</p>	<p>Factors to be considered in the development and implementation of solutions</p>	<p>Description of solution, person responsible, timeline to implementation</p>
<p>HTMs will be supported in their decisions to withhold interventions in order to minimize the risk of spreading infection</p>	<p>N</p>	<p>N</p>			<p>Participants expressed concerns that withholding potentially life-saving procedures could increase morbidity and mortality. While this is troublesome under most circumstances, participants expressed that it would be even more troubling in patients who are subsequently found not to have Ebola.</p> <p>Given that there have been limited cases in the developed world, participants suggested that each case be reviewed and decisions</p>	

					made on an individual basis. The importance of collaborative decision making with colleagues was emphasized. Furthermore, the clinical ethicist has been identified and is available as a resource in difficult decision-making.	
HTMs will modify their clinical assessment to provide the best possible patient care while minimizing the risk of contamination.	Y	N	<p>WHO⁵ – Guiding principal - provide best medical care to improve survival while minimizing the risk of onward transmission to others.</p> <p>WHO⁵ p. 23 - 25 – The initial clinical symptoms are non-specific and mimic many common infections. The HCW will expand their differential diagnosis to include other causes of fever and non-specific symptoms (e.g., malaria, typhoid, upper respiratory infections, urinary tract infections)</p> <p>WHO⁵ – Have dedicated equipment for each patient (ex. Stethoscope)</p>	<p>CCCS⁸ p.21 – amount of time that HCP are exposed to the patient should be limited. Change in history taking and routine communication is needed (e.g., intercom, telephone, white board...)</p> <p>CCCS⁸ p.26 – Minimize patient transport. Consider portable investigation (Chest x-ray, ultrasound)</p> <p>CCCS⁸ p.26 – “Given the limited diagnostic capabilities, it may be necessary to consider more liberal use of empiric therapies than is typical . In particular the two conditions in this group that must be considered and may warrant early empiric therapy if clinical risk factors exists and diagnostic investigations are delayed are: 1) Malaria, and 2) systemic bacterial infections.”</p> <p>CCCS⁸ p.28 – “Clinical examination of the patient should occur at least twice daily(...)”</p>	<p>Participants acknowledged the need to provide the best possible care while minimizing any nonessential contact. Activities should be planned to minimize the frequency of donning and doffing. Some activities will require coordination with other services (e.g. with housekeeping for removal of waste buckets from the room).</p> <p>Many participants expressed concerns about using a dedicated stethoscope, and felt the risk far outweighed the benefit. Suggestion was made to consider a dedicated electronic stethoscope with speaker.</p>	
HTMs will modify non-invasive and invasive monitoring to provide the best possible patient care while minimizing the risk of contamination	Y	Y	<p>EMORY⁴ p.15 – “All patients will have the following minimum orders as part of the admission protocol:</p> <ul style="list-style-type: none"> • Vital signs every 4 hours • Daily weight • Strict intake and output • Nursing assessment each shift with particular attention to presence of rash; mental status; lung and heart assessment; and presence of nausea, vomiting or diarrhea • Complete Blood Count (CBC), 	<p>CCCS⁸ p.30 – Minimal cardio-respiratory monitoring = EKG, O2 sat and NIBP.</p> <p>ETCO2 (p.32): should be considered in patients receiving mechanical ventilation (“the combination of ETCO2 monitoring and pulse oximetry may decrease the need for arterial blood gas analysis”)</p>	<p>Participants reviewed the practices of HR, RR, O2 sat, NIBP, urine output, invasive arterial blood pressure monitoring, CVP, central venous O2 sat and ETCO2 monitoring. Participants emphasized the need to have dedicated and where possible disposable equipment.</p> <p>The RTs expressed concerns with ETCO2 monitoring because installing the monitor requires a break in the ventilator circuit. They</p>	<p>Solution / Gap – could have used the wrong ETCO2 monitored. Added to ICU management plan to ensure newer one is used</p>

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			Comprehensive Metabolic Panel (CMP), and urinalysis, on the day of admission and every three days thereafter "		suggested using a transcutaneous CO2 monitor. Some RTs were not comfortable inserting arterial lines while others were comfortable with the procedure. Using a sutureless system was suggested as a measure to minimize risk of needle stick injury. The routine practice at this site is to suture arterial lines, hence it was suggested that in non-suspect Ebola cases the team could more frequently use sutureless systems to become more familiar with the process ensuring that they remain in place. In contrast, some HTMs had concerns that use of a sutureless would be outweighed by lines being accidentally pulled out thus increasing the risk of blood exposure and line reinsertion.	
There will be a clear process in place to perform CXRs and EKGs	Y	N	EMORY ⁴ p.35 – See Appendix 4 (Portable X-ray process for SCU). They describe the steps for safe CXR in their unit (SCDU: "Serious Communicable Diseases Unit")		HTMs identified that there is currently no clear process in place and suggested to adapt the Emory protocol to our context. Participants noted that both the RN or RT can perform the EKG and hence an EKG technician will not be required.	
HTMs will take appropriate measures to decrease the risk of exposure to body fluids	N	N		PHAC ¹⁰ – "Eating or drinking should not occur in areas where direct patient care is provided or in reprocessing or laboratory areas. HCWs with open skin areas/lesions on hands or forearms should not have contact with suspected or confirmed EVD cases or their environment. To prevent self-contamination, workers should avoid touching the mucous membranes of their eyes, nose and mouth with their hands." TOH – Use appropriate PPE. This included triple gloves when drawing blood. Once the specimen has been drawn, the outside of the specimen container must be wiped down with a hospital grade disinfectant prior to placing in	Participants indicated that NG, fecal collection system, Foley, etc. should be considered early in management. Participants also suggested obtaining disposable absorbable pads that turn liquid into gel to facilitate body fluid containment.	

				biohazard bag. The HCW will then remove the outer layer pair of gloves and wipe down the outside of the bag with a Clorox wipe then place the biohazard bag in a second biohazard bag and seal. The HCW will then pass the bags out the door to a receiving person in the anteroom.		
HTMs will avoid using aerosol generating procedures (AGP) whenever possible	Y	Y	<p>Minimizing aerosol generating procedure</p> <p>CDC¹² – Surface cleaning mandated after AGPs</p> <p>CDC¹² – Use disposable facial masks (N95) because of potential contamination risk associated with reusable units (PAPR)</p> <p>CDC¹² –</p> <ul style="list-style-type: none"> • Avoid AGPs for patients with EVD. • If performing AGPs, use a combination of measures to reduce exposures from aerosol-generating procedures when performed on Ebola HF patients. • Visitors should not be present during aerosol-generating procedures. • Limiting the number of HCP present during the procedure to only those essential for patient-care and support. • Conduct the procedures in a private room and ideally in an Airborne Infection Isolation Room (AIIR) when feasible. Room doors should be kept closed during the procedure except when entering or leaving the room, and entry and exit should be minimized during and shortly after the procedure. • HCP should wear appropriate PPE during aerosol generating procedures. 	<p>CCCS⁸ – Airway/Breathing considerations</p> <p>NIV (p.33): Can be attempted but several limitations:</p> <ol style="list-style-type: none"> 1) Frequent vomiting 2) Prolongation of aerosolization risk 3) If NIV failure, quick intubation might be difficult due to PPE donning (NIV trial requires close attention) 4) Risk of oropharyngeal bleeding <p>Intubation (pp. 33-34): Important considerations:</p> <ol style="list-style-type: none"> 1) Exhalation filter attached when bag ventilation provided 2) Appropriate PPE must be worn (see PPE section or CSSS guidelines) 3) Intubation by most experienced professional to limit manipulations 4) Adjuncts to direct laryngoscopy should be considered to distance the clinician from the patient (i.e., video/optical laryngoscopy, etc.) 5) Rapid sequence intubation preferred. Consider Ketamine or other agents that mitigate the post intubation hypotension 6) Should be performed in negative pressure ventilation room <p>Mechanical Ventilation (p.35): ventilators must have capability for</p>	<p>Participants stated that it is preferable not to do any aerosol generating procedures.</p> <p>Participants suggested that the following procedures should never be performed:</p> <ul style="list-style-type: none"> • BiPAP • Nebulized meds • Induced sputum • In-Exsufflation • Manual Lung volume recruitment • Tracheostomy • Nebulized Flolan • High frequency oscillation • Chest physiotherapy in spontaneously breathing patients. <p>Procedures that could generate aerosols if performed inappropriately require special attention including:</p> <ul style="list-style-type: none"> • Closed in-line airway suctioning (only perform closed suctioning) • Circuit manipulation <p>Participants suggested that the following procedures could be performed but only if absolutely necessary:</p> <ul style="list-style-type: none"> • Bag-valve mask ventilation • Intubation/extubation • Bronchoscopy • Nitric oxide • Proning <p>Participants felt that it would be important to develop procedures to</p>	<p>Solution – Review of TOH list of AGP and interviews with key stakeholders to clarify and the list of aerosol generating procedures was broadened and each one explored to categorize into procedures which should never be done and those that could be considered if absolutely necessary.</p>

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			<p>HEPA filtration of exhaled gases. In negative pressure ventilation room. No recommendations on how to disinfect equipment. Make reference to Emory's protocol (equipment kept in room until patient's discharge, then disinfected by a company with hydrogen peroxide prior to its return in circulation)</p> <p>MOHLTC (Oct 30th)⁹ p.8 – limit number of procedures. Limit number of staff present if AGP required. Recommended PPE = same +/- PAPR</p> <p>PHAC¹⁰ – “Strategies to prevent aerosol generation if AGPs are absolutely necessary (e.g. Intubation) AGPs should not be performed on patients suspected or confirmed to have EVD. If AGPs are absolutely necessary (e.g. intubation), implement strategies to reduce aerosol generation: AGPs should be anticipated and planned for. Appropriate patient sedation should be used. The number of personnel in the room should be limited to those required to perform the AGP. AGPs should be performed in airborne infection isolation rooms (also referred to as negative pressure rooms). Appropriate ventilation (e.g., level of air filtration and direction of air flow) should be maintained. Single rooms (with the door closed and away from other patients), should be used in settings where airborne infection isolation rooms are unavailable. Fit tested respirators (seal-checked NIOSH approved N95 at</p>	<p>minimize aerosol generation.</p> <p>With mechanical ventilation the AVEA ventilator is preferred with heated humidity and a HEPA Omnifilter as it is easier to clean.. A ventilator was identified that allows bronchoscopy with closed access (Kim Vent), however, we do not have this equipment. Participants identified that the circuit should not be changed unless soiled. Circuit disconnection and openings should be avoided.</p>	
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				<p>minimum) should be worn by all personnel in the room during the procedure. Closed endotracheal suction systems should be used wherever possible.”</p> <p>TOH – IPC policy and procedure manual on aerosol generating respiratory procedures - Aerosol-generating respiratory procedures (see list of procedures in document) prevention measures can be instituted by any regulated HCP. The procedure must be performed by an experienced HCP. When possible, avoid initiation of aerosol generating respiratory procedures. Carefully assess the benefit of the procedure versus the potential occupational risk</p>		
<p>HTMs will take measures to safely obtain central access when required</p>	<p>Y</p>	<p>Y</p>		<p>CCCS⁸ p.31 – Central line not indicated for CVP monitoring If central line established for alternative reasons (difficult peripheral access, requirement of vasopressors, electrolytes replacement), CVP monitoring can be considered. “Central venous access has been required in the management of the majority of EVD patients treated in ‘Western’ health care systems due to a) the requirement for aggressive potassium replacement and b) difficulty in obtaining peripheral venous access due to edema.”</p> <p>CCCS⁸ p.35-36 – “In the early states of EVD and for those with milder manifestations of the illness peripheral IV access is suitable for fluid management.”</p> <p>CCCS⁸ p.36 – “ Central or peripheral inserted central venous access should be considered for</p>	<p>Participants agreed that only experienced staff should perform the procedure. Some physicians were very comfortable inserting central lines blindly while others were more comfortable with ultrasound guided line insertion. It was highlighted that some guidelines recommended ultrasound guided line insertion and that use of ultrasound could decrease the risk of complications and body fluid exposure (e.g. arterial puncture or pneumothorax requiring chest tube insertion). Concerns were expressed regarding the use of the newest M-turbo ultrasound machine, because it was felt that it would be difficult to decontaminate and was in frequent use for other ICU patients.</p>	<p>Solution - Physicians suggested that an older, yet suitable, ultrasound model for line insertion, could be dedicated to the room.</p>

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				<p>patients who require electrolyte replacement, vasopressors, or where vascular collapse limits peripheral IV access (...)"</p> <p>CCCS⁸ p.36 – Minimize risks with ultrasound guidance. Consider non-suture securing devices to minimize skin punctures.</p>		
HTMs will safely draw blood	Y	I/P	<p>CDC¹² – “Limit the use of needles and other sharps as much as possible”</p> <p>WHO⁵ p. 50 – <i>Limit the use of needles and other sharp objects as much as possible. Limit the use of phlebotomy and laboratory testing to the minimum necessary for essential diagnostic evaluation and patient care.</i></p> <p>CDC¹⁵ – “Any person collecting specimens from a patient with a case of suspected Ebola virus disease should wear gloves, water-resistant gowns, full face shield or goggles, and masks to cover all of nose and mouth”</p> <p>CDC¹⁵ – Transportation of specimens: “(…)specimens should be placed in a durable, leak-proof secondary container for transport within a facility. To reduce the risk of breakage or leaks, do not use any pneumatic tube system for transporting suspected EVD specimens.” (Schema example in the CDC guideline) Preferred specimen: “A minimum volume of 4mL whole blood in <i>plastic</i> collection tubes can be used to submit specimens for testing for Ebola virus. Do not submit specimens to CDC in glass containers or in heparinized tubes. Whole blood preserved with EDTA is preferred but whole blood</p>	<p>TOH – Blood draw guidelines for patient with suspected or confirmed Ebola</p> <p>MOHLTC (Oct 30th)⁹ p.7 - “Use of needles and sharps should be kept to a minimum and for medically essential procedures only. The requirements of the Needle Safety Regulation (O. Reg. 474/07) under the Occupational Health and Safety Act must be met. Extreme care should be used when handling sharps. A puncture-resistant sharps container must be available at point of use. The risk of transmission of EVD through percutaneous injury is high; therefore, the most experienced HCWs in drawing bloods or starting lines (e.g. IV, arterial) should perform these tasks.”</p>	<p>HTMs expressed concerns about drawing blood according to the current Ebola protocol, as they had not received training on how to perform the procedure. In our ICU we have a satellite blood gas machine, It was identified by participants that any blood gas drawn should go to the main lab and that HTMs need to be aware of this. It was further suggested that the timing of the ABGs should be timed with other blood work to minimize transport.</p>	<p>Education and practice is being organized as part of the simulation lab training.</p>

		<p>preserved with; sodium polyanethol sulfonate (SPS), citrate, or with clot activator is acceptable. It is not necessary to separate and remove serum or plasma from the primary collection container. Specimens should be immediately stored or transported at 2-8°C or frozen on cold-packs to the CDC”</p> <p>Also – Limit the use of needles and other sharps as much as possible Phlebotomy, procedures, and laboratory testing should be limited to the minimum necessary for essential diagnostic evaluation and medical care All needles and sharps should be handled with extreme care and disposed in puncture-proof, sealed containers</p> <p>EMORY⁴ p.6-9 – A very detailed protocol on how to perform phlebotomy / blood test is available in their document (refer to document)</p> <p>EMORY⁴ p.45 – Appendix 6 Protocol for transport of specimen tubes</p> <p>WHO⁷ p. 8 - INJECTION SAFETY AND MANAGEMENT OF SHARPS</p> <ul style="list-style-type: none"> • Each patient should have exclusively dedicated injection and parenteral medication equipment, which should be disposed of at the point of care. Syringes, needles or similar equipment should never be reused. • Limit the use of needles and other sharp objects as much as possible. • Limit the use of phlebotomy 			
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		<p>and laboratory testing to the minimum necessary for essential diagnostic evaluation and patient care.</p> <ul style="list-style-type: none"> • If the use of sharp objects cannot be avoided, ensure the following precautions are observed: <ul style="list-style-type: none"> ○ Never replace the cap on a used needle. ○ Never direct the point of a used needle towards any part of the body. ○ Do not remove used needles from disposable syringes by hand, and do not bend, break or otherwise manipulate used needles by hand. ○ Dispose of syringes, needles, scalpel blades and other sharp objects in appropriate, puncture-resistant containers. • Ensure that puncture-resistant containers for sharps objects are placed as close as possible to the immediate area where the objects are being used ('point of use') to limit the distance between use and disposal, and ensure the containers remain upright at all times. If the sharps container is far, never carry sharps in your hand but place them all in a kidney dish or similar to carry to the sharps container. • Ensure that the puncture-resistant containers are securely sealed with a lid and replaced when 3/4 full. • Ensure the containers are placed in an area that is not easily accessible by visitors, particularly children (e.g. 			
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			containers should not be placed on floors, or on the lower shelves of trolleys in areas where children might gain access).			
Critical care staff will be aware of any lab testing which cannot be obtained for patients with suspected or proven Ebola	Y	Y		<p>CCCS⁸ p. 25 - Minimize lab tests. Limited menu of blood tests available</p> <p>CCCS⁸ p. 37 - "However, the provision of blood products to these patients presents significant technical and patient safety challenges given that no samples from any suspected or confirmed Ebola patients should be sent to the blood bank given that blood bank testing is "open" and therefore not allowed (or safe), until Ebola results come back negative" (see Blood product section further down)</p> <p>PHAC¹⁰ – "No virus culture should be attempted outside of the Public Health Agency of Canada's National Microbiology Containment Level 4 laboratory.</p> <p>For diagnostic or confirmatory services for EVD, liaise with the provincial public health laboratory of your jurisdiction to coordinate with the NML Operations Center Director (OCD) at 1-866-262-8433"</p>	One critical care staff MD identified that they had difficulty getting a thick film in a patient suspected of Ebola. Ultimately, the test was performed, but with significant delay. The staff questioned whether some tests were not available in this patient population.	Solution – we have obtained a list of tests that can and cannot be performed. This list is now available in the ICU Ebola binder. A thick film cannot be performed until the patient is confirmed Ebola negative.
Sharps will be safely handled and disposed of	N	N	<p>CDC¹² – "All needles and sharps should be handled with extreme care and disposed in puncture-proof, sealed containers"</p> <p>WHO⁵ – Keep a sharps container nearby when giving injections. Discard single-use needles and syringes immediately after use and directly into the sharps container,</p>	<p>PHAC¹⁰ – Limit the use of needles and other sharps as much as possible. Safety engineered devices should be made available and used.</p> <p>Used needles should not be recapped; used needles and other used single-use sharp items</p>	Participants emphasize some of the measures that should be carried out when handling and disposing of sharps in these cases.	<ul style="list-style-type: none"> Sharps go into red sharps container Sharps container should be kept close to procedure (limit distance) Never fill container more than

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			without recapping and without passing to another person. Close, seal and send sharps containers for incineration before they are completely full	should be disposed of immediately into designated puncture-resistant containers that are easily accessible at the point-of-use Used needles and other sharp instruments should be handled with care to avoid injuries during disposal."	half way • Do not recap	
HTMs will consider cardiopulmonary resuscitation in the appropriate setting. HTMs will not perform cardiopulmonary resuscitation in end-stage EVD	N	N		<u>CCCS</u> ⁸ p.26 – <u>Patients with suspected EBV</u> (not yet confirmed): "Given that most suspect cases of EVD currently presenting in Canada will NOT end up having EVD, life support and resuscitation should be considered if medically indicated in this group, particularly since even if the patients does have EVD they will most likely be in the early stage of the illness, free of multi-organ failure" Considerations for CPR: -rapid automatic external defibrillation -Max 3-4 person team -Meticulous attention to PPE -Adequate team leadership -Limited resources in the room -Organized team outside the room to support the resuscitation team's efforts (drug preparation, etc.)	All participants agreed and no gap was identified.	
HTM will consider dialysis in the appropriate setting and measures will be taken to minimize the contamination risk	Y	N	<u>CDC</u> ¹⁴ – Recommendations for selection of site and insertion technique for dialysis catheter: "The subclavian site for catheter insertion should be avoided because of the challenges with direct site compression if bleeding occurs. Selection of the internal jugular vs. femoral vein for catheter insertion may depend on patient characteristics and operator proficiency" "Ultrasound guidance should be used (by an individual fully trained in this technique) to reduce cannulation attempts and mechanical	<u>CCCS</u> ⁸ p. 40 – "In appropriate settings, dialysis should be considered in the patient with EVD and renal failure. The mode of dialysis, whether intermittent hemodialysis or continuous renal replacement therapy (CRRT), should be individualized based upon the patients status and the treating clinician. However, the use of CRRT will minimize the need for additional staff to enter the patient's room (...)"	Participants agreed that dialysis should be offered in the appropriate clinical context. Specific procedures to decrease the risk of contamination have not been clearly delineated. For example, currently aprons, which are recommended, are not available. CRRT is not available in our unit, only SLED or HD.	

		<p>complications, including arterial puncture. If used, the ultrasound machine should be dedicated to the isolation room until it can be terminally cleaned and disinfected.”</p> <p>“Attach closed, needleless connector devices to the catheter hubs to reduce blood exposure during catheter connections and disconnections.”</p> <p>CDC¹⁴ – “A hemodialysis/CRRT machine should be dedicated for use on the patient and kept in the isolation room until terminal disinfection procedures are undertaken”</p> <p>CDC¹⁴ – “The Ebola virus should not be able to cross an intact dialyzer membrane. Because a small dialyzer leak might not be apparent, however, dialysis effluent should always be handled with care, and while wearing appropriate PPE, to avoid contact and splashes. The effluent should be disposed of in the toilet or other dedicated drain in a manner that prevents splashes, and can be safely drained into the waste water sewer system.”</p> <p>CDC¹⁴ –</p> <p>“If clinically appropriate, consider <u>regional citrate anticoagulation during CRRT to reduce episodes of filter clotting</u> that require manipulation of the dialyzer and/or circuit. Regional citrate anticoagulation for CRRT should be used only if the hospital has a protocol in place and nurses who are trained in the protocol. Consider using the same CRRT machine for hemodialysis of the patient for as long as possible (while renal replacement therapy</p>			
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			is needed) to avoid introducing a second dialysis machine" CDC ¹⁴ – Provides some guidance on how to decontaminate the dialysis machines after use.			
ECMO will not be offered in patients with proven Ebola	N	N		CCCS ⁸ p. 40 – not recommended	While all participants agreed that ECMO should not be performed in patients with proven Ebola, it was unclear whether or not ECMO should be offered to patients with suspected Ebola. It was felt by some that ECMO should still be a therapeutic option in patients who screen positive yet are believed to suffer from a disease process other than Ebola.	
HTM will consider using nasogastric (NG) and feeding tube in the appropriate clinical setting and the insertion procedures will minimize the risk of contamination	Y	N		CCCS – Should consider if patient is unwell or unable to swallow. Extreme caution with placement of NG tube in patients already experiencing hemorrhagic complications	Participants suggested that NG placement should be considered for management of body fluids. Participants identified that routine NG and feeding tube placement procedures need to be modified to minimize the risk of contamination. For example, participants questioned whether it is necessary to use a two-step placement of feeding tube, which demands two X-rays. In addition, proper positioning is often determined using a stethoscope. At present, an electronic stethoscope is not available, and conventional stethoscope were identified as unsafe.	
The procedure used to handle food will minimize the risk of contamination	N	N			Coordination was noted to be important to deliver food in disposable cutlery containers that will be discarded after use. The dietician confirmed that this process was already in place.	
HTMs will be proficient in the management of sudden terminal events	N	N		CCCS ⁸ p. 45 – “Sudden Terminal Events (Massive hemoptysis, asphyxiation) - Midazolam 5-10mb IV/SC q5min PRN - Deliberate terminal sedation may	Participants noted that patients with Ebola may experience sudden terminal events such as (massive hemoptysis with asphyxiation). It was suggested that medications to palliate in the event of a terminal catastrophic event be available at	

				be important to avoid severe suffering at the time of death. (...)"	the bedside.	
There will be a plan detailing the management of obstetrical patients and newborns.	Y	I/P	WHO ⁵ p. 27 – Full term deliveries are rare in VHF. As uterine evacuation in pregnant patients appears to lower maternal mortality, it should be considered in confirmed cases given the extremely high maternal and fetal mortality. This procedure must be performed with extreme caution given potential for nosocomial transmission and the risk for inducing maternal hemorrhage. Follow usual clinical guidelines to manage post-partum bleeding.	CCCS ⁸ p. 37 – Considerations for EBV and Pregnancy: -“(...)increased severity of illness, high incidence of spontaneous abortion and risk of severe genital bleeding” -“Pregnant women have friable upper airway mucosa, increasing the likelihood of bleeding related to tube insertions and manipulation.” -“Fever is likely harmful to the foetus and should be avoided” -“Left lateral positioning is important to prevent the supine hypotension syndrome, in the 2 nd half of pregnancy”	Participants noted that the care of pregnant patients is very complex. In addition, the newborn may require resuscitation and/or interhospital transport to the Children Hospital of Eastern Ontario (CHEO)	The department of obstetrics and gynecology is currently performing a needs assessment and developing a plan with ID/IC
Policies and procedures for transfusion of blood products will be clearly documented.	Y	N	EMORY ⁴ p.84 – Support Document 11 “When it is determined that blood products need to be transfused to a SCDU patient, the following protocol will be followed: <input type="checkbox"/> A. For females of child bearing age, group O negative red blood cells and group AB plasma products will be issued. <input type="checkbox"/> B. For males and females not of child bearing age, group O positive red blood cells and group AB plasma products will be issued. <input type="checkbox"/> C. After the <u>first 24 hours</u> , if it is determined that more blood products will be required, the hospital blood bank will be notified to perform a type and screen by manual methods in the SCDU dedicated laboratory. Once a type has been established on two separate occasions, type specific plasma products can be issued. If no passive anti-A or anti-B is detected, type specific red blood cells may also be provided.	CCCS ⁸ p. 37 – “At present many hospitals are not doing phenotyping – but are providing phenotyped units based upon the following approach: - Unknown to the hospital and never seen by a blood bank elsewhere - issue O neg, Kell neg (so E,C,K neg = 85% of antibodies mitigated) - Unknown to the hospital but seen elsewhere - get info from all other hospitals – issue O neg, Kell neg as above + any antibodies matched (e.g., jka, etc.) - Known to the hospital – same as above - Sickle cell patients – give phenotyped matched based on CBS registry + matched for any antibodies” CCCS ⁸ p. 37 – “When transfusion is provided it is recommended that a very cautious 15 min test dose be undertaken at the beginning of the transfusion as essentially the final crossmatch will be done in the patient.”	No transfusion testing is available in patients who are suspected or confirmed to have Ebola at TOH. Further interviews with blood bank and infection control will be required.	
There will be a clear process to decide and	N	N	CDC ¹⁶ – Considerations to take into account when discharging a	CCCS ⁸ p. 44 – Case by case decision, but two general criteria	These decisions would be made jointly with ID specialists	

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<p>plan discharge from hospital</p>		<p>patient under investigation for EVD without a negative RT-PCR (either not done yet or done with specimen collected less than 72 hours from the start of symptoms):</p> <ol style="list-style-type: none"> 1) In the clinical judgment of the medical team, the PUI's illness no longer appears consistent with Ebola. 2) The PUI is afebrile off antipyretics for 24 hours, or there is an alternative explanation for fever. 3) All symptoms that are compatible with Ebola (e.g., diarrhea or vomiting) have either resolved or can be accounted for by an alternative diagnosis. 4) The PUI has no clinical laboratory results consistent with Ebola, or those that could be consistent with Ebola have been otherwise explained. 5) The PUI is able to self-monitor (or to monitor a child, if the PUI is a child) and comply fully with active monitoring and controlled movement. 6) There is a plan in place for the PUI to return for medical care if symptoms recur, which has been explained to the PUI, and the PUI understands what to do if symptoms recur. 7) Local and state health departments have been engaged and concur. 8) Active monitoring and controlled movement still apply for persons who have had Ebola virus exposures and are under follow-up as contacts for the full 21-day period following their last exposure. <p>WHO⁵ p. 61-62 – Discharge of an alert case is done on the following conditions: Patients have been reviewed by the VHF clinical management</p>	<p>currently in use are:</p> <ol style="list-style-type: none"> 1) Symptom free > 72 hours <p>Two consecutive blood samples at least 24 hours apart have been negative for the Ebola virus by PCR</p> <p>PHAC¹⁰ – “Discharge planning (including but not limited to continuation of infection control precautions in the home setting) should be managed on a case-by-case basis in consultation with infectious disease specialists, IPC and PH. Individuals <u>recovering from EVD should either abstain from sexual intercourse or wear condoms for a minimum of 12 weeks, ideally for 15 weeks after the date of symptom onset.</u>”</p>		
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		<p>team and found not to meet the case definition of a suspected case, with no epidemiological link to:</p> <ul style="list-style-type: none"> - Any suspected or confirmed case - Have a conclusive diagnosis that is not VHF, recognizing that co-infections do occur. - Have responded to specific treatment - Be in good health condition and able to go back home <p>Discharge of VHF-confirmed case or suspected cases is based on the clinical presentation and the correct interpretation of the laboratory findings. Consider discharge when the following criteria are met:</p> <ul style="list-style-type: none"> - 3 or more days without fever or significant symptom (symptoms suggestive of ongoing shedding of virus include diarrhea, coughing, bleeding). Instruct patients that despite resolution of symptoms, viral shedding is known to occur in the semen of male patients and probably breast milk of lactating females but this should not preclude discharge. - AND significant improvement in clinical condition - AND in good general condition - AND if laboratory testing is available: negative blood PCR for VHF (regardless of any other serologic tests) on day 3 or later following onset of symptoms (if the patient had a previously positive blood PCR test, this means a subsequent negative test 48 hours from the initial test or for patients with previously blood PCR positive mothers, 			
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			<p>that are breast feeding, it may be safer to delay discharge until PCR on breast milk turns negative as well)</p> <ul style="list-style-type: none"> - If a patient continues to suffer symptoms and/or their condition is not improving, but this is not thought to be due to active filovirus disease, 2 negative blood PCR tests 48 hours apart, with at least one test being done 3 days or more after onset of symptoms, are needed before discharge/referral to a normal ward for further care. <p>Discharge orders/prescriptions:</p> <ul style="list-style-type: none"> - 1 month supply of vitamin supplements - Nutritional advice - Use condoms for 3 months (male patients) - Breastfeeding women should stop until PCR testing of breast milk is negative. - Provide a medical certificate to the patient to certify that the patient does not constitute any danger to his family or his neighbors. <p>WHO⁵ – follow-up A system for follow-care should be set up for these patients. Psychological support and follow up should be considered.</p>			
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I. Ebola Specific Diagnosis and Treatment

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap identified	Solution Implemented	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
HTMs will order the most suitable test to diagnose Ebola	N	N	CDC ¹⁷ – CDC recommends testing for all persons with onset of elevated body temperature or		ICU physicians indicated that they would rely on Infectious Disease specialists to order and interpret the	Solution – None required

		<p>subjective fever within 21 days of having a high-risk exposure such as (See CDC's laboratory testing guidance):</p> <ul style="list-style-type: none"> -Percutaneous or mucous membrane exposure or direct skin contact with body fluids of a person with a confirmed or suspected case of EVD without appropriate personal protective equipment (PPE), -Laboratory processing of body fluids of suspected or confirmed EVD cases without appropriate PPE or standard biosafety precautions, or -Participation in funeral rites or other direct exposure to human remains in the geographic area where the outbreak is occurring without appropriate PPE. <p>For persons with a high-risk exposure but without a fever, testing is recommended only if there are other compatible clinical symptoms present and blood work findings are abnormal (i.e., thrombocytopenia <150,000 cells/μL and/or elevated transaminases).”</p> <p>CDC¹⁵ – Timing of testing: “Virus is generally detectable by real-time RT-PCR from <u>3-10 days after symptoms appear</u>. Specimens ideally should be taken when a symptomatic patient reports to a healthcare facility and is suspected of having an Ebola exposure. However, <u>if the onset of symptoms is <3 days, a later specimen may be needed to completely rule-out Ebola virus</u>, if the first specimen tests negative</p> <p>CDC¹⁶ – Important considerations</p>		required tests.	
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		<p>with the RT-PCR test for Ebola</p> <p>1) A negative RT-PCR test result for Ebola virus from a blood specimen collected less than 72 hours after onset of symptoms does not necessarily rule out Ebola virus infection.</p> <p>2) If the patient is still symptomatic after 72 hours, the test should be repeated.</p> <p>3) If the patient has recovered from the illness that brought them to medical attention, a repeat test is not required.</p> <p>4) A negative RT-PCR test result for Ebola virus from a blood specimen collected more than <u>72 hours after symptom onset rules out Ebola virus infection.</u></p> <p><u>5) Positive Ebola virus RT-PCR results are considered presumptive until confirmed by CDC</u> There will be a clear process to decide and plan discharge from hospital.</p> <p>WHO ⁵ p. 5-6, 15, Appendix A1 – Standard case definitions for VHF have been developed to identify cases as:</p> <p><u>“Alert”</u></p> <ul style="list-style-type: none"> • Definition: patient presenting with unexplained fever or history of fever (onset less than 3 weeks) AND unexplained bleeding signs (hemorrhagic or purpuric rash, epistaxis, hematemesis, hemoptysis, bloody stools, other hemorrhagic signs) AND no known predisposing 			
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			<p>factors for hemorrhagic manifestations OR a patient presenting with any fever OR 3 more of the following: headache, nausea or vomiting, abdominal pain, generalized or articular pain, loss of appetite, diarrhea, difficulty swallowing, difficulty breathing, intense fatigue) AND possible filovirus exposure: unexplained death(s) in the family or close contacts, unexplained (cluster of) serious illness in family or close contacts, provision of care for the seriously ill or handling bodies (caretakers, health workers, those participating in traditional funerals), at risk contact with apes or bats (dead or alive), entry into caves or proximity to fruit trees that host bats</p> <p><u>“Suspect”</u></p> <ul style="list-style-type: none"> • Definition: Any person 1) having had contact with a clinical case AND presenting with acute fever (T > 38 C) OR 2) having had contact with a clinical case (suspect, probable, or confirmed) AND presenting with 3 or more of the symptoms below: OR 3) presenting with acute fever AND presenting with 3 or more of the following concerning symptoms: headache, generalized or articular pain, intense fatigue, nausea or vomiting, loss appetite, diarrhea, abdominal pain, difficulty in swallowing, difficulty in breathing, hiccups, miscarriage OR 4) with unexplained bleeding or miscarriage OR 5) Any explained death 			
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			<p><u>“Probable”</u></p> <ul style="list-style-type: none"> Definition: 1) A suspect case that is known to have had contact with a known case (suspect, probable, or confirmed) OR 2) A patient that is, on clinical and/or epidemiological grounds, very likely to have Ebola <p><u>“Confirmed”</u></p> <ul style="list-style-type: none"> Definition: laboratory testing with positive PCR test for Ebola Once “Alert” cases present to the medical personnel, however, the “alert” label should be discarded and a determination made as to whether the person falls into one of the other categories. 			
Physicians will order and have access to the most appropriate therapy to target EVD	N	N			ICU physicians indicated that they would rely on Infectious Disease specialists to identify and recommend any EVD targeted therapies. Pharmacist did not identify any need at this time given that the current treatment is purely supportive.	

J. Critical Care Staffing Issues

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap identified	Solution Implement	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
There will be sufficient staff available at all times with the required expertise and PPE training to provide patient care and maintain the patient area	Y	I/P	EMORY⁴ p.13 – “It is recommended that nurses doff PPE every 4 hours to allow for personal needs and a break. At the highest level of PPE and patient care, 3 nurses will be working in the Unit at one time, in 12-hour shifts. They rotate in 4-hour shifts between the patient room, the anteroom and the	MOHLTC (Oct 30th)⁹ p.6 – “Care to suspect and confirmed cases must be provided by at least two registered nurses at all times. The two nurses do not need to be in the room at the same time and all the time – this depends on the patient care activities and the organization’s procedures. In	Participants proposed that only ICU attendings and critical care fellows would be allowed to manage patients with suspected or proven Ebola. Participants noted that managing patients with Ebola will be time-consuming especially during transfer. They suggested that additional physician staffing might therefore be required to manage	Solution - Minimum 3:1 nursing and possibly dedicated MD currently determining how this would be feasible with given resources/scheduling.

		nursing desk”	<p>some cases, the second nurse may be better placed outside the patient room in order to provide supplies. These nurses must have no other duties while caring for suspect or confirmed cases.”</p> <p>CCCS⁸ - Optimal RN to patient ratio = 2:1</p> <p>CCCS⁸ p. 22 – Physical Heat Stress. “(...) in situations where HCWs must remain in PPE for long periods of time, heat stress is a significant issue and has led some institutions to select the use of powered air purifying respirators (PAPRs)”</p> <p>CCCS⁸ p. 47 – “Hospitals should have a plan in place to support HCW caring for EVD patients. If at all possible, resilience training should be provided in advance of staff providing care for EVD patients to potentially protect them from the stress of the situation.”</p> <p>CCCS⁸ p.21 “Despite the need to minimize the amount of time spent in a patient’s room, a HCW must always be at the ready to quickly enter the patient’s room. Given the significant length of time to don PPE in a safe and controlled manner <u>this means that a HCW must always be dressed in PPE sitting in the warm zone and ready to enter into the hot zone at a moment’s notice</u> if the patient requires assistance (...)”</p> <p>MOHLTC (Oct 30th)⁹ p.6 – “Hospitals should limit the number of HCWs that come into contact with suspect and confirmed cases, and non-essential personnel ”</p>	<p>other ICU patients.</p> <p>Participants suggested that only experienced RTs and nurses (minimum of 3 years experience) be assigned to patients with suspected or proven Ebola.</p> <p>Staffing requirements must take into consideration the fatigue and stress associated with caring for patients with suspected or confirmed Ebola. This could be particularly problematic for staff wearing PPE. The participants expressed serious concerns that HTM would fail to recognize that they are becoming tired, thus increasing the risk of contamination. They suggested strategies to minimize fatigue including:</p> <ul style="list-style-type: none"> • A minimum of 3:1 nursing/patient ratio for critically ill patients to limit the period of time spent in the room or acting as the spotter. The ratio may need to be increase to 4 or 5:1 depending on the workload. • Restricting the responsibility of nurses to their patient with Ebola (i.e., not covering other patients) • Not allowing staff that has been up all night to enter the patient room. • A 1:1 physician/patient ratio (i.e. freeing physician of all other responsibilities) during transport or whenever the physician is called into the room to manage the patient. <p>The need to always have a HTM fully donned and available to enter the room was questioned by the participants.</p> <p>No concerns with staffing were identified by housekeeping and waste management.</p>	
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<p>The roles and responsibilities of HTMs directly or indirectly involved in the care of patients with suspected or proven Ebola will be clearly defined,</p>	<p>Y</p>	<p>N</p>	<p>CDC¹¹ – “Designate individuals as <u>site managers</u> responsible for overseeing the implementation of precautions for healthcare workers and patient safety. A site manager’s sole responsibility is to ensure the safe and effective delivery of Ebola treatment. These individuals are responsible for all aspects of Ebola infection control including supply monitoring and evaluation with direct observation of care before, during, and after staff enter an isolation and treatment area”</p> <p>Room nurse = “(...)in charge of all direct patient care, ensuring the quality of all protective practices of personnel entering and exiting the room, waste management and all patient room cleaning”</p> <p>Anteroom nurse = “(...)are utilized as quality control officers, ensuring all protective practices are strictly followed. They are responsible for constantly cleaning after all personnel leaving the patient room; transporting patient room waste through the anteroom and out for processing; and decontaminating all anteroom surfaces, equipment and the locker room. Anteroom nurses are relied upon for charting, supply ordering and stocking.”</p> <p>Desk nurse = “(...)are resources for breaks, food delivery, stocking, supply ordering, retrieving prescriptions, coordinating various patient care orders and managing anything else that is needed”</p> <p>EMORY⁴ General statement for nursing roles = “In an effort to minimize the number of health care workers potentially exposed to patients isolated in the Unit,</p>		<p>The roles and responsibilities of HTMs directly caring for these patients has not yet been clearly defined.</p>	
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			nursing personnel will perform all phlebotomist functions, obtain all cultures, perform electrocardiograms (ECG), run dialysis and ventilator management as needed, assist with patient physical therapy and use any other skill sets as necessary. Nursing staff will also perform all duties normally associated with nurse technician, environmental services and unit clerk roles” WHO ⁵ p. 46 – Members of staff will not move freely between the isolation areas and other clinical areas during the outbreak.			
HTMs who have cared for patients with Ebola will monitor themselves for signs of infection	Y	N		CCCS ⁸ p. 46-47 – “ There are no restrictions (e.g. quarantine) placed upon HCWs who care for EVD patients who have not experienced a noted breach in infection control procedures. However, HCWs caring for EVD patients are recommended to self-monitor for fever, for full details on current guidance please refer to ²⁰ⁿ	Participants were unclear on the monitoring of HTMs who have worked with patients with Ebola. They raised the following questions: <ul style="list-style-type: none"> • Should they only monitor temperature or other symptoms such as diarrhea (as is being recommended by Emory)? • Who would oversee the monitoring? 	

K. Visitation and Contacts

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap identified	Solution Implemented	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
Visitation rights will be clearly defined	N	N	CDC ¹¹ – “restrict non-essential personnel and visitors from the patient care area” CDC ¹² – “Avoid entry of visitors into the patient’s room” CDC ¹² – “Establish procedures for monitoring managing and training visitors” Schedule visits in order to plan for: 1) Screening for EVD in visitors	MOHLTC (Oct 30th) ⁹ p.6 – “... visitors must be excluded from entry to the patient’s room” CCCS ⁸ p.21 – Family or visitors should not enter the room CCCS ⁸ p.21 – “Arrangements should be made to allow family members to communicate from outside the unit (or hospital) with the patient. Internet based video chat technologies can be very	Participants had the following questions: <ul style="list-style-type: none"> • Should visitors be allowed? • If so, who would train them on the use of PPE? • Who would determine if they are proficient? • What actions would be taken if they are not compliant with the PPE procedures? <p>It was noted that these questions may not be relevant at present,</p>	

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			<p>2) Ability to comply with precautions 3) Instruction on proper PPE use</p> <p>WHO⁵ p. 46 – Assure restricted access. <i>Stopping visitor access to the patient is preferred.</i> If this is not possible, limit their number to those who are necessary for the patient’s care and well-being (i.e. parent for a sick child). The visitor should keep a minimum distance of 3 meters.</p> <p>WHO⁵ p. 46 – Use signage and other communications to alert restrictions of visitors.</p> <p>WHO⁵ p. 46 – All visitors must use PPE and perform hand hygiene. Provide them with the appropriate instructions prior to entering the room.</p>	useful for this”	given that the MOHLTC has stated that visitors were not allowed	
Support will be provided to patients and their family members	Y	N	<p>WHO⁵ p. 43, section 4 – Psychological support for the patient and the family are very important. Anxiety and fear are normal given the high mortality rate for confirmed VHF. Ideally, a psychologist or nurse skilled in providing psychological support should be involved from the outset, but providing psychological care in PEE can be uncomfortable and difficult.</p>	<p>CCCS⁸ p. 47 – “Hospitals should plan to provide support to both patients and their families. This includes ensuring that processes are in place to allow communication and visitation between patients and families”</p> <p>CCCS⁸ p. 47 – Offer support with services like Social Work, Chaplaincy and Psychiatry.</p> <p>CCCS⁸ p. 47 – “Given the concerns regarding transmission and desire to minimize patient exposure leveraging technologies such as internet video chat should be considered and the necessary IT infrastructure should be provided.”</p>	Has not yet been explored with participants	
There will be a clear process on how to manage anyone who has had unprotected contact with a patient with suspected or	Y	N		<p>PHAC¹⁸ – “Quarantine is not recommended for close contacts of a confirmed or probable case. Active daily monitoring of close contacts for fever and other</p>	Participants noted that family members or others who have been in close contact with a patient with Ebola could also be infected. Participants raised the following questions:	

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confirmed Ebola			<p>symptoms should be conducted by public health staff for the duration of the monitoring period (i.e. 21 days from the last possible exposure or upon receipt of negative testing for the probable case with whom this person was in contact).</p> <p>If necessary, teach the individual how to take their temperature accurately and provide a thermometer to them if they do not have access to one.</p> <p>For the 21 days following the last possible exposure, or until the probable case with whom this person was in contact no longer meets the case definition (i.e. the laboratory investigation has ruled out Ebola virus infection), advise the close contact to:</p> <p>Take (orally) and record their temperature twice daily and report any reading $\geq 38.6^{\circ}\text{C}$ (101.5°F) to public health immediately (as opposed to waiting for public health to contact them as part of active daily monitoring).</p> <p>Refrain from taking any antipyretic medication during the monitoring period if possible.</p> <p>Self-monitor for the appearance of any other early symptoms of EVD including severe headache, muscle pain, malaise, sore throat, vomiting, diarrhea and rash.</p> <p>Should symptoms develop, self-isolate as quickly as possible and contact the local public health authority immediately for further direction.</p> <p>If symptoms consistent with EVD (including an oral temperature reading $\geq 38.6^{\circ}\text{C}$ (101.5°F)) develop in the close contact, public health should manage the individual as a probable case.”</p> <p>PHAC¹⁸ –</p>	<ul style="list-style-type: none"> • What actions should be taken to safely manage these contacts? • Who will trace the contacts and decide whether quarantine is required? • Does ICU staff play a role in managing close patient contact? 	
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				“Close contacts of <i>confirmed and probable</i> cases should not travel outside of their city of residence during the monitoring period in order to facilitate daily contact with public health authorities conducting active daily monitoring as well as access to health care in an appropriate setting should it be required.”	
There will be a clear process on how to screen visitors to the ICU and manage any visitor who is found to be positive.	Y	N			Participants questioned whether all visitors to the ICU would be screened and if so how? It was noted that the current plan is to inform visitors that self-screening should be performed before entering the ICU. It was unclear if this plan would change if a patient with suspected or confirmed Ebola is admitted in the ICU. Some participants recommended that under these circumstances, all visitors should be screened before entering the ICU. Participants also questioned who would perform the screening and whether the person performing the screening should be wearing PPE.
There will be a clear process on how to manage any visitor who is screen positive	Y	N			The participants questioned what procedure to follow if a visitor was found to be screen positive. For example, do ICU clerks need to know the steps to take if a visitor self-screens positive?

L. Waste management, Environmental Cleaning, Management of Linens

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap identified	Solution Implement	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
Waste will be safely removed from the room	Y	I/P	EMORY ⁴ p.50-52 – (Appendix 9: Waste Management Process from High Containment Hospital Suite to Autoclave) Separated in 6	PHAC ¹⁰ – “Biomedical waste (e.g., sponges, dressings and surgical drapes soaked with blood	All disposable waste must be placed in red hazardous waste buckets. Participants had concerns with practical aspects of waste removal	Solution – Numerous walkthroughs have been performed. The waste management team has also

		<p>sections:</p> <ol style="list-style-type: none"> 1) IN PATIENT ROOM 2) IN THE ANTEROOM 3) AUTOCLAVING 4) POST AUTOCLAVE 5) VALIDATION OF AUTOCLAVE CYCLE 6) TRANSPORT <p>CDC¹⁹ – Management of disposable materials (e.g., any single-use PPE, cleaning cloths, wipes, single-use microfiber cloths, linens, food service) and linens, privacy curtains, and other textiles after use:</p> <p>“These materials should be placed in leak-proof containment and discarded appropriately. To minimize contamination of the exterior of the waste bag, place this bag in a rigid waste receptacle designed for this use. Incineration or autoclaving as a waste treatment process is effective in eliminating viral infectivity and provides waste minimization.”</p> <p>WHO⁵ p. 50 – Waste should be segregated at point of generation to enable appropriate and safe handling. Sharp objects (e.g., Needles, syringes, glass articles) and tubing that has been in contact with blood or body fluids should be placed inside puncture resistant waste containers. These should be located as close as practical to the patient care area where the items are used. Collect all solid, non-sharp infectious waste using leak-proof waste bags and covered bins. Bins should never be placed against the body</p>	<p>or secretions) should be contained in impervious waste-holding bags or double bags according to municipal/regional regulations.</p> <p>Blood, suctioned fluids, excretions and secretions should be disposed of in a sanitary sewer or septic system according to municipal/regional regulations.”</p> <p>TOH – Waste protocol for suspect/confirmed Ebola virus (Sept 2014): Nurse or designate will dispose all biomedical (blood and/or body fluid) waste from a suspect/confirmed Ebola patient into RED single use red containers AND label with a white UN2814 sticker. Nurse or designate will dispose all regular waste items (items NOT dripping with blood and/or body fluids) into the regular black bag trash. Nurse or designate will immediately place a call to a Housekeeping supervisor to have a trained staff member sent to remove the waste. Please ensure to identify to the supervisor that the waste is from a suspect/confirmed Ebola patient. Nurse or designate will seal and wipe down outside of bags/containers with a hospital grade disinfectant before bags/containers leave the patient room. Nurse or designate will pass bags/ containers out the patient room door to the housekeeping waste porter (wearing gloves) in the anteroom.</p>	<p>from the room, including how to seal the buckets and how to move them safely from inside to outside the room, given that the outer surface of the bucket is assumed to be contaminated. Further concerns were raised that the buckets were too small and that the process of removing body fluids, including suction disposal, was unclear.</p>	<p>acquired larger plastic blue drums for disposal of waste, which are also easier to seal and do not require a machine. They have developed a process for removal with a drum dolly. The drum will be disinfected twice and markers have been placed on the drums to help HTMs keep track of the disinfection process.</p> <p>Next step is to perform a walk-through with nursing staff and waste management with the new drum.</p>
Processes will be in place to handle spills.	Y	N	CDC ¹⁹ – “CDC guidelines recommend removal of bulk spill	Standard practice with spill kits and Clorox was identified as the practice	

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		<p>matter, cleaning the site, and then disinfecting the site. For large spills, a chemical disinfectant with sufficient potency is needed to overcome the tendency of proteins in blood and other body substances to neutralize the disinfectant's active ingredient (...)"</p> <p>EMORY⁴ p.44 – Spill Cleanup protocol Alert team. Assist patient. Establish a spill parameter. Visual check of PPE and clean any visible contamination Pour disinfectant on clean towel to establish chemical mat* near spill. Remove one bootie, then step onto newly created chemical mat*; repeat with second bootie. Sanitize gloves. Remove outer gloves. Sanitize gloves. Don outer gloves, then booties. Sanitize gloves. Soak clean towel in disinfectant. Cover spill outside-in with bathroom towel. Allow for appropriate contact time (10 minutes). Clean up spill from outside-in. Sanitize gloves. Remove outer gloves. Don new outer gloves. Mop area, placing wipes in red bag. Sanitize gloves. Remove one bootie, then step onto newly created chemical mat*; repeat with second bootie. Sanitize gloves. Remove outer gloves. Don outer gloves then booties Follow Waste Management for Patient Room protocol.</p>		<p>plan. Interviews with HTMs, including housekeeping, identified that the process of spill clean up needs to be established, including clarifying the roles and responsibilities of HTMs, (physicians, nurses housekeeping, etc.).</p>		
Processes will be in place to clean and disinfect surface	N	N	CDC¹¹ – “Perform regular cleaning and disinfection of patient care area surfaces, even absent visible	CCCS⁸ p.21 – “(...) even all cleaning of the room whilst the patient is present, should be	Participants noted that the anteroom should be cleaned more frequently	Solution – Housekeeping is developing a protocol

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<p>areas</p>		<p>contamination. <u>This should be performed only by nurses or physicians</u> as part of patient care activities in order to limit the number of additional healthcare workers who enter the room”</p> <p>CDC¹⁹ – “<u>Daily cleaning and disinfection of hard, non-porous surfaces</u> (e.g., high-touch surfaces such as bed rails and over bed tables, housekeeping surfaces such as floors and counters) should be done.⁴ <u>Before disinfecting a surface, cleaning should be performed.</u> In contrast to disinfection where products with specific claims are used, any cleaning product can be used for cleaning tasks. Use cleaning and disinfecting products according to label instructions. Check the disinfectant’s label for specific instructions for inactivation of any of the non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus) (...)”</p> <p>CDC¹⁹ – “Use a U.S. Environmental Protection Agency (EPA)-registered hospital disinfectant with a label claim for a non-enveloped virus (e.g., norovirus, rotavirus, adenovirus, poliovirus) to disinfect environmental surfaces in rooms of patients with suspected or confirmed Ebola virus infection”WHO⁵ – Use the same PPE for disinfecting the environment</p> <p>WHO⁷ p. 8 – Cleaning process Clean contaminated environment/objects as soon as possible using standard hospital detergents/disinfectants (ex. 0.5% chlorine solution or a solution containing 5000 ppm available free chlorine. Application of</p>	<p><u>conducted by core nurse and physician team”</u></p> <p>MOHLTC (Oct 30th)⁹ p.9 – “Experienced environmental services staff trained in OHS and IPAC practices and use of PPE should be assigned to perform these tasks.”</p> <p>MOHLTC (Oct 30th)⁹ p.9 – “All used cleaning wipes/cloths should be disposed of in leak-proof <u>color-coded bags/containers, doubled bagged and the outer container wiped</u> with disinfectant before removal from the room. The frequency of cleaning should be based on the level of contamination with blood and/or other body fluids, and at least daily. Housekeeping equipment should be disposable or remain in the room for the duration of the patient’s admission. Upon discharge of the patient or discontinuation of precautions, discharge/terminal cleaning of the room should follow the recommended practice for discharge/terminal cleaning of a room on Contact/Droplet Precautions. In addition to routine cleaning:</p> <ul style="list-style-type: none"> • All dirty/used items (e.g., suction containers, disposable items) should be removed/discarded • <u>Curtains (privacy, window, shower) should be disposed</u> of before starting to clean the room • Everything in the room that cannot be cleaned should be discarded • Fresh cloths, mop, supplies and solutions should be used to clean the room • Several cloths should be used 	<p>The practice at TOH includes experienced environmental services staff performing cleaning, not MDs or nurses. This is in keeping with the MOHLTC, which is contradicted by the CDC and CCCS.</p> <p>Concerns were raised by physicians, nurses, housekeeping and waste management about the possibility of MDs or nurses performing environmental cleaning, as they have not been trained to perform these duties and hence if they were assigned this task it may result in inadequate cleaning and/or contamination.</p>	
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			<p>disinfectants should be preceded by cleaning to prevent inactivation of disinfectants by organic matter. Change cleaning solutions (daily) and refresh equipment frequently while being used during the day, as they will quickly become contaminated. (Annex 6, preparing chlorine based solutions) Clean floors and horizontal work surfaces at least once a day with clean water and detergent. Surfaces should dry naturally before use.</p> <p>EMORY⁴ p.14 – “The nursing team is responsible for all cleaning within the anteroom and patient rooms”</p>	<p>to clean the room</p> <ul style="list-style-type: none"> • <u>Each cloth should be used one time only</u> • <u>Cloths should not be dipped back into disinfectant solution after use</u> <ul style="list-style-type: none"> • All surfaces should be cleaned and disinfected allowing for the appropriate contact time with the disinfectant as per manufacturer’s recommendations • All housekeeping equipment should be cleaned and decontaminated before putting it back into general use “ <p>PHAC¹⁰ – “All horizontal and frequently touched surfaces should be cleaned at least twice daily and when soiled. Surfaces that are likely to be touched and/or used frequently should be cleaned and disinfected on a more frequent schedule. This includes surfaces that are in close proximity to the patient (e.g., bedrails, bedside/over-bed tables, call bells) and frequently touched surfaces in the patient care environment, such as door knobs, surfaces in the patient’s bathroom.”</p>		
<p>Measures will be taken to avoid contamination and facilitate cleaning.</p>	<p>Y</p>	<p>N</p>	<p>CDC¹⁹ – “Avoid contamination of reusable porous surfaces that cannot be made single use. Use only a mattress and pillow with plastic or other covering <u>that fluid</u> cannot get through. Do not place patients with suspected or confirmed Ebola virus infection in carpeted rooms and remove all upholstered furniture and decorative curtains from patient rooms before use”</p> <p>CDC – “Routine cleaning of the PPE doffing area should be performed</p>		<p>Participants expressed concerns that disinfecting the hospital bed and/or stretcher might be difficult. Many HTMs recommended covering the stretcher in plastic prior to transporting the patient. HTMs also stressed the importance of ensuring the mattress did not have any rips, tears or worn out spots. Participants suggested that if grossly contaminated, the mattress should be disposed of.</p>	

			<p>at least once per day and after the doffing of grossly contaminated PPE. Cleaning should be performed by a HCW wearing clean PPE”</p> <p>WHO⁷ – Cleaning with a moistened cloth helps to avoid contaminating the air and other surfaces with air-borne particles.</p> <p>Cleaning should always be carried out from “clean” areas to “dirty” areas in order to avoid contaminant transfer.</p> <p>Do not spray the disinfectant.</p>			
There will be a clear process in place to handle and clean used linen	Y	Y	<p>WHO⁷ p.9 –</p> <ul style="list-style-type: none"> • Linen that has been used on patients can be heavily contaminated with body fluids (e.g. blood, vomit) and splashes may result during handling. When handling soiled linen from patients, use gloves, impermeable gown, closed shoes (e.g., boots) and facial protection (mask and goggle or face shield). • Soiled linen should be placed in clearly labeled, leak-proof bags or buckets at the site of use and the container surfaces should be disinfected (using an effective disinfectant) before removal from the isolation room/area. If there is any solid excrement such as faeces or vomit, scrape off carefully using a flat firm object and flush it down the toilet or in the sluice before linen is placed in its container. If the linen is transported out of the patient room/area for this procedure 	<p>PHAC¹⁰ – “Patient bed linen should be changed regularly and when soiled, upon discontinuation of precautions and following patient discharge.</p> <ul style="list-style-type: none"> • Soiled linen should be placed in a no-touch receptacle at the point-of-use. • Soiled linen should be handled with minimum agitation to avoid contamination of air, surfaces and persons. • Heavily soiled linen should be discarded into a no touch garbage receptacle at the point-of-use. hand hygiene should be performed after handling soiled linen” 	<p>Many concerns were voiced about the processing of linens. Participants expressed concerns that the plan to perform regular processing of linens could contaminate cleaning staff or others.</p>	<p>Solution – Meetings have been held with housekeeping, waste management and infection control. The plan for linens has been changed. At this time, all linens will be disposed of in the waste buckets and destroyed.</p>

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		<p>it should be put in a separate container – it should never be carried against the body.</p> <ul style="list-style-type: none"> • Linen should be then transported directly to the laundry area in its container and laundered promptly with water and detergent. • For low-temperature laundering, wash linen with detergent and water, rinse and then soak in 0.05% chlorine solution (a solution containing 500 ppm available free chlorine) for approximately 30 minutes. Linen should then be dried according to routine standards and procedures. • Washing contaminated linen by hand should be discouraged. However, if washing machines are not available or power is not ensured, take the soiled linen out of the container and empty it into a large drum container of hot water and soap. Soak the linen in this drum and make sure it is totally covered with water. Use a stick to stir; then throw out the water and refill the drum with clean water and add chlorine 0,1% (a solution containing 1 000 ppm available free chlorine) and allow to soak for 10 –15 minutes. Remove the linen and then rinse in clean water. Remove excess water and spread out to dry. Avoid as much splashing as possible. • If safe cleaning and disinfection of heavily soiled linen is not possible or reliable, it may be prudent to burn the linen to avoid any 			
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			<p>unnecessary risks to individuals handling these items.</p> <p>EMORY⁴ p.28 – “For patients who are felt to be infected with smallpox or VHF, all linen will be placed in biohazard, autoclavable bags. Bagged soiled linen bags are considered full when 3/4 full.”</p> <p>CDC¹⁹ – “To reduce exposure among staff to potentially contaminated textiles (cloth products) while laundering, discard all linens, non-fluid-impermeable pillows or mattresses, and textile privacy curtains into the waste stream and disposed of appropriately”</p>			
Processes will be in place to clean and disinfect non disposable equipment	Y	N	<p>EMORY⁴ p.53 – Appendix 10</p> <p>“1) In the patient room, the patient’s nurse should cleanse the contaminated equipment with disinfectant designated by the hospital.</p> <p>2) Both the patient room nurse and the anteroom nurse are to create disinfectant mats with disposable pads and the disinfectant (200 mL of the solution to 400 mL of water) from the patient’s doorway to the storage destination.</p> <p>3) The room nurse will then roll/hand off the unofficial cleaned equipment to the anteroom nurse, where he/she will clean equipment again with disinfectant while in full PPE similar to Waste Management.</p> <p>4) Cover equipment with plastic bag and label as dirty so that it will be further decontaminated with vaporized hydrogen peroxide. Roll/hand off equipment to resource nurse outside of anteroom and store in <u>designated dirty storage area</u>. The resource</p>	<p>PHAC¹⁰ – “There are no indications for the use of disposable dishes/cutlery, except in the circumstance of non-functioning dishwashing equipment.”</p>	<p>HTMs were unclear about the process to clean and disinfect non-disposable equipment, such as the central line tray or the bag-valve-mask apparatus.</p> <p>The manager of decontamination was identified as a key stakeholder who will need to be interviewed.</p>	

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		<p>nurse outside the room should wear gown, gloves, booties and mask with face shield.</p> <p>5) The resource nurse outside of the room doffs PPE per SOP protocol. Anteroom nurse removes PAPR Hood and sets aside. "</p> <p><i>"Quaternary Ammonium Compound Mat Procedure</i></p> <ul style="list-style-type: none"> -Mats will be changed every day at the beginning of the morning by the 7A-7P nurse. -To change, remove tape and discard both tape and mat in the trash. -Replace mat with the new fabric chuck pad and tape down with 2-inch silk tape. -Mix 200mL of the quaternary ammonium compound with 400 mL of water and pour on the mat. -The non-diluted compound can cause the floor to become sticky; if this occurs, use water to dilute the solution on the floor and mop until the floor is no longer sticky. -Dilute spills of the compound with water as soon as possible, as the quaternary ammonium compound will erode the floors. " 			
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M. Post mortem

			Document Analysis		Qualitative Data	Proposed solutions
Result	Cap identified	Solution Implement	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
There will be a clear process in place to handle a deceased patient	Y	I/P	CDC²⁰ – "Autopsies on patients who died of Ebola should be avoided" CDC²⁰ – <u>Post Mortem Preparation:</u>	PHAC¹⁰ – Medical devices (i.e., intravenous catheters, urinary catheter, or endotracheal tubes)	Participants identified that no process is currently in place to handle a patient who has died from Ebola.	Solution – Infection control is in the process of finalizing the process and documents

		<p>1) Preparation of the body</p> <ul style="list-style-type: none"> - Wrapped in a plastic shroud at the site of death (avoid contamination of external layer of shroud) - Leave endotracheal tube and/or central lines in the patient - Do not clean the body <p>-After wrapping, the body should be placed in a leak-proof plastic bag of a minimal thickness of 150 µm thick and zippered shut.</p> <p>-Thereafter, the bagged body should be placed in another plastic bag of a minimal thickness of 150 µm thick and zippered shut.</p> <p>2) Surface decontamination</p> <ul style="list-style-type: none"> -Before transport to the morgue, decontamination of the outer surface of the corpse-containing body bags. -Once the patient's body leaves the room, clean room and non-disposable equipment as per recommendations. <p>CDC²⁰ – <u>Transport of remains</u></p> <ul style="list-style-type: none"> -Should be coordinated with relevant regional and local authorities ... <p>WHO⁷ p. 12 – The handling of human remains should be kept to a minimum. The following recommendations should be adhered to in principle, but may need some adaptation to take account of cultural and religious concerns:</p> <ul style="list-style-type: none"> - Wear PPE (same as that used for patient care) when handling the remains. - Plug the natural orifices - Place the body in a double bag, wipe over the surface of each body bag with a suitable disinfectant (e.g. 0.5% 	<p>may be left in place.</p> <p>At the site of the death, the body should be wrapped in a plastic shroud. Care should be taken to prevent the contamination of the exterior surface of the shroud. A leak-proof body bag should be used over the shroud. Once closed the body bag should not be re-opened.</p> <p>Perform surface decontamination of the outer bag by removing visible soil on outer surfaces with a broad-spectrum disinfectant, in accordance to the manufacturer's instruction.</p> <p>Handling of Human remains should be kept to a minimum (e.g., no autopsies unless necessary, no embalming, and no post-mortem care).</p> <p>Post-mortem examinations and human remains handling should be in accordance with federal and provincial/territorial regulations.”</p>		
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			<p>chlorine solution) and seal and label with the indication of highly infectious material.</p> <ul style="list-style-type: none"> - Immediately move the body to the mortuary. - PPE should be removed immediately after and hand hygiene before and after. - Remains should not be sprayed, washed or embalmed. Any practice of washing the remains in preparation for “clean burials” should be discouraged. - Only trained personnel should handle remains during the outbreak. - PPE is not required for individuals driving or riding a vehicle to transport or collect human remains, provided the drivers or riders will not be handling a dead body of a suspected or confirmed case of HF. 			
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N. Conflict resolution

			Document Analysis	Qualitative Data	Proposed solutions	
Result	Gap identified	Solution Implemented	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
There will be a clear process in place to respond to family members/visitors who refuses to cooperate with the established policies	Y	N			Participants questioned who has authority if a family member refuses to cooperate (e.g. if a family refuses to follow the required procedures for contacts or tries to enter the patient room).	
There will be a clear process in place to respond to patients who are uncooperative and/or aggressive.	Y	N	WHO ⁵ p. 16 – Educate the patient if conscious and cooperative: Educated the patient on what will happen next (once the case is identified as probable or confirmed). Explain the reasons for the isolation/holding.		HTMs wanted to know what measures should be taken in the event that a patient does not cooperate or becomes aggressive. Participants envisioned scenarios where a patient could become angry, scared, or delirious and either refuse to go into isolation or attempt	

			<p>Explain the procedures you are following with respect to controlling transmission to the family, health workers and the community</p> <p>Educate the patient on respiratory hygiene.</p> <p>Give the patient a surgical mask and make sure he/she understands how to use it.</p>		<p>to leave the ICU. The safest practice to prevent contamination and care for the patient was not clear. Usual practice of calling a Code White, where security would come to assist, was described as problematic as it could put more HTMs at risk.</p>	
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O. Communication

			Document Analysis		Qualitative Data	Proposed solutions
Result	Gap identified	Solution Implemented	International Documents - WHO / CDC / Emory	National, Regional and Local - MOHLTC and TOH - CCCS - Public Health Agencies	Factors to be considered in the development and implementation of solutions	Description of solution, person responsible, timeline to implementation
There will be a clear process of communication to ensure that hospital and departmental leaders collaborate	N	N			The Ebola Core Group has been established and they are meeting regularly.	
There will be a clear process of communication, which ensures that HTMs are well informed and up to date	Y	I/P			<p>Gaps were identified in communication with front line HTMs. Many HTMs felt they were either misinformed or poorly informed regarding the preparedness planning. It was highlighted that the dissemination of information on Ebola preparedness is particularly complex given that the guidelines and processes are changing rapidly. Some participants believed that lack of information might have added to HTMs anxiety.</p> <p>Some participants identified that they were drowning in information yet still felt misinformed.</p> <p>Suggestions were made to have a central location for all documents and email notification when important updates were made. Simple links included in the email could ease access to pertinent information. Meeting with HTMs to</p>	<p>The following solutions have been implemented:</p> <ul style="list-style-type: none"> Open forums have been held for all HTMs by ID and infection control Grand rounds has been held with ICU staff NA team has met with ICU physicians and nurses at their respective staff meeting HTMs have been invited to meet with NA team members and these individuals have made themselves available during the day. <p>In Progress</p> <ul style="list-style-type: none"> Creating of a central location for information is being established in the ICU Need to meet with RTs?

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					ensure they have up to date information was emphasized.	Other HTMs?
Communication will be established with other institutions designated as Ebola Centers	Y	I/P			Participants suggested that communication and collaboration be established with other centers, such as Toronto.	Have made contact with Toronto,

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LIST OF ABBREVIATIONS:

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5 AGP – Aerosol-Generating Procedure
6 BiPAP – Bi-level Positive Airway Pressure
7 CAO – Chief Administration Officer
8 CCCS – Canadian Critical Care Society
9 CDC – Center for Disease Control and Prevention
10 CF – Care Facilitator
11 CXR – Chest X-Ray
12 Emory – Emory Healthcare
13 ED – Emergency Department
14 EKG - Electrocardiogram
15 ER – Emergency Room
16 EVD – Ebola Virus Disease
17 HCP – Health Care Provider
18 HCW – Health Care Worker
19 HTM – Hospital Team Member
20 ICU – Intensive Care Unit
21 ID – Infectious Disease
22 IPAC – Infection Prevention and Control
23 MOHLTC – The province of Ontario’s Ministry Of Health and Long-Term Care
24 NA – Needs Assessment
25 NG - Nasogastric
26 NIV – Non-Invasive Ventilation
27 OB GYN – Obstetrics Gynecology
28 PAPR – Powered Air Purifying Respirator
29 PCR – Polymerase Chain Reaction
30 PHAC – Public Health Agency of Canada
31 PHO – Public Health Ontario
32 PPE – Personal Protective Equipment
33 PPV – Positive Pressure Ventilation
34 RACE team – Rapid Assessment of Critical Events team
35 TOH – The Ottawa Hospital
36 VHF – Viral Hemorrhagic Fever
37 WHO – World Health Organization
38 WT – Walk-through
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