2 December 2024

Exercise Trillium Cura Post-Exercise Report

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1. Lay Summary. Exercise Trillium Cura was a preparedness exercise that simulated the challenge of managing the high and sustained flow of casualties who could be brought back to Ontario for treatment and recovery in the event of a conflict or war. Preparedness exercises help identify ways to perform better during a crisis and build relationships between the leaders who will need to work together to launch and sustain an effective health system response. Trillium Cura brought partners from the academic, health system, and public sectors together with members of the Canadian Armed Forces (CAF) and other experts to explore strategies on how to better prepare for this flow of wounded individuals, while ensuring ongoing access to healthcare for the rest of the population of Ontario. In this way, Trillium Cura was an exercise aimed at enhancing preparedness for large-scale health emergencies.

2. Participants reported that following the exercise they better understood how to respond to a sustained mass-casualty situation like the one presented in Exercise Trillium Cura, the stakeholders with whom they would need to work, and underscored the importance of having a clear understanding of their organization's role, and the roles of others, in this type of emergency. Exercise Trillium Cura helped identify ways to improve leadership and organization of care in case of a crisis; options for improving the efficiency and quality of health services; the importance of making plans to increase the number of people working together in the health system; planning for key resources like skin, blood and blood products, rehabilitation and mental health resources; and options for using new technologies and improving our ability to share

information across partners. Although Trillium Cura focused on managing wartime casualties, the recommendations in this report could enhance preparedness for many types of emergencies that could challenge our health system. Exercises like Trillium Cura are a valuable part of planning for crises and participants emphasized that the exercise be repeated on a regular basis and expanded to include other jurisdictions.

3. Executive summary. Exercise Trillium Cura was a strategy-level tabletop exercise (TTX) designed to help prepare the Ontario health system for the challenge of integrating large volumes of casualties that would occur if Canada was engaged in sustained large scale combat operations (LSCO). Several key recommendations emerged regarding leadership, governance, and collaboration; service delivery; health workforce considerations; medical products and technologies; and more. Exercise Trillium Cura adopted an all-hazards approach during the design and execution of the TTX. An all-hazards approach, as described by the World Health Organization (WHO), emphasizes that while hazards vary in source (natural, technological, societal), they challenge health systems in similar ways that require multisectoral response. So, while Exercise Trillium Cura focused on the specific challenges stemming from the repatriation of warzone casualties, the insights and recommendations gleaned throughout the exercise could support other health system challenges.

BACKGROUND

4. Health system preparedness. In Canada, members of the CAF receive healthcare directly from the military, funded by the federal government. This is because the Canada Health Act and provincial health insurance acts exclude CAF members from the list of insured persons for provincial healthcare coverage based on the understanding that the federal government, through the Department of National Defence (DND), is responsible for the healthcare of military personnel. As a result, the CAF provides comprehensive health services to its members through its own medical facilities and personnel.

5. The CAF does not have dedicated hospitals; therefore, it procures the specialized care and services that are not available within the military healthcare system through the provincial and territorial systems. While the impact of these needs may not cause appreciable health system strain during peacetime, in a complex mass casualty situation, such as that caused by an LSCO, new care needs from the military could have far-reaching impacts on the Ontario civilian health system. Meeting the demands of such a crisis requires careful planning to develop coordinated, innovative and adaptive approaches to expand capacities and conserve resources across civilian and military health systems, while ensuring high quality acute and routine care is provided for all Ontarians.

6. Exercise goals and objectives. The goal of Exercise Trillium Cura was to conduct a strategy-level TTX to help prepare the Ontario health system for the challenge of integrating large volumes of casualties that would occur if Canada was engaged in sustained LSCO (refs A-I).

7. Exercise Trillium Cura took place from 6-8 November 2024 at Unity Health in Toronto. Originally conceived in Spring 2024, this exercise was planned and executed through a strong partnership between the Dalla Lana School of Public Health (DLSPH) at University of Toronto,

the Canadian Institute for Military and Veteran Health Research (CIMVHR), Trauma Program – St. Michael's Hospital, Canadian Forces Health Services (CFHS), and the Canadian Joint Warfare Centre (CJWC).

METHODOLOGY

8. The planning and execution of Exercise Trillium Cura progressed over a six-month period, as noted below:

a. June 2024: Exercise concept discussed and key sponsors convened.

b. July-September 2024: CJWC, in collaboration with DLSPH and CFHS, designed and developed the exercise.

c. October 3rd, 2024: Participants and organizations confirmed.

d. October 17th, 2024: Exercise rehearsal.

e. November 6th, 2024: Exercise setup, introductory dinner.

f. November 7th, 2024: Day 1 activities, consisting of a detailed TTX involving a diverse group of civilian and military health system team members.

g. November 8th, 2024: Day 2 activities, including small group exploration and presentation of key areas.

9. Participants. Annex A offers a complete list of participants; key participating organizations included the Department of National Defence (DND) and Canadian Armed Forces (CAF), DLSPH and University of Toronto, CIMVHR, Trauma Program – St. Michael's Hospital, Sunnybrook Health Sciences Centre, Ontario Health, Public Health Ontario, Emergency Management Ontario, ORNGE, Ontario Coroner's Office, Canadian Blood Services (CBS), Veterans Affairs Canada (VAC), Health Canada, Transport Canada, and Public Safety Canada. While Exercise Trillium Cura was Ontario-focused, there were observers from British Columbia, Alberta, Quebec, Nova Scotia, the German Embassy, and Harvard University.

10. In total, 72 people attended Exercise Trillium Cura: 27 attendees were virtual observers and 45 attended in person. The 45 in-person attendees were assigned one of six roles, based on the organizations they represented:

a. The exercise directorate. This group consisted of the sponsors, designers, facilitators, and data capturers.

b. The patient evacuation coordination centre (PECC). Sixteen pre-selected participants formed the provincial PECC, which convened key decision-makers within the exercise responsible for assessing and triaging casualties while simultaneously trying to preserve the stability of the Ontario health system.

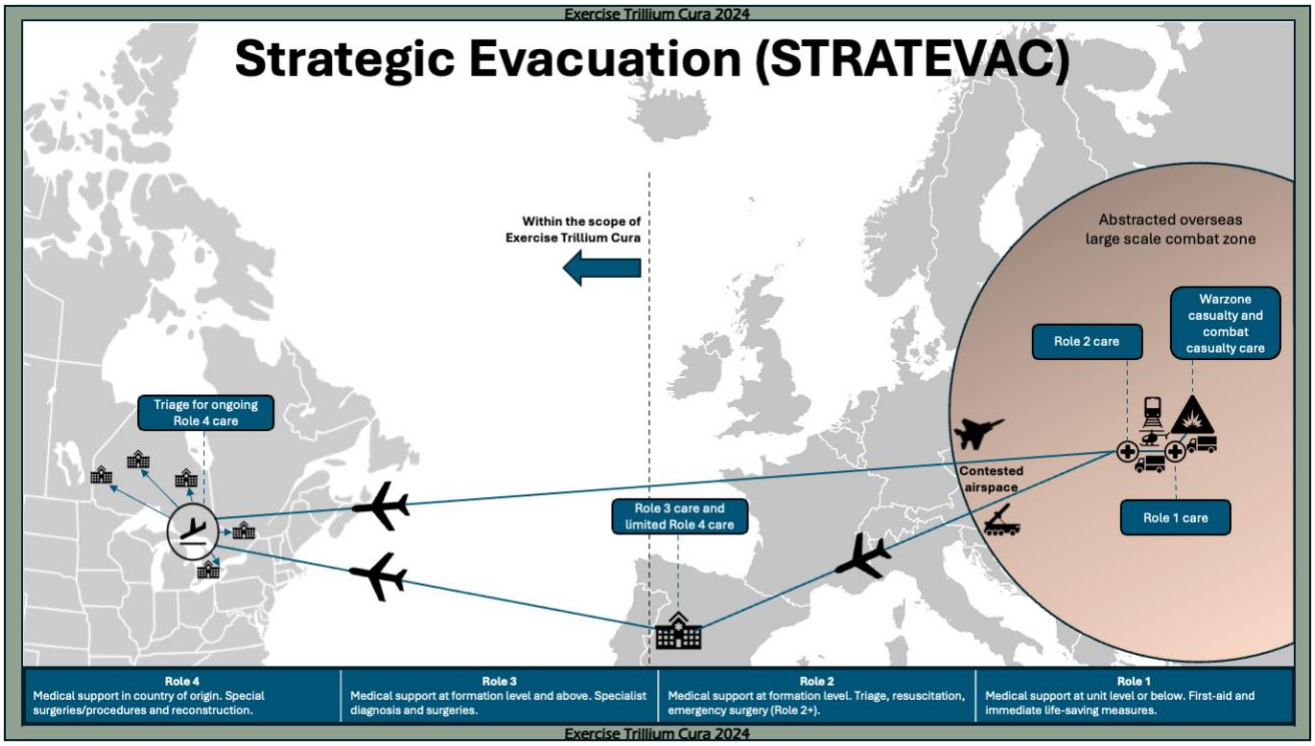
c. The red team. The red team consisted of three carefully chosen subject matter experts (SMEs), charged with the responsibility to challenge the PECC's assumptions, deductions, and decisions.

d. The investigator team. This team consisted of three SMEs that could be tasked to quickly explore the viability of a key idea raised during the exercise.

e. The media team. A team of one, this consisted of a journalist that represented the views of the public and was tasked with holding PECC members accountable for their decisions.

f. The in-person observers. Any attendee not assigned to another role was assigned as an official observer. Observers were responsible for tracking emergent insights and recording them on data capture cards, which were collected at the end of each day.

11. Exercise scope. The entire journey of a returning Canadian casualty can be long and complex, involving numerous stops and organizations along the way. The graphic below depicts a simplified version of a casualty's potential journey—from point-of-injury to arrival in Canada. While all stages merit exploration, Exercise Trillium Cura only focused on the latter stages once the casualty was arriving in Canada.



12. Exercise scenario. Annex B offers complete information on the design of Exercise Trillium Cura. The exercise was designed to simulate the sustained arrival of on average 45 casualties per week (ref H) who would require onward care and management from the Ontario provincial healthcare system. Each casualty had a unique story, consisting of demographics, injury mechanism, injuries, treatment received in theatre, and number of weeks needed in a burn unit, intensive care unit (ICU), or hospital ward. The participants on the provincial level PECC were charged with triaging the warzone casualties as they arrived. To ensure accuracy, the capacity of the Ontario healthcare system was modeled using up-to-date capacity and occupancy data provided by the Canadian Institute for Health Information (CIHI) (ref J) and the Ontario Ministry of Health (MOH) (ref K). Additionally, a very conservative 5% of Ontario's health workforce were removed as a starting condition, which represented the portion of human health resources (HHR) that would be deployed overseas during an LSCO. Finally, additional challenges were introduced throughout the exercise, such as chemical, biological, radiological, nuclear (CBRN) threats, local environmental disasters, cyber-attacks, multidrug-resistant infections, and public protests.

13. Surveys. Pre- and post-exercise surveys were conducted that revealed several positive changes in perception resulting from participation in Exercise Trillium Cura (Annex C). Survey data highlighted improvements in participants' perceptions of their preparedness and understanding related to a complex and sustained mass casualty scenario. Their perception of preparedness to coordinate between civilian and military health systems also improved. In addition to an increase in participants' understanding of their own roles during a prolonged crisis, the greatest increase was seen in participants' understanding of the roles of other organizations. In short, there was an increase in inter-organizational understanding, which is essential to effective coordination before and during emergencies. Specific insights from participants and observers are presented in Annex C.

14. During the exercise, participants noted key insights and findings on specified note-taking cards, which were retained by DLSPH at the conclusion of the exercise. The insights on these cards, along with notes and observations taken during the exercise, the pre- and post-exercise surveys, and conversations amongst the exercise directors are thematically organized and presented below, along with recommendations.

15. Daily summaries. A detailed log of the conversations and decisions was maintained throughout Exercise Trillium Cura (Annex D).

FINDINGS

16. An adapted WHO Health System Building Blocks was used as an overarching framework by which to organize the findings from Exercise Trillium Cura. The exercise framework outlines essential health system elements including (1) leadership, governance and collaboration; (2) service delivery; (3) health workforce (4) medical products and technologies; and (5) information systems that contribute to health systems resilience.

17. Insights and recommendations. Table 1 provides an overview of themes and insights. The details for each insight follow below.

Table 1. Summary of Exercise Trillium Cura themes and insights

Theme	Insights
Theme 1: Leadership, governance, and collaboration Defining and coordinating the casualty management process.	• Managing and tracking casualties repatriated back to Canada will require national-level oversight and command and control (C2). • The provincial PECC structure needs to be defined with clear roles and responsibilities. • A robust risk communication and community engagement strategy is essential to convey leadership decisions and build public trust. • Early collaboration with community organizations and charitable groups can foster comprehensive support for repatriated casualties and their families across their care journey.
Theme 2a: Service delivery Planning and operationalizing triage and pathways to care.	• Identifying a single national repatriation hub could support STRATEVAC and re-triage. • Consider incident management structures. • Artificial intelligence (AI) guided by an ethical framework offers an opportunity to support swift and effective triage. • Casualty pathway algorithms are needed to ensure coordinated care. • Identifying organizational responsibility is essential for efficient transport across the casualty pathway from repatriation to onward care.
Theme 2b: Service delivery Ensuring health system readiness to deliver high quality complex care for casualties.	• Cohorting casualties with similar care needs could enhance quality of care. • The ability to provide care for people with burns will be limited by access to already constrained specialized resources. • Management and care of non-Canadian casualties, including captured persons, requires inter-agency administrative readiness. • Ongoing rehabilitation and mental health care will be highly stressed. • Consider payment/reimbursement structures regarding the costs of healthcare for repatriated warzone casualties.
Theme 3: Health workforce Bolstering capacity and enhancing skills while minimizing burnout.	• It is essential to plan for expanding health workforce capacity, expediting specialized training, and preventing burnout. • Ensuring robust mental health supports for the health workforce will require deliberate attention.
Theme 4: Medical products and technologies Finding innovative and effective ways to ensure access to essential and specialized products.	• War could disrupt manufacturing and supply chains for key healthcare materials and equipment including human skin grafts for burn care, as well as blood products.
Theme 5: Information management and technology Developing robust systems for information management and sharing.	• Legal and privacy aspects must be considered when sharing casualty information. • Technical limitations could hinder coordinated information sharing. • A trauma registry or pan-Canadian patient registry is essential. • Cyber-attacks on health infrastructure must be considered and prepared for.

a. Theme 1: Leadership, governance, and collaboration. This theme pertains to defining and coordinating the casualty management process.

i. Insight. Managing and tracking casualties repatriated back to Canada will require national-level oversight and command and control (C2).

(a) Description. Exercise Trillium Cura focused on Ontario's role in providing care for repatriated warzone casualties. An assumption was made that a certain percentage of all repatriated casualties would be Ontario's to manage. The complexity of the repatriation stage became immediately apparent as participants discussed the casualty's journey between leaving Europe and arriving in Ontario. Key decisions such as (1) who decides which province will accept responsibility for each casualty and (2) where is the hand-off point between the CAF and a civilian healthcare organization were determined to require national level oversight.

(b) Recommendation 1. A national level team (perhaps a national PECC) should be defined and convened to serve as a link between the point-of-injury (the theatre), the intermediate place-of-care (Europe in this case), and the provinces and territories (the final destination for ongoing care). A key responsibility of a national PECC would be coordinating with the provinces and territories and determining how repatriated casualties will be distributed across the country.

(c) Recommendation 2. Working together, the national and provincial team should explore the requirements, expectations, commitments and related legislation that could shape oversight and C2 with an aim to clearly define and formalize these.

(d) Recommendation 3. Leverage existing policies to support further national-level exploration of this key issue. For example, Sections 1 and 2 of The Emergencies Management Act (ref G) outline ministerial and governmental agency responsibilities for the mitigation of, preparedness for, response to, and recovery from emergencies.

(e) Recommendation 4. Identify key stakeholders for a national "team of teams" to begin exploration of this issue and identify possible solutions. This could include all federal agencies that took part in Exercise Trillium Cura along with other agencies, ministries, and offices, for example the Department of Finance, Public Services and Procurement Canada, the Prime Minister's Office, Correctional Services Canada, the Royal Canadian Mounted Police

(RCMP), Canadian Border Services Agency (CBSA), Innovation an Economic Development Canada, and others.

ii. Insight. The provincial PECC structure needs to be defined with clear roles and responsibilities.

(a) Description. Exercise Trillium Cura endeavoured to put the right agencies and people together (see Annex A) such that they could form the provincial PECC, which is tasked with providing provincial oversight for managing repatriated casualties to Ontario. Two key exercise outputs developed by participants relate to the PECC; the first is a flowchart depicting agencies and organizations potentially involved in the oversight and management of repatriated casualties into Ontario (Annex E); the second is an organizational chart, describing one possible PECC structure (Annex F). These documents serve as starting points for further discussion and elaboration. It was highlighted that the provincial PECC must be structured and staffed in such a way that it is integrated and coordinated with the national PECC described above.

(b) Recommendation. Convene a multi-agency working group tasked to refine the flowchart by mapping organizations involved in the oversight and management of repatriated casualties, as well as their points of intersection. The group should also further articulate and refine the provincial PECC structure, as well as define and agree upon terms of reference. Once determined, existing healthcare (or healthcare-adjacent) agencies must identify which positions within the PECC they are ideally suited to fill. The same process should be repeated for the other provinces and territories, along with the national PECC.

iii. Insight. A robust risk communication and community engagement strategy is essential to convey leadership decisions and build public trust.

(a) Description. As was evident during the COVID-19 pandemic, effective leadership requires clear communication that actively builds trust. Exercise Trillium Cura underscored the need for effective communication during a time of war and the importance of transparency and accountability to communities. It was noted that a sustained influx of warzone casualties could impact how care is delivered to the public and that this will require community engagement and tailored communication strategies.

(b) Recommendation. A community-engaged communications and media approach should be considered as a core component of the

PECC. This strategy should be tailored to both the public and key stakeholders. Such a strategy should leverage lessons learned from COVID-19 about the need for tailored communication, engagement with community leaders to develop contextualized messaging, and building in feedback mechanisms so messaging can meet the needs, questions, and concerns of communities. Special care should be paid to quickly identifying and addressing mis- and disinformation.

iv. Insight. Early collaboration with community organizations and charitable groups can foster comprehensive support for repatriated casualties and their families across their care journey.

(a) Description. Past crises have underscored that community organizations should be involved early and often when developing responses. Exercise Trillium Cura offered an opportunity to consider how to engage on the homefront for a 'whole-of-society' response. Across the casualty journey, from before repatriation to ongoing rehabilitative care in communities, support will be needed for those requiring care, as well as for their families.

(b) Recommendation. Explore the latter stages of a casualty's journey and how care can be seamlessly continued after the point of discharge from an Ontario healthcare facility. Organizations such as Canada Company, Wounded Warriors, and True Patriot Love, amongst others are important starting points for engagement and consultation.

b. Theme 2a: Service delivery. This theme focuses on planning and operationalizing triage and pathways to care.

i. Insight. Identifying a single national repatriation hub could support STRATEVAC and re-triage.

(a) Description. As part of the exercise, participants were briefed on the intense challenges and pressures facing Role 3 hospitals in Europe and the importance of striving for a seamless and coordinated pathway that minimizes the operational and administrative demands in the warzone. Participants described how a single point of disembarkation could simplify the strategic evacuation (STRATEVAC) logistics and better enable a "re-triage" of all repatriated casualties. Toronto was identified as a possible single national hub for repatriation given (1) the geographic density of a diverse array of medical specialty expertise; (2) the proximity to the largest burn unit in Canada (Sunnybrook Health Sciences Centre); and (3) the possibility of

leveraging Lester B. Pearson International Airport as both an intermediary hospital and national triage point as it offers geographic proximity to Europe, as well as significant established horizontal infrastructure to accommodate air traffic and transport, and established vertical infrastructure (Terminal 2 itself), which may be repurposed into a sophisticated temporary hospital and triage point. Following the re-triage, casualties could be assigned and moved to other provinces/territories or integrated into the Ontario healthcare system. When discussing this plan, participants also reflected that having a single hub may result in additional patient transfers, delays and the need for increased transportation resources in Canada to redistribute patients, emphasizing the need for further discussion and planning.

(b) Recommendation. Convene a working group, with federal and provincial representation, that explores the viability, opportunities, and challenges of a single point of disembarkation, in addition to assessing all possible options and considerations for triage upon arrival in Canada. The group could also lead the development of trigger points for operationalization in the event that rapid establishment of such a facility is needed and liaise with stakeholders to elaborate on, and potentially practice, disembarkation procedures.

ii. Insight. Consider incident management structures.

(a) Description. One observer noted that every jurisdiction in Canada and the United States (with the exception of Ontario) uses a management structure known as an Incident Command System (ICS) whereas Ontario uses a similar, albeit different, system known as Incident Management System (IMS).

(b) Recommendation. Explore the merits and demerits of the existing incident management system, particularly within the context of sustained volumes of repatriated warzone casualties.

iii. Insight. Artificial intelligence (AI) guided by an ethical framework offers an opportunity to support swift and effective triage.

(a) Description. It was noted that there may be existing or emerging AI solutions that can aid decision makers (the PECC) in optimizing the triage process. An AI program, guided by an ethical framework for triage, could (1) monitor Ontario hospital capacity/occupancy/expertise, (2) assess the inflow of warzone casualties, and (3) make recommendations for casualty distribution

could both speed up and enhance the quality of the PECC's triaging process.

(b) Recommendation. Develop and operationalize an ethics framework for triage and PECC decision-making support and explore how this could be applied to existing or novel AI solutions.

iv. Insight. Casualty pathway algorithms are needed to ensure coordinated care.

(a) Description. Different types of casualties, both in terms of injuries and nationalities, will require different journeys from initial triage and onwards to disparate parts of the healthcare system in Ontario and elsewhere in Canada, based in part, on existing capacities. Ensuring that coordinated and high-quality care can be maintained between military and civilian healthcare systems will require interlinked casualty pathway algorithms that are tailored to different injuries and care trajectories.

(b) Recommendation. Develop a casualty pathway algorithm for the following (non-exhaustive) types of casualties: people with burns, people exposed to different CBRN hazards, and people with multidrug-resistant infections contracted in the warzone. In addition, considerations will need to be made for ensuring non-Canadians, state adversaries, and non-state adversaries receive the proper administrative processing in addition to their care. These would need to be integrated into information technology systems (discussed in more detail below).

v. Insight. Identifying organizational responsibility is essential for efficient transport across the casualty pathway from repatriation to onward care.

(a) Description. The STRATEVAC of a casualty from Europe to Canada was assumed to be a CAF responsibility. That said, it was acknowledged that this transport would likely be via a contracted carrier. Upon arrival in Ontario, it was noted that movement of this volume of casualties could exceed provincial resources.

(b) Recommendation. Several recommendations were discussed during the exercise and further engagement is needed to elaborate on transport pathways and resources. First, as described above, it was highlighted that a single point-of-entry into Ontario (Toronto) would simplify the logistics of moving casualties. Second, from both an authorities and decision rights perspectives, it was underscored that ORNGE had the leadership and expertise to manage the movement of casualties from the point of

disembarkation to whatever healthcare facility was necessary. However, it was also noted that ORNGE's air and land resources alone would be insufficient for the expected number of inter-provincial casualty movements, thereby requiring close coordination with regional Emergency Medical Services (EMS) and alternate private providers.

c. Theme 2b: Service delivery. This theme is about ensuring health system readiness to deliver high quality complex care for casualties.

i. Insight. Cohorting casualties with similar care needs could enhance quality of care.

(a) Description. As the number of complex casualties returning to Canada increased during the exercise, participants reported that creating cohorts of similar casualties could be a way to ensure infection prevention and control (e.g., for people with multidrug-resistant infections), facilitate patient tracking to enhance safety, and as a way to concentrate health worker expertise with those who need it most.

(b) Recommendation. Identify and explore the relative barriers, facilitators, and costs of innovative models of care, as well as the infrastructures and resources needed to support their development and scale up during crisis.

ii. Insight. The ability to provide care for people with burns will be limited by access to already constrained specialized resources.

(a) Description. The types of injuries arising from modern conflict strongly suggests that the number of casualties requiring burn care will quickly exceed the limited available burn capacity. During the exercise, the burn ward quickly escalated to well over 300% capacity, while other modeling done in support of Exercise Trillium Cura suggests that burn wards could escalate to over 600% capacity. In addition, there is a need to ensure an adequately trained health workforce able to provide the complex and specialized care required for effective and high-quality care for people with burns. Skin is another important resource for burn care that is discussed in Theme 4 below.

(b) Recommendation. Contingency plans should be developed that explore novel ways to expand health system capacity for treating burns, this could include actionable plans for fast-track training of a specialized health workforce focused on providing care for burns and repurposing facilities into high capacity burn wards.

iii. Insight. Management and care of non-Canadian casualties, including captured persons, requires inter-agency administrative readiness.

(a) Description. It is possible that non-Canadian allied casualties may be repatriated back to Ontario for follow-on care. NATO is developing alliance-wide policies pertaining to this. It is also possible that captured and injured adversary combatants may be repatriated back to Ontario for follow-on care.

(b) Recommendation. Further exploration is needed of the legal and technical nuances associated with treating non-Canadians. Issues such as information sharing, cultural considerations, funding, and eventual return to country-of-origin all must be explored. For captured persons, to ease security and tracking issues, it was suggested that a single healthcare facility be used to treat and manage captured persons. This facility could be a repurposed existing healthcare facility or a new purpose-built facility. It was agreed that this would be a federal-level issue to fund and resolve, requiring a multi-disciplinary planning team consisting of the RCMP, CBSA, CSIS, CAF, Correctional Services Canada (who have existing internal healthcare resources and secure patient wards) and other agencies.

iv. Insight. Ongoing rehabilitation and mental health care will be highly stressed.

(a) Description. One of the latter stages of the casualty's journey is rehabilitation. This rehabilitation could be done via a prolonged stay within a hospital ward, daily visits to a hospital ward, in another care facility such as a physiotherapy location, or within a casualty's home (through house calls or telehealth). The longer the conflict, the more casualties there will be requiring rehabilitation care. Modeling completed by the Exercise Trillium Cura planning team revealed that rehabilitative capacity will be amongst the most stressed and overloaded parts of the healthcare system. In addition, participants emphasized the importance of ensuring that casualties, as well as their families have access to timely, appropriate and coordinated mental health care, an already limited resource across Ontario. (Please note that health worker mental health is considered in the following section).

(b) Recommendation 1. Convene a working group that can explore methods of both increasing rehabilitative care capacity and decanting it.

(c) Recommendation 2. Convene a working group that can explore mental health care capacities and resources, and how to surge and extend these capacities to ensure ongoing access to care.

v. Insight. Consider payment/reimbursement structures regarding the costs of healthcare for repatriated warzone casualties.

(a) Description. Current reimbursement mechanisms regarding provincial healthcare resources for CAF personnel (Blue Cross) may not be suitable during LSCO and large amounts of repatriated casualties.

(b) Recommendation. Convene a working group, consisting of policy, legal, and financial experts that will explore existing policies (CAF, treasury board, emergencies acts, etc.) and agreements and determine what remains extant and what new policies would be needed.

d. Theme 3: Health workforce. This theme focuses on bolstering capacity and enhancing skills while minimizing burnout.

i. Insight. It is essential to plan for expanding health workforce capacity, expediting specialized training, and preventing burnout.

(a) Description. The sustained mass repatriation of warzone casualties would likely demand an increased number of health workers across multiple disciplines. These health workers would require specialized skills to provide high quality care for warzone casualties. Providing care during crisis, as seen during the COVID-19 pandemic, places significant and far-reaching strains on the health workforce leading to burnout and attrition. The post-pandemic reality is of an already overextended health workforce that may not be resilient to the intense and sustained stressors presented in Exercise Trillium Cura.

(b) Recommendation. Identify the required staffing mix and explore novel avenues for rapidly expanding the health workforce during crisis and sustaining this workforce across a long-lasting event. For example, identify ways to expedite cross-national or cross-regional licensure of health professionals. In addition, explore specific training needs and develop plans for organizing teams and delivering trainings tailored to providing care for warzone casualties. Ensure that mental health and well-being supports are built-in to plans and trainings.

ii. Insight. Ensuring robust mental health supports for the health workforce will require deliberate attention.

(c) Description. Sustaining care for this scale of repatriated warzone casualties will undoubtedly affect the mental health of Ontario's health workforce. Moreover, the ongoing mental health care that will be needed for the repatriated warzone casualties cannot be overlooked.

(d) Recommendation. Explore available and contingency mental health resources to ensure its health workforce will have access to the care it needs. Failure to do so could expedite health workforce burnout. Additionally, the CAF and VAC, in collaboration with the province, must ensure sufficient mental health resources are available for the repatriated casualties at all stages of their journey.

e. Theme 4: Medical products and technologies. This theme is about finding innovative and effective ways to ensure access to essential and specialized products.

i. Insight. War could disrupt manufacturing and supply chains for key healthcare materials and equipment including human skin grafts for burn care, as well as blood and blood products.

(a) Description. The impact of manufacturing and supply chain limitations on health system responses to crisis was a key lesson learned during the COVID-19 pandemic. While efforts have been made to bolster local manufacturing, Ontario continues to rely on foreign manufacturing for a range of essential healthcare materials and equipment. During a time of war, borders may be closed, manufacturing facilities could be destroyed, and supply chains could be disrupted, all of which would make access to such materials and equipment difficult or impossible. For example, Ontario produces only about one tenth of its skin graft needs, with the rest being sourced externally, mostly from the United States. During a time of war, it is possible that external skin supplies would be partially or wholly unavailable for Canadian use.

(b) Recommendation 1. Build upon lessons learned from COVID-19 to further assess Canadian medical product manufacturing capabilities and capacities that could be leveraged to produce essential and specialized products in war time. Explore innovative approaches for sustainable stockpiling, in-country manufacturing, alternate solutions, or new innovative ideas. For example, to ensure an adequate skin graft supply an assessment of projected needs could be conducted as part of planning alongside development of

innovative options to bolster supplies (e.g., national skin graft drives and other communication campaigns that elaborate on the need for organ donation).

(c) Recommendation 2. Create a military/civilian working group, to include Canadian Blood Services (CBS), that explores the importance of managing blood stocks and the logistics of blood storge and transportation. This working group would also explore novel ways of ensuring adequate supply during times of high demand and potential warzone disruptions.

f. Theme 5: Information management and technology. This theme focuses on developing robust systems for information management and sharing.

i. Insight. Legal and privacy aspects must be considered when sharing casualty information.

(a) Description. Specific medical information pertaining to military casualties is classified at the Protected B level, which limits (1) the electronic systems by which the information can be shared and (2) the healthcare organizations that can access this information.

(b) Recommendation. Explore the various military, federal, and provincial systems of record and confirm suitability to process and store information up to Protected B. Alternatively, explore both the mechanisms and risk pertaining to lowering the classification level of some casualty information such that it can be more easily shared. Finally, a trauma registry or pan-Canadian patient registry will be required to track progress of casualties.

ii. Insight. A trauma registry or pan-Canadian patient registry is essential.

(a) Description. A trauma registry collects and harmonizes information on the acute care pathway of patients with major traumatic injury from point of care to discharge. It is an important component of ensuring patient safety and can drive quality improvement efforts by providing real-time data that can be leveraged to create a linked performance improvement system from point of care/deployed care to acute care to rehabilitation.

(b) Recommendation. Convene a working group to leverage ongoing efforts on patient registries and to ensure that data systems are in place for optimal patient safety and performance improvement.

iii. Insight. Technical limitations could hinder coordinated information sharing.

(a) Description. The CAF will use a specific electronic system of record to process and monitor casualty information throughout the casualty's journey (from point of injury to Role 1, Role 2, and Role 3). This system will likely be different than what is used by Ontario. Moreover, there may be a NATO standard aimed at enhancing information management (IM) interoperability amongst the alliance. However, it was also noted that pan-Canadian digital interoperability is a challenge given the multiple systems of record.

(b) Recommendation. Convene a working group that can explore the various systems of record/management and address key interoperability gaps, which may include (1) adoption of different systems of record or (2) software bridges that can achieve the necessary level of interoperability.

iv. Insight. Cyber-attacks on health infrastructure must be considered and prepared for.

(a) Description. All digital healthcare information systems are vulnerable to cyber-attack and during a conflict there may be heightened risk of this type of deliberate event.

(b) Recommendation. Include efforts to strengthen cyber-security as part of preparedness planning.

Table 2. Summary of Exercise Trillium Cura themes and recommendations.

Theme	Recommendations and potential next steps
Theme 1: Leadership, governance and collaboration Defining and coordinating the casualty management process.	• Define and convene a national level team (perhaps a national PECC). • Explore the requirements, expectations, commitments, and related legislation that could shape oversight and command and control. • Leverage existing policies to support further national-level exploration of the impact of an LSCO on health systems. • Identify key stakeholders for a national "team of teams" to begin exploration of this issue and identify possible solutions. • Convene a multi-agency working group to define the provincial PECC and map the agencies and organizations potentially involved in the oversight and management of repatriated casualties into Ontario. • Develop a community-engaged communications and media approach as a core component of the PECC. • Explore how community organizations can support seamless care for casualties after discharge from an Ontario healthcare facility.
Theme 2a: Service delivery Planning and operationalizing triage and pathways to care.	• Convene a working group, with federal and provincial representation, that explores the viability, opportunities, and challenges for different models of triage upon arrival in Canada.

	• Explore the merits and demerits of the existing incident management system, particularly within the context of sustained volumes of repatriated warzone casualties. • Develop and operationalize an ethics framework for triage and PECC decision-making support and explore how this could be applied to existing or novel AI solutions. • Develop a casualty pathway algorithm for different types of casualties. • Continued engagement to elaborate on transport pathways and resources from triage to healthcare facility.
Theme 2b: Service delivery Ensuring health system readiness to deliver high quality complex care for casualties.	• Identify and explore the relative barriers, facilitators, and costs of innovative models of care, as well as the infrastructures and resources needed to support their development and scale up during crisis. • Contingency plans should be developed that explore novel ways to expand health system capacity for treating burns, this could include actionable plans for fast-track training of a specialized health workforce focused on providing care for burns and repurposing facilities into high capacity burn wards. • Exploration is needed of the legal and technical nuances associated with treating non-Canadians. • Convene a working group that can explore methods of both increasing rehabilitative care capacity and decanting it. • Convene a working group that can explore mental health care capacities and resources, and how to surge and extend these capacities to ensure ongoing access to care. • Convene a working group, consisting of policy, legal, and financial experts that will explore existing policies (CAF, treasury board, emergencies acts, etc.) and agreements and determine what remains extant and what new policies would be needed.
Theme 3: Health workforce Bolstering capacity and enhancing skills while minimizing burnout.	• Identify the required staffing mix and explore novel avenues for rapidly expanding the health workforce during crisis and sustaining this workforce across a long-lasting event. • Explore available and contingency mental health resources to ensure its health workforce will have access to the care it needs.
Theme 4: Medical products and technologies Finding innovative and effective ways to ensure access to essential and specialized products.	• Build upon lessons learned from COVID-19 to further assess Canadian medical product manufacturing capabilities and capacities that could be leveraged to produce essential and specialized products in war time. • Create a military/civilian working group, to include Canadian Blood Services (CBS), that explores the importance of managing blood stocks and the logistics of blood storge and transportation.
Theme 5: Information management and technology Developing robust systems for information management and sharing.	• Explore the various military, federal, and provincial systems of record and confirm suitability to process and store information up to Protected B. • Convene a working group to leverage ongoing efforts on patient registries and to ensure that data systems are in place for optimal patient safety and performance improvement. • Convene a working group that can explore the various systems of record/management and address key interoperability gaps. • Include efforts to strengthen cyber-security as part of preparedness planning.

18. Looking beyond COVID-19 towards all-hazards preparedness. During the exercise, participants often reflected on lessons learned during the COVID-19 pandemic. In many cases, these lessons applied to the challenge presented within the exercise, however, there will be many inherent differences between the necessary health system responses to a pandemic and those for a sustained mass casualty event – these range from the inputs needed to deliver care for injuries sustained in conflict, to ongoing military-civilian health system coordination, to effective communication and community engagement. During Exercise Trillium Cura, despite recent COVID-19 experience, it became apparent that an expanded suite of considerations and approaches were necessary for a robust and coordinated response to the challenge at hand. Care must be taken to ensure that the team builds on the strengths of the COVID-19 response, while also pursuing novel, adaptive, and effective strategies for all hazards.

19. Next steps. It was noted that Exercise Trillium Cura was an important first step in expanding our horizon of complex threats to prepare for and specifically an essential step towards preparedness for this type of crisis. The exercise offered an important opportunity to bring together diverse stakeholders, broaden understanding of risks to the health system, and in doing so enable necessary steps towards better preparedness. Additional regular exercises could further strengthen preparedness plans, enhance teams tasked with operationalizing these plans, and enable stakeholders to identify and pursue innovative and actionable solutions to complex challenges at the intersection of military and civilian health systems. Such future exercises could include the same participants that took part in Exercise Trillium Cura, as well as key allies (the United States, United Kingdom, Denmark, Sweden, Latvia), non-governmental organizations (Canadian Red Cross (CRC), etc.), and select industry partners.

20. Fulsome exploration of this problem area will require a chain of exercises, each building upon the last, and all aiming toward a comprehensive solution. Such exercises should include:

a. Military exercises, including the CAF and its allies, that focuses on the casualty's overseas journey and the collaboration needed between the deployed (European) PECC and the national PECC.

b. Additional regional exercises (like Trillium Cura), that focus on provincial (or multi-provincial) level readiness. This will help develop layers of resilience across the country.

c. An exercise that focuses on the latter stages of the casualty's journey. This exercise, which would include VAC, the CAF, and other healthcare partners, would examine acute long-term care (ALC) needs and ongoing rehabilitation considerations.

CONCLUSION

21. Exercise Trillium Cura was a first-of-its-kind exercise in Ontario that marks the beginning of efforts to explore and prepare for a complex and multifactorial problem space: a sustained mass casualty event resulting from an LSCO. The exercise presented an important opportunity to broaden thinking around risks to health systems through an all-hazards lens and identify key strategies to bolster health systems resilience. The observations and recommendations above outline a potential path forward to ensure problem-solving momentum is maintained. Developing, testing, and rehearsing a comprehensive contingency plan to care for repatriated casualties must remain a key priority. Exercise Trillium Cura revealed that the solution space to complex health system challenges demands a "team of teams" approach. It is clear that overcoming the obstacles and vulnerabilities identified during the exercise demands the combined power, intellect, and enthusiasm of regional, provincial, federal, and military agencies. Working together toward a common aim will help enable innovative and effective solutions, thereby ensuring the health and well-being of those repatriated, while strengthening the health system for all Ontarians.

A. Brown	**D. Pedlar**	**C. Forestier**	**D. Klein**
Dean & Professor	Scientific Director	Brigadier-General, M.D.	Physician
DLSPH	& Professor	DG Clinical Services	& Associate Professor
	CIMVHR	CF H Svcs HQ	Unity Health

Annexes:
Annex A – Participant list
Annex B – Exercise design
Annex C – Pre- and post-exercise surveys
Annex D – Exercise daily log
Annex E – Process flowchart
Annex F – Ontario PECC organizational chart

Distribution List:
CAF
Dean DLSPH
Scientific Director CIMVHR
Chief Medical Officer of Health in Ontario
Exercise participants (Annex A)

Team	#	Role	Name
Directorate and Facilitation	1	Co-exercise director	**Adalsteinn Brown**
	2	Co-exercise director	**Kieran Moore**
	3	Co-exercise director	**Dave Pedlar**
	4	Co-exercise director	**Colleen Forestier**
	5	Facilitator	**Anthony Robb**
	6	Facilitator	**David Redpath**
	7	Data capture lead	**Victoria Haldane**
Exercise PECC	8	Provincial coordinator role	**Andrew Baker**
	9	Provincial coordinator role	**Andrew Beckett**
	10	GTA hospitals	**Andy Smith**
	11	Ontario Health	**Rose Cook**
	12	Ontario Health	**Miren Chauhan**
	13	East hospitals	**Suzanne Madore**
	14	Central hospitals	**Shannon Maier**
	15	North hospitals	**Paul Engels**
	16	West hospitals	**David Klein**
	17	Canadian Blood Services	**David Howe**
	18	Emergency Management Ontario	**Bernie Derible**
	19	Canadian Armed Forces	**Ashley Helpin**
	20	Canadian Armed Forces	**Marilynn Chenette**
	21	ORNGE	**Homer Tien**
	22	Chief Coroner’s Office	**Reuven Jhirad**
	23	Former provincial government staff	**Mark Lawson**
	24	Former provincial government staff	**Heather Watt**
Red team	25	Red team 1	**Colin Mackay**
	26	Red team 2	**Ru Taggar**
	27	Red team 3	**Brian Schwartz**
Media	28	Press	**Bruce Arthur**
Investigator	29	Investigator	**David Gomez**
	30	Investigator	**Manveen Puri**

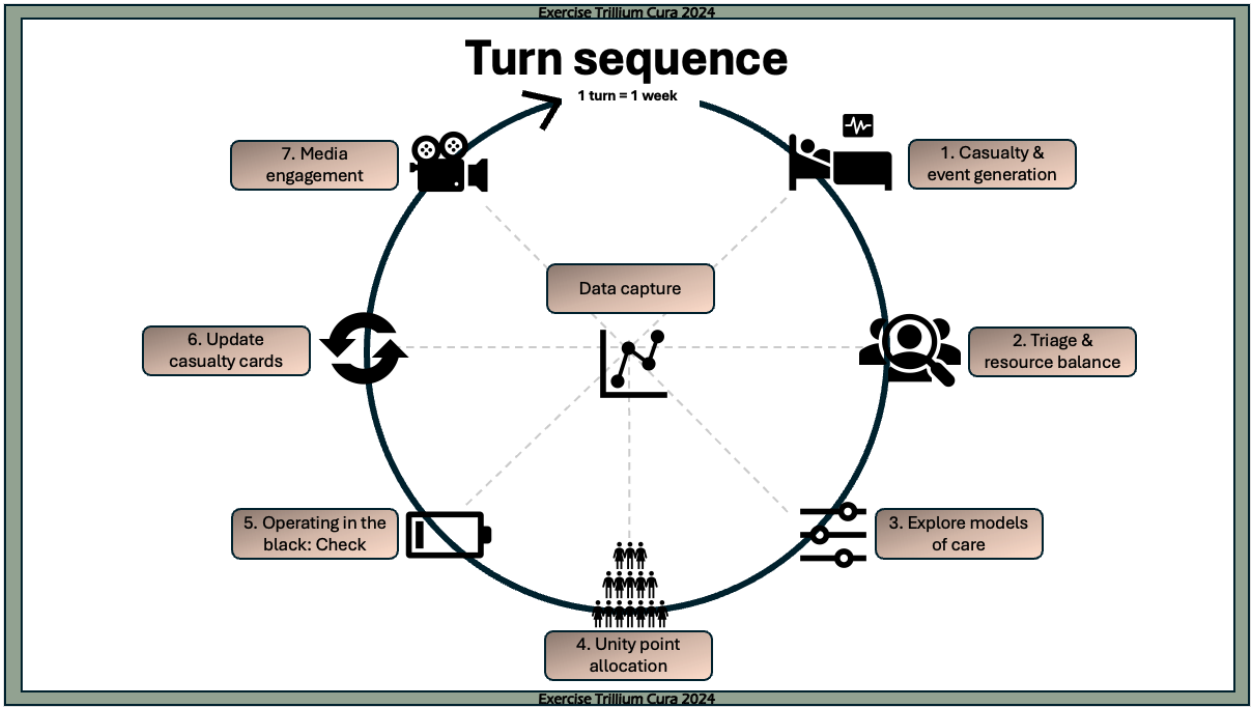
Observer	31	Veterans Affairs Canada	**Alexandra Heber**
	32	Public Health Ontario	**Jessica Hopkins**
	33	Emergency Health Services	**Justine Hartley**
	34	Health Canada	**Alexandra Lambert**
	35	Health Canada	**Luke Carter**
	36	Health Canada	David Lee
	37	Canadian Armed Forces: CJOC	Derek Lay
	38	Canadian Armed Forces: SJS	Brian Power
	39	Canadian Armed Forces: SJS	**Jason Barbagallo**
	40	Ontario Health	**Robin Horodyski**
	41	Ontario Health	**Chris Simpson**
	42	Veterans Affairs Canada	**Cyd Courchesne**
	43	Public Health Agency of Canada	Steven Kempton
	44	Public Health Agency of Canada	Olga Cechmistro Michie
	45	Public Health Agency of Canada	**Suchita Jain**
	46	Other province observers (ON)	**Anthony Dale (ON)**
	47	Other province observers (BC)	**Harvey Hawes (BC)**
	48	Other province observers (AB)	**Amanda Barros (AB)**
	49	Other province observers (QC)	**Stephane Bergeron (QC)**
	50	Other province observers (NS)	Pascal Rodier
	51	Other province observers (NS)	Jenni Cram
	52	Other province observers (NS)	Vanessa Nickelo
	53	Other province observers (NS)	Nicole MacIntyre
	54	Other province observers (NS)	Melissa Boland
	55	Transport Canada	Randa Saryeddine
	56	Public Safety Canada	**JF Duperre**
	57	Canadian Armed Forces	Chris Snejdar
	58	Canadian Armed Forces	Jody-Lynn Young
	59	Canadian Armed Forces	Beswick Escanlar
	60	Canadian Armed Forces	Dominic Richer
	61	Canadian Armed Forces	Nick Gauthier
	62	Canadian Armed Forces	Cher Goulet
	63	Canadian Armed Forces	Mark Fifield

	64	Health Canada	Brittany Sauvé
	65	Health Canada	Olivia Merritt
	66	DND Adm(Pol)	Tania Roth
	67	DND Adm(Pol)	Sue Stefko
	68	DND Adm(Pol)	Lisa Mullins
	69	Public Safety	Keith Smith
	70	German Embassy	Karina Hauslmeir
	71	Harvard University	Margaret Bourdeaux
	72	University of Toronto	Rob Steiner

*__Bold__ names represent in-person attendees

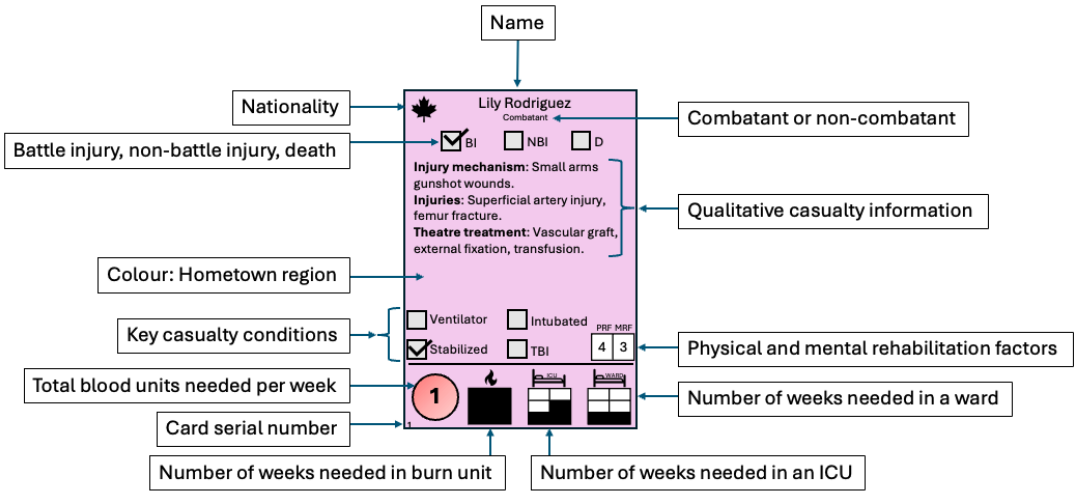
Exercise design. Exercise Trillium Cura was a turn-based TTX, with each turn representing one week of time. Each turn consisted of seven steps:

- Step 1 focused on generating a week's worth of civilian and warzone casualties (see example of a casualty card below), along with an adverse supplemental event.
- Step 2 was where exercise participants assessed each casualty and triaged them based on casualty details, hospital occupancy levels, and available logistics.
- Step 3 was an opportunity for participants to adjust their model of care for subsequent turns.
- Step 4 was an opportunity to exercise influence onto public policy via an abstracted creation (unity points).
- Step 5 included a check for health workforce, or health human resource (HHR), burnout, which was a function of hospital overload.
- Step 6 was a mortality check on all warzone casualties within the Ontario healthcare system. Mortality was a function of many TTX factors.
- Finally, Step 7 was a media engagement, aimed at challenging participants on the decision taken during the preceding turn.



Exercise Trillium Cura 2024

Casualty cards



Exercise Trillium Cura 2024

Exercise Trillium Cura 2024

1. Casualty and event generation

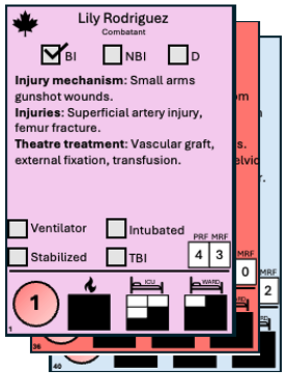
Actions

1.1 Update civilian ICU and ward casualty counts

1.2 Generate warzone casualty count

1.3 Draw required casualty cards from the casualty deck

1.4 Draw event card



Roll	Effect
1	-3%
2	-2%
3	-1%
4	+/-0%
5	+1%
6	+2%
7	+3%
8	+4%
9	+5%
10	+6%

Exercise Trillium Cura 2024

Exercise Trillium Cura 2024

2. Triage & resource balance

Actions

2.1 PECC considers:
- All casualty cards
- The event
- The state of Ontario health infrastructure

2.2 PECC decides where to send each casualty. This decision is based on:
- The nature of the casualty's injury and requisite treatment
- The casualty's hometown region
- The capacity within the Ontario health system

2.3 To free space, the PECC decides:
- Which casualties can be relocated from trauma centre hospitals to community hospitals
- Casualties placed in palliative care

2.4 Regions update database:
- Warzone casualties in ICUs and wards
- Number of casualties from different regions

Exercise Trillium Cura 2024

Exercise Trillium Cura 2024

3. Explore models of care

Actions

3.1 PECC evaluates state of Ontario health care infrastructure

3.2 PECC considers benefits and risks of implementing a different model of care for subsequent turn

3.3 PECC declares model of care for subsequent turn

3.4 If an innovative model of care is developed, then it will be pitched and assessed by the red team

Model of care	Effect	Risk
Conventional	No additional effect	No additional risk
Contingency	15% increase in ICU capacity	Reduction in quality of care
Crisis	25% increase in ICU capacity	Reduction in quality of care
Innovative	To be argued	To be argued

Exercise Trillium Cura 2024

Exercise Trillium Cura 2024

4. Unity point allocation

Actions

4.1 PECC receives 1 unity point per turn to save or spend in accordance with the table below:

Cost	Action	Description	Effect
1	Rehabilitation	Governmental lobbied to invest additional funding for mental and physical rehabilitation services for servicemembers	Reduce rehabilitation risk by 1% per point
1	PR campaign	Strong liaison with media	Reduction in press aggression
2	Extraordinary funding	Encourage increase in private donations to hospitals within a specified region	2% mortality reduction modifier
3	Vaccine campaign (reg)	Aggressive advertising across multiple media outlets encourages flu vaccination throughout a chosen region	5% reduction in the number of ICU and 20% reduction in number of ward civilian patients across a chosen region
5	Emergency preparedness	Aggressive contingency planning addresses next regional event	Next regional event is mitigated
6	Vaccine campaign (prov)	Aggressive advertising across multiple media outlets encourages flu vaccination throughout the province	5% reduction in the number of ICU and 20% reduction in number of ward civilian patients across the province
?	?	?	?

*Unity point reflects time, resources, effort

Exercise Trillium Cura 2024

Exercise Trillium Cura 2024

5. Operating in the black: Check

Actions

5.1 Evaluate regional capacities and determine burnout factor

5.2 Determine, by region, if "going in the black" occurs in accordance with the table

5.3 A declaration puts the region in the black for one turn, after which there is a re-assessment

Burnout factor	Risk of burnout
0.00-0.90	0%
0.91-1.00	5%
1.01-1.10	10%
1.11-1.20	20%
1.21 and above	30%

Exercise Trillium Cura 2024

Exercise Trillium Cura 2024

6. Update casualty cards

Actions

6.1 Conduct a mortality check for each casualty in accordance with the table:

6.2 For each casualty that received the required care, mark off one week on their casualty card

6.3 Any casualty that has completed its required ICU weeks can be moved into ward

6.4 Any casualty that has completed its required weeks in hospital care can be moved into rehabilitation

Location	Base chance of mortality	Modifiers
ICU	11%	Overload: +1% Ventilated: +4% Hospital in burnout: +1% Insufficient blood: +2% Contingency MoC: +2% Crisis MoC: +3% Innovative MoC: +/- X% Inter-hospital move: +2% Separated from family: +1% Extraordinary funding: -2%
Ward	7%	
Rehabilitation	0%	Mental health: +[(MRF total)/10]% Physical health: +[(PRF total)/10]%

Exercise Trillium Cura 2024

Exercise Trillium Cura 2024

7. Media engagement

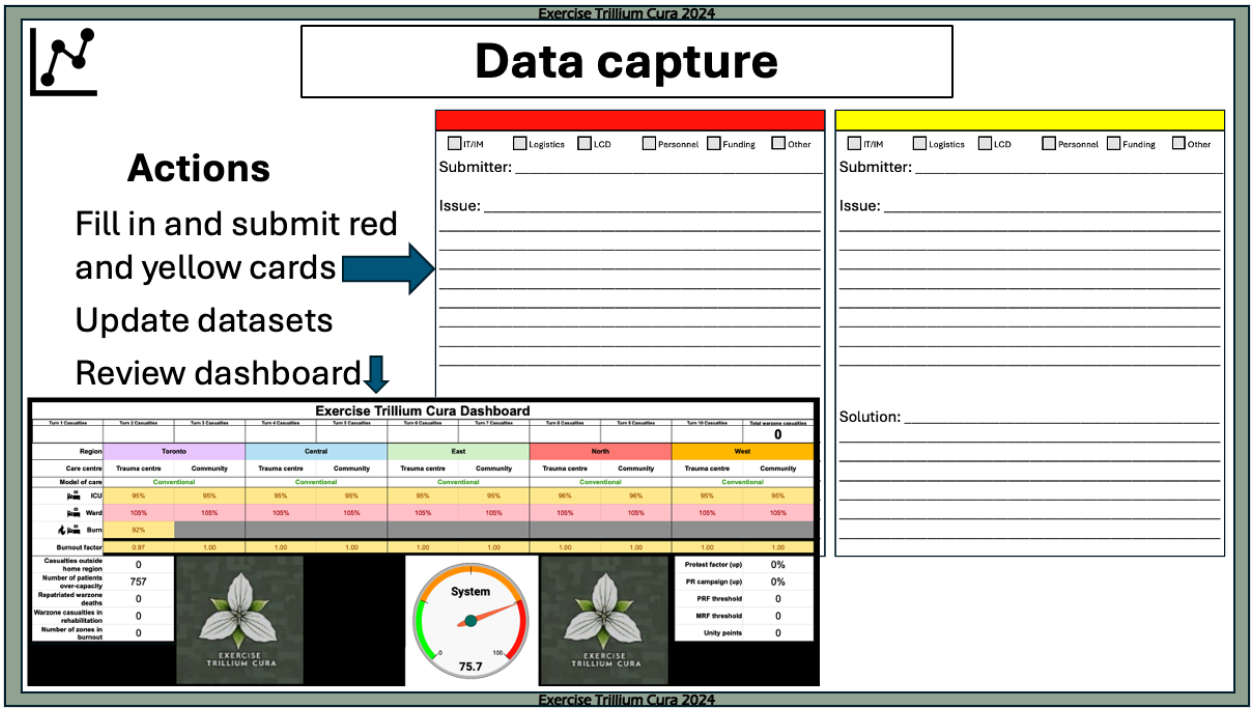
Actions

7.1 One member of the PECC is randomly selected to participate in a media engagement

7.2 Media engagement pressure is based on state of key metrics

7.3 Media engagement is live-streamed to exercise participants

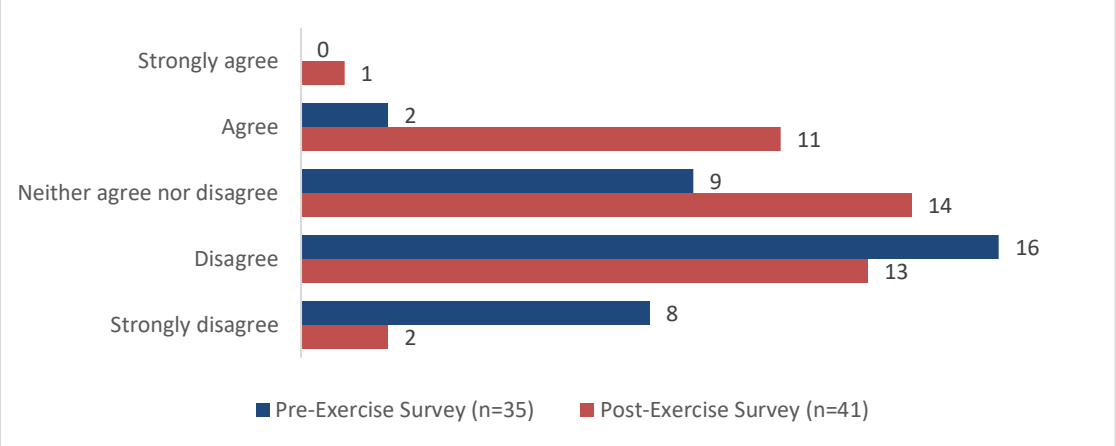
Exercise Trillium Cura 2024


Exercise Trillium Cura 2024
Data capture
Actions
Fill in and submit red and yellow cards
Update datasets
Review dashboard
IT/IM Logistics LCD Personnel Funding Other
Submitter:
Issue:
Solution:
Exercise Trillium Cura Dashboard
Region
Care centre
Model of care
Conventional
Casualties outside home region
Number of patients over-capacity
Repatriated warzone deaths
Warzone casualties in rehabilitation
Number of zones in burnout
Protest factor (up)
PR campaign (up)
PRF threshold
MRF threshold
Unity points
System
75.7
EXERCISE TRILLIUM CURA
Exercise Trillium Cura 2024

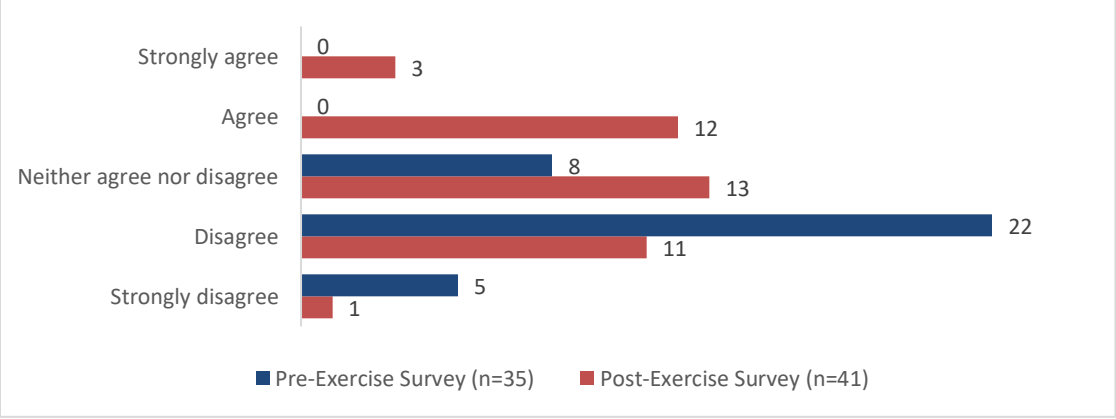
1. Pre- and post-survey summary. The analysis of pre- and post-training data reveals marked improvements in participants' self-reported perceptions of their preparedness and understanding related to a complex mass casualty scenario. After the training, there was an increase in the number of participants who reported that they felt prepared to respond to such scenarios. Similarly, the reported perception of preparedness to coordinate between civilian and military health systems improved. Participants reported an increased understanding of the role of their own organization, while understanding the role of other organizations showed the most improvement in self-reported understanding pre- and post- exercise. Overall, the training exercise enhanced participants' understanding of preparedness for, and clarity in their roles and coordination abilities to respond to, mass casualty scenarios.

2. Responses. A side-by-side comparison of pre- and post-survey responses are noted below. More attendees completed the post-exercise survey than the pre-exercise survey.

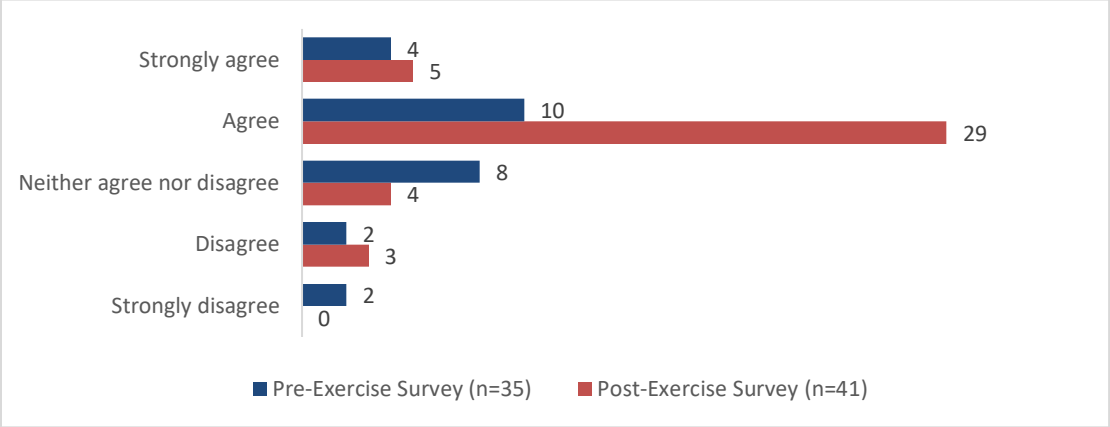
Question 1. Based on your role in the civilian or the military health system, do you think that the Ontario health system (all of its elements) is prepared to respond to a complex mass casualty scenario.



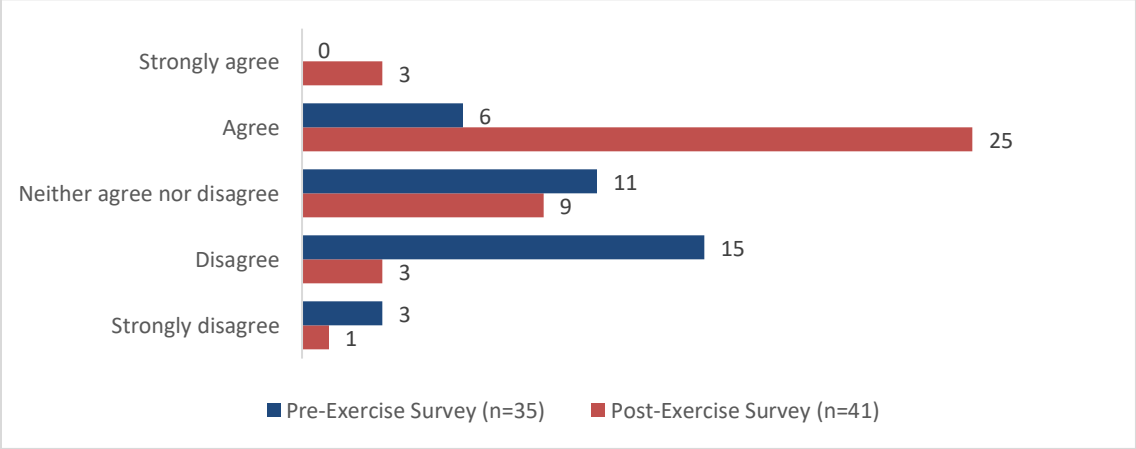
Question 2. Based on your role in the civilian or the military health system, do you think that the Ontario health system (all of its elements) is prepared to coordinate between civilian and military health systems in response to a complex mass casualty scenario.



Question 3. I understand the role of **my organization** in a complex mass casualty scenario.



Question 4. I understand the role of **other organizations** in a complex mass casualty scenario.



Question 5 & 6. What is the single most important idea that came up during the exercise that could help Ontario be better prepared? What challenge or topic surprised you the most during the exercise? *(These questions are presented together given the large overlap in responses)*

Participants praised the TTX construct and design, and after completing Exercise Trillium Cura the majority expressed a sense of urgency for collaboration and ongoing commitment towards advancing efforts to prepare for a prolonged mass casualty event. While participants reflected on lessons learned from COVID-19 throughout the exercise, they emphasized a newfound understanding that the scale and time span of disruption could far exceed that of the pandemic and other recent health emergencies. They emphasized that health system leaders must consider current warfare practices and potential threats to best prepare the health system for a crisis of this magnitude.

Participants called for action to establish and refine the required governance structures, plans, and processes necessary to ensure a fulsome response. Participants reported that it

is essential to establish clear governance structures to optimize response efforts. They highlighted the importance of convening a planning and operational committee to develop a comprehensive response plan that effectively and seamlessly leverages existing CAF systems and integrates them with civilian healthcare, while developing bespoke solutions for the crisis at hand. Participants noted the importance of fostering shared understanding, while strengthening integrated and coordinated processes across military and civilian health systems to support STRATEVAC. Participants stressed the importance of using one system such as American College of Surgeons (ACS) Trauma Center Verification Program across Canada and maintaining momentum with ongoing collaboration. Early collaboration between a breadth of stakeholders, including federal and provincial agencies and organizations, was underscored, with a focus on governance, collaboration, systems integration, shared digital ecosystems, and risk communication and media/community engagement.

Participants highlighted the complexity of issues not fully addressed including transport pathways, risk communication and media/community engagement strategies, command and control, and supply chain challenges.

Many participants advocated for innovative approaches that make best use of pre-planned structures adaptable to various scenarios, while remaining open to the emergent and unpredictable nature of polycrises. Participants emphasized the importance of creating triage processes, integrated trauma registries, and casualty pathways, while calling for a deeper dive into transport issues and possible solutions. They identified that the health workforce was already strained, which limits available clinical capacity, especially considering the potential deployment of a significant portion of Ontario's healthcare workforce. Participants also emphasized persistent supply chain gaps, including for products such as human skin, that may hinder effective and comprehensive responses. They identified several creative approaches to expand capacity, including the potential for repurposing intensive care units or other infrastructure to ensure a comprehensive casualty pathway but also called for more careful consideration of all possible options to ensure the best possible care for repatriated casualties and all Ontarians. For example, participants shared the importance of effective triage processes, addressing burn unit vulnerabilities and emphasized the need for immediate action to strengthen capacities to provide complex integrated care.

Participants also noted the challenges of covering all critical elements in a short time and the importance of learning from other jurisdictions' experiences. Participants stressed that training and practice are essential to ensure readiness. Holding regular preparedness and planning exercises was highlighted as an essential action towards strengthening interagency coordination and capacity to launch an effective and integrated response.

Question 7. Please provide any feedback or areas for improvement.

Participants shared that the exercise was a great first step in a long and challenging journey. Participants emphasized the urgent need to establish the PECC and other governance structures and highlighted that the role of the PECC was ambiguous in the

exercise. Participants valued the opportunity to explore coordination and suggested simulating federal government inputs, while praising the inclusion of a journalist in the exercise. They called for regular repetition of the exercise and highlighted the need for more attention to "what's next" and tangible next steps. They recommended replicating the exercise in other regions and incorporating a national and international lens.

From a game mechanics and administrative perspective, participants appreciated the organization and facilitation, suggesting a planning/strategy element before the first roll. They suggested more time for planning before the first casualties arrived and incorporating provincial-level policy coordination.

While they praised the exercise, describing it as well-designed and executed, some suggested that it could be further developed into a multi-player format. From a practical perspective, participants suggested more pre-reading, a list of frequently used acronyms to ensure shared understanding, and a pre-round to self-organize. Some suggested having a seating chart at the onset, providing whiteboards and flip charts for collaborative ideation, and limiting side discussions for faster decision-making.

3. Overall, the exercise was seen as a valuable start and participants called for another TTX to address pre-arrival coordination and decision-making, participants also requested a short summary of the main lessons learned and a formal list of all participants to grow the community of practice.

EXERCISE TRILLIUM CURA
HOT WASH DAY 1

Reflecting on preparedness: “What have we learned, and where is it on paper?”

Participants reflected how the COVID-19 pandemic taught us many hard lessons about health system preparedness and response. They emphasized, however, that awareness and agreement on the strengths and weakness of the COVID-19 response are not enough; we need to move beyond lessons learned and develop actionable frameworks, considering the increasingly volatile world. They suggested identifying triggers, specific policies and programs, and innovative models of care sooner rather than later to enhance preparedness for a sustained mass casualty event, such as the one explored in Operation Trillium Cura.

Based on their experiences during Day 1 of the exercise, participants discussed the need to look across the system to leverage top capabilities and optimize what we have, even as pressure on the system increases. They questioned, "What have we learned, and where is it on paper?" and stressed the importance of documenting the lessons from Exercise Trillium Cura and carrying them forward for better preparedness. Participants noted that there are more granular lessons to be learned from each region, presenting an opportunity to pull these together for a more fulsome reflection on health system preparedness for a sustained mass casualty event.

Participants explained how Exercise Trillium Cura gave them a leg up on responding as they activated the Emergencies Act within the game. They emphasized for real-world preparedness there is a need to consider what legislation, policy, and resources are in the toolbox for the next stage and what onramps would be available to ramp up the response as needed. Regarding the generalizability of the exercise, participants discussed how, as a province, important preparedness questions remain around how to manage situations that require decanting patients to other areas and transporting them to regions with the necessary expertise.

Reflecting on governance: “Who is on deck and what are their responsibilities?”

Participants shared that it would have been beneficial to spend some more time at the beginning of the exercise to set the scene amongst themselves and identify who contributes what, including the rules of the PECC itself and the resources at hand. They highlighted that at the outset of the exercise the PECC should have an agreed upon structure, identified leads, and terms of reference. Participants noted that this exercise underscored to them the importance of documenting the command center structure and all related elements. Participants emphasized the importance of being clear about who is around the table and their roles, in other words “who is on deck and what are their responsibilities regarding escalating, managing, etc.” Defining the scope of being a PECC member is essential, in addition to considering ways to engage with people and organizations to bring information back to the PECC to support decision-making. Participants suggested that a generic type of structure at the regional level is necessary, with defined positions and roles that can be quickly activated. They also discussed the roles of regional representatives, noting the many tasks associated with these roles and the need to think about interactions within and beyond the health sector in each region.

Participants highlighted that a national PECC or federal domain is missing in the design of the current exercise, and that in a real sustained mass-casualty there would be federal responsibilities that shape provincial decision-making. They reiterated the need for national-level directions to overlay the provincial piece. They acknowledged that simulating these aspects in a game is difficult, as there would be competing demands across organizations and levels of government. Additionally, they pointed out that in a real-world experience, political changes and the loss of institutional memory following the COVID-19 pandemic could leave us at a disadvantage.

Reflecting on planning: "What capacity do we need to build out across the province?"

Participants shared that at the start of the exercise, it would have been beneficial to think about the planning needed, not only for receiving patients returning to Ontario but also for the directives required from a capacity perspective. They emphasized the importance of asking "what capacity do we need to build out across the province?" as a start towards planning. Participants highlighted that the "secret sauce" is having informed and knowledgeable people contribute to planning and guidance documents, creating synergy among them. In real life, this would involve sitting down with a planning committee to look at structures, governance, and connections to national committees. The strength lies in the networks across Ontario, with leadership identifying effective regional networks. Leads for each region, such as those familiar with the EMS system, should be established in advance to ensure each region has the needed capacities.

Participants shared how a sustained mass casualty event will also require administrative planning within the health system, as this type of crisis will present administratively complex patient populations (e.g., non-Canadians including prisoners of war). Participant noted that it is unclear whether there is an effective mechanism within the hospital structure to address these considerations and that there is a need to explore the financing implications of this issue. Additionally, participants stressed the need to consider structural elements such as resources, phone lines, and the electrical grid. They highlighted the importance of business continuity, noting that the system is only as strong as its weakest link, and failures can have ripple effects.

Participants also shared concerns about manufacturing capacities, noting that over the majority of IG (blood product) and human skin supplies comes from the United States or overseas. They highlighted the need to consider gaps in raw materials, processing, and the locations where these activities occur. This led to a broader conversation about stockpiling critical supplies and determining what can be manufactured, stored, and deployed locally. Participants emphasized the importance of linking this to just-in-time delivery models within the health system across various resources. They noted that significant strides have been made in IPAC (Infection Prevention and Control), including in manufacturing, and the next focus should be on critical care materials.

Participants underscored that communities have not experienced war in 70 years and there is a risk of planning activities for this type of event being too abstract unless there is a clear understanding of the impact across the health system (and beyond) of a sustained mass casualty situation. They emphasized the need to think about mass casualty as a societal challenge and

encouraged involving the public in planning given the ethical decisions being made. From the pandemic, we know that these decisions played out in difficult ways. They emphasized that this exercise needs a connection to the community when planning and identifying capacities, including health workers who work outside of hospitals such as family doctors, to understand the implications of pushing from higher levels care out and into the community.

Reflecting on process: "What is the trigger to change the paradigm?"

Participants also highlighted the need to discuss a staged approach for activating a health system response to a sustained mass casualty situation. From the pandemic perspective, participants noted that hospitals can manage for six weeks, but longer durations become more challenging. The challenge lies in the disbelief and uncertainty about when to fully commit to action. They questioned what the trigger is to change the paradigm for how care is organized and delivered in Ontario during an emergency of this nature. Participants noted that during Day 1 of the exercise, they did not reach a state of activating all contingencies because there was an unspoken sense amongst participants that the situation presented in the exercise might improve on its own, which would not necessarily be the case. Participants emphasized the need to start soon with defining the concept of a staged approach and triggers for action. They discussed the importance of having a Code Orange around one facility, but also considering what a regional Code Orange and a provincial Code Orange would entail, and what their respective trigger points would look like.

Participants emphasized the importance of structures and processes to support civilian-military coordination, as the processes leading up to the delivery of patients from the theatre of war are complex and crucial. A key lesson learned from Day 1 of the exercise was that participants were initially stuck on placing patients where they originally came from, whereas they could have transported them all to Ottawa. This was a shuffling issue and a misunderstanding of sorting, but it provided a valuable lesson on patient allocation. Participants highlighted that the system would likely fail on transport before the hospital system, as hospitals can make room, but transport logistics are critical. They emphasized that the system would become locked up if the outflow of patients is not managed. During the Greater Toronto Area IMS, they grappled with managing the outflow of patients, underscoring the need for an IMS and a group focused on patient flow into the community. Participants warned that if surgeries are delayed as a response to the crisis, after 60 days it becomes an international crisis with a domestic price. Ensuring people can get to the hospital is crucial.

Reflecting on next steps: "What keeps this exercise vigorous and alive?"

Participants reported how Exercise Trillium Cura demonstrated the complexity of running a health system in a war while also serving civilians. Participants noted that COVID-19 was a sprint with clear goals and levers, such as vaccines and public health measures, whereas a large-scale conflict would be a marathon of sustained response with unique political tensions. Participants highlighted that while Code Oranges are often conducted across hospitals or regions, this exercise enabled broader thinking across the health sector. They noted that during the COVID-19 pandemic, sectors were siloed, moving patients across hospitals but struggling to get

people into the community. This exercise challenged that approach, encouraging continued efforts to integrate community care. Furthermore, the nuclear attack angle (CBRN) encouraged participants to think the unthinkable and prepare for extreme scenarios.

Participants emphasized that the exercise is an important first step towards planning for a sustained mass casualty situation and the need for clear directives to ensure people sit down and continue to engage in the process. The health system conducts annual preparedness exercises for pandemics, and the next focus should be on mass casualty preparedness and sharing best practices. This could include TTX or patient simulations to ensure safety, practice, and preparedness. Participants highlighted the importance of conducting these exercises on a cyclical basis, with connections identified from this meeting to be part of ongoing preparedness efforts.

Participants shared that what keeps this exercise vigorous and alive is having a mandate. They emphasized the need for an external independent third party to sponsor and facilitate these discussions and planning exercises. This could be an institution like the University of Toronto, associations, or other parts of civil society.

HOT WASH DAY 2

On Day 2, participants reported back on their small group discussion, presenting their findings for discussions with all participants.

Group 1: Describing the casualty management process

The group shared an initial outline of a possible casualty management process from Europe to discharge, detailing each step. They described the journey from Europe to the hub upon departure, arrival in Toronto, and transfer to the receiving hospital. The group highlighted that the STRATEVAC process in Europe involves a deployed PECC with provincial, federal, and military representatives. CAF Ops manages the military operations with provincial liaison officers (LOs) and other governmental departments (OGDs) to organize flights back to Canada. Upon arrival in Toronto, the group mapped out a process involving one location where the Ministry of Health, CritiCall, PECC, and OGDs are present. They emphasized the need for a data architecture that captures information to manage the different structures involved in this flow. For moving patients, the group noted that a transport cell, managed by ORNGE, could be responsible for getting patients to the various hospitals. They described a proposed patient care journey, including transport, POW, discharge, and rehab cycles. The process involves Veterans Affairs Canada (VAC) taking over or the military reintegrating patients back into their own stream.

Discussion

Participants discussed the importance of understanding the functions of different agencies through a detailed diagram, emphasizing leadership roles and patient information flow. They highlighted the use of the United States DoD registry and the re-establishment of the national

trauma registry in Canada, linking provincial registries for continuous quality improvement and patient safety. They emphasized the need for clear terms of reference for each category, detailing roles, skills, processes, and data management to support a learning systems approach. This ensures quality improvement and adaptability, especially as the system becomes overloaded. Regarding the Toronto hub, participants discussed the sequence of patient management, including clinical evaluations, administrative tasks like customs and handling of non-Canadian casualties, and operational tasks such as confirming receiving sites and coordinating transport. They noted the competition for space and the need for MOUs to organize these processes, suggesting the use of Terminal 2 at Pearson as a field hospital.

Group 2: Describing the PECC - role, composition, and structure

The group presented a potential outline for an initial PECC structure incorporating learnings from COVID-19 and the CAF. They noted that there are aspects that need discussion, liaison, and unpacking, especially considering the need for long-term operation across a heterogeneous system. Getting this right is crucial for success, particularly due to the unique considerations that will be inherently different than COVID-19 emergency management. For example, there needs to be interoperability between CAF and civilian structures.

The group presented one possible civilian PECC structure that operates 24/7, integrating components from both civil and military systems. Participants highlighted that the system is organic and can be adjusted as needed, following a learning systems approach. They emphasized the importance of having a nimble composition at the planning table, capable of adapting based on required capacities to react to emerging issues while ensuring sustainability. This includes having personnel redundancies and the ability to integrate handovers within the system.

Participants stressed that the planning table should be defined and begin operating as soon as possible and in consideration of the risk space, such as risk management at hospitals. They also highlighted the importance of communications and external affairs to work closely with clients and the press for external relations. Planning should ensure integration with the existing health system and consider measures to protect the system against disruption. Participants discussed the need for legal frameworks to quickly unlock capability and capacity when needed, emphasizing a comprehensive understanding of the system for effective operation. They also noted the importance of critical agency connections, including ORNGE, Public Health Ontario (PHO), Emergency Management Ontario (EMO), CAF, CritiCall, Supply Ontario, and Canadian Blood Services (CBS), amongst others.

Discussion

Participants shared that more detail is needed in the clinical stream, specifying regional needs and roles. They suggested having an admin and clinical lead from each region to understand capacity and make decisions. The PECC operations should be supported by a comprehensive structure, with a team in each region for 24/7 operations, minimizing the impact on civilian care.

They highlighted that the PECC structure should resemble an IMS to address all health system responsibilities. Participants stressed the importance of sustaining the continuum of care at all stages and handoffs, with civilian care pathways for these transitions. Integration with CAF involves communication, external affairs, and operational interfaces for 24/7 information flows, including planning, policy, and operations. The PECC should report to the MOH, with a federal PECC for interlocking responsibilities. Effective communication and management are crucial.

Participants emphasized resolving risk management and liability issues early. Immediate planning is needed to manage risks. For the incident commander, they discussed determining availability and needs as part of a comprehensive planning exercise. The MOH's existing IMS structure, which worked well during COVID-19, could be leveraged. They also noted the need for federal involvement, and reflected how in reality the Surgeon General would provide briefings in a war scenario.

Group 3 and 4: Analysis of strengths, weaknesses, opportunities, and threats (SWOT)

Groups 3 and 4 were tasked with conducting a SWOT analysis based on reflections from the TTX and information provided by participants on the red and yellow feedback cards.

Strengths

Participants identified several strengths, including education and training, with many lessons learned post-COVID that are being retained and integrated into personnel, trainings, and practices. There is a solid base to start from and momentum that can be leveraged post-pandemic. Communication was highlighted as a strength, with the potential to start from a place of goodwill with the citizens of Canada. The pandemic experience has prepared the system to adapt using contingency approaches, and developed policies from COVID-19 are adaptable for wartime support. Effective communication models, such as clinician-led communication exemplified by Bonnie Henry, have proven effective, and strong communicators are essential. Additionally, charitable groups like Canada Company could enhance civilian support for medical teams, soldiers, and their families.

Weaknesses

Participants noted some weaknesses, including the need to establish clear communication strategies with triggers for public buy-in to mitigate backlash and foster goodwill. Planning and coordination are essential, and activities in Ontario need to integrate with pan-Canadian efforts. Privacy legislation and civilian/military cooperation are necessary to ensure systems can communicate and data can flow. Financing and payment structures for the care of non-Canadian casualties and capital infrastructure need attention. Protecting healthcare human resources from burnout is crucial. Rapid retirements from the health workforce risk losing COVID-19 experience, and lessons are not yet institutionalized. Critical supply vulnerabilities were highlighted, such as Ontario sourcing the majority of its human skin externally. Slow progress on national licensure hampers rapid personnel deployment across provinces, and inconsistent communication from multiple sources creates messaging inconsistencies, slowing messaging and eroding trust.

Opportunities

Participants identified several opportunities, including frontloading the planning of the PECC to ensure a clear governance structure with terms of reference and a built-in learning/performance improvement structure. There is a need to capacity plan for transportation and leverage transportation capabilities. Technology and AI can support patient flow and triage processes, alleviate potential supply chain bottlenecks, and provide clear data for decision-making. Education and training could be strengthened through health workforce planning at a provincial level, including professional practice opportunities. Developing a prioritized list of emergency needs and contingencies for immediate action if war breaks out is essential. Integration of primary care with hospital partners, creating patient pathways, and regular war-preparedness exercises involving leaders, CAF, and government can build actionable outputs. Philanthropic engagement can be leveraged for capital, public awareness, and infrastructure. Implementing campaigns for increased wartime donations and expanding the Trillium Gift of Life Network skin recovery scope are also opportunities. Developing micro-credentialing programs for rapid skill-building, operationalizing ethics frameworks for triage, and prioritizing a unified communications strategy are crucial. Enhancing support for families of injured soldiers and investing in research and development targeted at supply chain weaknesses were also highlighted.

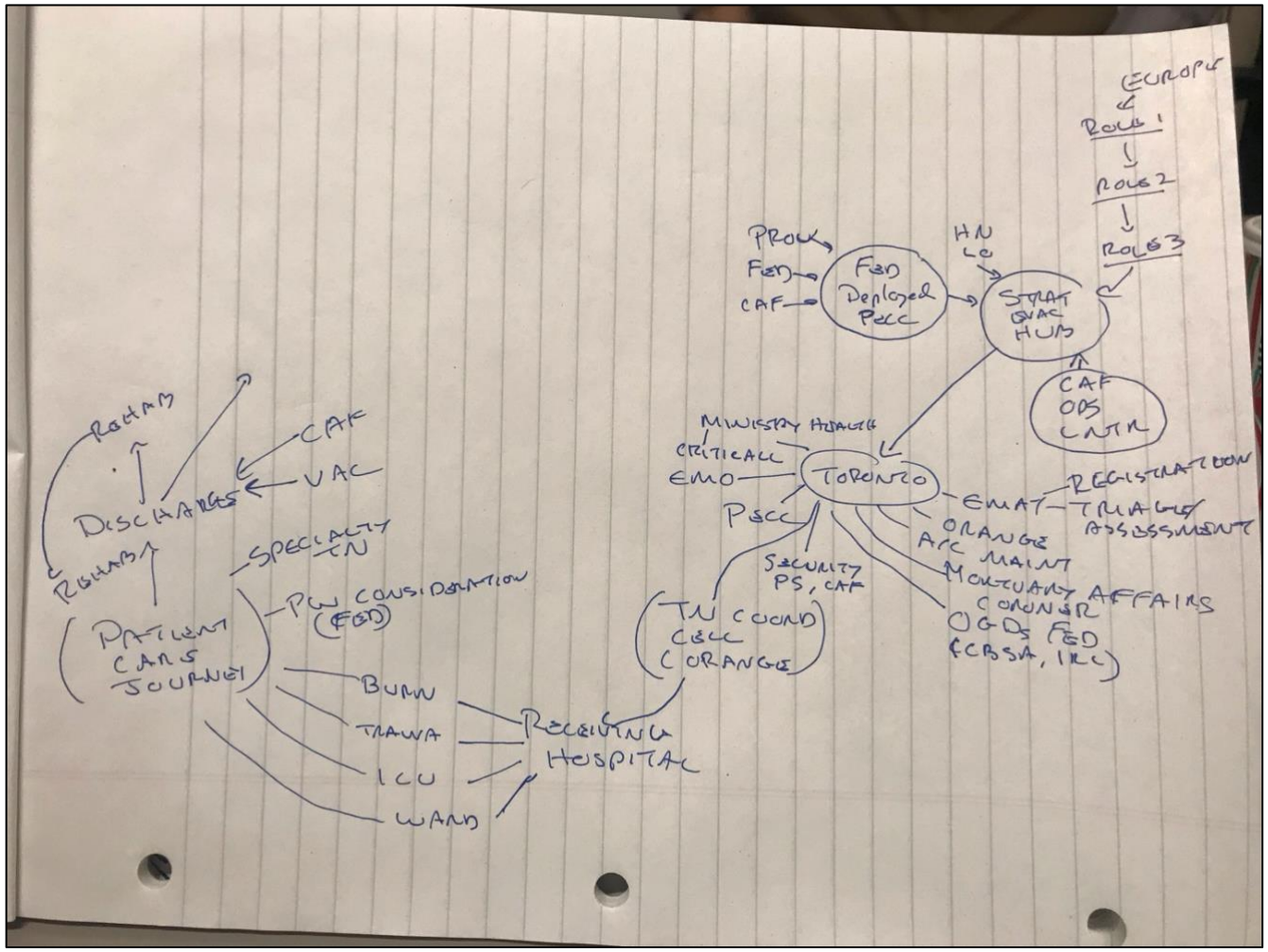
Threats

Participants noted threats, including changing societal expectations, misinformation, and disinformation. Supply management in the event of border closures or wider supply chain disruptions poses a risk. Over-reliance on COVID-19 lessons is a threat, as war injuries differ significantly. Current operational processes, like unloading planes on the tarmac, are too slow and could result in preventable deaths. Disparate electronic health records limit effective information sharing, and increased cyber-attack threats on health data during conflict are significant risks. Resource competition may reduce critical investment in wartime health infrastructure. The potential threat of disinformation impacting public perception and trust requires proactive measures.

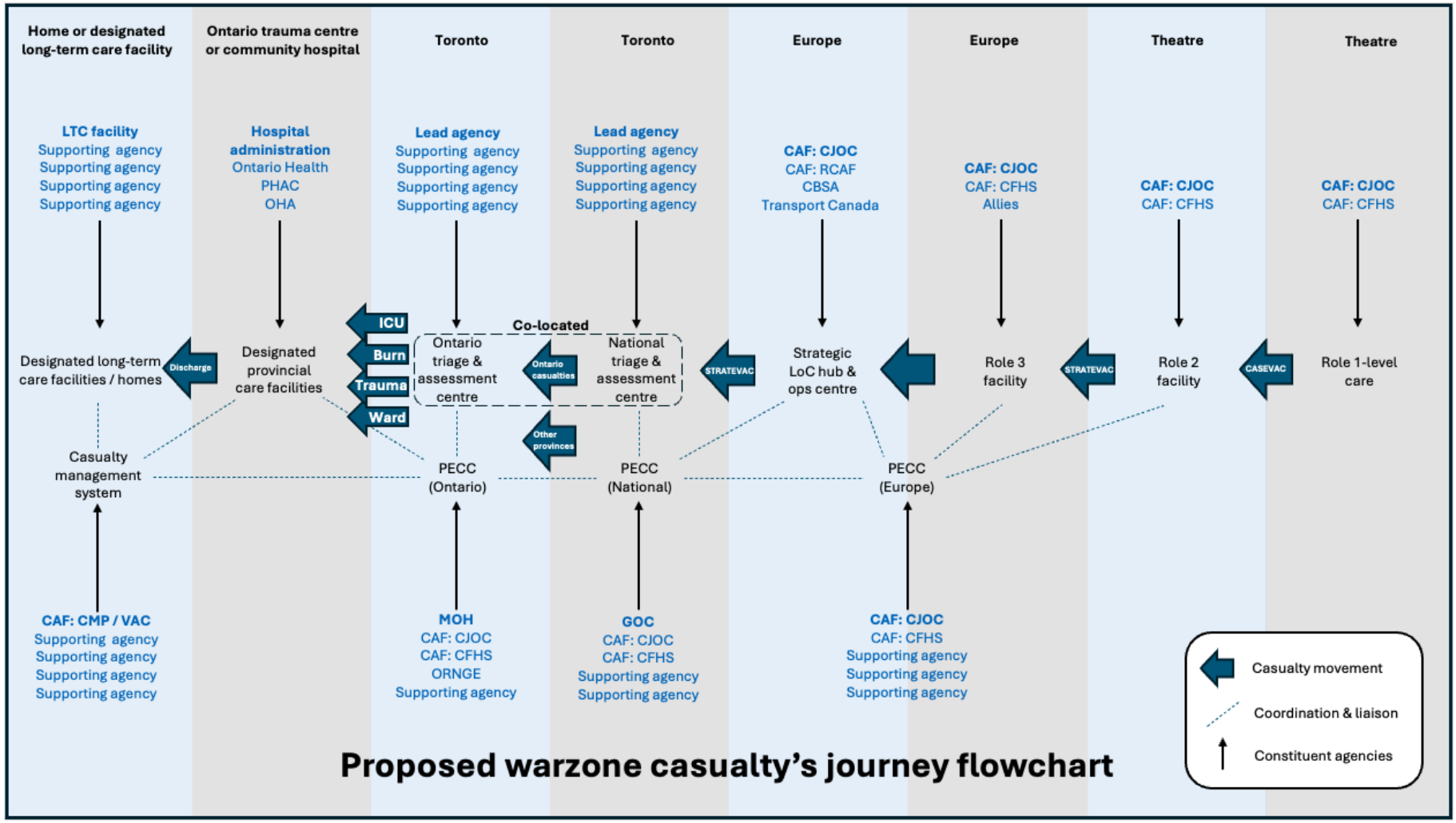
Annex E to 3000-1 (CJWC JRA) 2 Dec 2024
Process flowchart

The below charts represent insights from the discussion amongst participants and offers a starting point for further discussion and liaison to identify lead and supporting agencies and refine the structure of the PECC. This structure was developed for the purposes of this exercise and in no way preempts the formal PECC structure which remains to be determined.

Rough draft developed during the exercise



Revised and refined flowchart



- Lead/supporting agencies are only potential recommendations based on exercise insights and still require liaison/discussion
- Many lead and supporting agencies still need to be determined

Ontario PECC organizational chart

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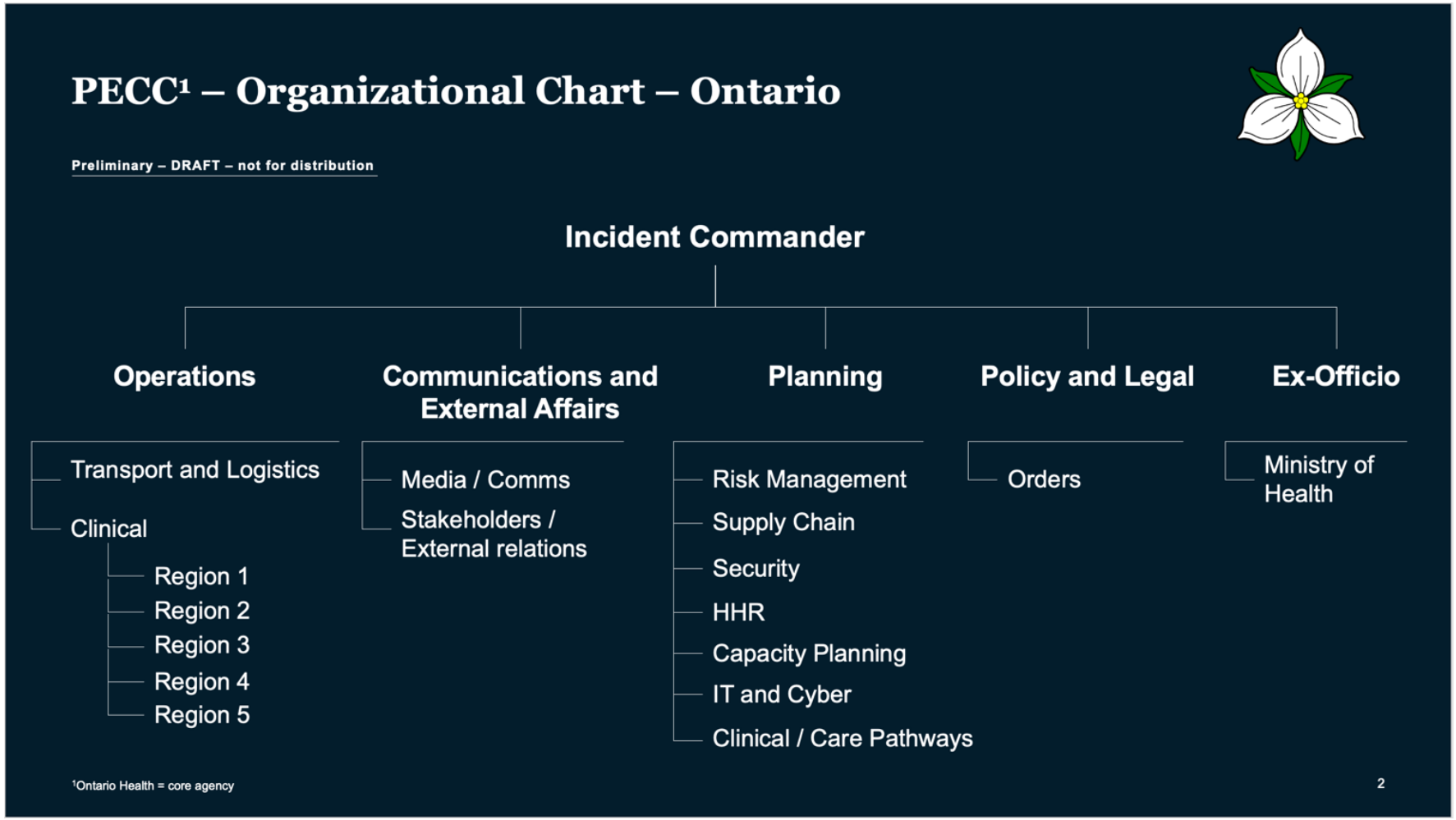
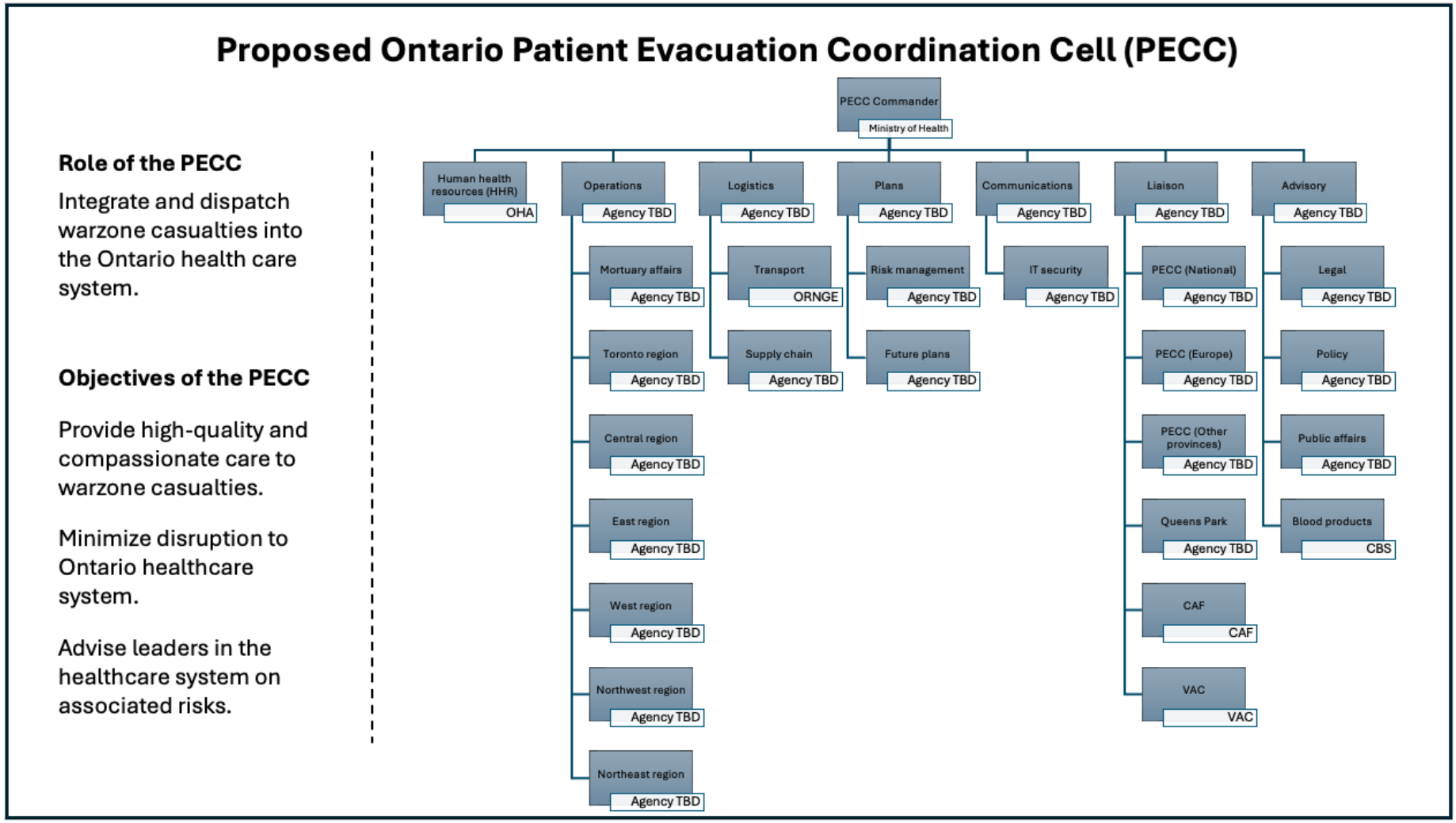


Revised and refined organizational chart



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- Many lead and supporting agencies still need to be determine