

**FINAL REPORT**

**OF THE**

**ONTARIO CRITICAL CARE**

**STEERING COMMITTEE**

**MARCH 2005**

**Dr. Robert Bell**  
**Lynda Robinson**  
**Steering Committee Co-Chairs**

March 2005

The Honourable George Smitherman  
Minister of Health and Long-Term Care  
Government of Ontario  
Toronto, Ontario

Dear Mr. Smitherman,

We are pleased to submit the Report of the Ontario Critical Care Steering Committee. As your Terms of Reference directed us, we have developed comprehensive recommendations to improve the quality and efficiency of Ontario's adult critical care services.

Critical care is a pivotal service that has the potential to "make or break" other hospital services. An effective system of critical care is a necessary support to the government's Wait Time Strategy. If critical care is not available, surgeries can be delayed or cancelled, and wait times for surgeries increased.

Over the course of its work, the Committee determined that Ontario's critical care services must be improved to meet the increasing demand for safe, high quality services. Severe Acute Respiratory Syndrome (SARS) highlighted the weaknesses of critical care services, and the inability of the system and individual hospitals to respond appropriately to surges in sudden demand for care. The Committee identified variations in the quality and cost of critical care, how it is staffed and managed, and the accountability structures that exist. Although these variations have the potential to sabotage efforts to reduce surgical wait times within the government's Transformation Agenda, they also present significant opportunities for change and improvement.

The Committee's recommendations focus on improving access to safe critical care by organizing services better, providing critical care supports, reducing the need for critical care through early intervention by intensivists, targeting efficiencies through better management, and advancing best practices and knowledge transfer. Specifically, the recommendations address:

- Access to critical care through greater efficiencies and effectiveness that include system- and organisation-level solutions, solutions to meet minor, moderate and major surges in demand, and ethical considerations for access;
- Safety and quality supported with a framework to improve critical care performance and create a foundation for future decision making;
- Sufficient and appropriate human resources to meet the future need for critical care;
- Critical care technologies;
- Critical care funding issues; and
- Critical success factors.

The Committee's recommendations recognize Local Health Integration Networks as an important vehicle to promote critical care networking, ensure surge capacity, support accountability and improve performance.

The Ministry is to be commended for initiating and supporting the Ontario adult critical care review. The Committee brought together a broad range of medical and clinical experts who enthusiastically discussed issues and identified opportunities for improvement. This initiative highlighted the importance of working together as a system of providers to strengthen and improve Ontario's healthcare system.

On behalf of the Ontario Critical Care Steering Committee, we submit this report with the firm belief that implementing these recommendations will lead to a more efficient and effective adult critical care system for the citizens of Ontario.

Yours truly,



Dr. Robert Bell  
Co-Chair  
Critical Care Steering Committee



Ms. Lynda Robinson  
Co-Chair  
Critical Care Steering Committee

cc: Ron Sapsford, Deputy Minister of Health and Long-Term Care  
Hugh McLeod, Associate Deputy Minister Responsible for the Ministry of Health and Long-Term Care's Transformation Agenda

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## **EXECUTIVE SUMMARY**

Patients who need critical care have a serious life-threatening disease or injury. These critically ill patients need to be in hospital critical care units since their care involves the use of mechanical ventilation to help them breathe, the support of sophisticated technologies and drugs, and/or highly specialised staff who may need to provide intense one-on-one care, around the clock. Critical care is a pivotal service that has the potential to “make or break” other hospital services. Patients who need critical care come from operating rooms, the emergency department and hospital wards. If critical care is not available, surgeries can be delayed or cancelled, wait times for surgeries and emergency services increased, fewer organs retrieved for life-saving transplants, and patient safety substantially reduced in our hospitals.

The demand for critical care is increasing dramatically due to an aging population, new drugs and life-support technologies, and increasing public expectations to “maintain life at any cost.” Access to critical care is also being challenged with human resource shortages and limits to available resources. Critical care is highly resource intensive. It has been estimated that critical care accounts for about 5-10% of acute care hospital bed occupancy and as much as 34% of hospital budgets in some jurisdictions.

Patients, providers and funders of healthcare are becoming increasingly concerned about continued access to critical care services in Ontario. Severe Acute Respiratory Syndrome (SARS) highlighted the weaknesses of critical care services, and the inability of the system and individual hospitals to respond appropriately to surges or sudden demands for care. SARS also highlighted the importance of a seamless continuum of care between the community, emergency departments, intensive care units and hospital wards.

The way that Ontario currently provides critical care services must be improved to meet the increasing demand for safe, high quality services. Indeed, the limitations of the current system have the potential to sabotage efforts to reduce surgical wait times within the government’s Transformation Agenda. Although more investments in critical care are necessary, increased funding will be insufficient to address the limitations of the current system.

In response to these challenges, the Ministry of Health and Long-Term Care (Ministry) began a formal review of Ontario’s adult critical care system in 2004. Led by the Ontario Critical Care Steering Committee, a wide range of research was conducted on critical care systems and evidence-based practices in Canada and internationally. Five task groups studied in-depth issues related to access, accountability, human resources, surge capacity and new technologies. In addition, provincial audits of adult critical care capacity and human resources, and future projections of demand were also completed. The findings of these reviews highlighted the importance of the Committee’s work. If current patterns of critical care practice are maintained into the future, it is estimated that Ontario will need 25-50 additional critical care beds each year.

The Steering Committee's report includes innovative recommendations to improve access to safe critical care for adults by better organizing services, providing critical care supports, and targeting efficiencies through better critical care management. There are many opportunities to improve Ontario's critical care system and make it a safer, and more efficient and effective service.

The Committee's vision for critical care in Ontario is: "All Ontarians who have a life-threatening disease or injury will have timely access to the appropriate level of high quality critical care services. The right care will be provided to the right patient at the right time in the right place."

The Committee identified opportunities for improvement in six areas:

- Access to critical care through greater efficiencies and effectiveness (which includes system- and organisation-level solutions, solutions across all levels to meet surges in demand, and ethical considerations for access);
- Safety and quality supported with a framework to improve critical care performance;
- Sufficient and appropriate human resources to meet the need for critical care;
- Critical care technologies;
- Critical care funding; and
- Critical success factors.

The Committee's recommendations take a patient-focused approach to critical care by improving each phase of the adult critical care patient's journey, as well as strengthening the overall system of adult critical care services.

## **Recommendations That Improve the Adult Critical Care Patient's Journey**

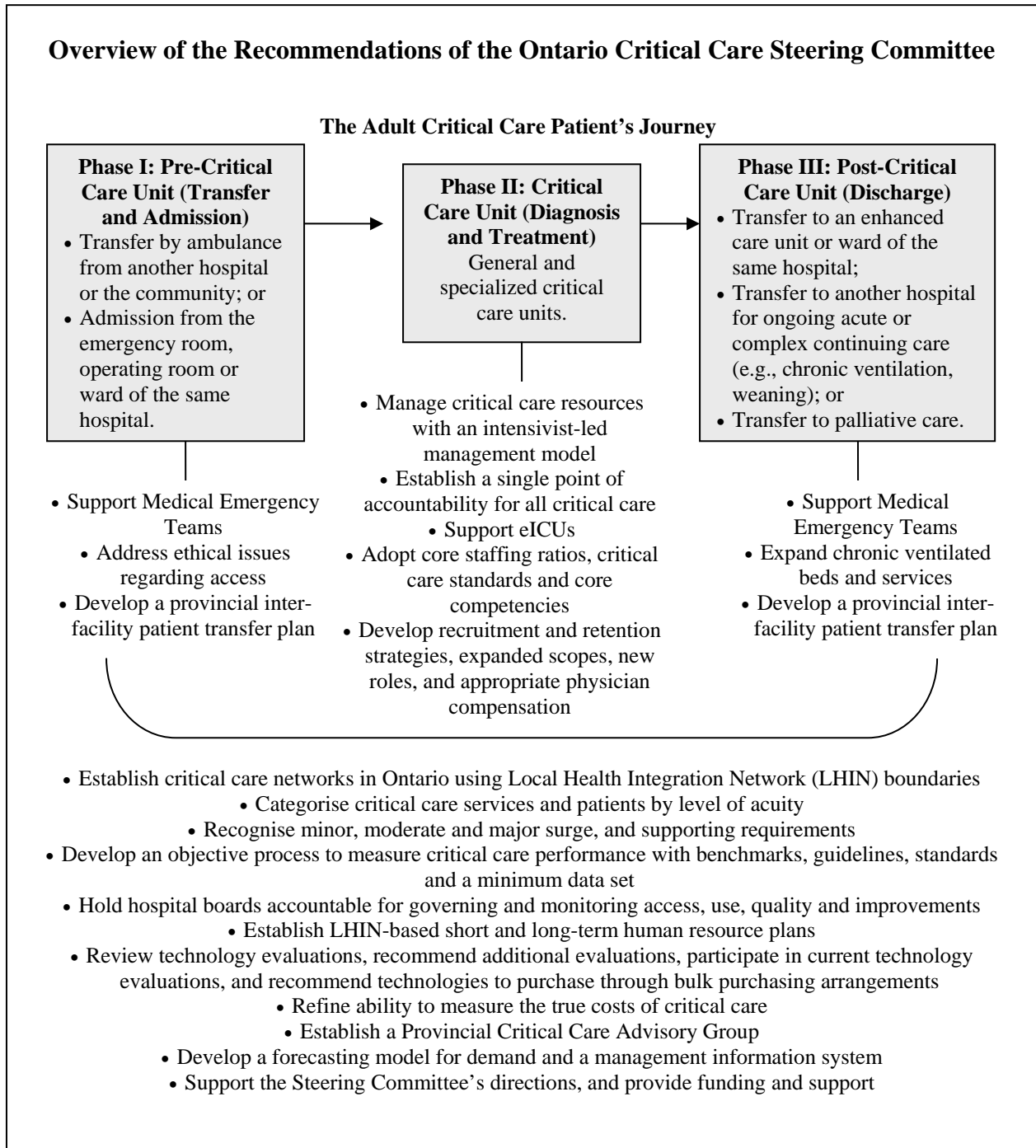
### ***Phase I: Pre-Critical Care Unit (Transfer and Admission)***

Before patients enter critical care, they are either transferred by ambulance from another hospital or the community, or are admitted from the emergency room, operating room or ward room of the same hospital. To improve this phase of the patient's journey, the Committee recommends stable ongoing funding support for Medical Emergency Teams (Outreach) and additional funding to expand these teams to avoid unnecessary admission into critical care. As well, the Committee recommends that a process be initiated to address ethical issues in accessing critical care services to ensure that patients receive appropriate care, and that the Ministry develop a provincial inter-facility transfer plan.

### ***Phase II: Critical-Care Unit (Diagnosis and Treatment)***

When the Committee examined the point at which patients are in a general or specialised critical care unit, discussions focused on improving safety, reducing errors, and promoting standardization and efficiencies. The Committee recommends that critical care resources be managed using an intensivist-led management model, which is not widely used in Ontario. There is compelling evidence that this model improves access, quality, patient safety, and the effective and efficient use of resources. It is also

recommended that hospitals improve access to services, the flow of patients, and the use of resources by establishing a single point of accountability for all critical care areas.



Additional recommendations to support electronic ICU technology in remote hospitals, core staffing ratios, critical care human resource standards and core competencies are targeted at maximising the use of resources within units. Recommendations to develop



recruitment and retention strategies, expanded scopes of practice for staff, new staff roles, and appropriate physician compensation strategies will all help to ensure a sufficient number of appropriately trained human resources in critical care units.

### ***Phase III: Post-Critical Care Unit (Discharge)***

When patients leave critical care units, they can be transferred to an enhanced care unit or ward of the same hospital, be transferred to another hospital for ongoing acute or complex continuing care (e.g., chronic ventilation, weaning), or be admitted to palliative care. Recommendations that call for Medical Emergency Teams that follow patients after they leave the critical care unit, a provincial inter-facility transfer plan, and expansion of chronic ventilated beds and services will improve the discharge phase of critical care.

### **Recommendations That Improve the Overall System of Adult Critical Care Services**

The Committee makes recommendations that will support and improve the overall system of critical care services.

The Committee recommends that critical care networks be established in Ontario using Local Health Integration Network boundaries, and that critical care services and patients be categorized by level of acuity. This will help ensure that patients receive the appropriate level of care. There may be opportunities to work with the Paediatric Critical Care Network on common solutions. In addition, it is recommended that the Ministry officially recognise the conditions and supporting requirements for minor, moderate and major surge. This includes taking an individual hospital, LHIN-based or provincial/national perspective depending on the magnitude of the surge, creating additional Emergency Medical Assistance Teams (EMAT), and facilitating the ability of staff to become EMAT volunteers. These recommendations will help to improve equity of access, achieve standardization across all critical care services, and improve efficiencies.

With regard to performance improvement, the Committee recommends that an objective process be developed to measure critical care performance based on benchmarks, guidelines and standards, and using a minimum data set. It is further recommended that hospital boards be held accountable for governing their organization's critical care resources including access, appropriate use, quality and ongoing improvements. The Ministry will monitor performance against established goals. In addition, performance report cards will be developed provincially, and individual critical care units and LHINs (or critical care networks) will measure their performance and institute quality improvement initiatives tailored to local needs.

The majority of the human resource recommendations focus on ensuring that there are sufficient numbers of appropriately trained critical care staff to meet current and future needs. Many of these recommendations encourage the participation of numerous stakeholders including the critical care community, the Ministry, the Nursing Secretariat

of the Ministry, the regulatory colleges and professional associations. It is also recommended that LHIN-based short- and long-term human resource plans be developed that are consistent with the Ministry's human resource planning.

With regard to critical care technologies (medical devices and drugs), the Committee recommends that available technology evaluations be used to inform the adoption, diffusion and withdrawal of critical care technologies. In addition, efforts should be made to promote additional evaluations of emerging technologies, participate in current technology evaluations, and support obtaining technologies through bulk purchasing arrangements.

The Committee was unable to determine the true cost of providing critical care in Ontario due to the broad range of indirect and direct costs that make up the critical care service. The Committee, therefore, recommends that the Ministry consult with stakeholders and focus on refining its ability to measure the true costs of critical care.

### **Critical Success Factors**

The Committee identified three success factors that must be put in place if successful changes are to be made in Ontario's critical care system.

A Provincial Critical Care Advisory Group is recommended, as the principal advisor to the Ministry on improving the access, quality, efficiency, safety and accountability of adult critical care services in Ontario. The group would be charged with overseeing the implementation of the provincial critical care strategy, among other tasks. The group would have three main committees: performance evaluation, human resources and technology review.

A second critical success factor is the development of a forecasting model and a provincial critical care management information system under the umbrella of the Ministry's provincial information management initiative, as part of the Transformation Agenda. This provincial review of adult critical care was hampered by the lack of management information which is crucial to support many of the key recommendations of this report.

The final success factor is a commitment to implementation. It is recommended that the Ministry support the Committee's directions, and provide funding and support to implement the recommendations.

The Ministry is to be commended for initiating this review and supporting the work of the Committee. The critical care community looks forward to participating in the implementation of this report, and strengthening and improving Ontario's adult critical care system.

## **PART 1: INTRODUCTION**

### **1. BACKGROUND**

#### **WHY CRITICAL CARE?**

Patients who need critical care have a serious life-threatening disease or injury. These critically ill patients need to be in hospital critical care units since their care involves the use of mechanical ventilation to help them breathe, sophisticated technologies and drugs, and/or highly specialised staff who may need to provide intense one-on-one care, around the clock. Critical care is a pivotal service that can “make or break” other hospital services. Patients who need critical care come from operating rooms, the emergency department and hospital wards. If critical care services are not available, surgeries can be delayed or cancelled, wait times for surgeries and emergency services increased, fewer organs retrieved for life-saving transplants, and patient safety substantially reduced in our hospitals.

Critical care is in a crisis situation which is impacting on other healthcare services. The demand for critical care is increasing dramatically for a number of reasons. The aging population is using high levels of critical care services, new drugs and life-support technologies are making more treatments possible, and there are increasing public expectations to “maintain life at any cost.” Access to critical care is also facing challenges from within: there is a shortage of specialised staff and limits to financial resources. Critical care is expensive. Advanced technologies, complex patient management and high staffing levels all add up to a high cost service. It has been estimated that critical care accounts for about 5-10% of acute care hospital bed occupancy and as much as 34% of hospital budgets in some jurisdictions.

Patients, providers and funders of healthcare are becoming increasingly concerned about continued access to critical care services in Ontario. Severe Acute Respiratory Syndrome (SARS) highlighted the weaknesses of critical care services, and the inability of the system and individual hospitals to respond appropriately to surges or sudden demands for care. SARS also highlighted the importance of a seamless continuum of care between the community, emergency departments, intensive care units and hospital wards.

The way that Ontario currently provides critical care services needs to be improved to meet the increasing demand for safe, high quality services. Indeed, the limitations of the current system have the potential to sabotage efforts to reduce surgical wait times within the government’s Transformation Agenda. Although more investments in critical care are necessary, increased funding will be insufficient to address the limitations of the current system.

There are many opportunities to improve Ontario’s adult critical care system and make it a safer, and more efficient and effective service. This includes ensuring that critical care

is used appropriately, there is equity of access for patients who need critical care services, care is standardized and meets quality targets, there is a focus on reducing errors, and clear accountabilities for quality and improving performance. Hospital boards, Local Health Integration Networks and government all have a role to play in creating a high quality, safe critical care system that will be there when Ontarians need it.

## **THE ONTARIO CRITICAL CARE STEERING COMMITTEE**

In the summer of 2004, the Ministry of Health and Long-Term Care (Ministry) established the Ontario Critical Care Steering Committee to identify improvements in the quality and efficiency of Ontario's adult critical care system (see Appendix A for the terms of reference). Made up of over 30 critical care specialists, physicians, nurses, respiratory therapists, hospital managers, ethicists, researchers and others, this external stakeholder committee was given a mandate to deliver its recommendations within 12-18 months. The Committee reports to, and is advised by, the Ministry's Internal Critical Care Working Group. See Appendix B for the members of the Ontario Critical Care Steering Committee.

## **STRATEGIES**

Three major strategies were used to support the work of the Committee: convening task groups, developing research papers, and conducting surveys.

### **Task Groups**

Five task groups, made up of Committee members, were struck to examine and make recommendations in focused areas. These groups included:

- ***Accessibility (Peter Kraus, Chair)***: This group examined strategies to improve access to critical services.
- ***Accountability (Andreas Laupacis, Chair)***: This group examined a framework for accountability and performance improvement in critical care.
- ***Human Resources (David McNeil, Chair)***: This group examined health human resource issues, and strategies to recruit and retain a sufficient number of critical care staff.
- ***Surge Capacity (Chris Mazza, Chair)***: This group examined how to deal with surges in demand for critical care, as well as thresholds for activating and deactivating a surge plan.
- ***Technology Assessment (Alfio Meschino, Chair)***: This group examined issues related to the use of technologies in critical care.

### **Research Papers**

Over 20 research papers were commissioned and prepared for the explicit use of the five working groups and the Committee. The papers addressed issues in the areas of access,

accountability, health human resources, technology assessment and surge capacity. Additional research literature and reports from other jurisdictions were also reviewed (see Appendix C). Of particular interest was the 1991 report of *The Working Group on Critical Care in Ontario* (William Sibbald and James E. Calvin, co-chairs).

## Surveys

Two surveys were conducted. One was a critical care capacity audit that collected information on the characteristics, bed capacity and administrative structure of critical care units across Ontario. A total of 130 out of 131 acute care hospitals responded to the survey. The second survey was an audit of the critical care medicine, nursing and allied health workforce in Ontario hospitals. As of March 2, 2005, information was available on staffing in 158 out of 210 critical care units in the province (75% response rate).

Survey results were used to provide a current profile of critical care resources and suggest future demand for services.

## **FRAMING THE WORK OF THE COMMITTEE: A VISION FOR CRITICAL CARE IN ONTARIO**

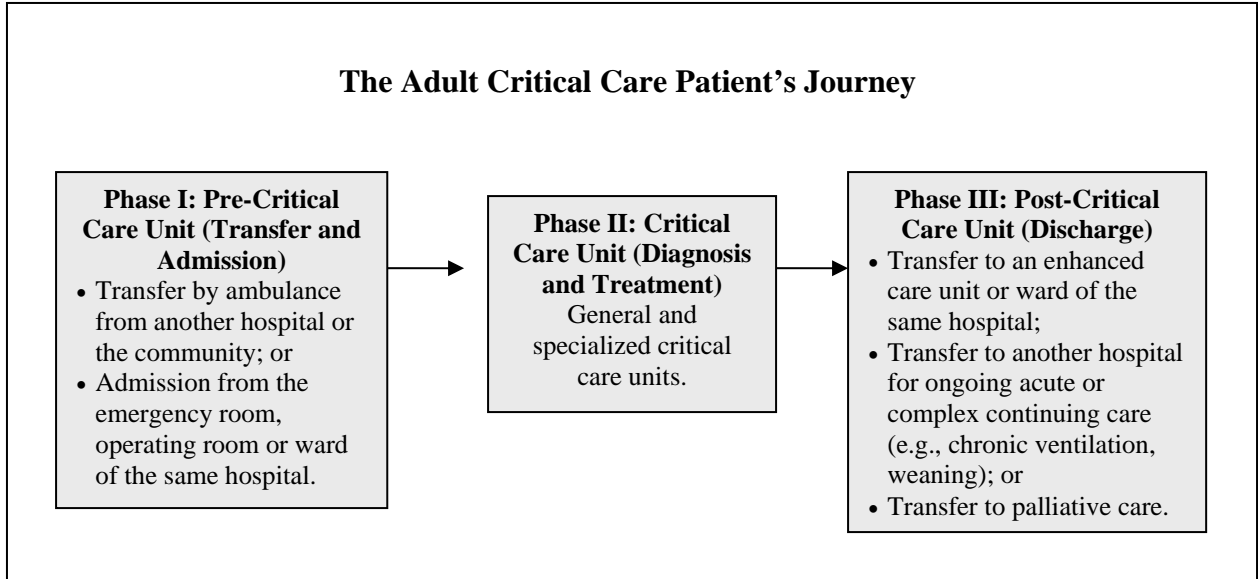
The Committee's vision for critical care in Ontario is:

All Ontarians who have a life-threatening disease or injury will have timely access to the appropriate level of high quality critical care services. The right care will be provided to the right patient at the right time in the right place.

The Committee identified six goals to support this vision. These goals reflect the broad aims that the Committee was trying to achieve for critical care services.

- Focusing on what is best for the patient.
- Developing a system of integrated and coordinated services that supports a seamless journey for the patient who needs critical care.
- Organizing Ontario's critical care services so that patients have timely and equitable access to the level of care that is appropriate to the severity of their condition.
- Making the best use of human, financial, technological and information resources so that Ontario's critical care services are provided both effectively and efficiently.
- Adopting a culture of accountability that continuously evaluates and improves how critical care services are provided using best practice standards, benchmarks and guidelines.
- Developing leaders in critical care who are skilled in managing critical care services.

Typically, when people think of critical care, they think of critical care units in acute hospitals. This Committee adopted a broader definition of critical care that includes the transfer, admission, diagnosis, treatment and discharge of critically ill patients. The critical care patient's journey can be understood as having three phases.



***Phase I: Pre-Critical Care Unit (Transfer and Admission):*** Before patients enter critical care, they are either transferred by ambulance from another hospital or the community, or are admitted from the emergency room, operating room or ward room of the same hospital.

***Phase II: Critical Care Unit (Diagnosis and Treatment):*** Patients who receive care in a critical care unit.

***Phase III: Post-Critical Care Unit (Discharge):*** When patients leave critical care units, they can be transferred to an enhanced care unit or ward of the same hospital, transferred to another hospital for ongoing acute or complex continuing care (e.g., chronic ventilation, weaning), or be admitted to palliative care.

The Committee developed recommendations that address all three phases as well as the overall system of adult critical care services in Ontario.

## 2. A PROFILE OF CRITICAL CARE TODAY AND PROJECTED INTO THE FUTURE

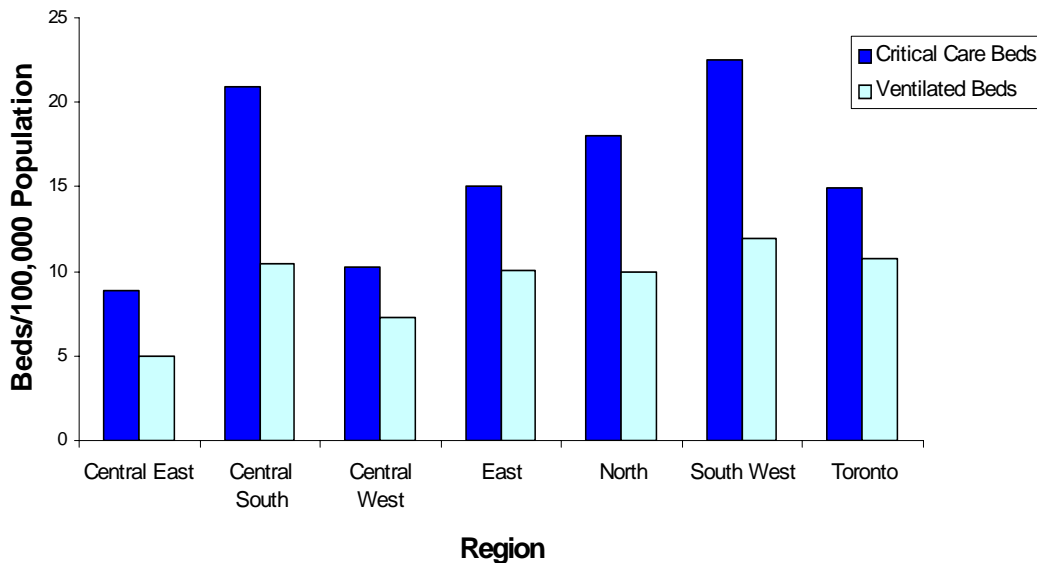
### CURRENT CRITICAL CARE ACTIVITY<sup>1</sup>

A critical care audit was conducted to collect data about critical care bed capacity; the availability of diagnostic, monitoring and therapeutic technologies; and the organizational structure of critical care services. The purpose of the audit was to develop a baseline of current critical care activity. A questionnaire was developed in collaboration with the Critical Care Research Network (CCR-Net), and distributed to hospitals in the summer of 2004.

A liberal definition of “critical care unit” was used. Hospitals were asked to report on any beds physically aggregated into a discrete unit to provide care to higher acuity patients. This included intensive care units, intermediate or stepdown units (also known as enhanced care), and subspecialty units (e.g., coronary care, trauma, cardiovascular). Of the 131 acute care hospitals contacted, 130 responded to the survey.

### BEDS

Ninety-seven or 74% of hospital corporations reported having some capacity for critical care activities. This capacity was located on 129 individual hospital sites, in 210 units



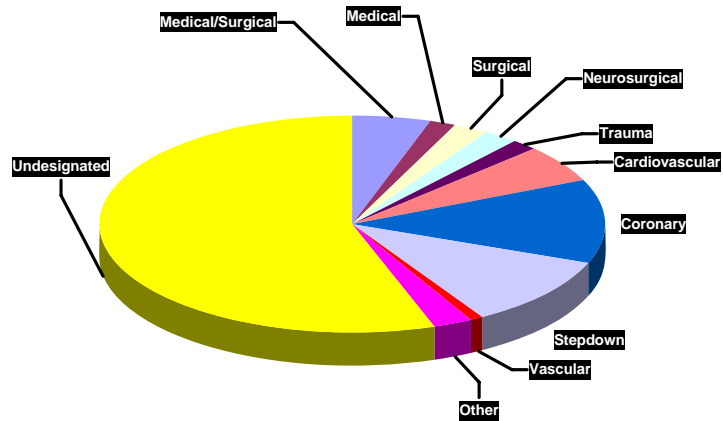
<sup>1</sup> *Audit of Ontario’s Critical Care Capacity* (Authored by Claudio Martin and Andrea Hill). Commissioned for the Ontario review (see Appendix C).

and accounted for 1,788 adult critical care beds (average of 18.4 beds per hospital corporation). Of these beds, 61% (1,096) were equipped to treat critically ill patients who required mechanical ventilation. This bed capacity represents 14.8 critical care beds and 9.1 mechanically ventilated beds per 100,000 population, respectively. The figure below details the regional breakdown of the per capita critical care and mechanical ventilated beds for Ontario.

A total of 807 or 45% of the critical care beds were designated for specific patient groups. These included:

- 223 (27.6%) coronary beds
- 185 (23.1%) stepdown or intermediate care beds
- 102 (12.8%) cardiovascular beds
- 90 (11.3%) medical/surgical beds

The remaining 981 (55%) critical care beds were undesignated for a specific patient group.



## THE AVAILABILITY OF TECHNOLOGY AND PROFESSIONAL SERVICES

### Diagnostic Technologies

Hospitals were asked whether they had the following diagnostic technologies on-site so that patients did not need to be transferred by ambulance for these procedures:

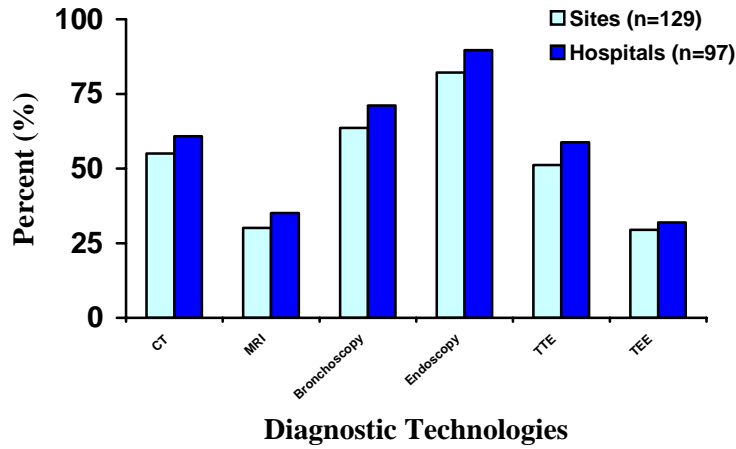
- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Bronchoscopy
- Endoscopy
- Transthoracic Echocardiography (TTE)
- Transesophageal Echocardiography (TEE)

MRI was available on-site in 30.5% of the individual sites and in 35.5% of hospital corporations (see figure below). The availability of on-site CT and bronchoscopy at individual sites was 55.5% and 64%, respectively. These numbers went up slightly when sites were collapsed into hospital corporations.

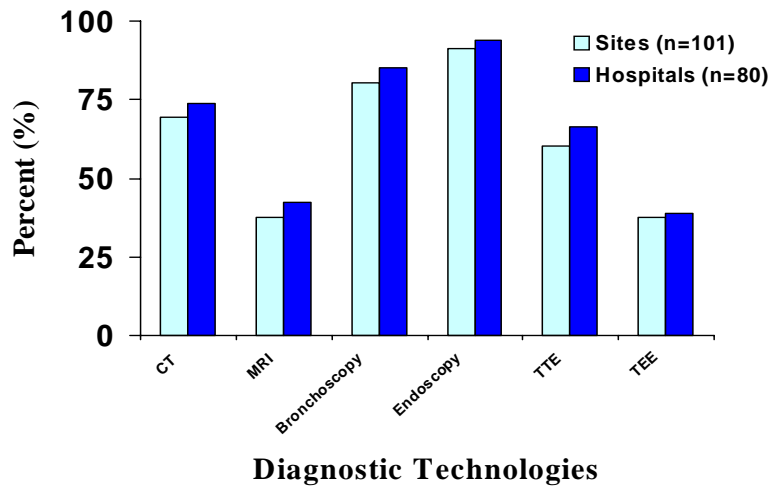
When only units with mechanical ventilation were considered, on-site availability of these technologies was over 60% with the exception of MRI and TEE.



### Availability of Diagnostic Technologies (All Units)



### Availability of Diagnostic Technologies (Units with Mechanically Ventilated Beds)



### Monitoring Technologies

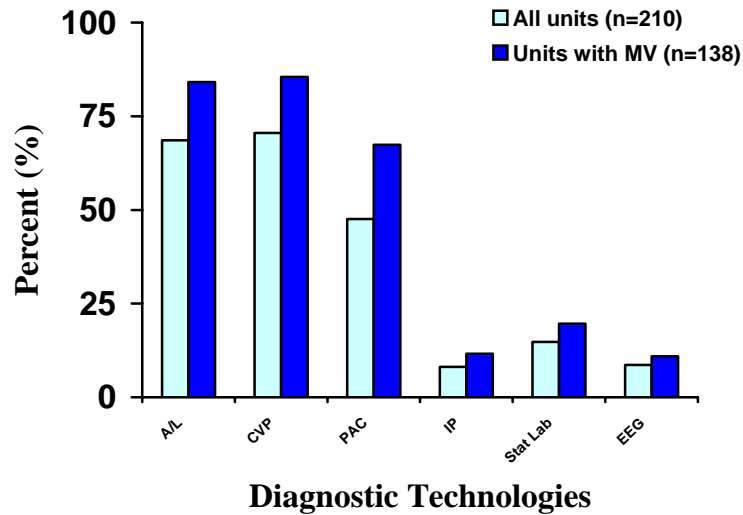
Hospitals were asked whether they had the following monitoring technologies within individual units:

- Invasive arterial blood pressure monitoring (A/L)
- Central venous pressure monitoring (CVP)
- Pulmonary artery catheter monitoring (PAC)
- Intracranial pressure monitoring (IP)

- Stat lab analyzer (Stat lab)
- Continuous electroencephalography (EEG)

The availability of monitoring technologies varied widely. Least available was continuous EEG - 8.7% in all units and about 11% of units with the capacity for mechanical ventilation. The monitoring technology most available was invasive arterial blood pressure and central venous pressure monitoring (about 70% capability for both).

**Availability of Monitoring Technology**



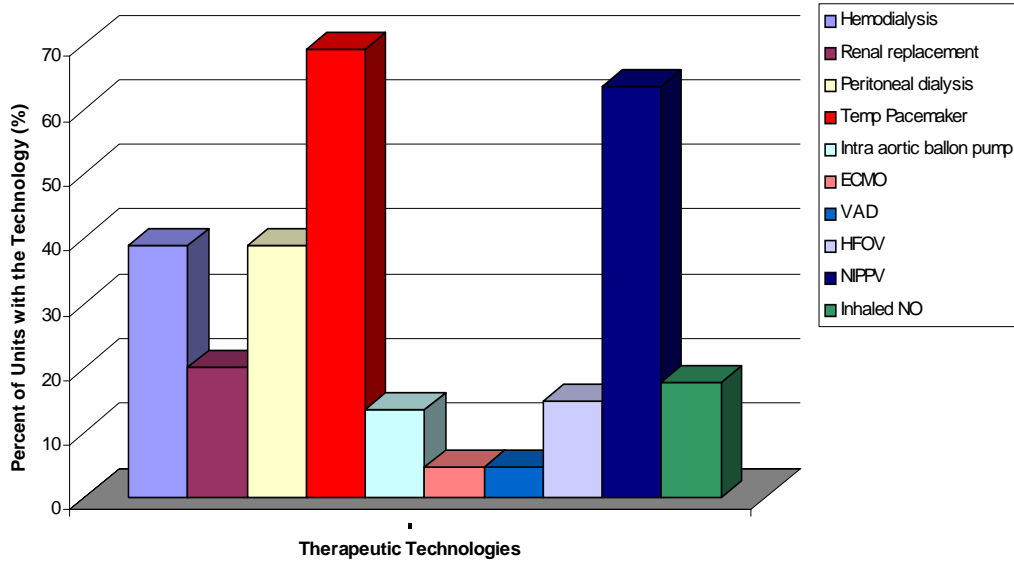
**Therapeutic Technologies**

Hospitals were asked whether they had the following therapeutic technologies within individual units:

- Intermittent hemodialysis (Hemodialysis)
- Continuous renal replacement therapy (Renal replacement)
- Peritoneal dialysis
- Temporary pacemaker (Temp pacemaker)
- Intra aortic balloon pump (Intra aortic balloon )
- Extracorporeal membrane oxygenation (ECMO)
- Ventricular assist device (VAD)
- High frequency oscillation ventilation (HFOV)
- Non-invasive positive pressure ventilation (NIPPV)
- Inhaled NO

On-site availability of these therapeutic technologies varied but was generally low. In particular, only 38.9% and 20.2% of hospitals reported being able to provide hemodialysis and renal replacement therapy, respectively.

### Availability of Therapeutic Technology

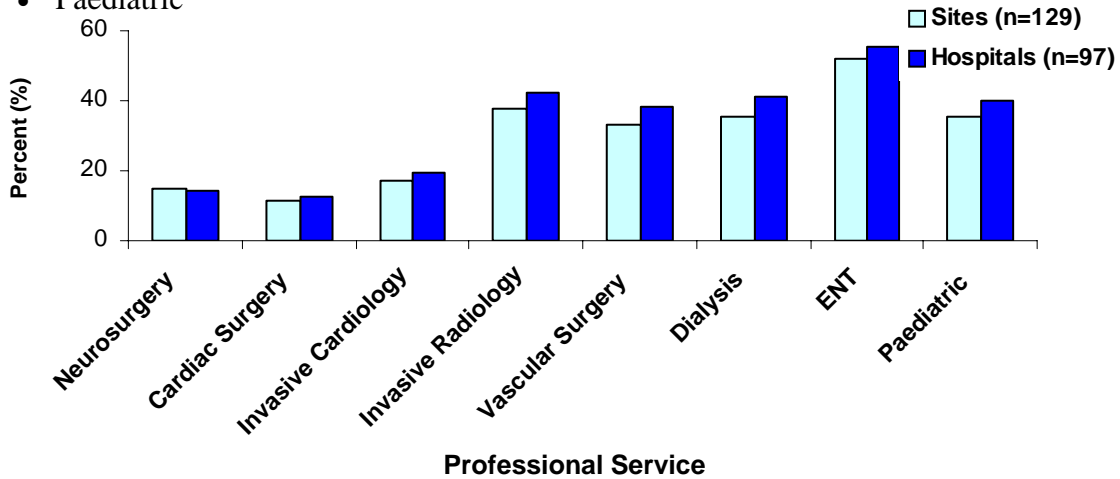


### AVAILABILITY OF PROFESSIONAL SERVICES

Hospitals were asked whether they had the following professional services within their institution, so that patients did not need to be transferred for these services:

- Neurosurgery
- Cardiac surgery
- Invasive cardiology
- Invasive radiology
- Vascular surgery
- Dialysis
- Ear, nose and throat (ENT)
- Paediatric

Less than 25% of hospitals with critical care units reported having cardiac surgery, invasive cardiology and neurosurgery services available. Less than 50% had invasive radiology, vascular surgery, dialysis and paediatric services.



## ADMINISTRATIVE STRUCTURE

Hospitals were asked to state whether admission and overall coordination of care decisions were made by:

- Any physician
- Any specialists
- A subgroup of specialist physicians
- Primary attending in collaboration with a group of ICU physicians
- Only through a group of ICU attending physicians

The table below indicates that a group of ICU attending physicians made admission decisions and overall coordination of care decisions in 33 out of 210 critical care units with the capacity for mechanical ventilation. In 24 of the largest units with 14 or more beds, an intensive care physician was involved in decisions about admission and care of patients admitted to the unit. The remaining 15 largest units did not have a physician staffing model that incorporated intensivists. In addition, half of the relatively large critical care units of 9-13 beds did not involve intensivists in the admission and coordination of care decisions related to critical care.

### Decisions Regarding Admissions and Coordination of Critical Care by Unit Size (Units with the Capacity for Mechanical Ventilation)

Decision Maker	Unit Size by Number of Beds			
	<5 Beds	5-8 Beds	9-13 Beds	>=14 Beds
<b>Any physician</b>	11 (36.7%)	8 (22.9%)	2 (6.1%)	0 (0%)
<b>Any specialist</b>	9 (30.0%)	12 (34.3%)	8 (24.2%)	8 (20.5%)
<b>A subgroup of specialist physicians</b>	5 (16.7%)	9 (25.7%)	6 (18.2%)	7 (18.0%)
<b>Primary attending in collaboration with a group of ICU physicians</b>	4 (13.3%)	2 (5.7%)	6 (18.2%)	7 (18.0%)
<b>Only through a group of ICU attending physicians</b>	1 (3.3%)	4 (11.4%)	11 (33.3%)	17 (43.5%)
<b>Total Units</b>	30 (100%)	35 (100%)	33 (100%)	39 (100%)

## IMPLICATIONS OF THE CRITICAL CARE ACTIVITY AUDIT

The activity audit suggests that the availability of critical care resources varies across the province. There appears to be marked variations in per capita bed capacity across the different regions. The data also suggests that the availability of critical care technologies is less than optimal across acute care hospitals.

Many hospitals have both general and specialized critical care units. The majority of these units report to and are managed by different program areas. The audit indicated that ICU attending physicians make decisions about admissions and coordination of critical care in only a minority of critical care units.

## **CURRENT CRITICAL CARE HUMAN RESOURCES<sup>2</sup>**

A critical care human resource audit was conducted of critical care units across Ontario. In January 2005, a survey was distributed to acute care hospitals that had at least one critical care unit. A total of 97 hospital corporations – with 210 critical care units – were asked to provide details about the registered nurses (RN), physicians, respiratory therapists (RT) and other allied staff who work in critical care. These preliminary results reflect the responses as of March 2, 2005; 158 out of 210 critical care units in the province provided information on staffing (75% response rate).

The human resource audit was limited by the lack of hospital data, the use of inconsistent definitions, and “anecdotal” reporting of some measures. Efforts were made to address these limitations, where possible. Work is ongoing beyond March 2, 2005 to refine these data.

### **REGISTERED NURSES**

Information was received from 158 critical care units. Of these, 135 units provided unit-specific information about their nursing staff.

#### **Full- and Part-Time RNs**

A total of 3,479 *full-time* RNs were employed in 135 critical care units in Ontario. The average and median number of RNs per unit was 25.9 and 19 RNs, respectively, with a reported range of 1-103 nurses. A total of 1,714 *part-time* RNs were employed in these critical care units. The average and median number of part-time RNs per unit was 12.9 and 10 RNs, respectively.

#### **Critical Care Experience and Training**

Most units reported that they do not hire RNs without experience (i.e., new graduates). However, units varied in the level of critical training they provided to new hires and their requirements for formal critical care certification. In total, 63% of units reported providing a critical care course or having a mechanism to provide critical care certification for newly hired critical care nurses or nurses interested in pursuing critical care training. Just under half of the nurses in all the reporting units had formal critical care certification. It is unclear whether this was reflected successful completion of a college-based critical care course or the National Critical Care-RN certification.

#### **Nursing Resignations, Terminations, Vacancies and Turnover**

Over 75% of units reported having one or more nurses resign between April 1, 2003 and March 31, 2004. A total of 385 nurses working in critical care resigned in this time

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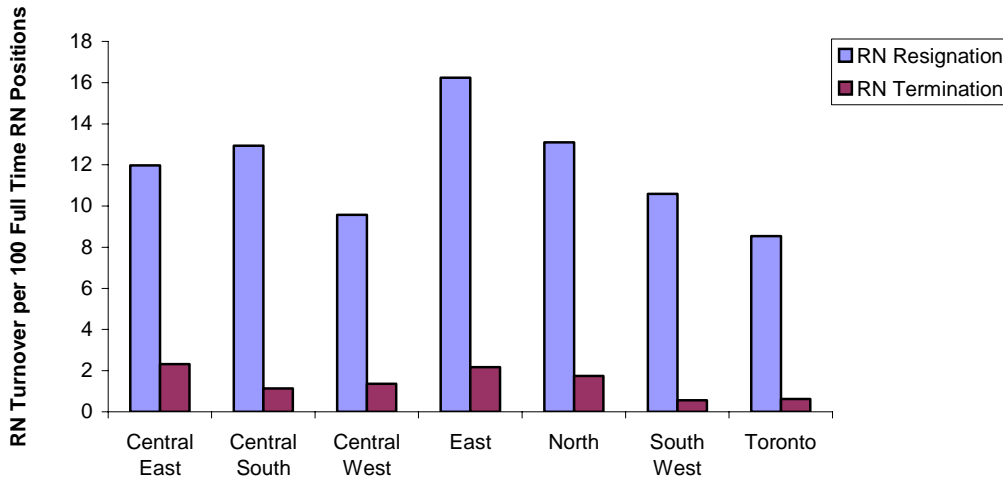
<sup>2</sup> *Audit of Ontario's Current Health Human Resource Supply in Critical Care* (Authored by Andrea Hill). Commissioned for the Ontario review (see Appendix C).

period. In the same fiscal year, 40 RN terminations were reported; 22% of units reported terminating one or more nurses.

Of the total budgeted nursing positions in these units, 49% of units reported having one or more nursing vacancies. At the time of this audit, there were 107 vacant full-time positions and 189 vacant part-time positions.

The number of RN resignations and terminations – as a proportion of the total full-time RN workforce – was used as proxy for nursing turnover. The number of resignations – as a proportion of total full-time RN positions – was lowest in Toronto (8 RNs per 100 full-time positions) and highest for the East (16 RNs per 100 full-time positions). The figure below presents RN turnover (resignation and terminations) for 2003/2004 in the reporting units.

### RN Turnover During Fiscal Year 2003/2004



The table below presents RN vacancies per 100 critical care beds. The highest full-time vacancies per 100 beds was in Toronto (13.7) whereas the lowest was in Central West and South West (1.7 each).

**Regional Distribution of RN Vacancies Per 100 Critical Care Beds, by Work Status**

<b>Region</b>	<b>Vacancies Full-time (FT)</b>	<b>Vacancies Part-time (PT)</b>	<b>Critical Care Beds</b>	<b>FT Vacancies Per 100 CC Beds</b>	<b>PT Vacancies Per 100 CC Beds</b>
<b>Central East</b>	8	13	172	4.7	7.6
<b>Central South</b>	11	58	248	4.4	23.4
<b>Central West</b>	4	21	233	1.7	9.0
<b>East</b>	20	25	246	8.1	10.2
<b>North</b>	4	18	151	2.6	11.9
<b>South West</b>	6	9	344	1.7	2.6
<b>Toronto</b>	54	45	394	13.7	11.4
<b>Total</b>	107	189	1,788	6.0	10.6

**Recruitment Efforts**

There were marked regional variations in the ability to recruit RNs to vacant positions. For example, 63% of units in the South West reported an average time to recruit RNs of less than a month, whereas the average time to recruit RNs in 67% of the units in Central East ranged from 2-6 months.

**Use of Agency Staff**

A total of 27 responding units (20%) reported using agency staff to supplement their RN workforce. These units were located in 19 hospitals in the following regions:

- Central East: 2 hospitals
- Central South: 1 hospital
- Central West: 5 hospitals
- Toronto: 11 hospitals

**ALLIED AND RESPIRATORY THERAPY HUMAN RESOURCES**

The majority of critical care units reported having some coverage from allied healthcare staff including pharmacists, dietitians, social workers and physiotherapists. Coverage for most units was provided as part of the wider hospital service, and was not under the critical care unit budget or staffing schedule.

A total of 68 individual hospital sites (representing 108 units) provided information about their respiratory therapists (RT). Most sites reported that RT services were not dedicated to the critical care unit, but rather were a shared hospital resource that provided services to the critical care unit on an “as needed basis.”

### Number and Hours of RTs to Staff the Units

Respondents were asked to approximate the average number of RTs and total RT hours required to staff their critical care units appropriately. The table below presents the estimates from 79 units.

#### Estimated Number and Hours of Respiratory Therapists Required to Staff the Critical Care Unit Appropriately Per Day

Unit Size	Number of RTs		Total Hours	
	Mean	Median (Range)	Mean	Median (Range)
< 5 beds (n=15)	1.6	1 (1-4)	17.6	8 (1-90)
5- 8 beds (n=21)	1.4	1 (1-2)	12.5	8 (1-24)
9-13 beds (n=17)	1.8	2 (1-4)	18.3	22 (2-24)
≥ 14 beds (n=26)	3.7	3 (1-10)	26.8	24 (4-108)

Respondents were also asked to provide an estimate of the average RT to patient ratio for the unit. The table below summarizes this information for critical care units capable of mechanical ventilation. It is noted that 25% of the units with nine or more beds indicated an RT to patient ratio of greater than 1:12 or only limited availability of RT coverage.

#### Average RT to Patient Ratio Reported by Units with the Capacity for Mechanical Ventilation

Unit Size	RT to Patient Ratio					As needed coverage*
	1 RT to 1-3 Patients	1 RT to 4-5 Patients	1 RT to 6-8 Patients	1 RT to 9-12 Patients	1 RT to ≥13 Patients	
< 5 beds (n=14)	3	3	-	-	3	5
5 – 8 beds (n=20)	2	4	7	-	1	6
9 – 13 beds (n=20)	2	-	5	8	1	4
≥ 14 beds (n=28)	1	4	7	9	2	5

\*Units in this category were unable to provide an estimate of the average RT to patient ratio. Most of these units noted that RT coverage was sporadic, depended on patient need, and RT availability at the time they were needed.

### RT Vacancies

Six hospitals reported a least one vacant full-time RT position. These vacancies were located in the following regions:

- Toronto: 7 full-time RT vacancies
- North: 2 full time RT vacancies
- South West and Central West: 1 full-time RT vacancy



Five hospitals reported at least one vacant part-time RT position. These vacancies were located in the following regions:

- Toronto: 5 part-time RT vacancies
- Central South: 4 part-time RT vacancies
- Central East: 2 part-time RT vacancies

**Recruitment Efforts**

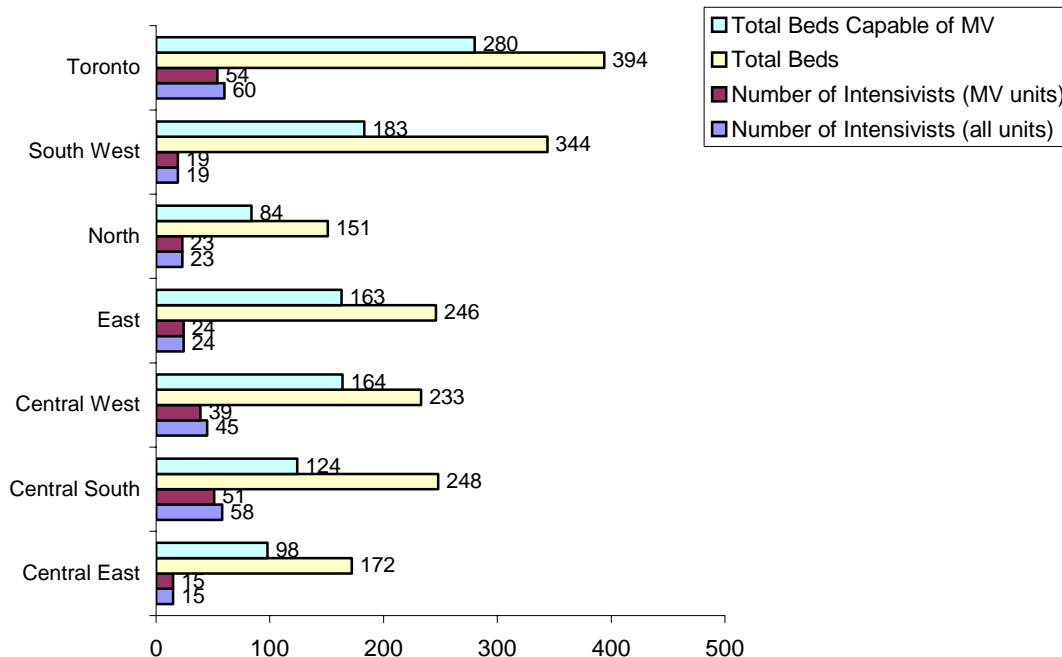
The ability to recruit RTs to fill vacant positions varied markedly across hospitals. Of 68 hospitals, 55% of those in Central East reported that RT recruitment took between 2-6 months. In the North, 50% of hospitals reported an RT recruitment time of three or more months. In the Central South and South West regions, 65% of hospitals reported RT recruitment times within two months.

**PHYSICIAN HUMAN RESOURCES**

A total of 133 units provided information about physician management of their critical care units. Of these, 46 units (34%) reported having one or more intensivists working in the unit; 244 intensivists staff these units, averaging about 5.4 intensivists per unit (with a range of 1-12 intensivists). Three-quarters of these intensivists (186) completed formal critical care training (Royal College of Physicians and Surgeons of Canada or equivalent).

The availability of intensivists varied widely by region. The figure below shows the regional distribution of intensivists for all units and for units capable of mechanical ventilation.

**Regional Distribution of Intensivists**



This figure also shows the total number of critical care beds and beds capable of mechanical ventilation.

About 80% of units reported that the total number of intensivists in their unit was adequate for optimal patient care. The remaining 20% felt that the number was inadequate for optimal patient care. The following two tables summarize the number of units reporting intensivists as part of the clinical team, by size of the unit.

#### Level of Intensivist Staffing by Unit Size (All Units)

Level of Intensivist Staffing	Unit Size			
	< 5 beds (n=40)	5- 8 beds (n=34)	9-13 beds (n=29)	≥ 14 beds (n=29)
None	36	27	15	9
1-4 Intensivists	2	2	7	6
5-9 Intensivists	2	5	6	9
≥ 10 Intensivists	-	-	1	5

#### Level of Intensivist Staffing by Unit Size (Mechanical Ventilated Units)

Level of Intensivist Staffing	Unit Size			
	< 5 beds (n=18)	5- 8 beds (n=23)	9-13 beds (n=24)	≥ 14 beds (n=28)
None	17	17	11	8
1- 4 Intensivists	1	1	6	6
5- 9 Intensivists	-	5	6	9
≥ 10 Intensivists	-	-	1	5

In units without intensivists, the physicians making admission decisions and providing overall coordination of care in the unit, primarily had fellowship certification in internal medicine, cardiology and/or surgery.

### THE IMPACT OF STAFF SHORTAGES

Respondents were asked to identify issues with critical care workforce shortages during fiscal 2003/2004. A total of 90 critical care units in 59 individual hospitals reported experiencing one or more of the following issues as a result of shortages of critical care staff:

- 47 hospitals reported having to reduce the number of staffed critical care beds;
- 37 hospitals reported having to divert emergency room patients; and
- 37 hospitals reported having to cancel surgeries.

### IMPLICATIONS OF THE AUDIT OF CRITICAL CARE HUMAN RESOURCES

The findings suggest that there are marked variations in RN vacancies across regions, ranging from a high of 13.7 per 100 critical care beds in Toronto, to a low of 1.7 in the

South West. This may account for the higher use of RN agency staff in Toronto's critical care units. The use of agency staff is less than optimal and has implications for quality of care. The use of agency staff along with the high turnover of RNs across the province suggests the need for targeted strategies aimed at improving RN training and recruitment in the critical care setting.

There is evidence to suggest that involving support staff – such as pharmacists and nutritionists – in the care of critically ill patients results in improved outcomes. The audit produced limited information on the use of allied healthcare providers in critical care units. The audit revealed that RT staffing in units with the capacity for mechanical ventilation does not reflect current evidence, and may point to the need for best practice standards in this area. The fact that 25% of larger units did not have dedicated RTs is reflected in concerns expressed by some respondents about the need for more funded RT positions at their hospital.

Just over a third of units reported having an intensivist in the unit. It is noted, however, that eight of the largest units ( $\geq 14$  beds) with the capacity for mechanical ventilation reported having no intensivist. In addition, 20% of the units with intensivists reported being understaffed. This underscores the need for more intensivists in the province.

### **FUTURE PROJECTIONS OF DEMAND FOR CRITICAL CARE<sup>3</sup>**

The future need for mechanically ventilated critical care beds in Ontario was calculated using the following data sources: i) Ministry of Finance population data for 2001 and population forecasts for 2006 and 2026; ii) the Critical Care Research Network's Minimum Data Set (CCR-Net MDS); and iii) the Critical Care Capacity Audit reported above (2004).

The analysis used the following assumptions:

- The selected sample of ICUs from the CCR-Net dataset is representative of adult admissions to ICUs across the province.
- All critically ill patients admitted to the sample ICUs were mechanically ventilated at some point during their ICU stay.
- The total number of mechanically ventilated beds in 2003 was the same as reported in the 2004 audit.
- The proportion of mechanically ventilated patients in each age category remains constant for all projections.
- Critical care capacity in 2004 is adequate to meet demand and, therefore, "2004-like" capacity will be maintained in Ontario until 2026.
- The current or "realistic" occupancy rate for mechanically ventilated beds is 90%.
- The "ideal" occupancy rate for mechanically ventilated beds is 80%.

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<sup>3</sup> *Demand Forecasting for Critical Care Capacity in Ontario to 2026* (Authored by Eric Nauenberg). Commissioned for the Ontario review (see Appendix C).

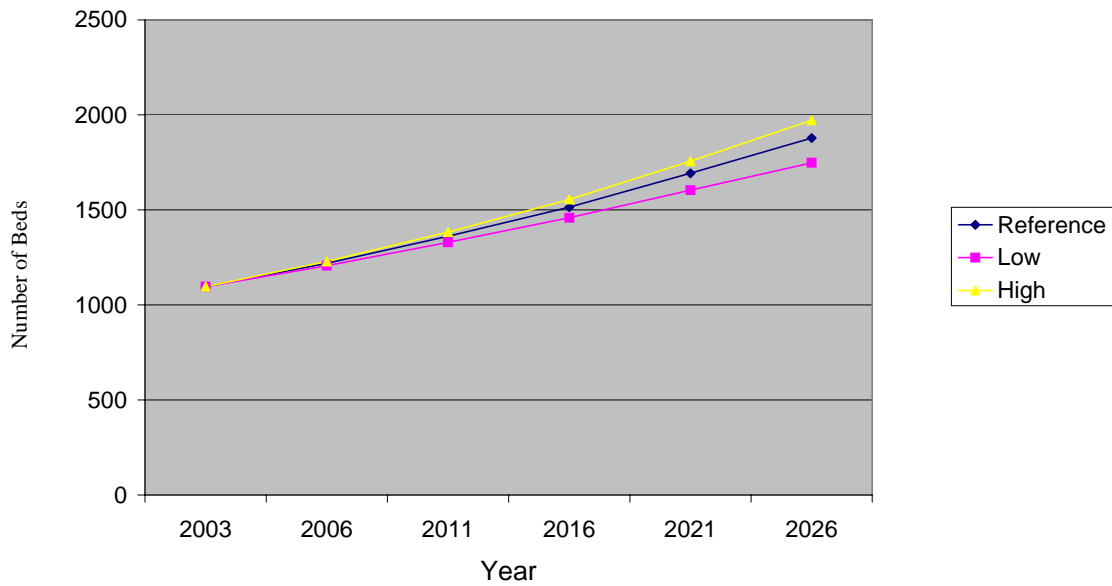
- The average annual bed-days per mechanically ventilated patient in 2003 remains constant for all projections.

**Forecast Using a 90% Occupancy Rate**

Assuming a 90% occupancy rate:

- By 2006, an additional 123 mechanically ventilated beds will be required in Ontario compared to 2003.
- By 2026, an additional 782 beds will be required or 70% more beds than in 2003.

**Figure 1. Needs Based Forecast for Mechanical Ventilation Beds in Ontario 2006-2026 (90% occupancy)**



**Number of Mechanical Ventilation Beds Required in Ontario From 2003-2026 (90% Occupancy)**

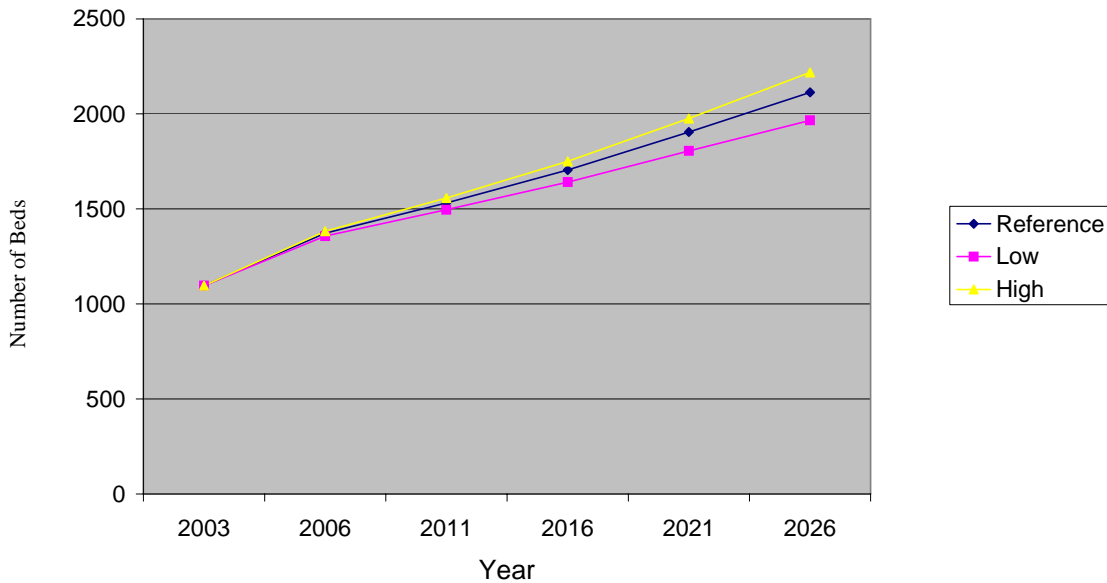
Year	Reference	Low	High
2003	1,096	1,096	1,096
2006	1,219	1,206	1,228
2011	1,362	1,330	1,384
2016	1,515	1,459	1,555
2021	1,693	1,604	1,756
2026	1,878	1,748	1,971

### Forecast Using an 80% Occupancy Rate

Assuming an 80% occupancy rate:

- By 2006, an additional 276 mechanically ventilated beds will be required in Ontario compared to 2003.
- By 2026, an additional 1,017 beds will be required or 93% more beds than in 2003.

**Figure 2. Needs Based Forecast for Mechanical Ventilation Beds in Ontario 2006-2026 (80% occupancy)**



**Number of Mechanical Ventilation Beds Required in Ontario From 2003-2026 (80% Occupancy)**

Year	Reference	Low	High
2003	1,096	1,096	1,096
2006	1,372	1,357	1,382
2011	1,532	1,496	1,557
2016	1,705	1,641	1,750
2021	1,904	1,805	1,976
2026	2,113	1,966	2,218

## **IMPLICATIONS OF THE PROJECTED DEMAND FOR CRITICAL CARE**

The data suggest that the demand for mechanically ventilated critical care beds will increase considerably by 2028, given current occupancy rates of 90%. When a lower occupancy is used – one that can better handle capacity surges – the number of required mechanically ventilated beds almost doubles by 2026. Assuming that current patterns of practice are maintained into the future, this analysis estimates that an additional 40-50 critical care beds will be needed annually, at a projected cost of \$28-35 million dollars each year (based on today's bed costs).

A recent study of the projected incidence of mechanical ventilation in Ontario predicted a lower but still substantial increase in beds to 2026.<sup>4</sup> When the sex- and age-specific incidence of mechanical ventilation for adult patients in 2000 was projected onto expected population growth, an 80% increase in the number of vented patients was predicted to 2026. This reflects a 2.3% annual growth rate or 25-28 additional critical care beds needed each year.

Both estimates suggest that Ontario will face substantial difficulties in meeting future requirements for critical care services if adequate strategic and operational solutions are not identified and implemented. Additional investments must be coupled with more efficient and effective use of critical care resources to ensure timely access and appropriate use of high quality, safe critical care services.

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<sup>4</sup> Needham DM, Bronskill SE, Calinawan JR, Sibbald WJ, Pronovost PJ, Laupacis A. "Projected incidence of mechanical ventilation in Ontario to 2026: Preparing for the aging baby boomers." *Crit Care Med.* 2005; 33 (3): 574-579.

## **PART 2: THE ISSUES**

### **3. INTRODUCTION TO THE ISSUES**

Part Two of this report presents five major critical care issues that the Steering Committee and its task groups addressed.

Chapter 4, *Access to Critical Care Through Greater Efficiencies and Effectiveness*, presents solutions to improve access on a system and organization level. System-level solutions focus on critical care networks, critical care service and patient levels, and a patient transfer system. Organization-level solutions include critical care management, medical emergency teams, telemedicine, electronic ICU and chronic ventilation. In addition, this chapter addresses the important access issue of preparing for and meeting surges in demand for critical care. Ethical considerations for access are also examined.

Chapter 5, *Safety and Quality Through a Framework to Improve Critical Care Performance*, presents an accountability structure to oversee performance improvement, an objective process to measure performance, and a performance improvement process.

Chapter 6, *Sufficient and Appropriate Human Resources to Meet the Need for Critical Care*, looks at methodologies to determine critical care staff requirements, as well as recruitment and retention strategies, innovative uses of human resources, and education to support ongoing staff development.

Chapter 7, *Critical Care Technologies*, examines evaluation activities as well as medical devices and drugs used in critical care.

Chapter 8, *Funding Critical Care in Ontario*, explores the cost of critical care in the province.

In each chapter, background information is presented to familiarize the reader with the issues. This descriptive section is followed by the Committee's observations and recommendations. Although issues are presented individually, they do overlap. Where this occurs, the reader is referred to relevant issues that are presented elsewhere in the report. Recommendations are included within each chapter and appear in a consolidated form in Chapter 11.

## **4. ACCESS TO CRITICAL CARE THROUGH GREATER EFFICIENCIES AND EFFECTIVENESS**

### **INTRODUCTION**

Appropriate access to critical care occurs when a patient who needs the service receives the care required within a clinically acceptable amount of time. Appropriate access assumes that critical care resources are used by those patients who truly require them.

Appropriate access to critical care needs to be understood broadly. It means that the patient receives appropriate care when they are critically ill, or at risk of becoming critically ill, no matter where they are located physically. Whether the patient is being transferred or admitted to hospital, waiting for or recovering from surgery, or waiting for appropriate discharge, he or she needs to have appropriate and timely access to and from critical care. Access to the critical team or service does not always need to occur in a critical care unit. The critical care team can provide care to a patient in other areas of the hospital.

Critical care is an expensive resource. It has been estimated that critical care accounts for a substantial proportion of hospitals' resources: about 5-10% of acute care hospital bed occupancy and as much as 34% of hospital budgets. In the United States, critical care accounts for almost 1% of the American Gross National Product.<sup>5</sup> With the projected increased demand for critical care services, the cost of meeting future needs will be significant. There is consensus among Ontario health care managers and leading critical care physicians that increased hospital funding needs to be strategically invested to improve the seamless functioning of critical care. It is recognized, however, that any additional investments must be coupled with more efficient and effective use of critical care resources to ensure timely access to high quality, safe critical care services.

This chapter presents the Committee's observations and recommendations on improving access to critical care through greater efficiencies and effectiveness. Observations and recommendations are presented in four broad areas:

- System-level solutions to improve access;
- Organizational-level solutions to improve access;
- Solutions across all levels to meet surges in demand; and
- Ethical considerations for access.

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<sup>5</sup> Berenson RA. *Intensive Care Units: Clinical outcome, costs, and decision-making* (Health Technology Case Study). Office of Technology Assessment, U.S. Congress, OTA-HCS-28. Washington DC, U.S. Government Printing Office, November 1984.



## **SYSTEM-LEVEL SOLUTIONS TO IMPROVE ACCESS<sup>6</sup>**

System-level solutions focus on initiatives that improve the efficient and effective functioning of critical care across the whole system. These initiatives include:

- A system of critical care networks;
- Critical care services and patients categorised by level of acuity; and
- A patient transfer system.

### **BACKGROUND**

#### **A System of Critical Care Networks and Levels of Critical Care Acuity**

Many jurisdictions have identified system-level solutions that use network arrangements and levels of critical care to improve access to critical care services. These include the United Kingdom's Department of Health, the Welsh planning region, the American Society of Critical Care Medicine, and the Ontario Working Group on Critical Care. Each of these is briefly described.

The United Kingdom's Department of Health launched a review of adult critical care services in April 1999.<sup>7</sup> The recommended framework for the future organization and delivery of critical care included integrated networks made up of several National Health Service Trusts. Members of each network were expected to work with common standards and protocols, provide a comprehensive range of critical care services, and take responsibility for all critically ill patients in all specialties within a geographic area. This approach enabled hospitals within a network to make more flexible use of their critical care beds and communicate their needs to each other. Currently, every critical care facility in the UK is part of a network.

The UK framework also incorporated a classification of critical care patients based on the level of care they need. The four-level classification ranges from a low level of care (i.e., patients whose needs can be met through normal ward care in an acute hospital) to a high level of care (i.e., patients who require advanced respiratory support alone or basic respiratory support together with the support of at least two organ systems). This classification is supplemented by nine additional codes that identify the need for specialist investigation and treatment (e.g., neurosurgical care, cardiac surgical care, thoracic surgical care, etc.).

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<sup>6</sup> This section was informed by the following reports commissioned for the Ontario review (see Appendix C). 1) *Backgrounder: Toward Establishing Levels of Critical Care in Ontario, and Draft Recommendations: Establishing Levels of Critical Care in Ontario Based on Patient Acuity* (Authored by Robert McKay). 2) *Definition of a Critical Care Bed by Different Jurisdictions: A Literature Review* (Authored by Greg Lowe). 3) *Literature Review on the Patient Population in ICUs* (Authored by Greg Lowe). 4) *Report on Critical Care Performance Measurement and Accountability* (Authored by Michael P. Hillmer and Andrea Hill).

<sup>7</sup> Department of Health, National Health Service (UK), *Comprehensive Critical Care: A Review of Adult Critical Care Services*. May 2000.

The second example – the Welsh planning region – built on the UK Department of Health framework tailored to the local planning region.<sup>8</sup> After a study that found a significant imbalance between the need and provision of critical care services in Wales, the All Wales Critical Care Development Group recommended five levels of adult general critical care with supplementary specialist classifications.

The third example – the American Society of Critical Care Medicine – developed guidelines identifying types of hospitals, the range of services each type should provide, and the conditions for transferring patients to higher level care sites.<sup>9</sup> Levels of patient acuity and three levels of critical care facilities were outlined, forming the basis of a wide range of guidelines (e.g., physician management structure, requirements for healthcare personnel training, nursing, pharmacy and laboratory services).

Finally, in 1991, the Ontario Working Group on Critical Care proposed a three dimensional regional planning model for critical care services.<sup>10</sup> This model classified patients into four types, health care facilities into four levels according to their case mix, and hospitals according to their teaching status. Underpinning this model was a decentralized and vertically integrated structure that recognized organizational mechanisms at the local, district, regional and provincial levels.

### **A Patient Transfer System**

An effective patient transfer system is an essential element for improving access to critical care services. Critically ill patients need to be transferred to the most appropriate hospital to meet their needs, and transferred back to a less resource-intensive, local hospital when a lower level of care is required.

The challenges of implementing an effective transfer system to improve access to healthcare services in Ontario have been well documented.<sup>11</sup> In response to these challenges, the Ontario Ministry of Health and Long-Term Care struck a Land Ambulance Acute Transfers Task Force in 2004 to review land ambulance and inter-facility transfer arrangements, and recommend short- and long-term solutions for improvement.<sup>12</sup> One focus of the task force's deliberations is the impact of Ontario's Local Services Realignment policy instituted in January 1, 2001. This policy transferred the responsibility for providing land ambulance services from the province to municipalities. The province maintained responsibility for regulating the ambulance system, providing air ambulance services, and dispatching municipal land ambulance

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<sup>8</sup> *Standards for Adult Critical Care in Wales: All Wales Critical Care Development Group*. September 2003.

<sup>9</sup> "Guidelines on critical care services and personnel: Recommendations based on a system of categorization of three level of care." *Crit Care Med* 2003; 31(11): 2677-83.

<sup>10</sup> *The Report of the Working Group on Critical Care in Ontario* (William Sibbald and James E. Calvin, Co-chairs), February 1991.

<sup>11</sup> See for example, the Ontario Hospital Association's, *Non-Emergency Ambulance Transfer Issues for Ontario's Hospitals*, September 2004.

<sup>12</sup> Land Ambulance Acute Transfers Task Force (Chair, Dr. Chris Mazza), report pending.

fleets. The provincial government and municipalities equally split the approved operating costs for land ambulances.

Traditionally, ambulances have been used in emergency and urgent situations, as well as for non-emergency transfers (e.g., patients transferred between hospitals for treatment; patients transferred from a hospital to a long-term care facility). Since the realignment policy, municipalities are increasingly using their ambulances for local emergency services rather than for patient transfers. This enables municipalities to respond to emergencies in a more timely fashion and helps them manage their costs. It also keeps ambulances nearby in the event of an emergency. If ambulances are transferring patients locally or across municipal boundaries, they are not available for emergencies. Furthermore, ambulance costs increase when patients are transferred out of the community to regional medical treatment centres, and then back again to their local community hospitals. In the wake of SARS and other new respiratory diseases (e.g., avian flu), new infection control standards have increased the time it takes to deal with each patient. This ties up ambulance crews and vehicles for longer periods of time, which further limits their availability for inter-facility transfers and puts additional pressure to respond to emergencies.

The demand for inter-facility patient transfers is increasing for a number of reasons.

- Hospital restructuring has resulted in fewer hospital sites and the centralisation of specialised services.
- Shorter lengths of stay in acute hospitals are possible – in part – due to more transfers to specialty rehabilitation hospitals and back to less specialised acute hospitals closer to home.
- The increase in Ontario’s long-term care bed capacity to meet the needs of the growing aging population is resulting in an increase in inter-facility transfers between these facilities and hospitals.
- The Ministry’s support for provincial health strategies in areas such as trauma, stroke, cardiac, paediatrics and neonatal care, has increased the demand for specialized institutional transfers.

The municipalities’ focus on emergency transfers in the face of increasing demands for inter-facility transfers is impacting on patient care and hospital operations. Some of these impacts include the following.

- Access to the appropriate level of care is being compromised. Anecdotal evidence suggests that hospitals are experiencing serious problems transferring high-risk patients between facilities. If critical care patients do not receive the right level of care, their outcomes will be negatively impacted.
- Hospitals and long-term care facilities are increasingly turning to unregulated medical transportation services to transfer non-emergency patients between facilities. There is no designated provincial funding to support these services, nor are they subject to provincial or municipal regulations, standards or operating policies for vehicles, personnel, and the care and treatment of patients. In the absence of standards and

regulations, patient safety and the risk of a patient’s medical condition deteriorating en route are major concerns.

- Patients who miss essential diagnostic and treatment appointments due to transfer delays may experience complications or adverse events.
- Sick patients who need to be transferred back to their local community hospital are being left “stranded” due to the lack of ambulance transportation to repatriate them back to their home community. These patients may continue to occupy a critical care bed that is needed for a patient who is really critically ill.
- Hospital staff and physicians who accompany patients may be stranded from their home hospital. Staff escorts are an added costs to hospitals that may have to pay overtime to escorts, as well as to staff who are needed to “backfill” the temporary vacancies.
- Air ambulance costs are increasing due to a greater reliance on air to transfer patients across municipal borders, and delays transferring patients from the air ambulance to specialised hospitals using land ambulances. Anecdotal evidence suggests that some air ambulance patients have waited unreasonably long to be transferred from the airport to hospitals. Complicating the issue is the fact that municipal land ambulance services are generally not equipped or trained to handle specialized transports.

## COMMITTEE’S OBSERVATIONS AND RECOMMENDATIONS

There is no shortage of system-level approaches to improve access to critical care services. After reviewing and discussing many of these approaches, the Committee identified three broad system-level solutions that it believes will improve access to critical care in Ontario. These solutions are the building blocks to improved efficiencies and effectiveness in critical care:

Establish a system of critical care networks of hospitals  
Categorize critical care services and patients by level of acuity.  
Develop an inter-facility patient transfer plan.

**System of Critical Care Networks**

**Services and Patients Categorized by Level of Acuity**

**An Inter-Facility Patient Transfer Plan**

Each of these solutions is described below.

### Establish a System of Critical Care Networks of Hospitals

Networks are formally integrated groups of organisations and providers working together with a common vision or goal. They encourage the sharing of ideas and problem solving, and help to make the health system or a particular clinical area more efficient and effective. Networks facilitate the integration of services within sectors and across the continuum of care.

The Committee believes that critical care networks of hospitals need to be established in Ontario. Each network should:

- Have a range of services that may include, but not be limited to, a cardiac centre (with cardiac surgery and interventional cardiology), a neurosurgical centre, a trauma centre, renal/dialysis capability, mechanical ventilator support, and obstetrics and gynaecology services.
- Have standards and protocols for patient transfers between hospitals. This is especially important in more northern, rural and remote areas where highly specialized facilities and staff may not be available, and distances complicate the transfer of patients.
- Have well-defined roles and responsibilities for each provider that are outlined in accountability agreements.
- Designate a lead critical care clinician for administrative purposes.

The Committee believes that critical care networks should respect the boundaries of the Local Health Integration Networks (LHINs), recognising that a number of LHINs may need to partner to provide the range of service noted above. Network-level planners should focus on managing critical care resources with the goal to attain as high a degree of self-sufficiency within each critical care network as possible. Transfer agreements within and between critical care network will help promote greater accessibility, and ensure that patients receive the appropriate level of care.

The Committee recommends that:

**R1 Adult critical care networks be established in Ontario using the boundaries of the Local Health Integration Networks (LHINs). Each critical care network should have a range of services that may include, but not be limited to, a cardiac centre (with cardiac surgery and interventional cardiology), a neurosurgical centre, a trauma centre, renal/dialysis capability, mechanical ventilator support, and obstetrics and gynaecology services. A number of LHINs may need to partner to achieve these service levels. The roles and responsibilities of providers within each critical care network should be well-defined and outlined in accountability agreements. Furthermore, all networks should have standards and protocols for patient transfers between hospitals, attempt to have as high a degree of self-sufficiency as possible, and be guided by a lead critical care clinician for administrative purposes.**

The establishment of adult critical care networks can benefit from the work of the Ontario Paediatric Critical Care Network (PCCN). The role of this organisation is to lead the development of a coordinated system for the delivery of paediatric critical care services. In the fall of 2004, PCCN completed an analysis of current referral patterns and utilisation of paediatric critical care in Ontario. The goal was to determine catchment area boundaries and the implications of these boundaries for paediatric critical care services. The development of adult critical care networks should recognise and capitalise

on the analytical work conducted by PCCN. Indeed, there may be opportunities to work together towards common solutions.

### **Categorize Critical Care Services and Patients by Level of Acuity**

Currently, critical care is provided in a wide range of hospital settings including general ICUs, specialized ICUs, and stepdown or intermediate units (also known as enhanced care). Large hospitals frequently have multiple ICUs or critical care centres that are separated and defined by speciality or sub-speciality practices. Small hospitals may only have one ICU designed to care for a large variety of critically ill patients, including adult and paediatric populations. The critical care services that each hospital provides have evolved due to such things as the size of the facility, community need, hospital priorities, physician and staff availability and interest, hospital funding, and available services in the region. This ad hoc method of responding to the need for critical care resources has contributed to confusion about what services are available and where, and concerns about the standards of practice and care across the province.

The Committee believes that categorizing critical care services by level of acuity would clarify the scope of each hospital's critical care business. Furthermore, it would help determine the appropriate level of resources needed to provide care and help establish parameters for the level of care that each hospital is reasonably expected to provide. Ultimately, access to quality care will be improved due to uniform standards of practice across hospitals.

In addition, categorizing critically ill patients by their level of acuity would help identify the level of care and resources that each patient requires. The concept of patient severity is not new in healthcare. Indeed, patient severity has been used to determine the level and type of human, financial and technological resources a hospital needs, the services it should provide, and the guidelines and care pathways needed to provide safe quality care.

The Committee recommends that

**R2 The Ministry of Health and Long-Term Care categorize critical care services and patients by level of acuity ranging from most acute (Level 3) to least acute (Level 1).**

The table below presents the level of critical care services and patients, by recommended elements. This categorization is relatively consistent with those used by other jurisdictions (e.g., National Health Service in the UK).

**Level of Critical Care Services and Patients, by Recommended Elements**

<b>Level of Acuity</b>	<b>Recommended Elements</b>
<b>Level 3</b>	<ul style="list-style-type: none"> <li>• Service to meet the needs of patients who require advanced or prolonged respiratory support alone, or basic respiratory support together with the support of at least two organ systems.</li> </ul>
<b>Level 2</b>	<ul style="list-style-type: none"> <li>• Service to meet the needs of patients who require more detailed observation or intervention including support for a single failed organ system, short-term ventilation, post-operative care, or patients “stepping down” from higher levels of care.</li> <li>• Patient transfer agreements and patient stabilization/transfer protocols to transfer patients to a Level 3 service.</li> <li>• Management may involve remote support provided in collaboration with a Level 3 service (e.g., telemedicine, eICU).</li> </ul>
<b>Level 1</b>	<ul style="list-style-type: none"> <li>• Service to meet the needs of patients at risk of their condition deteriorating, or those recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from a critical care team.</li> <li>• Patient transfer agreements and patient stabilization/transfer protocols to transfer patients to a Level 2 or 3 service, as required.</li> <li>• Management may involve remote support provided by a Level 3 service (e.g., telemedicine, eICU).</li> </ul>

**Develop an Inter-Facility Patient Transfer System**

The Committee believes that an effective patient transfer system is an essential element for improving access to critical care services. This includes transferring critically ill patients to the most appropriate hospital to meet their needs, as well as transferring patients to another hospital for ongoing care once the critical episode is over. Patients who are in critical care beds and do not need to be, block access for other critically ill patients, and contribute to increased waiting times for surgery when post-operative critical care is needed.

Ontario’s ambulance system needs to reflect the different types of patient transfers, and provide the appropriate support to each level. Municipalities appear to be meeting the need for local emergency (911) transport. The issue of concern for critical care is patient transfers between facilities. The Ministry is to be commended for striking the Land Ambulance Acute Transfers Task Force to examine this issue. The increasing use of unregulated medical transportation services and the potential risks to a patient’s health and safety, delays in obtaining essential care, sick patients awaiting transfer back to their local community hospital, and hospital staff and physician escorts being stranded and less likely to want to escort patients, are impediments to a seamless continuum of critical care services.

The Committee recommends that:

- R3 The Ministry of Health and Long-Term Care develop a provincial inter-facility patient transfer plan that supports timely access to a seamless continuum of critical care services. The plan should be coordinated and operated as a provincial system, be sensitive to regional needs, and be resourced appropriately.**



## **ORGANIZATION-LEVEL SOLUTIONS TO IMPROVE ACCESS (CRITICAL CARE MANAGEMENT, MEDICAL EMERGENCY TEAMS, TELEMEDICINE, E-ICU AND CHRONIC VENTILATION)<sup>13</sup>**

### **BACKGROUND**

Various organization-level solutions have been used to help improve access to critical care. Some of these improve access within a hospital's walls while others improve access by groups of hospitals working in partnership with each other.

#### **Critical Care Accountability and Management Within Hospitals**

A large body of literature demonstrates that the management of critical care areas impacts on access, patient outcomes, mortality rates, costs and lengths of stay. Two main approaches for organizing ICUs have been identified.<sup>14</sup> In the "open" model, patients are admitted to the ICU and managed under the primary care of their primary physician, with or without consultation of an intensivist. In the "closed" model – also known as the intensivist-led model – the intensivist directs the care of all patients admitted to the ICU. The intensivist is also responsible for all admission and discharge decisions for the ICU. In a hybrid model – the "semi-closed" model – the intensivist manages ICU care in close collaboration with the primary admitting physician.

Evidence from a recent meta-analysis and the literature reviews conducted for this review suggest that an ICU model of care that includes the input of a physician trained and experienced in critical care (i.e., an intensivist) is associated with improved patient and hospital outcomes.<sup>15</sup> Improvements are evident in reduced complications, lower hospital mortality, reduced lengths of stay in the ICU and the hospital, and lower costs due to reduced stays.

Effective management of critical care resources is particularly important when units are filled to capacity and access becomes a significant problem. When demand exceeds supply, there is benefit to having one person, in cooperation with physician/ICU directors, have access to all critical care units with the responsibility and authority to

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<sup>13</sup> This section was informed by the following reports commissioned for the Ontario review (see Appendix C). 1) *Intensivist Management of the Intensive Care Unit: A Literature Review* (Authored by Andrea Hill). 2) *Alleviating the Shortage of Critical Care Health Human Resources* (Authored by Marsha Pinto). 3) *Literature Review of ICU Admission and Discharge Practices* (Authored by Marsha Pinto).

<sup>14</sup> Carlson RW, Haupt MT. "Organization of critical care services." *Acute Care* 1987; 13:2-43.

<sup>15</sup> Pronovost PJ, Angus DC, Dorman T, Robinson KA, Dremsizov TT, Young TL. "Physician staffing patterns and clinical outcomes in critically ill patients: a systematic review." *JAMA* 2002; 288: 2151-2162. Studies authored for this review (see Appendix C): *Intensivist Management of the Intensive Care Unit: A Literature Review* (Authored by Andrea Hill). *Alleviating the Shortage of Critical Care Health Human Resources* (Authored by Marsha Pinto).

admit and discharge patients from these units. Although research supports an intensivist-led model for ICU care, appropriate and sufficient funding and professional issues have hampered widespread implementation of an intensivist-led model.

### **Improving the Flow of Patients Within and Between Hospitals**

There are a number of initiatives that can improve patient flow between and within hospitals and, thereby, result in improved access to critical care services. These include medical emergency teams, telemedicine, electronic ICUs, and chronic ventilation.

#### ***Medical Emergency Teams<sup>16</sup>***

Medical Emergency Teams (METs) are made up of experienced healthcare professionals who provide critical care expertise beyond the walls of the traditional ICU. METs may be called at any time by anyone in the hospital to help care for a patient who appears acutely ill and in danger of an adverse event. METs help to increase critical care education throughout the hospital, and thereby increase the safety and quality of patient care. These teams enable critically ill patients to access safe and appropriate care when they need it, regardless of where they are physically located in the hospital. METs also help shape demand by minimizing inappropriate utilization of critical care units and providing preventive measures before patients become critically ill. Teams provide continuity of care and help prevent readmission by following up with patients after they have been discharged from the ICU.

METs can play an important role in minimizing the admission of patients who are either too well or too sick to benefit from intensive care. Rosenthal et al. found that a substantial proportion of patients admitted to the ICU have a very low likelihood of death and may not require ICU care.<sup>17</sup> Similarly, critical care units have served as comfort units for the terminally ill and short-stay transition units for post-surgical and post-procedural patients. A study of 26 French ICUs found that 26.1% of admitted patients had brain death, a persistent vegetative state, or diagnoses generally believed to leave little or no hope of improvement with intensive care.<sup>18</sup>

METs can use sound admission and discharge criteria to identify patients who will receive the most benefit from intensive care. One study found that the use of appropriate admission criteria contributed to a reduction in the number of low-risk patients admitted to critical care units by as much as 20% and up to 35%.<sup>19</sup>

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<sup>16</sup> Medical Emergency Teams are also known as Rapid Response Teams and Outreach Teams.

<sup>17</sup> Rosenthal G, Sirio C, Shepardson L, Harper D, Rotondi A, Cooper G. "Use of Intensive Care Units for Patients with Low Severity of Illness." *Archives of Internal Medicine* 1998; 158(10): 1144-1141.

<sup>18</sup> Azoulay E, Pouchard F, Chevret S, Vinsonneau C, Garrouste M, Cohen Y, Thuong M, Paugam C, et al. "Compliance with triage to intensive care recommendations." *Critical Care Medicine* 2001; 29(11): 2132-36.

<sup>19</sup> Dlugacz et al. "Expanding a performance improvement initiative in critical care from hospital to system." *Jt Comm J Qual Improv* 2002; 28(8): 419-434.

Research has shown that hospitals with METs reduced the number of cardiac arrests and deaths, and the number of ICU and hospital bed days among cardiac arrest survivors.<sup>20</sup> Furthermore, the use of METs for surgical patients has been associated with a reduction in the incidence of respiratory failure, stroke, severe sepsis, and acute renal failure, as well as a reduction in the number of ICU admissions, length of stay and postoperative mortality.<sup>21</sup>

### ***Telemedicine***

Telemedicine is “the use of medical information exchanged from one site to another via electronic communication for the health and education of the patient or health care provider and for the purpose of improving health care.”<sup>22</sup> Telemedicine supports the dissemination of critical care knowledge and expertise to remote locations so that Ontarians can benefit from critical care expertise that is not available locally. Telemedicine also promotes best practices. It has been recommended and used to provide clinical expertise to ICU patients with positive results.<sup>23</sup>

### ***Electronic Intensive Care Units (eICUs)***

The electronic intensive care unit or eICU is a new model of telemedicine that enables highly specialized critical care staff – such as nurses and physicians – to monitor patients admitted to critical care elsewhere in the province, and provide continuous support to clinical staff in “remote” units. The eICU uses telecommunication technologies, clinical information systems, care protocols, and best practices to leverage the limited supply of critical care providers over more patients and multiple locations. The eICU also supports continuity of care 24/7 where appropriate medical coverage is lacking.

Rosenfeld et al. published the first report of around-the-clock remote intensivist telemedical care to adult ICU patients.<sup>24</sup> The study ICU was a 10-bed surgical and trauma unit in an academic affiliated community hospital with a consulting intensivist. Compared with two baseline control periods, 24/7 remote management resulted in the following outcomes: i) APACHE II severity-adjusted ICU and hospital mortality decreased by 60% and 30% respectively; ii) severity-adjusted ICU length of stay and cost both decreased 30% and; iii) ICU complications decreased 40%. The efficacy of the intervention demonstrated that off-site intensivists can deliver effective ICU care, and

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<sup>20</sup> Buist MD, Moore GT, Bernard SA, Waxman BP, Anderson JN, Nguyen TV. “Effects of a medical emergency team on reduction of incidence of and mortality from unexpected cardiac arrests in hospital; preliminary study.” *BMJ* 2002; 324: 387-390. Bellomo R, Goldsmith D, Uchino S et al. “A prospective before-and-after trial of a medical emergency team.” *MJA* 2003; 179: 283-287.

<sup>21</sup> Bellomo R, Goldsmith D, Uchino S et al. “Prospective controlled trial of effect and medical emergency team on postoperative morbidity and mortality rates.” *Crit Care Med* 2004; 32: 916-921.

<sup>22</sup> American Telemedicine Association <http://www.atmeda.org> (2001).

<sup>23</sup> Breslow MJ. “ICU telemedicine. Organization and communication.” *Crit Care Clin* 2000; 16:707-7xi. Celi LA, Hassan E, Marquardt C, Breslow M, Rosenfeld B. “The eICU: it's not just telemedicine.” *Crit Care Med* 2001; 29: N183-N189.

<sup>24</sup> Rosenfeld B, Dorman T, Breslow M, Pronovost P, Jenckes M, Zhang N, Anderson G, Rubin, H. “Intensive care unit telemedicine: Alternate paradigm for providing continuous intensivist care.” *Critical Care Medicine* 2000; 28(12): 3925-31.

suggested that remote care models can improve clinical outcomes when continuous on-site intensivist coverage is not available.

The eICU presents a number of challenges including patient confidentiality, a non-traditional patient-physician relationship, the need to develop virtual provider teams, the need to obtain clinical privileges at remote sites, and provider liability. It has been suggested that the dominant obstacles for the future are cost and physician resistance.<sup>25</sup> Software licensing fees, technology management, and sufficient personnel to staff the eICU contribute to costs. Evidence suggests, however, that these costs are more than offset by hospital savings due to avoidable ICU days, reduced ancillary services, cost-effective drug utilization, and improved nursing job satisfaction. Physician resistance stems from the belief of some physicians that there is nothing to fix and that they should be autonomous when providing care.

### ***Chronic Ventilation***

Care in critical care units should be reserved for patients who require critical care services to improve. The audit conducted for this review indicated that Level 3 critical care beds in Ontario are being used by patients who are not critically ill but need long-term mechanical ventilation (e.g., patients with spinal cord injury or neuromuscular disease who need assistance to breathe). The audit suggested that the greatest need for chronic ventilatory beds is in the central Ontario corridor, ranging from Barrie in the north, Oshawa in the east, Mississauga in the west and the southernmost parts of the Greater Toronto Area in the south.

## **COMMITTEE’S OBSERVATIONS AND RECOMMENDATIONS**

The Committee identified a number of organization-level solutions to improve access, which include:

- Instituting a critical care management and accountability model within hospitals; and
- Improving the flow of patients within and between groups of hospitals using medical emergency teams, telemedicine, eICUs and chronic ventilation.

### **Instituting a Critical Care Accountability and Management Model Within Hospitals**

The Committee identified the need for a system of accountability for critical care resources in the hospital. Currently, critical care resources – ranging from high intensity beds to enhanced care/intermediate care beds – may not be perceived as being a hospital-wide resource. Anecdotal evidence suggests that this impacts on the ability of a hospital to use all its critical care resources as efficiently and effectively as possible, and may compromise patient access to critical care.

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<sup>25</sup> Celi LA, Hassan E, Marquardt C, Breslow M, Rosenfeld B. “The eICU: It’s not just telemedicine.” *Critical Care Medicine* 2001; 29(8): 183-9.

The Committee believes that there should be a single point of accountability for a hospital's critical care areas and a unified approach to the utilization of critical care resources. This includes developing admission and discharge criteria, prioritizing patients, matching resources to priorities, and defining and tracking quality, safety and performance indicators. A single point of accountability would improve access to services, the flow of patients, and the efficient and effective use of resources. There are various options for a single point of accountability including, but not limited to, having all of a hospital's critical care areas reporting to one hospital program or a single senior manager, or liaising through a critical care committee of the Board or Medical Advisory Committee.

The Committee recommends that:

**R4 Hospitals improve access to critical care services, the flow of patients, and the efficient and effective use of resources by establishing a single point of accountability for all of a hospital's critical care areas, and a unified approach to the utilization of critical care resources regardless of acuity level.**

With regard to critical care management, the positive impacts of an intensivist-led ICU management model are compelling. Research has shown that effective management of critical care resources improves access, quality and patient safety, and results in a more effective and efficient use of resources that match patient need.

The Committee believes that hospitals capable of providing Level 3 care should have an intensivist coordinate access to and be the most responsible physician for critical care in these units. For units with a maximum Level 2 capability, one person – ideally an intensivist or a specialist with intensivist training or experience – should coordinate access and be the most responsible physician.

The Committee recommends that:

**R5 Ontario hospitals manage their critical care resources using an intensivist-led management model. An intensivist should coordinate access to and be the most responsible physician for critical care in units capable of providing Level 3 care. For units with a maximum capability of Level 2 care, one person – ideally an intensivist or a specialist with intensivist training or experience – should coordinate access to and be the most responsible physician for these units. The most responsible physician should ensure timely patient flow in and out of critical care, and be accountable for the appropriate use of resources by level of care.**

There are a number of examples in Ontario of the successful development of an intensivist-led model of critical care.<sup>26</sup> Experience indicates that appropriate financial incentives, additional training and experience, clear roles and responsibilities, and sufficient medical and hospital staff are important success factors for successful implementation.

The table below presents a detailed critical care clinical management model, by size of critical care unit and recommended elements. The following are key considerations to support this model:

- ***The definition of an intensivist*** – Ideally, an intensivist is defined as having Royal College accreditation or equivalent training in critical care medicine. Recognizing that there are human resource issues and that this is a relatively new accredited specialty, specialists with at least a minimum of six post-graduate months of critical care training or experience, or training appropriate to the patients being cared for, are a reasonable alternative. This is especially appropriate for sub-speciality ICUs such as coronary care, cardiac surgery, trauma, neurosurgery and others.
- ***The number of intensivists to support a large intensivist-led unit (14+ beds)*** – The number of intensivists needed to support an intensivist-led unit, while providing a quality of life that is acceptable for recruiting and retaining these individuals, is debatable. The table below presents a range since the number required will vary by type of hospital. For example, in large units of 14 beds or more, a teaching facility with skilled residents and fellows available 24/7 could probably function with four full-time intensivists working 1:4. Large non-teaching units without residents and fellows will need additional intensivists to provide 24/7 coverage, probably in the magnitude of 5-8 intensivists. An alternate off-hour coverage plan could also be created.
- ***Responsibilities of full-time intensivists*** – A full-time intensivist should be solely responsible for no more than 12-16 beds at a time. Larger units will need to ensure quality physician coverage while honouring the premise that a full-time intensivist should generally provide coverage on a 1:4 basis to a 12-16 bed unit.
- ***To support implementation*** – The following need to be in place to support implementation:
  - Additional training – Additional training to support physicians should use a targeted approach that includes the Society of Critical Care Medicine’s FCCS course or equivalent (core knowledge), procedural skills training (simulation/ACES course) and a critical care leadership/management skills package.
  - Appropriate Physician Funding – In the absence of an alternate funding plan (AFP), it may be difficult for physicians who are paid fee-for-service and working as intensivists in an intensivist-led model to generate a competitive income with less than 12 beds. Physicians in hospitals with fewer beds and working towards an

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<sup>26</sup> For example, see *Proposal for the Development of a Critical Care Department and Comprehensive Critical Care Unit: Thunder Bay Regional Hospital*. Dr. Michael Scott, November 2003.

intensivist-led model may need to be supported with alternate payment methods. The development of an appropriate and flexible funding model for intensivists is a key requirement to support this model.

**Critical Care Clinical Management Model by Size of the Critical Care Unit and Recommended Elements**

Size of the Critical Care Unit	Recommended Elements
<b>14 Beds or More</b>	
<ul style="list-style-type: none"> <li>• Level 3 patients</li> <li>• Mechanical ventilation capability</li> </ul>	<ul style="list-style-type: none"> <li>• A full-time Intensivist Medical Director who is:                             <ul style="list-style-type: none"> <li>• Responsible for overseeing all clinical and admission/discharge decisions for the unit, in consultation with expert sub-specialties, where necessary.</li> <li>• Dedicated to the unit.</li> </ul> </li> <li>• Minimum of 4-6 Intensivists providing 24/7 coverage (minimum varies depending on the availability of residents and fellows, and alternate off-hour coverage using other clinical staff).</li> <li>• Intensivists should have no other clinical responsibilities while covering the unit.</li> </ul>
<ul style="list-style-type: none"> <li>• Level 2 patients</li> <li>• Mechanical ventilation capability</li> </ul>	<ul style="list-style-type: none"> <li>• A full-time Medical Director who is, ideally, an Intensivist or a subspecialist with Intensivist training and is:                             <ul style="list-style-type: none"> <li>• Responsible for overseeing all clinical and admission/discharge decisions for the unit, in consultation with expert sub-specialties, where necessary.</li> <li>• Dedicated to the unit.</li> </ul> </li> <li>• Minimum of 4-6 Intensivists providing 24/7 coverage (minimum varies depending on the availability of residents and fellows, and alternate off-hour coverage using other clinical staff).</li> <li>• Intensivists should have no other clinical responsibilities while covering the unit.</li> <li>• Partnering arrangements with units that have Level 3 capability – either within a hospital that has multiple critical care units or with a Level 3 centre – to transfer or manage Level 3 patients.</li> </ul>
<b>9-13 Beds</b>	
<ul style="list-style-type: none"> <li>• Maximum Level 3 patients</li> <li>• Mechanical ventilation capability</li> </ul>	<ul style="list-style-type: none"> <li>• Formally trained Intensivist Medical Director who is:                             <ul style="list-style-type: none"> <li>• Responsible for overseeing all clinical and admission/discharge decisions for the unit, in consultation with expert sub-specialties, where necessary.</li> <li>• Dedicated to the unit.</li> </ul> </li> <li>• Group of specialists providing care and reporting to the Medical Director.</li> </ul>
<ul style="list-style-type: none"> <li>• Maximum Level 2 patients</li> <li>• Mechanical ventilation capability</li> </ul>	<ul style="list-style-type: none"> <li>• A Medical Director who is, ideally, an Intensivist or a subspecialist with Intensivist training and is:                             <ul style="list-style-type: none"> <li>• Responsible for overseeing all clinical and admission/discharge decisions for the unit, in consultation with expert sub-specialties, where necessary.</li> <li>• Dedicated to the unit.</li> </ul> </li> <li>• Group of specialists providing care and reporting to the Medical Director.</li> </ul>

Size of the Critical Care Unit	Recommended Elements
	<ul style="list-style-type: none"> <li>Partnering arrangements with units that have Level 3 capability – either within a hospital that has multiple critical care units or with a Level 3 centre – to transfer or manage Level 3 patients.</li> </ul>
<b>5-8 Beds</b>	
<ul style="list-style-type: none"> <li>Level 3 patients</li> <li>Mechanical ventilation capability</li> </ul>	<ul style="list-style-type: none"> <li>Formally trained Intensivist Medical Director who is:                             <ul style="list-style-type: none"> <li>Responsible for overseeing all clinical and admission/discharge decisions for the unit, in consultation with expert sub-specialties, where necessary.</li> </ul> </li> <li>Partnering arrangements within a hospital that has multiple critical care units.</li> <li>Partnering arrangements with larger centres with dedicated intensivists who could provide off-site expertise through management protocols, telemedicine consults and eICU, with in-house physician coverage not dedicated to the ICU.</li> </ul>
<ul style="list-style-type: none"> <li>Level 2 patients</li> <li>Mechanical ventilation capability</li> </ul>	<ul style="list-style-type: none"> <li>A Medical Director who is, ideally, an Intensivist or a subspecialist with Intensivist training and is:                             <ul style="list-style-type: none"> <li>Responsible for overseeing all clinical and admission/discharge decisions for the unit, in consultation with expert sub-specialties, where necessary.</li> </ul> </li> <li>Partnering arrangements with units that have Level 3 capability – either within a hospital that has multiple critical care units or with a Level 3 centre – to transfer or manage Level 3 patients.</li> </ul>
<b>Less Than 5 Beds</b>	
<ul style="list-style-type: none"> <li>Level 2 patients</li> </ul>	<ul style="list-style-type: none"> <li>In the event that these units have Level 3 patients, they should be transferred as soon as possible to hospitals with the facilities and staff capable of caring for Level 3 patients.</li> <li>Intensivist medical director or medical director with training or experience in critical care.</li> <li>Partnering arrangements with larger centres with dedicated intensivists who could provide off-site expertise through management protocols, telemedicine consults and eICU, with in-house physician coverage not dedicated to the ICU.</li> </ul>

## Improving the Flow of Patients Within and Between Groups of Hospitals

### *Medical Emergency Teams*

Medical Emergency Teams (METs) have been shown to be an effective way to improve patient outcomes and decrease the use of critical care resources. The Ministry of Health and Long-Term Care has funded an 18-month pilot project to evaluate the use of critical care METs in Ontario hospitals. Four hospitals have received funding (University Health Network in Toronto in partnership with Oakville-Trafalgar Hospital, and The Ottawa Hospital in partnership with the Queensway-Carleton Hospital). The goal of the teams is to provide 24 hour coverage by responding to potentially critically ill patients in the hospital who are not in critical care units. The teams will also follow up patients discharged from the ICU. The four hospitals are designing their teams in response to



local circumstances. Some teams will be comprised of a physician, attending or fellow in critical care medicine and a critical care nurse, other teams will be nurse-driven, whereas others will be a hybrid model.

The Committee commends the Ministry for supporting the development of METs, and encourages the Ministry to provide stable ongoing funding to support these teams, and additional funding to expand these teams to other hospitals in Ontario, subject to the results of the evaluation.

The Committee recommends that:

**R6 The Ministry of Health and Long-Term Care provide stable ongoing funding to support the Medical Emergency Team pilots and additional funding to expand the pilots to include other hospitals in Ontario, subject to the results of the evaluation.**

### *Telemedicine*

Telemedicine is an enabling strategy that transports critical care knowledge and expertise to providers in other locations throughout the province. Simply put, telemedicine helps scarce resources go further. Recently, the Ministry funded a 24-month demonstration project that uses telemedicine resources to disseminate critical care best practices. The overall goal is to improve quality, enhance patient safety, and improve access to critical care. Sunnybrook and Women's College Health Sciences Centre in Toronto is the project lead with 12 additional participating hospitals. The Committee commends the Ministry for funding this important initiative.

### *Electronic Intensive Care (eICU)*

The eICU supports access to safe critical care expertise for patients in small and medium-sized hospitals, in rural and remote areas of the province, and in any facility that lacks continuous on-site coverage for critical care. This benefit is not limited to one facility since critical care physicians can monitor and care for patients at multiple locations simultaneously. The eICU can also be used to network with other facilities in the same critical care network, enabling organizations to pool their resources and allow for a single intensivist to monitor patients in all hospitals. Rural hospitals that do not have critical care physicians or staff can also use the eICU to network with tertiary care centers for intensivist coverage. This would enable patients to stay in their local community hospital, and close to family supports.

Currently, the Ministry is considering a proposal to conduct a three-year demonstration project of eICU technology in remote hospitals. The project and evaluation will determine if this approach to caring for critically ill patients contributes to an improved system of critical care services in the province.

The Committee recommends that:

- R7 The Ministry of Health and Long-Term Care fund the proposal to conduct a three year demonstration project of electronic ICU technology in remote hospitals.**

### *Chronic Ventilation*

The Committee is concerned about the number of long-term ventilated patients in Ontario ICU beds who do not require ongoing critical care support. Maintaining these patients in critical care beds limits access to critical care for Ontarians who may need it, and is an inefficient and inappropriate use of valuable healthcare resources. In addition, this situation has a detrimental effect on the quality of life of these patients. Long-term ventilated patients receive better quality care when they are treated by a healthcare team experienced with meeting their unique needs.

An immediate way to enhance the capacity of critical care resources in Ontario is to increase the number of chronic ventilatory beds. The audit conducted for this review suggests that the greatest need for these beds is in the central Ontario corridor from Barrie in the north, Oshawa in the east, Mississauga in the west and the southernmost parts of the GTA in the south). It appears that siting beds in this area as a priority investment will ensure that chronic ventilated patients are located close to home and can receive family support which will, in turn, have a positive impact on outcomes and quality of life. Siting in this area will also build on established chronic ventilatory programs in a timely fashion.

In addition to beds, there is a need to support expanded chronic ventilatory services such as home ventilation assessment and training for persons living in the community. The Committee notes that the Ministry is establishing an expert panel to review the current utilisation and future needs of chronically ventilated patients in Ontario. It is expected that this panel will explore solutions to meet the needs of chronic ventilatory patients, especially in the long run.

The Committee recommends that:

- R8 The Ministry of Health and Long-Term Care enhance the capacity of critical care resources in Ontario by increasing the number of chronically ventilated beds in Ontario in a timely fashion. These beds should be sited where the need is the greatest. In addition, the Ministry should support the expansion of innovative chronic ventilatory services such as home ventilation to meet the needs of these patients.**

## **SOLUTIONS ACROSS ALL LEVELS TO MEET SURGES IN DEMAND<sup>27</sup>**

### **BACKGROUND**

Severe Acute Respiratory Syndrome (SARS) highlighted the weaknesses of critical care services in Ontario, one of which was the inability of the system and individual hospitals to respond appropriately to surges or sudden demands for services when access is compromised. Moreover, SARS highlighted the importance of a seamless continuum of care between the community, emergency department, critical care units and hospital wards.

In 2003, after the SARS crisis was “over”, the Ministry focused on ways to mobilize critical care resources quickly in the event of another SARS outbreak or some other disaster. On January 23, 2004, the Ministry announced the Emergency Medical Assistance Team (EMAT), a mobile acute-care field unit consisting of 20 negative-pressure tents and 36 intermediate care beds. EMAT is fully-equipped with its own medical equipment and supplies, a communications centre, electricity and water. It is staffed by an on-call support team of healthcare professionals including physicians, paramedics, nurses, respiratory therapists and X-ray technologists who have volunteered to work on EMAT during an emergency. Each staff member is trained to manage major health emergencies. The staff ratio varies with the acuity of the patient.

EMAT can be sent to the aid of local communities with road access anywhere in Ontario, within 24 hours of an infectious disease outbreak, health emergency or other disaster. EMAT provides a staging and triage base for the evaluation and management of patients prior to being transported to a hospital. EMAT is integrated with land and air ambulance services so that patients can be transported to a hospital once that facility is able to accept them. EMAT can also isolate patients who have infectious diseases in a tent that filters the air at a level greater than national standards.

EMAT is only meant to be used in the event of a major surge or disaster. If any community in Ontario finds that it does not have the capacity to respond effectively to a health emergency, it can request that EMAT be sent. However, EMAT is deployed only after a community’s own disaster plan has been activated and the community’s systems are overwhelmed.

The literature presents various definitions of surge, most of which refer to major incidents or disasters that overwhelm the system. There are no clearly defined criteria for the levels of surge capacity, only response guidelines.<sup>28</sup>

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<sup>27</sup> This section was informed by the following report commissioned for the Ontario review (see Appendix C). 1) *International Benchmarks for Surge Capacity: Plans for Managing Demands on Critical Care Services* (Authored by Diane Wilson).

## COMMITTEE’S OBSERVATIONS AND RECOMMENDATIONS

Many members of the Steering Committee experienced the “SARS crisis” first hand. This experience highlighted the importance of developing an effective critical care system to accommodate major surges. In addition, the Committee recognized the need to develop a system to accommodate minor and moderate surges in critical care, as well. These have the ability to overwhelm individual hospitals and local areas, and negatively impact access to services. It is recognized that critical care units that operate at, or near, full occupancy may routinely experience surges or “bumps” in demand. At times, these increases may reflect minor surges that need to be managed consistently using well-defined processes that are outlined below.

Surges in critical care may have consequences for levels of care (e.g., staff to patient ratios) and the equipment used. Generally, as the magnitude of a surge increases, the level of care will change since available resources are being called upon to meet greater demands. Although all individual patients will continue to be assessed and cared for compassionately, access to care may be triaged to make the best use of resources for those most likely to benefit.

It is critical that surges be understood only as a temporary phenomenon. A surge is not a sustained slow increase that persists overtime and becomes a “new normal”. Rather, the recommendations for surge management are designed to be sustained for less than 60 days. In addition, the surge recommendations are not a disaster plan, rather they are consistent with the Ministry’s work on health system disaster planning.

In its deliberations, the Committee identified five major components that will vary depending on whether a surge is minor, moderate or major. These include:

- **Oversight:** Who is accountable for overseeing the surge situation?
- **Human Resources:** What is the most effective and efficient use of valuable human resources to meet the needs of patients, and how can specialized skills be sustained during times of normal operation?
- **Equipment and Technology:** How can technology be used to expand skills and knowledge as broadly as possible (e.g., digital radiography, tele/video consultation and eICU)?
- **Physical Plant:** How can physical space be maximized to meet the critical and acute care needs of the patient while being economically feasible?
- **Processes to Address Surges:** What processes should be followed to address each level of surge?

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<sup>28</sup> CNA Corporation (2004) *Medical Surge Capacity and Capability: A management for integrating medical and health resources in a large-scale emergency*. CN #233030028 Available at [http://www.cna.org/documents/mscc\\_aug2004.pdf](http://www.cna.org/documents/mscc_aug2004.pdf).

### **Minor Surge**

A minor surge is defined as an acute increase in demand for critical care services – ranging from 15-20% – localized to an individual hospital.

The Committee recommends that:

- R9** A minor surge in critical care be defined as an acute increase in demand for critical care services – ranging from 15-20% – that is localized to an individual hospital. A local hospital response should be sufficient to respond to minor surges, and individual hospital boards accountable for overseeing the surge response. A hospital’s acute care human resources – such as physicians, nurses, respiratory therapists and others – its critical and acute care supplies, and physical plant resources – including post-anaesthetic care units, emergency departments and intermediate units – should be sufficient to meet a minor surge. However, other hospital staff with additional acute and critical care training, and alternate space within the facility should be considered to help address the surge. A written checklist with processes to help address the surge situation should also be formally assessed.

### **Moderate Surge**

A moderate surge is defined as a larger increase in demand for critical care services that goes beyond individual hospitals and impacts on a Local Health Integration Network (LHIN) or critical care network.

The Committee recommends that:

- R10** A moderate surge in critical care be defined as a larger increase in demand for critical care services that impacts on a Local Health Integration Network (LHIN) or critical care network. Networks will respond to moderate surges, and be held accountable for overseeing the surge response. Acute care human resources – such as physicians, nurses, respiratory therapists and others – working within the LHINs or critical care networks should be sufficient to meet the surge and should be supported to travel to the area of need. Other hospital staff, with additional acute and critical care training, should be deployed to help address moderate surge. LHINs or critical care networks should stockpile specialized equipment and medications to meet moderate surges, and have a structured process for access and maintenance. Physical plant resources in a LHIN or critical care network will be sufficient to meet demand, however, the use of alternate space should be considered, prepared and equipped prior to a surge (e.g., post-anaesthetic care units, emergency departments, intermediate units, etc.). A written checklist with processes to help address the surge situation should also be formally assessed.

## Major Surge

A major surge is defined as an unusually high increase in demand that overwhelms the healthcare resources of individual hospitals and regions for an extended period of time. Major surge is explicitly defined using the deployment criteria for the Emergency Medical Assistance Team (EMAT).

The Committee recommends that:

**R11 A major surge in critical care be defined as an unusually high increase in demand that overwhelms the healthcare resources of individual hospitals and regions for an extended period of time. A major surge should be responded to provincially or nationally, with the participation of the Ontario Chief Medical Officer of Health, and with the Deputy Minister of Health and Long-Term Care having ultimate accountability. Human resource assistance should be provided by hospital staff across the province with additional acute and critical care training. Specialized equipment and medications should be stockpiled to meet major surges, be centrally stored in the province and have a structured process for access and maintenance (i.e., Emergency Medical Assistance Team (EMAT) and the Emergency Medical Unit). EMAT will provide additional physical plant resources and be deployed after a written checklist with processes to help address the surge situation is formally assessed.**

The table below presents each level of surge, outlines the level of response and presents the recommended oversight, human resource response, equipment and technology requirements, physical plant response, and processes to address the surge.

In a major surge, EMAT is deployed since a region is overwhelmed and has exhausted its ability to care for patients. EMAT is necessary since hospitals outside an affected region cannot be “emptied” in a timely manner to accommodate major surge. During the first 72 hours, hospitals outside the affected region should go through their major surge checklists since these facilities may be needed to care for patients after the first 72 hours of a major surge. Designated hospitals in a critical care network will take the most acutely ill patients, while EMAT manages the other patients in partnership with the remaining hospitals.

Currently, Ontario has only one EMAT. The Committee believes that there is a need to create additional EMATs to respond to major surges. These additional teams should enhance current EMAT resources by focusing on the care of patients with intermediate and major needs.

The Committee recommends that:

**R12 The Ministry of Health and Long-Term Care create additional Emergency Medical Assistance Teams (EMATs) to respond to major surges in Ontario.**

**Definition of Surge, Level of Response, Oversight, Human Resources, Equipment and Technology, Physical Plant and Processes to Address Surge, by Level of Surge**

<b>Elements</b>	<b>Minor Surge Individual Hospital Response</b>	<b>Moderate Surge Local Health Integration Network or Critical Care Network Response</b>	<b>Major Surge Provincial or National Response</b>
<b>Definition</b>	An acute increase in demand for critical care services – ranging from 15-20% – localized to an individual hospital.	A larger increase in demand for critical care services that impacts on a LHIN or critical care network.	An unusually high increase in demand that overwhelms the healthcare resources of individual hospitals and regions for an extended period of time. A major surge is explicitly defined using the deployment criteria for the Emergency Medical Assistance Team (EMAT). See Note 1.
<b>Level of Response</b>	A local response at the individual hospital level is sufficient.	An organized response at the LHIN or critical care network level is required.	An organized response at the provincial or national level is required.
<b>Oversight (Accountability)</b>	Individual hospital boards are accountable for overseeing the surge response.	LHINs or critical care networks are accountable for overseeing the surge response.	Ontario’s Chief Medical Officer of Health has powers in emergency situations, however, the Deputy Minister of Health and Long-Term Care is ultimately in charge.
<b>Human Resources</b>	Human resources working in the hospital’s critical care services will be sufficient to meet the surge. In some instances, more assistance may be provided by other hospital staff who have received additional acute and critical care training. All local staff who have volunteered and have been trained in EMAT will provide an excellent “pool” of human resources for the local hospital.	Human resources working in critical care services within hospitals of the LHIN or critical care network may be sufficient to meet demand. These staff will need to be mobile throughout the region. More assistance may be provided by other hospital staff who have received additional acute and critical care training. All local staff who have volunteered and have been trained in EMAT will provide an excellent “pool” of human resources for the local hospital.	Human resources that work in critical care services are insufficient to meet demand. More assistance will be provided by hospital staff across the province who have received additional acute and critical care training. All staff across the province who have volunteered and been trained in EMAT will provide an excellent “pool” of human resources.

Chapter 4: Access to Critical Care Through Greater Efficiencies and Effectiveness  
Solutions Across All Levels to Meet Surges in Demand

<b>Elements</b>	<b>Minor Surge Individual Hospital Response</b>	<b>Moderate Surge Local Health Integration Network or Critical Care Network Response</b>	<b>Major Surge Provincial or National Response</b>
<b>Equipment and Technology</b>	Supplies in critical and acute care services will be sufficient to meet demand.	<p>Supplies in critical and acute care services may be insufficient to meet demand. Specialized equipment and medications should be stockpiled to meet moderate surges. These caches should be centrally stored in the LHIN or critical care network, and have a structured process for access and maintenance.</p> <p>Technologies will be used to disseminate knowledge and skills as broadly as possible (e.g., digital radiography, tele/video consultation, eICU).</p>	<p>Supplies in critical and acute care services will not be sufficient to meet demand. Specialized equipment and medications should be stockpiled to meet major surges. These caches should be centrally stored in the province and have a structured process for access and maintenance. The existing capabilities of EMAT will provide much of this cache, complemented by the Emergency Management Unit.</p> <p>Technologies will be used to disseminate knowledge and skills as broadly as possible (e.g., digital radiography, tele/video consultation, eICU).</p> <p>EMAT has its own medical equipment and supplies.</p>
<b>Physical Plant</b>	Physical plant resources in the hospital will be sufficient to meet demand, however, the use of alternate space within the facility should be considered (e.g., post-anaesthetic care unit, emergency departments, intermediate units). It is necessary for hospitals to evaluate, prepare and equip this space prior to a surge event.	<p>Physical plant resources in a LHIN or critical care network will be sufficient to meet demand, however, the use of alternate space should be considered (e.g., post-anaesthetic care unit, emergency departments, intermediate units). It is necessary for LHINs or critical care networks to evaluate, prepare and equip this space prior to a surge event.</p> <p>A high degree of communication and</p>	<p>Physical plant resources in LHINs or critical care networks are not sufficient to meet demand. Additional physical plant resources are needed using EMATs.</p> <p>A high degree of communication and collaboration between hospitals and transport medicine systems are necessary for the province to leverage its provincial resources.</p>



Chapter 4: Access to Critical Care Through Greater Efficiencies and Effectiveness  
Solutions Across All Levels to Meet Surges in Demand

Elements	Minor Surge Individual Hospital Response	Moderate Surge Local Health Integration Network or Critical Care Network Response	Major Surge Provincial or National Response
		collaboration between hospitals and transport medicine systems are necessary for the LHIN or critical care network to leverage the region's resources.	
<b>Processes to Address Surge (Coping With Surge Checklist)</b>	<p>An individual hospital will go through the process check list to help address minor surges:</p> <ul style="list-style-type: none"> <li>• Evaluate the risks and benefits of delaying all elective ORs and other activities versus selected cancellations.</li> <li>• Transfer patients to complex continuing care, long-term care, other appropriate facilities or home, where appropriate.</li> <li>• Open up the use of other physical spaces such as post-anaesthetic care unit, emergency department, acute care floor beds/step-down units and operating rooms.</li> <li>• Call upon alternate staff who have appropriate training and skills.</li> <li>• Assess and care compassionately for individual patients while triaging access to care making the best use of resources for those most likely to benefit.</li> <li>• Engage transport systems appropriately.</li> </ul>	<p>All hospitals in the LHIN or critical care network will go through the process check list to address minor surges.</p> <p>An assessment will be made of the LHIN or critical care network's capability to cope with moderate surge.</p>	<p>All hospitals in the province will go through the process check list to help address minor and moderate surges.</p> <p>If the major surge continues to exist:</p> <ul style="list-style-type: none"> <li>• The Ministry's Emergency Management Unit will alert the CEO of Ontario Air Ambulance about a request for help. The Ministry will ensure all deployment criteria have been met and then will direct the CEO to dispatch EMAT.</li> <li>• EMAT will assess, treat and triage cases. In the first 72 hours, EMAT will manage patients and transfer those most critical to designated LHIN or critical care network hospital(s).</li> <li>• EMAT may continue to manage patients in the field, as necessary, but will begin to transfer patients.</li> </ul>

**Note 1:** The definition of a Major Surge, consistent with the criteria for deployment of EMAT, is when:

1. Local hospital and regional acute care resources are overwhelmed by an emergency, which is defined by:
  - Labour availability inadequate to meet requirements.
  - >10% over normal sick calls, which compromises the ability to provide acute care services to emergency-related patients.
  - AND Chief Nursing Officer identifies staffing levels as compromising patient/staff safety.
  - AND Staff unavailable to meet needs of emergency-related patients.
  - OR Physical resources overwhelmed (i.e., >100% of emergency capacity in use for >24 hours; AND  $\geq 20\%$  of in-patient beds dedicated to emergency; AND specialty beds, as defined by the emergency, are at full capacity for >18 hours; OR other mitigating factors such as single hospital community, length of emergency and impact on local health services and resources, community infrastructure unable to meet demands (e.g., community care access centres, public health units).
2. Local hospital and regional acute care resources physically incapacitated by emergency and unable to care for current and/or anticipated in-hospital acute care patients:
  - Volume of patients cannot be managed.
  - Patients have been discharged, as appropriate.

## **Requirements to Support the Recommended Approach to Surge**

A number of requirements are needed to support the recommended tiered response to surge in critical care. These include:

- Develop auxiliary acute and critical care staff;
- Clarify a hospital's roles and responsibilities during surge situations;
- Develop information systems to monitor surges; and
- Maximize the use of technology.

### ***Develop Auxiliary Acute and Critical Care Staff***

As noted previously, EMAT is staffed by an on-call support team of healthcare professionals who volunteer to work on EMAT during an emergency. All of the staff are specially trained to manage major health emergencies. The Committee believes that this approach should be used to staff the additional EMATs, recommended earlier (Recommendation 12). Hospital staff should be encouraged to volunteer for EMAT, and receive appropriate training and ongoing education to develop and maintain competencies.

Staff must be mobile if they volunteer to work in moderate and major surge situations. Trained staff need to function within the entire LHIN in the event of a moderate surge. Once a major surge is triggered, trained staff need to be mobile throughout the province. The legal liability of staff in these situations is also an issue. Once a moderate or major surge is triggered, there may be legal implications for healthcare professionals who provide care or who must make care decisions based on fewer healthcare resources. These labour issues need to be addressed by hospitals and unions.

The Committee recommends that:

**R13 Ontario's hospitals encourage and facilitate their staff to volunteer for the Emergency Medical Assistance Team (EMAT). Through its training and exercise funding, EMAT should provide appropriate training and ongoing education to volunteer staff to develop and maintain competencies to be used in the event of surges. This will ensure that participating hospitals and Local Health Integration Networks have a core of trained personnel who can be deployed in minor and moderate surges, and which the province can deploy in major surges. The Ministry of Health and Long-Term Care, in partnership with hospitals and unions, should establish the terms and conditions to support the mobility of staff and protect them from legal liability in the event of surge situations.**

### ***Clarify a Hospital's Roles and Responsibilities During Surge Situations***

Individual hospitals are accountable for responding to minor surges. LHINs or critical care networks are accountable in moderate surges and play an important role in major surges, as well. Each hospital in a LHIN or critical care network needs to have clear roles and responsibilities in surge situations. In addition, each LHIN or critical care network should identify a key contact person who will provide leadership on preparing for and managing surge situations. In the event of a major surge, this individual will work with EMAT and other provincial systems to facilitate interactions between provider organizations.

The Committee recommends that:

**R14 Hospitals develop contractual agreements with their Local Health Integration Networks (LHINs) or critical care networks, as appropriate, that outline each hospital's role and responsibilities in surge situations. In addition, each LHIN or critical care network should identify a key contact person to provide leadership in surge situations.**

### ***Develop Information Systems to Monitor Surges***

Currently, CritiCall technology can be used to identify potential acute surge situations. Ideally, however, a common critical care information system should be developed across Ontario, or efforts should be made to interconnect current systems. Indicators should be identified to flag potential surge situations (see Chapter 5, *Safety and Quality Through a Framework to Improve Critical Care Performance*; and Chapter 9, *Critical Success Factors*).

### ***Maximize the Use of Technology***

There is a need to develop an inventory of equipment in Ontario's hospitals, to promote increased standardization of equipment to take care of surges, and to advance the rationalization of current equipment (e.g., some ventilators could be "retired" or recycled elsewhere). See Chapter 7, *Critical Care Technologies*.

## **ETHICAL CONSIDERATIONS FOR ACCESS<sup>29</sup>**

### **BACKGROUND**

Considerable anecdotal evidence suggests that critical care in Ontario is often provided to patients who do not, or can no longer, benefit from this level of care. This raises a number of key ethical issues.

One, a common understanding of the purpose of critical care does not exist. Patients and relatives have increasing expectations that a critical care bed should be available for all seriously-ill patients.<sup>30</sup> In contrast to public expectations, professional providers tend to view critical care as a resource to be used only if it will provide some benefit. The Society of Critical Care Medicine Ethics Committee (1994), for example, noted that patients should not be admitted to intensive care if they are not expected to benefit from it. These include patients with fatal illnesses or permanent unconsciousness, and patients with very poor prognoses and little likelihood of benefit, patients with very good prospects with or without ICU care. Others have suggested that because of the utilization of expensive resources, ICUs should, in general, be reserved for patients with reversible medical conditions who have a “reasonable prospect of substantial recovery.”<sup>31</sup>

Contrary to the notion of critical care for those who are expected to benefit and recover, is the use of critical care resources to support the retrieval of organs and tissue from deceased donors. Critical care physicians and other healthcare providers play a key role in identifying potential organ donors and taking appropriate action to ensure that the option of donating is preserved.

A second key ethical issue is determining who will access critical care services when the demand for care exceeds the level of resources that are available. Who decides who gets critical care and what criteria should be used to make this decision? Although admission and discharge criteria can be used to shape demand and streamline the flow of patients in and out of ICUs, there are ethical dilemmas regarding who the criteria include and exclude.

Decisions impacting on access to healthcare are made routinely. They occur when governments decide how much money to allocate to healthcare, when administrators decide which programs should receive funds, and when individual providers decide which patients should have access to a limited number of critical care beds. The criteria used to make these decisions vary. In the past, decisions regarding patient care were

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<sup>29</sup> This section was informed by the following report commissioned for the Ontario review (see Appendix C). *Ethical Considerations for the Transformation of Critical Care in Ontario* (Authored by Robert Sibbald).

<sup>30</sup> Report of Short-Life Working Group on ICU and HDU Issues, 2000.  
<http://www.scottishintensivecare.org.uk/bccr2000.htm>.

<sup>31</sup> Kollef MH, Shuster DP. “Predicting ICU Outcomes with Scoring Systems.” *Crit Care Clin* 1994; 101-118.

always traced back to the physician as the final moral authority. Only recently has the concept of a moral organization or an ethical healthcare system really been explored.

A number of professional organizations have attempted to address the ethical issues of accessing critical care. The Society of Critical Care Medicine Ethics Committee (1994) suggested general principles to guide moral decision making for distributing available resources. These include: i) providers should advocate for patients; ii) members of the provider team should collaborate; iii) care must be restricted in an equitable system; iv) decisions to give care should be based on expected benefit; v) mechanisms for alternative care should be planned; vi) explicit policies should be written; and vii) prior public notification is necessary.

Another example is the American Thoracic Society's comprehensive statement on the allocation of intensive care resources (1997). The statement aims to: i) establish an ethical framework for sound decision making in ICU resource allocation; ii) provide a comprehensive source of information beneficial to ICU practitioners and their health care institutions in dealing with ICU allocation issues; iii) provide guidelines defining ethically appropriate and inappropriate criteria for admitting and discharging ICU patients and for the use of scarce resources in the ICU; and iv) promote the development of policies and practices by health care providers and their institutions that enhance justice and fairness in the allocation of ICU resources.

As for the public's view of rationing healthcare, in Britain numerous surveys have led Kneeshaw to conclude that it is not clear what the public thinks about the necessity of rationing due to contradictory evidence.<sup>32</sup> Furthermore, society favours treatment that preserves quality of life above life saving interventions, and prioritizes the young ahead of the old. Finally, the public believes rationing decisions should be left to the doctors, with health service managers, government, and the general public involved in the process.

## **COMMITTEE'S OBSERVATIONS AND RECOMMENDATIONS**

Considerable anecdotal evidence suggests that critical care in Ontario is often provided to patients who do not, or can no longer, benefit from this level of care. Although the extent to which this occurs is unknown, a number of reasons have been suggested to explain this, such as the lack of clear admission and discharge policies, lack of advanced planning between the healthcare team and the patient and his or her family, society's expectations to continue treating, and inadequate communication between healthcare providers and patients.

The need to clarify who can benefit from critical care services must take into account the importance of supporting organ donation and timely organ recovery, and maximising the number of organs available for transplantation. Providing critical care resources to support these activities will become an increasing issue with the proposed "routine

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<sup>32</sup> Kneeshaw J. "What does the public think about rationing?" *Rationing, Talk and Action in Health Care*. Bill New (Editor) London: BMJ Publishing Group, 1997.

notification” and “required request” regulations proposed in Ontario for the fall of 2005. Hospitals with organ donation potential will be required to notify the Trillium Gift of Life Network of Ontario of the death or impending death of a patient and, at Trillium’s request, discuss organ donation with the patient’s family.<sup>33</sup>

There are many ethical implications of access to critical care services. Some of these include:

- To what extent is critical care in Ontario provided to patients who can no longer benefit from this level of care?
- To what extent is critical care provided to patients with the potential of organ donation?
- What factors are responsible for the use of critical care resources, and how can inappropriate use be minimised?
- When should withdrawal of life support be contemplated?
- What are the appropriate admission and discharge criteria for access to a critical care bed?
- Should standards of care, admission and discharge criteria change in the event of a surge?
- How can the “promise of new technologies” be balanced with limited critical care resources and the fact that new technology may not change outcomes?

There is a need for a broad range of stakeholders to address these issues (e.g., critical care providers, the public, ethics experts, organisations such as the Trillium Gift of Life Network and others). A dialogue needs to be held with the public about ethical issues of access. In addition, clinicians need to be equipped with the skills and tools to address end of life care, advanced directives, organ donation and related issues. A number of hospitals already have policies and tools in place to help staff discuss level of treatment wishes with patients when they are being admitted for care.

**The Committee recommends that:**

**R15 The critical care community in Ontario initiate a process with a broad range of stakeholders to address ethical issues in accessing critical care services.**

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<sup>33</sup> Trillium Gift of Life Network. *Access to Critical Care Beds to Support Organ Donation: Report to the Ministry of Health and Long-Term Care Internal Critical Care Working Group*, February 9, 2005.

## **5. SAFETY AND QUALITY THROUGH A FRAMEWORK TO IMPROVE CRITICAL CARE PERFORMANCE<sup>34</sup>**

### **INTRODUCTION**

There is an increasing expectation that critically ill patients will receive safe, high quality evidence-based care. Furthermore, it is expected that this care will be provided as efficiently and effectively as possible, and make the best use of valuable human and financial resources. This is especially important to help meet the likely significant increase in future demand for critical care services.

Improving critical care performance involves adopting a culture of accountability that continuously evaluates and improves how critical care services are provided in Ontario. This is consistent with the government's commitment to ensure that Ontarians get the results they want and deserve by putting accountability measures in place for both government and front-line service delivery organizations.<sup>35</sup>

This chapter sets out a framework to improve critical care performance. It presents an approach to support the use of performance measurement on a number of levels. Measures will be used by healthcare providers and government decision makers to support improvements in performance. Measures will also be used to demonstrate accountability to the public and other interested stakeholders.

### **BACKGROUND**

There are many benefits to developing a framework to improve critical care performance. At the system level, a performance improvement framework will support greater integration and coordination of critical care services across the system and within parts of the system. At an individual hospital level, a framework will promote best practice standards in critical care units, and identify areas where hospitals can make more effective and efficient use of their critical care resources and, thereby, improve performance. At an individual practitioner level, a framework will help promote best clinical practice standards in critical care units, identify potential clinical "problem" areas that need to be addressed, and focus on supporting individual practitioners to improve their performance. Practitioners will be encouraged to network, share experiences and support each other by transferring knowledge of best practices.

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<sup>34</sup> This section was informed by the following reports commissioned for the Ontario review (see Appendix C). 1) *Report on Critical Care Performance Measurement and Accountability* (Authored by Michael P. Hillmer and Andrea Hill). 2) *Literature Review on ICU Admission and Discharge Practices* (Authored by Marsha Pinto). 3) *Alleviating the Shortage of Critical Care Health Human Resources* (Authored by Marsha Pinto). 4) *Non-Physician Staff/Patient Ratios Across Key Jurisdictions* (Authored by Mohamad Alameddine).

<sup>35</sup> Government of Ontario. *Getting Results for Ontario – Progress Report 2004*.



Generally, a framework to improve critical care performance will make better use of healthcare resources by using appropriate and timely interventions to help avoid critical illness and by reducing the length of time someone is critically ill. The framework will also foster a culture of accountability through public reporting, lead to greater public awareness of the safety and quality of the critical care system, and generate clinical service and system design research questions, which will lead to further improvements.

An extensive review was conducted of performance evaluation and improvement frameworks in healthcare (see table). Each framework focuses on different domains and selects different performance indicators, depending on the needs and interests of the group. This highlights the importance of deciding which stakeholder groups will be the focus of performance measures.

Donabedian noted that quality can be analyzed by examining these three separate, but inter-related aspects of medical care – structure, process and outcomes.<sup>36</sup>

Structure refers to available resources

(equipment such as ventilators and telemetry units, and labour such as the proportion of intensivists or nurse hours per patient day), organization (governance, discharge policies), geographic location, and physical setup where medical care is provided. Process refers to the actions and interventions undertaken on behalf of the patient. All of the actions of the nursing staff and physicians are considered to be process. Outcome is the consequence of

<b>A Selected Sample of Performance Improvement Frameworks in Healthcare</b>	
<b>Institution/ Organization</b>	<b>Domain</b>
Ontario Hospital Report	<ul style="list-style-type: none"> <li>• Financial Performance and Condition</li> <li>• Patient/Client Satisfaction</li> <li>• Clinical Utilization and Outcomes</li> <li>• System Integration and Change</li> </ul>
University Health Network (Toronto). Dimensions originally developed by the Canadian Council for Health Services Accreditation (Canada)	<ul style="list-style-type: none"> <li>• System Competency</li> <li>• Responsiveness</li> <li>• Work Life</li> <li>• Financial Performance and Condition</li> <li>• Innovation</li> <li>• Client and Community Focus</li> </ul>
Agency for Healthcare Research and Quality (USA government agency)	<ul style="list-style-type: none"> <li>• Prevention Quality Indicators</li> <li>• In-patient Quality Indicators</li> <li>• Patient Safety Indicators</li> </ul>
New South Wales Department of Health (Australia)	<ul style="list-style-type: none"> <li>• Safety</li> <li>• Effectiveness</li> <li>• Efficiency</li> <li>• Access</li> <li>• Appropriateness</li> <li>• Consumer Participation</li> </ul>
Victorian Department of Human Services (Australia)	<ul style="list-style-type: none"> <li>• Access</li> <li>• Efficiency</li> <li>• Continuity</li> <li>• Acceptability</li> <li>• Technical Proficiency</li> <li>• Appropriateness</li> </ul>
National Health Service Project (United Kingdom)	<ul style="list-style-type: none"> <li>• Health Improvement</li> <li>• Fair Access</li> <li>• Effective Delivery of Appropriate Healthcare</li> <li>• Efficiency</li> <li>• Patient Experience</li> </ul>

<sup>36</sup> Donabedian, A. "Evaluating the quality of medical care." *Milbank Memorial Fund Quarterly* 1966; 44(3): Suppl-206.

the structure and the process of the medical setting, as well as individual patient differences.

A review of performance evaluation frameworks in critical care resulted in similar findings. For example, Rotondi et al. defined four domains of critical care performance: appropriateness of care, effectiveness of care, efficiency of care and customer needs fulfilled.<sup>37</sup> This conceptual framework identified performance measures directly related to outcomes and process of care. Berenholtz et al. conducted a review of the intensive care literature to identify potential quality indicators for intensive care.<sup>38</sup> Domains of quality included safety, effectiveness, efficiency, patient-centered, timely and equitable.

To make performance evaluation a meaningful activity, there is a need to focus on improving performance. Within healthcare, strategies to improve performance include establishing best practice standards and benchmarks that measure performance, accrediting programs or organizations, working actively with organizations that need to improve, and linking funding to quality.

## **COMMITTEE’S OBSERVATIONS AND RECOMMENDATIONS**

Consistent with adopting a culture of continuously evaluating and improving how critical care services are provided in Ontario, the Committee believes that a framework for improving critical care performance in Ontario needs to be developed.

The goal of the framework is to develop regular provincial measures that include standardized minimum data for all critical care units in the province by level of critical care, and individualized performance measures for individual units or LHINs/critical care networks. This information will be used to assess and improve the safety and quality of critical care services, promote accountability for the effective use of resources, and support research initiatives. Some but not all of the results will be publicly available. For example, indicators that are just being developed will not be publicly released until they are finalized.

The recommended framework includes three main elements:

- A provincial accountability structure to oversee performance improvement;
- An objective process to measure performance using benchmarks, guidelines, standards and a minimum data set; and
- A performance improvement process.

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<sup>37</sup> Rotondi AJ, Sirio CA, Angus DC, Pinsky MR. “A new conceptual framework for ICU performance appraisal and improvement.” *J Crit Care* 2002; 17(1): 16-28.

<sup>38</sup> Berenholtz SM, Dorman T, Ngo K, Pronovost PJ. “Qualitative review of intensive care unit quality indicators.” *J Crit Care* 2002; 17(1):1-12.

**Element 1: A Provincial Accountability Structure to Oversee Performance Improvement**

A provincial accountability structure is needed to oversee performance improvements in critical care. The Committee believes that a group made up of experts in critical care, continuous quality improvement and health management, and other stakeholders should oversee evaluation and improvement of critical care performance in the province. The group would:

- Develop an objective process to measure performance.
- Monitor performance across: i) the system of critical care; and ii) by individual organizations that provide critical care services.
- Initiate and oversee action-oriented provincial quality improvement initiatives. This includes identifying critical care units that consistently perform exceptionally well and can be used as learning models, and those that need targeted action to improve performance.
- Report to providers, funders and the public on a regular basis. The standardized, minimum dataset will form the basis of these reports. In general, information will be publicly available except in instances where the data needs to be developed further.

The details of a recommended provincial accountability structure are presented in Chapter 9, *Critical Success Factors*.

**Element 2: An Objective Process to Measure Performance Using Benchmarks, Guidelines, Standards and a Minimum Data Set**

An objective process is needed to measure critical care performance. This process should focus on establishing evidence-based benchmarks, best practice guidelines and standards, and a minimum data set to assess critical care performance against these measures.

The Committee recommends that:

- R16 An objective process to measure critical care performance be developed that includes establishing evidence-based benchmarks, best practice guidelines and standards, and identifying a minimum data set to assess critical care performance against these measures.**

***Evidence-Based Benchmarks, Best Practice Guidelines and Standards***

A great deal of work has been done to develop evidence-based benchmarks, and best practice guidelines and standards in critical care. For example, the Society of Critical Care Medicine has developed a broad range of guidelines on clinical practice, professional issues, education, and the management and design of critical care services.

In addition, this report includes recommendations that set out standards for:

- Critical care networks (Recommendation 1);
- Categories of critical care services and patients by level of acuity (Recommendation 2);
- Intensivist-led management model requirements by levels of acuity (Recommendation 5);
- Minor, moderate and major surges (Recommendations 9-11);
- Core staffing ratios by level of acuity (Recommendation 20); and
- Prototype lists of technologies and drugs by level of acuity (Chapter 7).

### ***Minimum Data Set***

A number of organisations have contributed to the development of a minimum data set (MDS) in critical care. The Canadian Critical Care Society endorsed a definition and the details of an MDS that focuses on outcomes (i.e., mortality and length of stay, with variables to permit illness severity adjustment). In addition, a recent workshop attended by physicians and nursing leaders from seven centres in Canada focused on developing a report card for critical care.<sup>39</sup>

Using these initiatives – along with the extensive review of performance frameworks conducted for this review – the Steering Committee began by identifying a long list of indicators for critical care performance (see Appendix D). It then developed underlying principles upon which to select a minimum data set. This MDS is being proposed for all critical care units in the province. It is suggested that the MDS be reported centrally, on a quarterly basis, within 60 days of the end of each quarter. Additional data may be collected by hospitals depending on their local needs and the level of their critical care units.

The underlying principles to guide the critical care MDS include:

1. The MDS will be used for management and quality improvement of critical care services.
2. The intended audience of the information are providers and those accountable for overseeing the effective use of critical care services.
3. Indicators will reflect present performance using a mix of lead and lag indicators.
4. Indicators will enable action and, thereby, be strategic.
5. Indicators will represent a mixture of outcomes, processes and cost.
6. In the absence of high-level evidence, indicators will have value based on available evidence or benchmarks.
7. When using a benchmark, the target will be set at a high level (e.g., using the Achievable Benchmarks for Comparison methodology), as opposed to an average or median target as a benchmark.
8. Indicators will be chosen based on their usefulness, feasibility and reliability.

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<sup>39</sup> *Developing a Report Card for Critical Care aka Vital Signs Monitor for Critical Care*. Rocky Mountain Critical Care Conference, February 9-12, 2005.

9. Where possible, previously validated indicators and definitions will be used.

The proposed critical care MDS includes six domains – safety, timely, effective, efficient, patient/family satisfaction, and staff worklife (STEEPS) – and the following indicators.

**Proposed Critical Care Minimum Data Set: Domains, Indicators and Status**

<b>Domain</b>	<b>Indicator</b>	<b>Status*</b>
Safe	Readmission	Now
	Prevention VAP (HOB elevation)	
	Deep Vein Thrombosis (DVT) Prophylaxis	
	Sedation & restraint	
	Blood transfusion	
	Catheter-related blood stream infection	
	Unplanned extubation	
Timely	Occupancy	Now
	Night time discharges	Now
	Delayed admissions (from emergency department)	Recommend
	Cancelled scheduled surgery	Recommend
	CritiCall availability	Recommend
	Admissions from other institutions	Recommend
	Repatriation	Recommend (Pilot April 2005)
Effective	LOS (top diagnosis by prevalence)	Now
	Mortality (APACHE II adjusted)	Now
	Organ donation	Now
	Nutrition	
	Severe sepsis treatment	
Intensivist-led patient care	Recommend	
Efficient	Avoidable days	Now
	Ventilator occupancy	Recommend
	Staffing (aHPPD, direct nursing)	
	Acuity-adjusted HPPD	
	Agency nurse use	Recommend; Regional
Overtime		
Patient/Family Satisfaction	Azoulay questionnaire (14 items+ open ended)	Proposed
Staff Worklife	Absenteeism	Now
	Turnover	

\*“Now” connotes indicators that should be available from all ICUs with current information systems.

“Recommend” connotes indicators that the Committee believes are useful to collect.

“Regional” connotes indicators that may be relevant or useful only to certain jurisdictions or programs.

The Steering Committee recognises that there is a need to facilitate access to data as well access to resources for developing performance measures.

The Committee recommends that:

**R17 The Ministry be accountable for funding and providing access to the minimal dataset elements. As well, consideration should be given to providing additional resources for performance measures that may need to be developed.**

**Element 3: A Performance Improvement Process**

Generally, evaluation initiatives tend to fall short on implementing changes to improve performance. Results are not used in a concerted manner to improve performance. This may be due to a number of factors including: results are not disseminated to the right people who can influence decisions; it is unclear who is accountable for making changes; clear actions and timelines for remedial action are not developed; there is a lack of follow-up to see if changes have been made; and there is limited if any recourse or consequences of inaction.

The proposed provincial structure recommended in Chapter 9 will be accountable for initiating and overseeing action-oriented provincial quality improvement initiatives, and reporting to providers, funders and the public on a regular basis.

At the hospital level, the Committee believes that hospital boards should be held accountable for governing their organization's critical care resources including access, appropriate use, quality and ongoing improvement. Government will monitor the performance of hospitals against established targets and hold organizations accountable, using funding incentives.

Individual critical care units and LHINs or critical care networks should measure their performance, and institute quality improvement initiatives tailored to their specific needs. These targeted accountability initiatives will be in addition to the provincial initiatives, and will be supported and funded by the participating organizations (e.g., hospitals, LHINs or critical care networks).

The Committee recommends that:

**R18 Individual critical care units, and Local Health Integration Networks/critical care networks measure their performance, and institute quality improvement initiatives tailored to their specific needs.**

The Committee further recommends that:

**R19 Hospital boards be held accountable for governing and monitoring their organization's critical care resources including access, appropriate use, quality and ongoing improvements. Government will monitor the performance of hospitals against established targets and hold organizations accountable, using funding incentives.**

## **6. SUFFICIENT AND APPROPRIATE HUMAN RESOURCES TO MEET THE NEED FOR CRITICAL CARE<sup>40</sup>**

### **INTRODUCTION**

Health care is a people business. This is especially evident in critical care which is a highly intensive, team-based, human resource specialty. Although advances in technology have transformed many aspects of health care, technology cannot substitute for competent, experienced and appropriately trained critical care staff. These individuals must continuously build their knowledge base and expand their expertise.

There is a shortage of critical care health human resources in Canada, as well as in other jurisdictions (e.g., United States, United Kingdom). Although critical care nursing and intensivist shortages are widely publicized, most critical care units also lack a sufficient number of respiratory therapists and pharmacists. If the increasing demand for critical care services in Ontario is to be met, it is necessary to recruit and retain a sufficient number of appropriately trained physicians, nurses and other members of the team. This chapter examines issues in critical care human resource, and presents recommendations for improvement.

### **BACKGROUND**

Critical care is provided by a wide range of professional and non-professional staff. Professional staff include, but are not limited to, intensivists, other physicians, critical care nurses, respiratory therapists, physiotherapists, nutritionists, pharmacists, social workers, pastoral care workers and paramedics. Non-professional staff include, but are not limited to, ward clerks, health care assistants, catering staff, environmental support workers, equipment support workers, and maintenance staff.

Although nursing makes up the largest group of critical care providers, research has shown that patient needs are best met through a strong and dynamic partnership between the professional and non-professional members of the critical care team

General trends in healthcare are having an impact on critical care human resources. Some of these trends include:

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<sup>40</sup> This chapter was informed by the following reports commissioned for the Ontario review (see Appendix C). 1) *Workload Assessment* (Authored by Judy Kojlak). 2) *Alleviating the Shortage of Critical Care Health Human Resources* (Authored by Marsha Pinto). 3) *Non-Physician Staff/Patient Ratios Across Key Jurisdictions* (Authored by Mohamad Alameddine). 4) *Critical Care and Work/Life Issues* (Authored by Mohamad Alameddine). 5) *The Impact of Performance-Based Financial Incentives on Organizational Outcomes: A Literature Review* (Authored by Monica Aggarwal). 6) *The Impact of Compensation Mechanisms on Organizational Outcomes: A Review of the Literature* (Authored by Monica Aggarwal). 7) *Audit of Ontario's Current Health Human Resource Supply in Critical Care* (Authored by Andrea Hill).

- The healthcare workforce is aging. The average age of physicians and nurses has increased significantly. Nursing graduates typically work in critical care and specialty units early in their career. With fewer young people choosing nursing as a career, the number of new hires available for critical care units is decreasing at alarming rates.<sup>41</sup>
- There is a trend among health professionals to retire early.
- Some professional education programs are becoming longer to accommodate the increased knowledge base that is required to care for more complex patients (e.g., effective in 2005, the entry to practice for nursing will be a B.Sc.N.).
- Young people have more career opportunities with healthcare being only one of many from which to choose.
- Healthcare is becoming increasingly complex, with more sophisticated technologies and more complex patients.

The critical care environment presents a number of challenges to recruiting and retaining a sufficient number of appropriately trained staff. These challenges can be understood in terms of physical, mental and professional challenges.

In terms of physical challenges, critical care environments bring together critically ill patients, highly trained medical teams and sophisticated technologies under one roof. The physical environment of critical care units tends to exhibit a number of stressors including inappropriate lighting, annoying and confusing alarm systems and inappropriate workstation layout. In most cases, critical care units are not designed properly to enable staff to obtain and analyze data, respond to high dependency patients, or care for patients who require isolation (e.g., SARS). Critical care medical and non-medical staff work in an extremely difficult environment that subjects their physical and mental well being to higher than usual risks.<sup>42</sup>

In terms of mental challenges, critical care medical staff work in an emotionally charged atmosphere in which decisions must be made quickly. They are routinely exposed to patient suffering and family distress, increasing public expectations to treat “at all costs,” and the potential futility of care. It is extremely stressful if staff do not have proper training, and adequate managerial and peer support to cope with these issues. The literature reports that emotional exhaustion and negative feelings take a heavy toll on the psychological and physiological well being of critical care staff.<sup>43</sup>

In terms of professional challenges, autonomy, group cohesion, effective communication and manageable workloads are among the most important distinguishing characteristics of a satisfying working environment. Effective critical care managers play an important

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<sup>41</sup> Buerhaus PI, Staiger DO, Auerbach DI. “Why are shortages of hospital RNs concentrated in specialty care units?” *Nurs Econ* 2000; 18(3):111-6. Buerhaus P. “Shortages of hospital registered nurses: causes and perspectives on public and private sector actions.” *Nursing Outlook* 2002; 1:4-6.

<sup>42</sup> Aiken L., Clarke S., Sloane D. et al. “Nurses' Report on Hospital Care in Five Countries.” *Health Aff* 2001; 20(3):43-53. Levy MM. “Caring for the caregiver.” *Crit Care Clin* 2004; 20(3):541-7, xi.

<sup>43</sup> Donchin Y, Seagull FJ. “The hostile environment of the intensive care unit.” *Curr Opin Crit Care* 2002; 8(4): 316-20. McVicar A. “Workplace stress in nursing: a literature review.” *J Adv Nurs* 2003; 44(6): 633-42.



role in ensuring that these conditions exist in the critical care environment. In addition to making for a good work place, these conditions also impact positively on patient care. There is evidence to suggest that good communication and better collaboration between physicians and nurses positively influence patient outcomes.<sup>44</sup>

The literature documents numerous examples of poor healthcare working environments. Critical care physicians and nurses complain of long shift hours, excessive workloads and burnout. Many nurses report that they are expected to perform a number of non-nursing tasks and that their educational preparation is not consistently used. As a result, nurses are spending less time providing one-to-one patient to nurse care that defines nursing.<sup>45</sup> Critical care staff burnout is one of the important causes of critical care staff turnover.<sup>46</sup>

Two meta-analyses conducted for this review noted that lower numbers of nursing staff have been associated with higher mortality in the ICU, more postoperative complications, including pulmonary and infectious complications and re-intubation, higher infection rates in both adult and paediatric ICUs, higher fall rates and more medication errors.<sup>47</sup> Poorer patient outcomes lead to increased lengths of stay in the ICU and hospital, as well as increased costs. One study estimated that inadequate nurse to patient ratios could lead to about a 14% increase in total hospital costs.<sup>48</sup>

The literature documents a broad range of strategies to improve the recruitment and retention of healthcare professionals.<sup>49</sup> Some of these include:

- Redesigning critical care units using ergonomic science;
- Involving critical care staff in decision making;
- Hiring additional staff to relieve the pressure and decrease the workload of current critical care workers;
- Establishing burnout assessment and prevention programs;
- Reducing workplace violence by creating an aggression-free environment;
- Offering staff support groups;
- Holding regular inter-disciplinary meetings to discuss difficult cases;
- Giving critical care staff more autonomy and flexibility in setting their work schedules; and
- Offering professional training in communication and conflict resolution.

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<sup>44</sup> Aiken LH, Sloane DM, Sochalski J. "Hospital organisation and outcomes." *Qual Health Care* 1998; 7(4): 222-6.

<sup>45</sup> Aiken L, Clarke S, Sloane D et al. "Nurses' reports on hospital care in five countries." *Health Aff.* 2001; 20: 43-53. Cartledge S. "Factors influencing the turnover of intensive care nurses." *Intensive Crit Care Nurs* 2001; 17(6): 348-55.

<sup>46</sup> Wilters JH. "Stress, burnout and physician productivity." *Med Group Manage J* 1998; 45(3): 32,4, 36-7.

<sup>47</sup> Marsha Pinto. *Alleviating the Shortage of Critical Care Health Human Resources*. Mohamad Alameddine *Non-Physician Staff/Patient Ratios Across Key Jurisdictions* (see Appendix C).

<sup>48</sup> Dimick JB, Swoboda SM, Pronovost PJ, Lipsett PA. "Effect of nurse-to-patient ratio in the intensive care unit on pulmonary complications and resource use after hepatectomy." *Am J Crit Care* 2001; 10(6): 376-82.

<sup>49</sup> As documented in the meta-analysis authored by Mohamad Alameddine: *Critical Care and Work/Life Issues* (see Appendix C).

Offering higher salaries, sign up bonuses, tuition reimbursements, relocation fees and other incentives to recruit professionals with critical care skills are strategies that may succeed in the short run, however, they may be prone to failure in the long run. Research suggests that the key underlying problem that causes staff to leave their jobs is a poor work environment.

## **COMMITTEE’S OBSERVATIONS AND RECOMMENDATIONS**

The Committee believes that a proactive, systematic, standardized approach to short- and long-term health human resources management is needed in critical care in Ontario. This approach includes:

- Developing valid and reliable methodologies to determine the appropriate number and types of critical care staff who are required;
- Instituting recruitment and retention strategies;
- Making innovative use of human resources to provide critical care services; and
- Providing appropriate educational preparation for critical care professionals and ensuring that their ongoing development needs are met.

### **Developing Valid and Reliable Methodologies to Determine the Appropriate Number and Types of Critical Care Staff Who are Required**

Determining the appropriate number, type and skill mix of critical care staff is complex. Factors that influence estimates include the complexity of patients, the experience of the provider, the model of care, the type and size of the units, the staff organization, and the amount of time that is spent on non-clinical activities (e.g., management, professional development, mandatory medical equipment training, mentoring and practice development and research). Factors that impact on determining appropriate staff/patient ratios include the model of care and available medical technologies. Additional factors such as the needs of relatives and friends of patients, the number of transfers that take nurses away from their units, risk management and patient safety have been cited in the critical care nursing literature as impacting on the appropriate skill mix on units.<sup>50</sup> Physical plant also impacts on human resource needs (e.g., are patients easily seen and accessible, is the necessary technology close by, how interdependent is critical care with other departments such as diagnostic imaging, the operating rooms and the emergency department).

Different workload measurement systems are being used in Ontario by nursing and allied health, whereas physicians do not use a standard of workload measurement. These systems attempt to quantify staffing resources that are used in particular areas. They are used in Ontario to meet the Ministry of Health and Long-Term Care’s external reporting

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<sup>50</sup> Galley J, O’Riordan B, Royal College of Nursing. “Guidance for nurse staffing in critical care.” *Intensive Crit Care Nurs* 2003; 19(5): 257-6.

requirements, and for internal hospital budgeting, planning, staffing and quality assurance activities. Unfortunately, the reliability and validity of workload measurement systems are questionable.<sup>51, 52</sup>

Traditionally, critical care units have been regarded as high cost, high nursing-intensity areas due to their staffing ratios, use of advanced technologies and pharmaceuticals, and complex patient management.<sup>53</sup> Although staff/patient ratios – as a workload measure – are relatively easy to calculate and understand, they are not sensitive to the care environment nor the range of abilities and experiences within each professional group.

Based on current knowledge and its expert opinion, the Committee identified core staffing guideline ratios by level of care for selected professional groups. The levels of care reflect patient acuity as recommended earlier (Recommendation 2). Although the Committee felt that it was important to present staff ranges to guide the field, it is recognised that there is a need for a valid and more refined way to measure the workload of nurses, physicians and other health professionals working in critical care. This involves moving away from standardized ratios and exploring measures such as hours per patient day.

The Committee recommends that:

**R20 Core staffing ratios be adopted as minimum guidelines for critical care professionals in Ontario. The number of staff required will be influenced by patients, staff and environmental factors such as the size of the unit and available technologies. To refine these workload measures, an expert panel should be convened to explore options for measuring the workload of professionals working in critical care in Ontario. These options should include an approach to identify hours based on patient need.**

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<sup>51</sup> As documented in the meta-analysis conducted for this report: *Workload Assessment* (Authored by Judy Kojlak).

<sup>52</sup> Ball C, McElligot M. “Realising the potential of critical care nurses: an exploratory study of the factors that affect and comprise the nursing contribution to the recovery of critically ill patients” (2003); 226-234.

<sup>53</sup> Donoghue J, Decker V, Mitten-Lewis S, Blay N. “Critical care dependency tool: Monitoring the changes” (2001).

### Minimum Guidelines for Core Staffing Ratios for Selected Professions, by Level of Service and Patient Acuity

Level of Acuity	Description	Staff : Patient Ratios			
		Nursing	Respiratory Therapy	Clinical Pharmacy	Physical Therapy, Dietetics and Spiritual Services
<b>Level 3</b>	Patients who require advanced or prolonged respiratory support alone, or basic respiratory support together with the support of at least two organ systems.	Range 1:1 to 1:1.5	Range for Vented Pts (invasive and non-invasive) 1:4 to 1:6 (Note 1)	Access to clinical pharmacist 24/7	Access to these services during the day
<b>Level 2</b>	Patients who require more detailed observation or intervention including support for a single failed organ system, short-term ventilation, post-operative care, or patients “stepping down” from higher levels of care.	Range 1:1.5 to 1:2	Range for Vented Pts (invasive, non-invasive, non-ventilated/intubated) Range 1:5 to 1:7 (Note 2)	Access to clinical pharmacist during the day	Access to these services during the day
<b>Level 1</b>	Patients who are at risk of their condition deteriorating, or those recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from a critical care team.	Range 1:2 to 1:3	1 RT per unit day	Access to clinical pharmacist during the day	Access to these services during the day

Note 1: Depends on the acuity of patients, the technology used, and the respiratory therapy skills provided on the unit (e.g., hemodynamic monitoring, arterial line insertions).

Note 2: Depends on the size of the unit, the number of ventilated patients, and the respiratory skills provided on the unit (e.g., hemodynamic monitoring, arterial line insertions).

The meta-analyses conducted for this review indicated that members of a successful critical care team should have proper educational and professional training as well as proper experience and exposure in their field. Anecdotal evidence suggests that the competencies of critical care staff vary across hospitals in Ontario and need to be standardized. Although some professional associations have developed core competencies (e.g., the Canadian Association of Critical Care Nurses), these are not being consistently used across the province.

The Committee recommends that:

**R21 Professional staff working in critical care meet standards and core competencies that are recognised provincially.**

In addition, there is a need to identify the competencies of an effective critical care team. The literature does not support one specific critical care model over another. Rather, it supports a model that encourages the formation of a specialized critical care team consisting of full-time intensivists, ICU nurses, respiratory therapist practitioners and pharmacists.<sup>54</sup>

Once appropriate measures of workload in critical care are determined, attention must focus on ensuring that there are a sufficient number of appropriately trained staff working in critical care. These efforts should be consistent with the Ministry's provincial human resource planning processes.

The Committee recommends that:

**R22 Local Health Integration Networks (LHINs) establish short- and long-term human resource plans that will support an appropriate level of critical care services in each LHIN. These plans should be consistent with and support the Ministry of Health and Long-Term Care's provincial human resource planning processes.**

### **Instituting Recruitment and Retention Strategies**

The Committee identified a broad range of recruitment and retention strategies to support sufficient numbers of appropriately trained staff in critical care.

- Institute flexible working arrangements and family-friendly working arrangements that help meet the need for staff to have worklife balance.
- Offer career development opportunities through in-house training and web-based training modules.
- Establish staff support groups and provide staff mentoring such as regular interdisciplinary meetings to discuss difficult cases, and training courses in communication and conflict resolution to help alleviate caregiver stress.
- Develop critical care teams comprised of staff who range in experience and expertise. This enables senior staff to mentor newer staff.
- Offer clinical leadership opportunities.
- Examine opportunities for informatics to help streamline work.
- Offer telemedicine linkages to support staff working in remote critical care units.

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<sup>54</sup> Brillli RJ, Spevetz A, Branson RD, Campbell GM, Cohen H, Dasta JF, et al. "Critical care delivery in the intensive care unit: defining clinical roles and the best practice model." *Crit Care Med* 2001; 29(10): 2007-19.

- Promote staff rotation where staff with appropriate skills are rotated between two or more clinical areas for a predetermined period of time. (One study noted that staff rotation resulted in improved clinical skills and experience, improved interdepartmental relationships, and heightened motivation and opportunities to network.<sup>55</sup> The study concluded that providing rotational programs for critical care nurses would be a valuable strategy for recruitment, retention and developing the workforce.)

The Committee's recommendation to categorise Ontario's critical care services and patients by level of acuity may have a positive impact on recruitment and retention (Recommendation 2). Ewart et al. noted that a tiered system of critical care will channel patients who are in need of more intensive or complex services to higher caseload facilities with a better ability to provide the necessary personnel.<sup>56</sup> This will also help standardise the practice of critical care by level of facility.

The Committee concluded that efforts need to go into promoting the most effective recruitment and retention strategies.

The Committee recommends that:

**R23 The Nursing Secretariat of the Ministry of Health and Long-Term Care, the College of Nurses, the Registered Nurses' Association of Ontario, and academic partners develop a strategy for the recruitment, retention and training of critical care nurses and other professional staff in Ontario that includes opportunities for critical care internships, enhanced mentorship, and team and leadership training.**

Finally, there is a need to ensure that the salaries of individuals working in critical care areas are competitive, and enhance recruitment and retention efforts. One issue that needs to be pursued is adopting an alternate funding plan for critical care medical staff across the province to stabilize the intensivist physician resource. The current fee-for-service arrangement for physicians will not necessarily support a transformation agenda that includes such things as flow management, clear accountabilities, a system approach to care, and partnerships with colleagues in other facilities. Alternate payment strategies would support these initiatives and lead to improved access to appropriate critical care services.

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<sup>55</sup> Richardson A, Douglas M, Shuttler R, Hagland MR. "Critical care staff rotation: outcomes of a survey and pilot study." *Nurs Crit Care* 2003; 8(2): 84-9.

<sup>56</sup> Ewart GW, Marcus L, Gaba MM, Bradner RH, Medina JL, Chandler EB. "The critical care medicine crisis: a call for federal action: a white paper from the critical care professional societies." *Chest* 2004; 125(4): 1518-21.

The Committee recommends that:

**R24 The Ministry of Health and Long-Term Care, the Ontario Medical Association, and other appropriate stakeholders implement an appropriate compensation system for physicians working in critical care that supports sufficient medical coverage in all critical care units in Ontario, promotes an intensivist-led model of critical care management, and enhances the quality and safety of patient care.**

### **Making Innovative Use of Human Resources to Provide Critical Care Services**

There are opportunities for innovative uses of human resources in critical care both in terms of maximising as well as expanding scope of practice. Some of these strategies include the following:

- Provide additional nursing staff in critical care areas to support nurses who provide critical care services. One study found a statistically significant decrease in the incidence of critical nursing situations during the period in which additional nurses were present. This was due, in part, to the amount of time the non-critical care nurses added to the availability of nursing care by ICU-trained nurses.<sup>57</sup>
- Allow “assistants” to free up ICU nurses’ time by performing technical non-nursing tasks.
- Train critical care nurse practitioners especially in units that do not have 24/7 intensivist coverage. St. Michael’s Hospital in Toronto successfully uses critical care nurse practitioners.
- Expand the scope of nursing and RT practice to develop critical care assistants. In the US, midlevel providers are responsible to and work in conjunction with an attending physician to provide direct patient care. They are typically physician assistants and acute nurse practitioners who have specialized critical care training. In an ICU environment, mid-level providers usually perform the same duties as residents.
- Float a Medical Emergency Team to critical care patients who are on the hospital wards (see Recommendation 6). Not only does this help ensure equality of care for all critically ill patients irrespective of their locations, it provides a training ground for staff to develop their critical care skills and knowledge.
- Expand the skill sets of critical care staff (e.g., use rehabilitation-focused staff to address the rehabilitation and recovery needs of critical care patients while they are still in critical care; use palliative care-focused staff to address the end of life care needs of patients).
- Develop decision support tools and clinical care process guidelines to help expand the role of providers.

The Committee believes that it is important to make innovative use of human resources to provide critical care services.

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<sup>57</sup> Binnekade JM, Vroom MB, de Mol BA, de Hann RJ. “The quality of Intensive Care nursing before, during, and after the introduction of nurses without ICU-training.” *Heart & Lung* 2003; 32(3): 190-196.

The Committee recommends that:

**R25 The critical care community – in partnership with the Nursing Secretariat of the Ministry of Health and Long-Term Care, professional regulatory colleges and other groups – promote regulatory changes in the scopes of practice for all healthcare professionals who work in critical care to maximise their knowledge and skills.**

Furthermore, the Committee recommends that:

**R26 The critical care community – in partnership with regulatory colleges and professional associations – evaluate new roles in critical care.**

### **Providing Appropriate Educational Preparation for Critical Care Professionals and Ensuring That Their Ongoing Development Needs Are Met**

As recommended above, professional critical care staff need to meet provincially-accepted standards and core competencies. Currently, individual hospitals provide training programs either on their own or in affiliation with local educational institutions. Since these programs vary across the province, it is suspected that staff who complete training may not all have the same competencies. A standardized prototype education program needs to be developed that will support provincial critical care standards and core competencies.

All professional critical care staff need to learn leadership skills and management skills, and be trained to work effectively in teams. Leadership, management and team skills should be recognised as core competencies to work in critical care, and be included in the standardized prototype education program.

Additional training for physicians should use a targeted training approach. This includes the Society of Critical Care Medicine's FCCS course of equivalent (core knowledge), procedural skills training (simulation/ACES course), and a critical care leadership and management skills package.



## 7. CRITICAL CARE TECHNOLOGIES<sup>58</sup>

### INTRODUCTION

Critical care is rich in current and emerging technologies which are increasingly becoming more costly. In addition, there is no systematic and standardized approach to acquiring and retiring these technologies. Decisions about which technologies to buy tend to be driven by physicians and made locally within individual hospitals. Effective processes for assessing technology evaluations, adopting and diffusing new technologies, and withdrawing obsolete or less effective technologies do not exist.

This chapter addresses medical devices and drugs in critical care, and examines current evaluation initiatives. Information technology is addressed in Chapter 9, *Critical Success Factors*.

### BACKGROUND

Technology assessment in critical care is complex since care is provided to a broad range of individuals, for a wide range of conditions, using multiple drugs and medical devices. However, there are opportunities to standardize technology requirements and help decision makers come to effective and efficient decisions. Increasingly, countries are establishing agencies that make evidence-based recommendations on health technologies to guide health care expenditures and decisions. Typically, these decisions are made by local providers unless a central agency directly funds the device or drug.

The International Agency for Health Technology Assessment (INAHTA) has 39 members from 20 countries undertaking one thousand projects at any point in time. Europe alone has more than 20 government health technology assessment agencies that employ 500 full-time equivalents, work with 3,000 researchers and are developing 600 technology assessments at any given time. It is noted that assessments are being conducted on the same technologies.

In Canada, the Canadian Coordinating Office of Health Technologies (CCOHTA) is an independent, not-for-profit organization that reviews research that has been done on medical technologies (devices and drugs). Developed in 1989, CCOHTA is funded by Canadian federal, provincial and territorial governments, and provides information to the ministries of health, Health Canada, hospitals and health practitioners to help with healthcare decisions. In September 2002, CCOHTA's mandate was expanded to include managing a common review process for new drugs submitted to participating federal, provincial and territorial drug benefit programs for funding consideration. A number of

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<sup>58</sup> This chapter was informed by the following report commissioned for the Ontario review (see Appendix C). *International, National and Provincial Health Technology Assessment Activities* (Authored by Eric Nauenberg).

provinces have health technology assessment initiatives including British Columbia, Alberta, Manitoba, Saskatchewan and Quebec.

In Ontario, a number of organizations and groups assess medical technologies. One important group is the Ministry of Health and Long-Term Care's Medical Advisory Secretariat (MAS) and the Ontario Health Technology Advisory Committee (OHTAC). OHTAC assesses new and upcoming diagnostic and treatment-related medical devices and services, equipment and supplies, and laboratory tests and clinical procedures used in any health services delivery setting. OHTAC also commissions field studies of emerging technologies. OHTAC does not assess pharmaceuticals or information technology. OHTAC's vision is to be a single advisory voice to the Ministry and other healthcare decision makers on the uptake, diffusion and distribution of new health technologies. Its future goal includes assessing existing technologies. MAS provides evidence-based policy information on the coordinated uptake of emerging health technologies and health services in Ontario, and provides secretariat support and evidence-based health technology policy analysis for OHTAC. MAS/OHTAC use the following evaluation process:

- OHTAC sets priorities in consultation with the Ministry and other stakeholders, and requests technical support from MAS;
- MAS prepares comprehensive technology assessments based on reviews of the scientific literature to determine if the technology warrants diffusion;
- The assessments determine whether the evidence supports diffusion, does not support diffusion or whether field testing is required; and
- OHTAC reviews and makes recommendations to the Ministry and other decision makers.

Another group in Ontario that assesses drugs – albeit in a limited way – is the Ministry's Drug Quality and Therapeutics Committee. This expert committee provides independent advice to the Minister and the Drug Programs Branch on the therapeutic value and cost-effectiveness of out-patient drugs reimbursed under the Ontario Drug Benefit program,<sup>59</sup> and of out-patient cancer drugs. The committee assesses which drugs government should fund by evaluating the therapeutic value of the drug, the inter-changeability of generic drug products, and the value for money of the drug.

A third provincial initiative – focused on assessing drugs – is being developed by the Council of Academic Hospitals of Ontario (CAHO). CAHO is in the process of establishing a Drugs and Therapeutics Committee made up of hospital representatives,

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<sup>59</sup> The Ontario Drug Benefit Program (ODB) of the Ontario Ministry of Health and Long-Term Care, covers most of the cost of prescription drug products listed in the Ontario Drug Benefit Formulary. The ODB Program covers Ontario residents with valid Ontario Health Insurance cards who: are 65 years of age and older, reside in long-term care facilities, reside in homes for special care, receive professional services under the home care program, or are Trillium Drug Program recipients. ODB coverage is also provided to those receiving social assistance under Ontario Works or the Ontario Disability Support Program.

clinicians, pharmacists and evidence experts.<sup>60</sup> The proposed committee will review and make recommendations on new and high impact drugs with significant health outcomes and/or financial cost to the Ontario hospital system. The committee may focus on a specific medication, a class of medications or drug treatment of a disease state. In addition to reviewing drugs, the committee will also advise on best prescribing practices, benchmarking, performance measurement, pharmaceutical fiscal planning and policy. Subcommittees will include clinical evaluation, economic evaluation, and measurement and evaluation. CAHO's work will not replace or replicate the work of local pharmaceutical and therapeutics committees or existing groups involved in drug evaluations (e.g., Ontario Drug Benefit Program, Cancer Care Ontario). CAHO's committee will be formally launched April 2005. Key discussions are being held with stakeholder groups, and partners are being sought for this initiative.

## COMMITTEE'S OBSERVATIONS AND RECOMMENDATIONS

### Evaluation Activities

Many international, national and provincial organizations and groups evaluate medical technologies. In Ontario, OHTAC plays a valuable role in evaluating emerging technologies and recommending field evaluations of emerging devices to the Medical Advisory Secretariat. The Committee believes that establishing yet another group to evaluate critical care-related technologies would replicate much of the excellent work that is being done by these groups. A more effective approach, that would add value, is for Ontario's critical care community to use the evaluations being done by others to inform the adoption, diffusion and withdrawal of technologies in critical care. In addition, the critical care community should proactively identify emerging technologies to be assessed by existing evaluation groups.

### The Committee recommends that:

**R27 The critical care community review the evaluations conducted by other organizations and groups to inform the adoption, diffusion and withdrawal of critical care technologies. Furthermore, the critical care community should make recommendations to such bodies as the Ontario Health Technology Advisory Committee on emerging critical care technologies that need to be evaluated.**

Existing groups tend to evaluate new and emerging technologies rather than current technologies. Although the use of current technologies is harder to control since they have already been adopted, there is a need to evaluate these technologies with a view to identifying those that are obsolete or less effective. The critical care community can make an important contribution evaluating current technologies using existing evaluation groups.

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<sup>60</sup> Council of Academic Hospitals of Ontario (Executive Director, Mary Catherine Lindberg), *A Common Approach to Hospital Drug Use*. Presentation made to the Technology Assessment Working Group, January 14, 2005.

The Committee recommends that:

**R28 The critical care community offer to participate in the evaluation of current critical care technologies in partnership with existing evaluation bodies such as the Ontario Health Technology Advisory Committee.**

A significant amount of time and effort go into evaluating technologies. Less effort goes into communicating the results of these evaluations and limited effort into telling hospitals which technology they should acquire and retire. The mandate of evaluation groups, such as OHTAC, does not include recommendations on what to buy. As a result, a hospital's decision may not take evaluation results into account. The Committee believes that the results of evaluations need to be used systematically to guide decisions about purchasing critical care technologies in Ontario hospitals. These decisions should be sensitive to the level of critical care provided by hospitals, and be reviewed and updated on a regular basis. Furthermore, these technologies should be viewed as standards against which critical care performance is assessed (see Chapter 5, *Safety and Quality Through a Framework to Improve Critical Care Performance*). Opportunities for bulk purchasing these technologies should also be pursued.

The Committee recommends that:

**R29 The evaluation of technologies unique to critical care, conducted by the Ontario Health Technology Advisory Committee and other groups, be used to identify the standard technologies that hospitals with critical care services should acquire or retire. Opportunities for bulk purchasing should be pursued.**

### Medical Devices

A broad range of medical devices is used in critical care. The Committee reviewed the technologies that should be considered by patient acuity level, and developed prototype listings of technology and laboratory diagnostic capability, and technology treatment capability.

#### Prototype Technology and Laboratory Diagnostic Capability by Patient Acuity Level\*

	Technology and Laboratory	Patient Acuity Level		
		3	2	1
<b>1</b>	<b>Clinical Laboratory</b>			
	1.1 Basic laboratory such as hematologic, chemistry, blood gas, and toxicology analysis should be available on a 24-hr basis	E	E	E
	1.2 Specialised laboratory (e.g., complete toxicologic analyses)	E*	E*	E*

	Technology and Laboratory	Patient Acuity Level		
		3	2	1
<b>2</b>	<b>Radiology – Other</b>			
	2.1 Portable chest radiographs in the ICU.	E	E	E
	2.2 Fluoroscopy capability in ICU (or readily available in radiology)	E	E	E
	2.3 Interventional radiologic capabilities including invasive arterial and venous diagnostic and therapeutic techniques, percutaneous access to the renal collecting system and biliary tract, percutaneous gastrostomy, and percutaneous drainage of fluid collections.	E	E	E/TP
	2.4 Computed tomography and computed tomography angiography	E	E	TP
	2.5 Duplex doppler ultrasonography	E	E/TP	TP
	2.6 Magnetic resonance imaging/magnetic resonance angiography.	E	E/TP	TP
	2.7 Echocardiography			
	2.7.1 Transthoracic	E	E	TP
	2.7.2 Transesophageal	E*	E*	TP
<b>3</b>	<b>Cardiorespiratory – Other</b>			
	3.1 Continuous ECG	E	E	E
	3.2 Noninvasive arterial pressure	E	E	O
	3.3 Pulse oximetry	E	E	E
	3.4 Invasive pressures			
	3.4.1 Arterial	E	E	-
	3.4.2 PA/CVP	E	E	-
	3.5 Cardiac output	E	E	-
	3.6 Continuous mixed venous O2 saturation	U	U	-
	3.7 Capnography (End Tidal CO2)	E	E	O
<b>4</b>	<b>Neurophysiology</b>			
	4.1 EEG (non-continuous)	E	O/TP	O/TP
	4.2 Continuous EEG	U	U	-
	4.3 Intracranial pressure (ICP)	E	E/TP	TP
	4.4 Electromyography (EMG)	E	E/TP	-

	Technology and Laboratory	Patient Acuity Level		
		3	2	1
	4.5 Somato-sensory evoked potentials (SSEP)	E	TP	-
	4.6 Transcranial Doppler	E	TP	-
<b>5</b>	<b>Other</b>			
	5.1 Temperature monitoring devices	E	E	E
	5.2 Weigh Scales	E	E	E

\*Code – E: Essential. D: Desirable. O: Optional. (-): Not applicable. U: Unknown. TP: Transport protocol must be in place to transfer patients to the technology, within or between hospitals.

Note: In some cases, the technology may be needed for only a limited number of Level 2 and 3 patients. Local Health Integration Network planning should determine which of these technologies should be available within the LHIN. Transfer protocols would need to be developed to access the technologies that are not available locally.

### Prototype Technology Treatment Capability by Patient Acuity Level\*

	Technology Treatment	Patient Acuity Level		
		3	2	1
<b>1</b>	<b>Circulation</b>			
	1.1 Access to CPR equipment	E	E	E
	1.2 Central Lines Cutdown Tray	E	E	E
	1.3 Blood Warmer	E	E	E
	1.4 Pacemakers, temporary - transvenous	E*	E/TP	TP
	1.5 Pacemakers, temporary - external	E	E	E
	1.6 Balloon Pump	E*	E/TP	-
	1.7 Artificial Heart/LVAD	U	-	-
	1.8 Specialised electrophysiology	E**	E**	E**
<b>2</b>	<b>Respiratory</b>			
	2.1 Airway support (laryngoscope; endotracheal tubes)	E	E	E
	2.2 Suction	E	E	E
	2.3 Humidification for upper airway	E	E	E
	2.4 Bronchoscopy – therapeutic	E	E/TP	-
	2.5 Ventilator: Conventional	E	E	E

	Technology Treatment	Patient Acuity Level		
		3	2	1
	2.6 Ventilator: Non-conventional (e.g., HFO)	E*	E*	-
	2.7 Ventilator: transport	E	E	E
	2.8 ECMO	U	-	-
<b>3</b>	<b>Renal</b>			
	3.1 Hemodialysis (Continuous, intermittent dialysis and ultrafiltration)	E*	E*	E/TP*
	3.2 Peritoneal Dialysis	E*	E*	TP
<b>4</b>	<b>Other</b>			
	4.1 Rewarming - Blanket Warmer	E	E	E
	4.2 Cooling for neuro-resuscitation	E	E	E
	4.3 Portable patient lifts	E	E	-
	4.4 Patient controlled analgesia device	E	E	E
	4.5 Beds with removable headboard/adjustable position	E	E	E
	4.6 Specialty beds	E	E	E
	4.7 Positive and negative pressure isolation rooms	E	E	O/TP
<b>5</b>	<b>Other: Specialised Patient Support</b>			
	5.1 Trauma patients	E*	E*	TP
	5.2 Burn patients	E**	E**	TP
	5.3 Transplant patients	E**	E**	TP
	5.4 Support of the organ donor +	E	E	E

\*Code – E: Essential. D: Desirable. O: Optional. (-): Not applicable. U: Unknown. TP: Transport protocol must be in place to transfer patients to the technology, within or between hospitals.

Note: In some cases, the technology may be needed for only a limited number of Level 2 and 3 patients. Local Health Integration Network planning should determine which of these technologies should be available within the LHIN. Transfer protocols would need to be developed to access the technologies that are not available locally.

\*\*Some therapeutic technologies may be needed for so few patients in a LHIN that transfer protocols to access the technologies elsewhere would be more effective, efficient and safe.

+ All levels of critical care should be capable of supporting potential organ donors with the guidance and assistance of the Trillium Gift of Life Network.

## Drugs

Opportunities exist to enhance the use of existing drug therapies and support the appropriate implementation of new drug therapies in critical care. Anecdotal evidence suggests that there are large variations in the prescribing practices of existing drugs in critical care. Variations in practice may result in variations of patient outcome. Many centres develop their own drug use guidelines rather than collaborate to develop joint guidelines.

The Committee believes that the critical care community needs to develop evidence-based guidelines to be used by Ontario hospitals for the adoption and use of new and expensive drug therapies in critical care (e.g., selecting appropriate patients to get the drug), and storing and administering requirements for new drugs (e.g., biologically derived drugs). For example, low-molecular-weight heparins for the prevention of DVTs in critical care patients is not a new drug. However, its application in the critical care setting is evolving. <sup>61</sup>

With the availability of widely accepted guidelines, an opportunity exists to define and mandate the standard of care for such expensive critical care drugs as:

- Activated Protein C
- Anti-fungal Agents (i.e. Caspofungin, Voriconazole, Liposomal Amphotericin)
- EPO
- Sedatives / Analgesics (i.e. Propofol)
- Pantoloc IV
- Octreotide
- Antibiotics (i.e. Meropenem, Cefepime)
- Paralytics (i.e. Rocuronium, vecuronium)
- Nitric Oxide
- Factor 7
- In the future as hospitals take responsibility from Canadian Blood Services: Pentaspan, Albumin, IVIG.

The evaluation of these expensive drugs and the development of provincial practice guidelines governing their use should leverage current and proposed drug evaluation initiatives, where possible.

A broad range of drugs are used in critical care. The Committee developed a prototype drug formulary by patient acuity level.

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<sup>61</sup> *Chest Supplement* 2004.



**Prototype Drug Formulary by Patient Acuity Level\***

Drug	Patient Acuity Level			Comments
	3	2	1	
<b>Biologics</b>				
Activated Protein C	F	L	L	
Erythropoetin	O	N	N	
<b>Cardiac Drugs</b>				
Fibrinolytics	F	F	F	Based on Emerg visits
Glycoprotein Iib/IIIa Inhibitors	F	L	L	Based on transfer to cardiac cath
Esmolol	F	L	N	
Ibutilide	O	O	N	
<b>Heparin Alternatives</b>				
LMWHs	F	F	F	Including guidelines for appropriate use
Danaparoid	F	F	F	
Argatroban	O	O	N	Based on availability of cardiac surgery
Lepirudin	O	O	N	
<b>Vasopressors</b>				
Dopamine	F	F	L	
Norepinephrine	F	L	L	
Phenylephrine	F	L	L	
Dobutamine	F	L	L	
Milrinone	F	O	N	
<b>Broad-Spectrum Antibiotics</b>				
Meropenem / Imipenem	O	O	L	Based on local and regional susceptibility patterns
Linezolid	O	O	L	
Piperacillin +/- Tazobactam	O	O	L	
Ciprofloxacin	O	O	O	
Cefipime	O	O	O	
Ceftazidime	O	O	L	
<b>Antifungals</b>				
Fluconazole	F	F	F	
Amphotericin B	F	F	F	
Liposomal Amphotericin B	O	N	N	Based on local and regional susceptibility patterns and clinical specialty (BMT, transplant, HIV)
Caspofungin	O	N	N	
Voriconazole	O	N	N	
<b>Other</b>				
Solid Organ Transplant/ BMT immunosuppressive medications	O	N	N	
Rasburicase	O	N	N	For BMT patients
Pantoprazole IV	F	F	O	
Neuromuscular Blocking Agents	F	N	N	
Propofol	F	F	N	
Nitric Oxide	O	N	N	

\*Code – F: Formulary. N: Non-Formulary. L: Limited quantities only (e.g., 24 hour supply until transfer). O: Optional based on ICU functions.

## 8. FUNDING CRITICAL CARE IN ONTARIO

### INTRODUCTION

Critical care is expensive. Advanced technologies, complex patient management and high staffing levels all add up to a high cost service. This chapter presents a preliminary overview of critical care costs in Ontario, along with the Committee's observations and recommendations on funding critical care.

### BACKGROUND

A number of jurisdictions have attempted to estimate current and future costs of critical care. Recent data estimated that critical care cost the US economy \$55.5 billion in 2000.<sup>62</sup> This represented 4.2% of the national health expenditure and 0.56% of the gross domestic product. Other estimates put critical care services at 1-2% of the American gross domestic product.<sup>63</sup> There is evidence that critical care costs are increasing. Halpern et al. noted that the daily cost of operating an ICU bed increased 126% from 1985 to 2000.<sup>64</sup>

It is unclear how much critical care costs the Ontario economy. Although the Ministry of Health and Long-Term Care has a number of administrative systems for tracking healthcare system expenditures, determining the cost of critical care with any degree of confidence is complicated by several factors:

- Critical care is a clinical function or a series of clinical events rather than one clinical event. It is harder to track the cost of multiple events.
- It is difficult to determine what costs should be included in critical care costs.
- The Ministry funds critical care from several funding envelopes. These include: i) the Ontario Health Insurance Plan for physician billings; ii) hospital global budgets; iii) capital allocations and associated "post-construction" operating plans; iv) priority program funding for certain procedures; and v) targeted one-time funding in selected areas.

### COMMITTEE'S OBSERVATIONS AND RECOMMENDATIONS

The future projections of demand for critical care services documented earlier (Chapter 2, A Profile of Critical Care Today and Projected into the Future) suggest that the need for mechanically ventilated critical care beds will increase considerably by 2028, given current occupancy rates of 90%. When a lower occupancy is used – one that can better

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<sup>62</sup> Halpern NA, Pastores SM, Greenstein RJ. "Critical care medicine in the United States 1985-2000: an analysis of bed numbers, use and costs. *Crit Care Med.* 2004; 32(6): 1254-9.

<sup>63</sup> Chalfin DB, Cohen IL, Lambrinos J. "The economics and cost-effectiveness of critical care medicine." *Intensive Care Med.* 1995; 21(11): 952-61.

<sup>64</sup> Halpern et al., *Ibid.*

handle capacity surges – the number of required mechanically ventilated beds almost doubles by 2026. Assuming that current patterns of practice are maintained into the future, estimates project that 25-50 additional critical care beds will be needed in Ontario each year.

These findings suggest that Ontario will face substantial difficulties in meeting future requirements for critical care services if adequate strategic and operational solutions are not identified and implemented. Consequently, a major focus of the Committee’s report has been on improving the efficient and effective use of critical care resources. Although these improvements will have a significant impact on meeting critical care needs, additional investments are needed if demands are to be met.

The Committee addressed the importance of:

- Determining the true costs of critical care;
- Allocating appropriate funding to support critical care beds; and
- Recognising critical care as a system-level resource.

### **Determining the True Costs of Critical Care**

There is a need to determine the true costs of, and the funding required to support, the three levels of critical care services (see Recommendation 2). Currently, there appears to be a great deal of variability in the funding that hospitals receive for adult critical care services and what hospitals spend on these services. It is unclear whether lower cost hospitals are more efficient, treat lower acuity patients or are not following best practices.

The true costs of critical care include a wide range of direct and indirect costs. The “upstream” and “downstream” costs associated with critical care are significant. When a hospital receives funding for additional beds, its ward-level costs also increase. For example, the costs of a patient who is finally discharged from critical care to a lengthy stay in a ward bed are taken from the hospital’s general global budget. There is a need to determine the true costs of critical care.

The Committee recommends that:

**R30 The Ministry of Health and Long-Term Care, in consultation with stakeholders, refine its ability to measure the true costs of critical care taking into account the broad range of costs to provide this service.**

The Committee identified the broad range of cost categories for critical care for future consideration:

## **OPERATING COSTS**

### **I. Direct Hospital Operating Costs**

These costs include funds from the Ministry of Health and Long-Term Care to the hospital. Alternate Payment Plan funding is not included.

#### **A. Health Human Resources**

1. Medical Care
  - a) Physicians - Other Fees
  - b) On Call
2. Management and Support
  - a) Nurse Managers
  - b) Nurse Practitioner/Nurse Educator/CNS
  - c) Clerical
  - d) Service
  - e) Biomedical Engineering Support
  - f) ICU Medical Emergency Team (Includes Nursing, Respiratory Therapy and Physicians)
  - g) Medical Director
3. Direct
  - a) Nursing
  - b) Respiratory Therapists
  - c) Pharmacists
  - d) Dietitians
  - e) Physiotherapy
  - f) Social Worker
  - g) Spiritual Services
  - h) Ongoing Training Costs

#### **B. Laboratory & Diagnostic Costs**

1. Laboratory
2. Diagnostic Imaging
3. Other

#### **C. Treatment & Therapeutics Costs**

1. Med/Surg Supplies
2. Other Supplies/Equipment
3. Pharmacy

## **II. Indirect Hospital Operating Costs**

These costs include funds from the Ministry of Health and Long-Term Care to the hospital.

#### **A. Contribution to Overheads**

1. Administration
2. Information System Costs/Connectivity
3. Other Overhead Costs

#### **B. Upstream/Downstream Costs**

1. Surgical Costs
2. Inpatient Unit Beds
3. Other

## **III. Other Health System Costs**

#### **A. Physician Remuneration (OHIP or APP)**

#### **B. Patient Transportation Costs**

1. Ambulance Operating Costs (Total)
2. Critical Care Costs

#### **CAPITAL/ONE-TIME COSTS**

##### ***A. Capital Renovation***

##### ***B. Capital Purchases***

##### ***C. One-Time Training***

### **Allocating Appropriate Funding to Support Critical Care Beds**

Funding for a critical care bed – taking into account level of patient acuity – needs to be based on the total costs of maintaining a staffed bed, 24-hours-a-day, 7-days-a-week, 365-days-a-year. Hospitals should be accountable for keeping this bed available and in operation. This approach recognizes that critical care occupancy fluctuates and may go beyond 100% at certain times of the year. This approach also recognizes that patient type may fluctuate. For example, a Level 2 patient may temporarily be in a Level 3 bed or a Level 2 bed may be used for a Level 3 patient, especially in surge situations.

Data on occupancy and utilization fluctuations should be used to adjust total funding for critical care in the Local Health Integration Network, over time. It is not reasonable to adjust individual hospital funding each year because of annual fluctuations.

### **Recognising Critical Care As a System-Level Resource**

Due to the need for specialized facilities, staff and expertise – which are not available in every hospital – critical care must be viewed as a system-level resource. Funding should support the coordination of critical care services at the LHIN or critical care network level. New beds should not be funded through annual global hospital funding increases or through individual hospital business cases. Rather, the Ministry in consultation with the Joint Policy and Planning Committee, should review its hospital funding options to determine how best to fund the expansion of future critical care beds. This new approach should:

- Include joint business cases or collaborative service delivery plans developed jointly by all hospitals that provide critical care services in a LHIN;
- Harmonize with the current hospital funding formula to ensure that if hospitals receive increased funding and responsibility to provide critical care services, this should not impact negatively on future global funding increases; and
- Harmonize with current Post-Construction Operating Plans which include new operating dollars for critical care beds.

## **PART 3: CONCLUSION AND RECOMMENDATIONS**

### **9. CRITICAL SUCCESS FACTORS**

The Committee has identified three critical success factors that must be put in place if Ontario's critical care system is to meet the significant challenges of the future. These factors include a principal advisory body on critical care, a critical care management information system, and a commitment to implementation.

#### **A PRINCIPAL ADVISORY BODY ON CRITICAL CARE**

The critical care community is made up of many dedicated individuals who care not only for their patients but also for the health of critical care services in the province. These individuals have a wealth of information to offer to the Ministry on issues and innovations. Currently, an effective communication mechanism does not exist to harness this information into collective advice for the Ministry. The Steering Committee's experience illustrated the power of bringing together individuals to discuss issues and identify opportunities for improvement. There is a need to continue this type of dialogue with a focus on ongoing monitoring and improvement of the critical care system.

The Committee recommends that:

**R31 The Ministry of Health and Long-Term Care establish a Provincial Critical Care Advisory Group as the principal advisor to the Ministry on improving the access, quality, efficiency, safety and accountability of adult critical care services in Ontario. The Group should be made up of individuals involved in the provision of critical care services in the province including clinicians, administrators, and representatives from patient transportation, community-based healthcare, researchers and government.**

The proposed terms of reference and structure of the Advisory Group is as follows.

#### **Objectives**

- To oversee the implementation of the provincial critical care strategy.
- To monitor the ongoing functioning of Ontario's critical care system, evaluate its performance, identify areas for improvement, and initiate action-oriented provincial quality improvement initiatives.
- Report regularly on critical care performance and improvement to providers, funders and the public. (A standardized, minimum dataset will form the basis of these reports. In general, information will be publicly available except in instances where the data needs to be developed further).
- Establish partnerships with other critical care and research associations and groups – such the Paediatric Critical Care Network, the Institute for Clinical Evaluative

Sciences and the Trillium Gift of Life Network – to promote research, knowledge transfer and improvement.

### **Guiding Principles**

- ***Patient Focused:*** Focus on meeting the needs of critical care patients and their families.
- ***Equity of Appropriate Access:*** Promote equity of access to standardized critical care services, as appropriate, that meet safety and quality standards, for all Ontarians regardless of where they live.
- ***Performance Improvement Oriented:*** Promote ongoing performance improvements at the professional, organizational and system levels.
- ***Data and Consensus-Driven:*** Advise using the best available data and evidence, and consensus-driven methods.
- ***Consultative and Collaborative:*** Consult with and develop collaborative partnerships with critical care providers, administrators and researchers.
- ***Transparent:*** Use a transparent approach to sharing performance-related information with funders, providers and the public.

### **Chair and Membership**

The Chair will be appointed by the Ministry of Health and Long-Term Care and be a member of the Advisory Group.

The membership will include:

- A critical care physician and administrative representative from each LHIN or critical care network in the province
- Representatives from the allied health professions (e.g., nursing, respiratory therapy, pharmacy)
- A healthcare representative from a sector other than acute care (e.g., rehabilitation, complex continuing care, long-term care, community-based home care)
- A representative from medical transportation
- Representatives from research

### **Committees**

The Advisory Group will have three committees: performance improvement, human resources, and technology review.

#### ***Performance Improvement Committee***

Made up of experts in critical care, continuous quality improvement and health management, and other stakeholders, the Performance Improvement Committee will monitor, evaluate and identify areas for critical care performance improvements.

The Committee will be responsible for:

- Developing an objective process to measure performance;
- Monitoring performance across: i) the system of critical care; and ii) by individual organizations that provide critical care services; and

- Identifying action-oriented provincial quality improvement initiatives. This includes identifying critical care units that consistently perform exceptionally well and can be used as learning models, and those that under perform and need targeted action to improve performance.

As the Ministry proceeds with its *Transformation Agenda*, it is recognized that the responsibilities of the Performance Improvement Committee may change or merge with other groups. For example, the Cardiac Care Network of Ontario may focus on performance measurement and quality improvement initiatives in aspects of cardiac care that occur in critical care. Similarly, some aspects of critical care may fall under the purview of the Ontario Health Quality Council once its mandate becomes clear.

### ***Human Resources Committee***

Made up of experts in critical care, human resources and other stakeholders, the Human Resources Committee will develop approaches to support the recruitment and retention of professionals in critical care.

The Committee will be responsible for:

- Developing strategies to maximise and expand the scopes of practice of critical care providers.
- Identifying, advocating for, and evaluating new roles in critical care.
- Reviewing the current capacity for training critical care professionals to ensure that there are a sufficient number of people to meet future demand;
- Developing a leadership and team building training model to be offered to critical care providers in Ontario; and
- Developing an appropriate compensation system for physicians working in critical care that supports sufficient medical coverage in all critical care units in Ontario.

### ***Technology Review Committee***

Made up of experts in critical care, technology assessment (devices, drugs and information), and other stakeholders, the Technology Review Committee will develop and maintain a systematic and standardized approach to acquiring and retiring critical care technologies in Ontario.

The Committee will be responsible for:

- Identifying and summarizing technology reviews conducted by other organizations and groups, and using this information to recommend standard technologies that should be acquired or retired within each level of critical care in hospitals; and
- Developing guidelines on expensive critical care drugs for use by hospital pharmacy and therapeutics committees.

### **Staff Support**

The Ministry needs to ensure that the Advisory Group is sufficiently and appropriately supported if it is to fulfil its purpose and meet its objectives. It is recognized that the Ministry will determine the nature of this support consistent with its approach to addressing provincial initiatives using the LHIN structures. It is suggested, however, that



the Advisory Group have a physician champion within the Ministry, preferably a full-time individual, who is dedicated to monitoring and improving critical care on an ongoing basis.

### **Accountability**

The Advisory Group will be accountable and provide expert advice and recommendations on improving the system of critical care services to the Ministry, through an Assistant Deputy Minister of Health and Long-Term Care. The Ministry has ultimate responsibility for decisions about critical care funding, resource allocation and the introduction of new critical care services.

## **A CRITICAL CARE MANAGEMENT INFORMATION SYSTEM**

The Steering Committee was hampered in its work by the lack of information on critical care capacity, human resources and funding. Indeed, much time and effort went into collecting data through surveys. In addition, projected increases in critical care demand provided, at best, gross estimates of the future need for critical care. A forecasting model for critical care that assesses the impact of multiple factors on demand does not exist (e.g., efficiencies, changes in practice, technological innovations, population characteristics).

A rigorous forecasting model for critical care demand, and a provincial critical care management information system – that focuses on the performance of individuals as well as groups of institutions – are needed to support a number of the report's key recommendations, most notably performance improvement and surge management. The model would provide more refined estimates of future demand, and the provincial system would support improvements in effective and efficient management processes, best practices, safety and research. It would also be the backbone for an integrated critical care system for Ontario.

Currently, a number of data sources can be used to measure some aspects of critical care performance. These include:

- The Canadian Institute for Health Information discharge abstract database (DAD) which generates records when a patient is discharged from the hospital.
- The minimum dataset collected by the Critical Care Research Network (CCR-Net) at the critical care unit level. Almost 40 hospitals across Ontario, Alberta, and Newfoundland contribute to this database, accounting for over 100,000 admissions. CCR-Net's data is collected by critical care personnel, and includes a clinically rich set of variables.

Although these data bases provide valuable information, they are insufficient to provide the kind of data that are required for provincial monitoring, evaluation and improvement of critical care.

Developing a comprehensive and useful information management system is complex, and can be overwhelming, time consuming and resource-intensive. This is especially true when the goal is to integrate information collected by a large number of providers. It is not feasible to create a stand alone critical care information management system. The Committee commends the Ministry for its provincial information management initiative as part of the Transformation Agenda, and looks forward to linking critical care into this initiative. This linkage is especially important for the Wait Time Strategy since critical care impacts directly on surgical wait times: surgeries are delayed or cancelled, if critical care resources are not available. Information on the availability and location of critical care beds is an important enabler of the Strategy.

The Committee recommends that:

**R32 A rigorous forecasting model for critical care demand and a provincial critical care management information system be developed under the umbrella of the Ministry of Health and Long-Term Care's provincial information management initiative, as part of the *Transformation Agenda*. These initiatives should support improvements in effective and efficient management processes, best practices, safety and research in critical care.**

## **A COMMITMENT TO IMPLEMENTATION**

The final success factor that is necessary if Ontario's critical care system is to meet the significant challenges of the future, is a commitment to implementation. This includes a willingness to follow through with recommended changes and provide appropriate financial assistance to support the Committee's recommendations. A work plan has been developed to help guide decision makers in achieving these recommendations.

After much deliberation, the Steering Committee developed recommendations that it believes will have a significant impact on improving the safety, quality, efficiency and effectiveness of critical care services in Ontario. The Ministry is to be commended for initiating this review and supporting the work of the Committee. The critical care community looks forward to participating in the implementation of this report.

The Committee recommends that:

**R33 The Ministry of Health and Long-Term Care accept the directions proposed by the Ontario Critical Care Steering Committee, and provide appropriate financial assistance and support to implement the recommendations of the Committee's report.**

## 10. WORKPLAN

The Committee presents the following workplan for the Ministry's consideration.

Recommendations can be implemented in the short term (1-6 months), medium term (6-12 months) or long term (12-18 months). Some recommendations are ongoing in nature. A number of medium- and long-term recommendations require planning and development before they can be implemented. This planning should begin immediately.

RECOMMENDATIONS	RESPONSIBILITY	TIMING
<b>ACCESS TO CRITICAL CARE THROUGH GREATER EFFICIENCIES AND EFFECTIVENESS</b>		
<b>System-Level Solutions to Improve Access</b>		
<p>R1 Adult critical care networks be established in Ontario using the boundaries of the Local Health Integration Networks (LHINs). Each critical care network should have a range of services that may include, but not be limited to, a cardiac centre (with cardiac surgery and interventional cardiology), a neurosurgical centre, a trauma centre, renal/dialysis capability, mechanical ventilator support, and obstetrics and gynaecology services. A number of LHINs may need to partner to achieve these service levels. The roles and responsibilities of providers within each critical care network should be well-defined and outlined in accountability agreements. Furthermore, all networks should have standards and protocols for patient transfers between hospitals, attempt to have as high a degree of self-sufficiency as possible, and be guided by a lead critical care clinician for administrative purposes.</p>	Ministry of Health and Long-Term Care in consultation with the Provincial Critical Care Advisory Group	Medium Term
<p>R2 The Ministry of Health and Long-Term Care categorize critical care services and patients by level of acuity ranging from most acute (Level 3) to least acute (Level 1).</p>	Ministry of Health and Long-Term Care in consultation with the Provincial Critical Care Advisory Group	Medium Term
<p>R3 The Ministry of Health and Long-Term Care develop a provincial inter-facility patient transfer plan that supports timely access to a seamless continuum of critical care services. The plan should be coordinated and operated as a provincial system, be sensitive to regional needs, and be resourced appropriately.</p>	Ministry of Health and Long-Term Care in consultation with the Provincial Critical Care Advisory Group	Short Term

RECOMMENDATIONS	RESPONSIBILITY	TIMING
<b>Organization-Level Solutions to Improve Access (Critical Care Management, Medical Emergency Teams, Telemedicine, e-ICU and Chronic Ventilation)</b>		
R4 Hospitals improve access to critical care services, the flow of patients, and the efficient and effective use of resources by establishing a single point of accountability for all of a hospital's critical care areas, and a unified approach to the utilization of critical care resources regardless of acuity level.	Provincial Critical Care Advisory Group, hospitals	Medium Term
R5 Ontario hospitals manage their critical care resources using an intensivist-led management model. An intensivist should coordinate access to and be the most responsible physician for critical care in units capable of providing Level 3 care. For units with a maximum capability of Level 2 care, one person – ideally an intensivist or a specialist with intensivist training or experience – should coordinate access to and be the most responsible physician for these units. The most responsible physician should ensure timely patient flow in and out of critical care, and be accountable for the appropriate use of resources by level of care.	Provincial Critical Care Advisory Group, hospitals	Medium Term
R6 The Ministry of Health and Long-Term Care provide stable ongoing funding to support the Medical Emergency Team pilots and additional funding to expand the pilots to include other hospitals in Ontario, subject to the results of the evaluation.	Ministry of Health and Long-Term Care	Long Term
R7 The Ministry of Health and Long-Term Care fund the proposal to conduct a three year demonstration project of electronic ICU technology in remote hospitals.	Ministry of Health and Long-Term Care	Short Term
R8 The Ministry of Health and Long-Term Care enhance the capacity of critical care resources in Ontario by increasing the number of chronically ventilated beds in Ontario in a timely fashion. These beds should be sited where the need is the greatest. In addition, the Ministry should support the expansion of innovative chronic ventilatory services such as home ventilation to meet the needs of these patients.	Ministry of Health and Long-Term Care The Provincial Critical Care Advisory Group	Medium Term
<b>Solutions Across All Levels to Meet Surges in Demand</b>		
R9 A minor surge in critical care be defined as an acute increase in demand for critical care services – ranging from 15-20% – that is localized to an individual hospital. A local hospital response should be sufficient to respond to minor surges, and individual hospital boards accountable for overseeing the surge response. A hospital's acute care human resources – such as physicians, nurses, respiratory therapists and others – its critical and acute care supplies, and physical plant	Ministry of Health and Long-Term Care The Provincial Critical Care Advisory Group	Medium Term and Ongoing

RECOMMENDATIONS	RESPONSIBILITY	TIMING
resources – including post-anaesthetic care units, emergency departments and intermediate units – should be sufficient to meet a minor surge. However, other hospital staff with additional acute and critical care training, and alternate space within the facility should be considered to help address the surge. A written checklist with processes to help address the surge situation should also be formally assessed.		
<p>R10</p> <p>A moderate surge in critical care be defined as a larger increase in demand for critical care services that impacts on a Local Health Integration Network (LHIN) or critical care network. Networks will respond to moderate surges, and be held accountable for overseeing the surge response. Acute care human resources – such as physicians, nurses, respiratory therapists and others – working within the LHINs or critical care networks should be sufficient to meet the surge and should be supported to travel to the area of need. Other hospital staff, with additional acute and critical care training, should be deployed to help address moderate surge. LHINs or critical care networks should stockpile specialized equipment and medications to meet moderate surges, and have a structured process for access and maintenance. Physical plant resources in a LHIN or critical care network will be sufficient to meet demand, however, the use of alternate space should be considered, prepared and equipped prior to a surge (e.g., post-anaesthetic care units, emergency departments, intermediate units, etc.). A written checklist with processes to help address the surge situation should also be formally assessed.</p>	<p>Ministry of Health and Long-Term Care</p> <p>The Provincial Critical Care Advisory Group</p>	<p>Medium Term and Ongoing</p>
<p>R11</p> <p>A major surge in critical care be defined as an unusually high increase in demand that overwhelms the healthcare resources of individual hospitals and regions for an extended period of time. A major surge should be responded to provincially or nationally, with the participation of the Ontario Chief Medical Officer of Health, and with the Deputy Minister of Health and Long-Term Care having ultimate accountability. Human resource assistance should be provided by hospital staff across the province with additional acute and critical care training. Specialized equipment and medications should be stockpiled to meet major surges, be centrally stored in the province and have a structured process for access and maintenance (i.e., Emergency Medical Assistance Team (EMAT) and the Emergency Medical Unit). EMAT will provide additional physical plant resources and be deployed after a written checklist with processes to help address the surge situation is formally assessed.</p>	<p>Ministry of Health and Long-Term Care</p> <p>The Provincial Critical Care Advisory Group</p>	<p>Medium Term and Ongoing</p>
<p>R12</p> <p>The Ministry of Health and Long-Term Care create additional Emergency Medical Assistance Teams (EMATs) to respond to major surges in Ontario.</p>	<p>Ministry of Health and Long-Term Care</p>	<p>Long Term</p>

<b>RECOMMENDATIONS</b>	<b>RESPONSIBILITY</b>	<b>TIMING</b>
R13 Ontario's hospitals encourage and facilitate their staff to volunteer for the Emergency Medical Assistance Team (EMAT). Through its training and exercise funding, EMAT should provide appropriate training and ongoing education to volunteer staff to develop and maintain competencies to be used in the event of surges. This will ensure that participating hospitals and Local Health Integration Networks have a core of trained personnel who can be deployed in minor and moderate surges, and which the province can deploy in major surges. The Ministry of Health and Long-Term Care, in partnership with hospitals and unions, should establish the terms and conditions to support the mobility of staff and protect them from legal liability in the event of surge situations.	Hospitals, Labour Unions, Ministry of Health and Long-Term Care	Medium Term
R14 Hospitals develop contractual agreements with their Local Health Integration Networks (LHINs) or critical care networks, as appropriate, that outline each hospital's role and responsibilities in surge situations. In addition, each LHIN or critical care network should identify a key contact person to provide leadership in surge situations.	Hospitals Local Health Integration Networks	Medium Term
<b>Ethical Considerations for Access</b>		
R15 The critical care community in Ontario initiate a process with a broad range of stakeholders to address ethical issues in accessing critical care services.	The Provincial Critical Care Advisory Group	Long Term and Ongoing
<b>SAFETY AND QUALITY THROUGH A FRAMEWORK TO IMPROVE CRITICAL CARE PERFORMANCE</b>		
R16 An objective process to measure critical care performance be developed that includes establishing evidence-based benchmarks, best practice guidelines and standards, and identifying a minimum data set to assess critical care performance against these measures.	The Provincial Critical Care Advisory Group	Medium Term and Ongoing
R17 The Ministry be accountable for funding and providing access to the minimal dataset elements. As well, consideration should be given to providing additional resources for performance measures that may need to be developed.	The Ministry of Health and Long-Term Care	Ongoing
R18 Individual critical care units, and Local Health Integration Networks/critical care networks measure their performance, and institute quality improvement initiatives tailored to their specific needs.	Local Health Integration Networks Hospitals	Long Term and Ongoing

<b>RECOMMENDATIONS</b>	<b>RESPONSIBILITY</b>	<b>TIMING</b>
<p>R19 Hospital boards be held accountable for governing and monitoring their organization’s critical care resources including access, appropriate use, quality and ongoing improvements. Government will monitor the performance of hospitals against established targets and hold organizations accountable, using funding incentives.</p>	<p>Hospital boards Ministry of Health and Long-Term Care</p>	<p>Medium Term and Ongoing</p>
<b>SUFFICIENT AND APPROPRIATE HUMAN RESOURCES TO MEET THE NEED FOR CRITICAL CARE</b>		
<p>R20 Core staffing ratios be adopted as minimum guidelines for critical care professionals in Ontario. The number of staff required will be influenced by patients, staff and environmental factors such as the size of the unit and available technologies. To refine these workload measures, an expert panel should be convened to explore options for measuring the workload of professionals working in critical care in Ontario. These options should include an approach to identify hours based on patient need.</p>	<p>The Provincial Critical Care Advisory Group Hospitals</p>	<p>Immediate and Ongoing</p>
<p>R21 Professional staff working in critical care meet standards and core competencies that are recognised provincially.</p>	<p>The Provincial Critical Care Advisory Group Hospitals</p>	<p>Long Term</p>
<p>R22 Local Health Integration Networks (LHINs) establish short- and long-term human resource plans that will support an appropriate level of critical care services in each LHIN. These plans should be consistent with and support the Ministry of Health and Long-Term Care’s provincial human resource planning processes.</p>	<p>Local Health Integration Networks Hospitals</p>	<p>Long Term</p>
<p>R23 The Nursing Secretariat of the Ministry of Health and Long-Term Care, the College of Nurses, the Registered Nurses’ Association of Ontario, and academic partners develop a strategy for the recruitment, retention and training of critical care nurses and other professional staff in Ontario that includes opportunities for critical care internships, enhanced mentorship, and team and leadership training.</p>	<p>Nursing Secretariat of the Ministry of Health and Long-Term Care College of Nurses Registered Nurses’ Association of Ontario Academic partners</p>	<p>Medium Term</p>
<p>R24 The Ministry of Health and Long-Term Care, the Ontario Medical Association, and other appropriate stakeholders implement an appropriate compensation system for physicians working in critical care that supports sufficient medical coverage in all critical care units in Ontario, promotes an intensivist-led model of critical care management, and enhances the quality and safety of patient care.</p>	<p>Ministry of Health and Long-Term Care Ontario Medical Association The Provincial Critical Care Advisory Group</p>	<p>Medium Term</p>

<b>RECOMMENDATIONS</b>	<b>RESPONSIBILITY</b>	<b>TIMING</b>
R25 The critical care community – in partnership with the Nursing Secretariat of the Ministry of Health and Long-Term Care, professional regulatory colleges and other groups – promote regulatory changes in the scopes of practice for all healthcare professionals who work in critical care to maximise their knowledge and skills.	The Provincial Critical Care Advisory Group Nursing Secretariat of the Ministry of Health and Long-Term Care Professional Regulatory Colleges	Long Term
R26 The critical care community – in partnership with regulatory colleges and professional associations – evaluate new roles in critical care.	The Provincial Critical Care Advisory Group Regulatory Colleges Professional Associations	Long Term
<b>CRITICAL CARE TECHNOLOGIES</b>		
R27 The critical care community review the evaluations conducted by other organizations and groups to inform the adoption, diffusion and withdrawal of critical care technologies. Furthermore, the critical care community should make recommendations to such bodies as the Ontario Health Technology Advisory Committee on emerging critical care technologies that need to be evaluated.	The Provincial Critical Care Advisory Group	Medium Term and Ongoing
R28 The critical care community offer to participate in the evaluation of current critical care technologies in partnership with existing evaluation bodies such as the Ontario Health Technology Advisory Committee.	The Provincial Critical Care Advisory Group	Medium Term and Ongoing
R29 The evaluation of technologies unique to critical care, conducted by the Ontario Health Technology Advisory Committee and other groups, be used to identify the standard technologies that hospitals with critical care services should acquire or retire. Opportunities for bulk purchasing should be pursued.	The Provincial Critical Care Advisory Group	Medium Term and Ongoing
<b>FUNDING CRITICAL CARE IN ONTARIO</b>		
R30 The Ministry of Health and Long-Term Care, in consultation with stakeholders, refine its ability to measure the true costs of critical care taking into account the broad range of costs to provide this service.	Ministry of Health and Long-Term Care The Provincial Critical Care Advisory Group	Long Term
<b>CRITICAL SUCCESS FACTORS</b>		
R31 The Ministry of Health and Long-Term Care establish a Provincial Critical Care Advisory Group as the principal advisor to the Ministry on improving the access, quality, efficiency, safety and	Ministry of Health and Long-Term Care	Immediate



<b>RECOMMENDATIONS</b>	<b>RESPONSIBILITY</b>	<b>TIMING</b>
accountability of adult critical care services in Ontario. The Group should be made up of individuals involved in the provision of critical care services in the province including clinicians, administrators, and representatives from patient transportation, community-based healthcare, researchers and government.		
<p>R32 A rigorous forecasting model for critical care demand and a provincial critical care management information system be developed under the umbrella of the Ministry of Health and Long-Term Care's provincial information management initiative, as part of the <i>Transformation Agenda</i>. These initiatives should support improvements in effective and efficient management processes, best practices, safety and research in critical care.</p>	<p>Ministry of Health and Long-Term Care Joint Policy and Planning Committee The Provincial Critical Care Advisory Group</p>	<p>Medium Term</p>
<p>R33 The Ministry of Health and Long-Term Care accept the directions proposed by the Ontario Critical Care Steering Committee, and provide appropriate financial assistance and support to implement the recommendations of the Committee's report.</p>	<p>Ministry of Health and Long-Term Care</p>	<p>Immediate</p>

## **11. CONSOLIDATED RECOMMENDATIONS**

### **ACCESS TO CRITICAL CARE THROUGH GREATER EFFICIENCIES AND EFFECTIVENESS**

#### **System-Level Solutions to Improve Access**

The Committee recommends that:

- R1 Adult critical care networks be established in Ontario using the boundaries of the Local Health Integration Networks (LHINs). Each critical care network should have a range of services that may include, but not be limited to, a cardiac centre (with cardiac surgery and interventional cardiology), a neurosurgical centre, a trauma centre, renal/dialysis capability, mechanical ventilator support, and obstetrics and gynaecology services. A number of LHINs may need to partner to achieve these service levels. The roles and responsibilities of providers within each critical care network should be well-defined and outlined in accountability agreements. Furthermore, all networks should have standards and protocols for patient transfers between hospitals, attempt to have as high a degree of self-sufficiency as possible, and be guided by a lead critical care clinician for administrative purposes.
- R2 The Ministry of Health and Long-Term Care categorize critical care services and patients by level of acuity ranging from most acute (Level 3) to least acute (Level 1).
- R3 The Ministry of Health and Long-Term Care develop a provincial inter-facility patient transfer plan that supports timely access to a seamless continuum of critical care services. The plan should be coordinated and operated as a provincial system, be sensitive to regional needs, and be resourced appropriately.

#### **Organization-Level Solutions to Improve Access (Critical Care Management, Medical Emergency Teams, Telemedicine, e-ICU and Chronic Ventilation)**

The Committee recommends that:

- R4 Hospitals improve access to critical care services, the flow of patients, and the efficient and effective use of resources by establishing a single point of accountability for all of a hospital's critical care areas, and a unified approach to the utilization of critical care resources regardless of acuity level.
- R5 Ontario hospitals manage their critical care resources using an intensivist-led management model. An intensivist should coordinate access to and be the most responsible physician for critical care in units capable of providing Level 3 care. For units with a maximum capability of Level 2 care, one person – ideally an

- intensivist or a specialist with intensivist training or experience – should coordinate access to and be the most responsible physician for these units. The most responsible physician should ensure timely patient flow in and out of critical care, and be accountable for the appropriate use of resources by level of care.
- R6 The Ministry of Health and Long-Term Care provide stable ongoing funding to support the Medical Emergency Team pilots and additional funding to expand the pilots to include other hospitals in Ontario, subject to the results of the evaluation.
- R7 The Ministry of Health and Long-Term Care fund the proposal to conduct a three year demonstration project of electronic ICU technology in remote hospitals.
- R8 The Ministry of Health and Long-Term Care enhance the capacity of critical care resources in Ontario by increasing the number of chronically ventilated beds in Ontario in a timely fashion. These beds should be sited where the need is the greatest. In addition, the Ministry should support the expansion of innovative chronic ventilatory services such as home ventilation to meet the needs of these patients.

### **Solutions Across All Levels to Meet Surges in Demand**

The Committee recommends that:

- R9 A minor surge in critical care be defined as an acute increase in demand for critical care services – ranging from 15-20% – that is localized to an individual hospital. A local hospital response should be sufficient to respond to minor surges, and individual hospital boards accountable for overseeing the surge response. A hospital’s acute care human resources – such as physicians, nurses, respiratory therapists and others – its critical and acute care supplies, and physical plant resources – including post-anaesthetic care units, emergency departments and intermediate units – should be sufficient to meet a minor surge. However, other hospital staff with additional acute and critical care training, and alternate space within the facility should be considered to help address the surge. A written checklist with processes to help address the surge situation should also be formally assessed.
- R10 A moderate surge in critical care be defined as a larger increase in demand for critical care services that impacts on a Local Health Integration Network (LHIN) or critical care network. Networks will respond to moderate surges, and be held accountable for overseeing the surge response. Acute care human resources – such as physicians, nurses, respiratory therapists and others – working within the LHINs or critical care networks should be sufficient to meet the surge and should be supported to travel to the area of need. Other hospital staff, with additional acute and critical care training, should be deployed to help address moderate surge. LHINs or critical care networks should stockpile specialized equipment and medications to meet moderate surges, and have a structured process for

access and maintenance. Physical plant resources in a LHIN or critical care network will be sufficient to meet demand, however, the use of alternate space should be considered, prepared and equipped prior to a surge (e.g., post-anaesthetic care units, emergency departments, intermediate units, etc.). A written checklist with processes to help address the surge situation should also be formally assessed.

- R11 A major surge in critical care be defined as an unusually high increase in demand that overwhelms the healthcare resources of individual hospitals and regions for an extended period of time. A major surge should be responded to provincially or nationally, with the participation of the Ontario Chief Medical Officer of Health, and with the Deputy Minister of Health and Long-Term Care having ultimate accountability. Human resource assistance should be provided by hospital staff across the province with additional acute and critical care training. Specialized equipment and medications should be stockpiled to meet major surges, be centrally stored in the province and have a structured process for access and maintenance (i.e., Emergency Medical Assistance Team (EMAT) and the Emergency Medical Unit). EMAT will provide additional physical plant resources and be deployed after a written checklist with processes to help address the surge situation is formally assessed.
- R12 The Ministry of Health and Long-Term Care create additional Emergency Medical Assistance Teams (EMATs) to respond to major surges in Ontario.
- R13 Ontario's hospitals encourage and facilitate their staff to volunteer for the Emergency Medical Assistance Team (EMAT). Through its training and exercise funding, EMAT should provide appropriate training and ongoing education to volunteer staff to develop and maintain competencies to be used in the event of surges. This will ensure that participating hospitals and Local Health Integration Networks have a core of trained personnel who can be deployed in minor and moderate surges, and which the province can deploy in major surges. The Ministry of Health and Long-Term Care, in partnership with hospitals and unions, should establish the terms and conditions to support the mobility of staff and protect them from legal liability in the event of surge situations.
- R14 Hospitals develop contractual agreements with their Local Health Integration Networks (LHINs) or critical care networks, as appropriate, that outline each hospital's role and responsibilities in surge situations. In addition, each LHIN or critical care network should identify a key contact person to provide leadership in surge situations.

### **Ethical Considerations for Access**

The Committee recommends that:

- R15 The critical care community in Ontario initiate a process with a broad range of stakeholders to address ethical issues in accessing critical care services.

### **SAFETY AND QUALITY THROUGH A FRAMEWORK TO IMPROVE CRITICAL CARE PERFORMANCE**

The Committee recommends that:

- R16 An objective process to measure critical care performance be developed that includes establishing evidence-based benchmarks, best practice guidelines and standards, and identifying a minimum data set to assess critical care performance against these measures.
- R17 The Ministry be accountable for funding and providing access to the minimal dataset elements. As well, consideration should be given to providing additional resources for performance measures that may need to be developed.
- R18 Individual critical care units, and Local Health Integration Networks/critical care networks measure their performance, and institute quality improvement initiatives tailored to their specific needs.
- R19 Hospital boards be held accountable for governing and monitoring their organization's critical care resources including access, appropriate use, quality and ongoing improvements. Government will monitor the performance of hospitals against established targets and hold organizations accountable, using funding incentives.

### **SUFFICIENT AND APPROPRIATE HUMAN RESOURCES TO MEET THE NEED FOR CRITICAL CARE**

The Committee recommends that:

- R20 Core staffing ratios be adopted as minimum guidelines for critical care professionals in Ontario. The number of staff required will be influenced by patients, staff and environmental factors such as the size of the unit and available technologies. To refine these workload measures, an expert panel should be convened to explore options for measuring the workload of professionals working in critical care in Ontario. These options should include an approach to identify hours based on patient need.

- R21 Professional staff working in critical care meet standards and core competencies that are recognised provincially.
- R22 Local Health Integration Networks (LHINs) establish short- and long-term human resource plans that will support an appropriate level of critical care services in each LHIN. These plans should be consistent with and support the Ministry of Health and Long-Term Care's provincial human resource planning processes.
- R23 The Nursing Secretariat of the Ministry of Health and Long-Term Care, the College of Nurses, the Registered Nurses' Association of Ontario, and academic partners develop a strategy for the recruitment, retention and training of critical care nurses and other professional staff in Ontario that includes opportunities for critical care internships, enhanced mentorship, and team and leadership training.
- R24 The Ministry of Health and Long-Term Care, the Ontario Medical Association, and other appropriate stakeholders implement an appropriate compensation system for physicians working in critical care that supports sufficient medical coverage in all critical care units in Ontario, promotes an intensivist-led model of critical care management, and enhances the quality and safety of patient care.
- R25 The critical care community – in partnership with the Nursing Secretariat of the Ministry of Health and Long-Term Care, professional regulatory colleges and other groups – promote regulatory changes in the scopes of practice for all healthcare professionals who work in critical care to maximise their knowledge and skills.
- R26 The critical care community – in partnership with regulatory colleges and professional associations – evaluate new roles in critical care.

## **CRITICAL CARE TECHNOLOGIES**

The Committee recommends that:

- R27 The critical care community review the evaluations conducted by other organizations and groups to inform the adoption, diffusion and withdrawal of critical care technologies. Furthermore, the critical care community should make recommendations to such bodies as the Ontario Health Technology Advisory Committee on emerging critical care technologies that need to be evaluated.
- R28 The critical care community offer to participate in the evaluation of current critical care technologies in partnership with existing evaluation bodies such as the Ontario Health Technology Advisory Committee.

- R29 The evaluation of technologies unique to critical care, conducted by the Ontario Health Technology Advisory Committee and other groups, be used to identify the standard technologies that hospitals with critical care services should acquire or retire. Opportunities for bulk purchasing should be pursued.

## **FUNDING CRITICAL CARE IN ONTARIO**

The Committee recommends that:

- R30 The Ministry of Health and Long-Term Care, in consultation with stakeholders, refine its ability to measure the true costs of critical care taking into account the broad range of costs to provide this service.

## **CRITICAL SUCCESS FACTORS**

The Committee recommends that:

- R31 The Ministry of Health and Long-Term Care establish a Provincial Critical Care Advisory Group as the principal advisor to the Ministry on improving the access, quality, efficiency, safety and accountability of adult critical care services in Ontario. The Group should be made up of individuals involved in the provision of critical care services in the province including clinicians, administrators, and representatives from patient transportation, community-based healthcare, researchers and government.
- R32 A rigorous forecasting model for critical care demand and a provincial critical care management information system be developed under the umbrella of the Ministry of Health and Long-Term Care's provincial information management initiative, as part of the *Transformation Agenda*. These initiatives should support improvements in effective and efficient management processes, best practices, safety and research in critical care.
- R33 The Ministry of Health and Long-Term Care accept the directions proposed by the Ontario Critical Care Steering Committee, and provide appropriate financial assistance and support to implement the recommendations of the Committee's report.

## **APPENDICES**

### **APPENDIX A: TERMS OF REFERENCE CRITICAL CARE STEERING COMMITTEE**

#### **Preamble**

Ontario has one of the finest critical care systems in the world. However, there is a need to improve the quality, comprehensiveness and appropriateness of the care it delivers transforming service delivery into an integrated system of critical care planning, coordination and evaluation, focusing on areas such as improved *service capacity, patient access, patient safety, accountability, human resource alignment and technology integration.*

#### **Mandate and Objectives**

The Steering Committee will oversee the creation of a “transformed system” that “manages” Ontario’s adult *critical care resources through standardized planning and service delivery criteria across strategic partnerships, which function to align planning with goals, resources and population need. The transformed system will also include the capacity to respond to sudden, unexpected demand.*

The Committee will:

- Develop a system-wide approach to critical care services in Ontario emphasizing access, accountability, and innovation, through the development of critical care hospital networks and an overall systems perspective for sharing learnings, approaches, and best practices;
- Provide direction, management and monitoring for various *ad hoc* task groups assigned for achieving project deliverables; and
- Provide reporting on achieving project deliverables, and performance impacts of specific projects and system implementation.

The Committee will focus on imperatives for adult critical care.

#### **Deliverables (12 Months)**

- Provide recommendations on development of up to 8-10 hospital networks, including network roles, responsibilities, mandates, and accountabilities;
- Advise on results of audit tool (or data survey) describing critical care resources in Ontario;
- Advise on development of on-going tool for benchmarking and best practice identification;



- Advise on critical care health human resources strategies and plans for the province (medical, nursing and allied health);
- Recommend approaches to ensure surge capacity for unexpected emergencies;
- Provide recommendations on improving critical care access in the province demonstrated through a measurable impact on CriteCall's time to destination and out-of-province transfers;
- Advise on leadership development for critical care; and
- Recommend critical care technologies for assessment by Ontario's Health Technology Advisory Committee (OHTAC), including a framework for assessing new and emerging technologies.

**Co-Chairs: Dr. Bob Bell and Lynda Robinson**

### **Committee Membership**

This Committee will be comprised of about 25 members, including physicians, nurses, respiratory therapists, hospital administration, allied health professionals, data and evaluation expertise, academia, and Ministry of Health and Long-Term Care staff (ex-officio).

### **Frequency of Meetings**

Committee meetings will take place on a monthly basis for the first 12 months, and subsequently will be reviewed for changes in mandate and meeting frequency.

### **Reporting Relationship**

The Committee will report to the ADM, Acute Services Division, through the Ministry Critical Care Working Group.

May 19, 2004

## **APPENDIX B: MEMBERS OF THE ONTARIO CRITICAL CARE STEERING COMMITTEE**

Dr. Robert S. Bell (Co-Chair)	Vice-President & Chief Operating Officer, Princess Margaret Hospital Site, University Health Network
Lynda Robinson (Co-Chair)	Managing Director, Robarts Clinical Trials, Robarts Research Institute
John Babos	Senior Communications Advisor, Communications and Information Branch, Ministry of Health and Long-Term Care
Jocelyn Bennett	Program Director, Nursing – Clinical Specialties, Mount Sinai Hospital
Dr. David Boyle	Intensivist, Sudbury Regional Hospital
Dr. Fabrice Brunet	Chief, Critical Care Department, St. Michael’s Hospital
Dr. Pierre Cardinal	Director Critical Care, The Ottawa Hospital
Debra Carew	Director of Operations, Sunnybrook and Women’s College Health Sciences Centre
Dr. Jim Chirico	Medical Director, North Bay General Hospital
Paula Cripps-McMartin	Manager Allied Health Professionals, University Health Network
Bruce Farr	Emergency Medical Services Chief for Toronto
Brenda Flaherty	Vice President, Patient Services, Hamilton Health Sciences Centre
Maude Foss	Nurse Manager, University Health Network
Wendy Fucile	Chief Nursing Officer, Peterborough Regional Health Centre
Dr. Murray Girotti	Medical Director, Trauma Program, London Health Sciences Centre
Dr. Peter Glynn, PhD (Ex officio)	Advisor, Wait Time Strategy, Health Results Team
Dr. Alan Hudson (Ex officio)	Lead Advisor, Wait Time Strategy, Health Results Team
Dr. Robert H. Hyland	Physician-in-Chief, St. Michael’s Hospital
Judy Kojlak	Acting Director Critical Care, London Health Sciences Centre
Dr. Peter Kraus	Chief, Department of Critical Care Medicine, Hamilton Health Sciences Centre

Dr. Andreas Laupacis	President and CEO, Institute for Clinical Evaluative Sciences of Ontario
Dr. Les Levin	Senior Medical Advisor, Medical Advisory Secretariat, Ministry of Health and Long-Term Care
Jeffrey Lozon	President and Chief Executive Officer, St. Michael's Hospital
Dr. Claudio Martin	Associate Director Critical Care Research Network, London Health Sciences Centre
Dr. Chris Mazza	Chief Executive Officer, Ontario Air Ambulance Base Hospital Program
David McNeil	Vice President, Clinical Programs and Chief Nursing Officer, Sudbury Regional Hospital
Dr. Donna McRitchie	Director of Critical Care, North York General Hospital
Dr. Alfio Meschino	Chief of Staff, Toronto East General Hospital
Shelley Moneta	Program Manager CritiCall Central Resource Registry, McMaster University Medical Centre
Jane Montgomery	Manager, Respiratory Therapy Service, Critical Care Program, London Health Sciences Centre
Dr. John Muscedere	Intensivist, Kingston General Hospital
Sandy Nuttall	Manager Hospitals Branch, Ministry of Health and Long-Term Care
Chris Power	Vice President, Patient Services, Trillium Health Centre
Alison Quigley	Executive Director, Child Health Network for the Greater Toronto Area
Vince Rice	Senior Communications Advisor, Health Results Team, Ministry of Health and Long-Term Care
Eleanor Rivoire	Vice President, Patient Care Programs, Kingston General Hospital
Dr. Brian Schwartz	Director, Prehospital Care, Sunnybrook Land Ambulance Base Hospital Program
Don Scott	President and CEO, Joseph Brant Hospital
Dr. William J. Sibbald	Physician-in-Chief, Sunnybrook and Women's College Health Sciences Centre
Dr. Carmine Simone	Director, Critical Care, Toronto East General Hospital
Dr. Thomas Stewart	Director, Critical Care Medicine, Mount Sinai Hospital and University Health Network
Dr. Carmine Stumpo	Director, Pharmaceutical Services, Toronto East General Hospital
Allison Stuart	Director, Emergency Management Unit, Ministry of Health and Long-Term Care

Brenda Weir	Program Director ICU, Medical/Surgical, Birthing Suites, Surgical Service, Northumberland Hills Hospital
Elizabeth Woodbury	Program Manager, Hospitals, Toronto Region Ministry of Health and Long-Term Care
Valerie Zellermeier	Program Director, Perioperative Services, St Michael's Hospital

**Ministry of Health and Long-Term Care Staff Support**

Marnie Weber	Regional Director, Toronto, Ministry of Health and Long-Term Care
David Reeleder	Project Manager, Critical Care Strategy, Ministry of Health and Long-Term Care
Robert McKay	Coordinator, Critical Care Steering Committee, Ministry of Health and Long-Term Care
Dr. Joann Trypuc, PhD	Project Officer/Technical Writer

The Committee would like to acknowledge Dr. Michael Scott, Thunder Bay Regional Health Sciences Centre for providing input on North West Ontario critical care issues.

## **APPENDIX C: RESEARCH REPORTS PREPARED FOR THE ONTARIO CRITICAL CARE STEERING COMMITTEE**

*Alleviating the Shortage of Critical Care Health Human Resources.* Authored by Marsha Pinto.

*Audit of Ontario's Critical Care Capacity.* Authored by Claudio Martin and Andrea Hill.

*Audit of Ontario's Current Health Human Resource Supply in Critical Care.* Authored by Andrea Hill.

*Backgrounder: Toward Establishing Levels of Critical Care in Ontario. Draft Recommendations: Establishing Levels of Critical Care in Ontario Based on Patient Acuity.* Authored by Robert McKay.

*Critical Care Demand Forecasting to 2026.* Authored by Eric Nauenberg.

*Critical Care and Work Life Issues.* Authored by Mohamad Alameddine.

*Definition of a Critical Care Bed by Different Jurisdictions: A Literature Review.* Authored by Greg Lowe.

*Ethical Considerations for the Transformation of Critical Care in Ontario.* Authored by Robert Sibbald.

*Intensivist Management of the Intensive Care Unit: A Literature Review.* Authored by Andrea Hill.

*International Benchmarks for Surge Capacity: Plans for Managing Demands on Critical Care Services.* Authored by Diane Wilson.

*International, National and Provincial Health Technology Assessment Activities.* Authored by Eric Nauenberg.

*Literature Review on ICU Admission and Discharge Practices.* Authored by Marsha Pinto.

*Literature Review on the Patient Population in ICUs.* Authored by Greg Lowe.

*Mapping Critical Care Networks for Ontario.* Developed by Erik Alkenbrack

*Non-Physician Staff/Patient Ratios Across Key Jurisdictions.* Authored by Mohamad Alameddine.

*Other Health Planning Initiatives in Ontario.* Authored by Joann Trypuc.

*Report on Critical Care Performance Measurement and Accountability.* Authored by Michael P. Hillmer and Andrea Hill.

*The Impact of Compensation Mechanisms on Organizational Outcomes: A Review of the Literature.* Authored by Monica Aggarwal.

*The Impact of Performance-Based Financial Incentives on Organizational Outcomes: A Literature Review.* Authored by Monica Aggarwal.

*Workload Assessment.* Authored by Judy Kojlak.

## APPENDIX D: PERFORMANCE INDICATORS FOR CRITICAL CARE

The Committee identified domains and considered a broad range of indicators for a critical care minimum data set.

### Domains by Examples of Potential Indicators

Domains	Examples of Potential Indicators for Consideration
<p><b>Appropriateness</b></p> <p>Appropriateness: Care/service provided is relevant to the clients’/patients’ needs and based on established standards. (CIHI Health Indicator Framework)</p>	<p><b>Patients</b></p> <ul style="list-style-type: none"> <li>• Patient acuity by hospital level</li> <li>• Deaths within six hours of admission</li> <li>• Number of patients with advanced directives</li> <li>• Critical care patients managed outside the usual critical care area</li> <li>• Average ICU length of stay</li> <li>• Average number of days on mechanical ventilation</li> <li>• ICU length of stay greater than seven days</li> </ul> <p><b>Human Resources</b></p> <ul style="list-style-type: none"> <li>• ICUs not staffed by trained intensivists by size of ICU</li> <li>• Nurse/patient ratios, other staff/patient ratios</li> <li>• Percentage part-time nurses</li> <li>• Vacancies</li> <li>• Injuries on the job</li> <li>• Trained staff to operate equipment in ICU</li> </ul> <p><b>Environment</b></p> <ul style="list-style-type: none"> <li>• Number of beds by level</li> <li>• Type of unit: closed/open</li> <li>• Delays being admitted into critical care and reasons why</li> <li>• Existence of evidence-based decision tools</li> <li>• Use of severity measures</li> <li>• Range of severity</li> </ul> <p><b>Technologies</b></p> <ul style="list-style-type: none"> <li>• Available technologies</li> <li>• Access to technology on-site (24/7, days only, etc.)</li> </ul>
<p><b>Safety and Quality</b></p> <p>Safety: Potential risks of an intervention or the environment are avoided or minimized (CIHI Health Indicator Framework)</p> <p>Quality: Evidence-based care that leads to optimal outcomes.</p>	<p><b>Evidence-based Process Measures</b></p> <ul style="list-style-type: none"> <li>• Appropriate Deep Venous Thrombosis (DVT) prophylaxis</li> <li>• Appropriate peptic ulcer disease (PUD) prophylaxis</li> <li>• Appropriate use of blood transfusion</li> <li>• Nutrition support</li> <li>• Ventilation practice (e.g., ARDS)</li> <li>• Assessment for weaning and extubation</li> <li>• Glucose control, etc.</li> <li>• Steroids for septic shock</li> <li>• Drotrecgin alfa activated for severe sepsis</li> <li>• Timeliness of antibiotic administration</li> <li>• Timeliness of infection workup</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>• Unplanned readmissions within certain period of time (as opposed to planned readmissions)</li> </ul>

<b>Domains</b>	<b>Examples of Potential Indicators for Consideration</b>
	<ul style="list-style-type: none"> <li>• Length of stay for patient groups that have high volumes</li> <li>• Palliative care deaths in ICU</li> <li>• Deaths in ICU with CPR</li> <li>• Risk-adjusted mortality</li> <li>• Mortality for patient groups that have high volumes</li> <li>• Mortality 30-day post ICU</li> <li>• Rate of organ/tissue donation</li> </ul> <p><b>Patient Safety</b></p> <ul style="list-style-type: none"> <li>• Medication errors</li> <li>• Unplanned extubation</li> <li>• Near misses</li> <li>• Rate of resistant infections</li> <li>• Procedure-related complications (e.g., pneumothorax after central line placement)</li> <li>• Allergic reactions</li> <li>• Trigger events</li> <li>• “Culture” that supports reporting of errors</li> </ul>
<p><b>Accessibility/Integration</b></p> <p>Accessibility: The ability of clients/patients to obtain care/service at the right place and the right time, based on respective needs (<i>CIHI Health Indicator Framework</i>).</p>	<ul style="list-style-type: none"> <li>• Delays to ICU admission and discharge</li> <li>• Inappropriate stays in ICU</li> <li>• Cancelled OR cases</li> <li>• Percentage transfer to equal or lower acuity hospital due to lack of bed</li> <li>• Refusal of appropriate admission due to lack of bed</li> <li>• Timeliness of consultation/specialty services (e.g., CT, dialysis)</li> <li>• Number of cancelled elective operations due to a lack of critical care beds (ICU and stepdown)</li> <li>• Reduced time to destination for referrals in from the community</li> <li>• Occupancy rate</li> <li>• Time to ICU bed from ER</li> <li>• Patient turnover rate (daily patients/bed)</li> <li>• Out-of-province transfers for critical care</li> <li>• Number of times land ambulances do not meet the response time standard for emergency calls.</li> <li>• Number of delays by land ambulance in picking up critical patients due to hospital emergency room capacity pressures</li> <li>• Number of land ambulance redirects from closed ER to more distant locations</li> <li>• Number of land ambulance redirects that reduce ambulance services in the home community</li> <li>• Delays transferring critical care patients from air ambulance to land ambulance to hospital</li> </ul>
<p><b>Patient/Family Satisfaction</b></p> <p>Patient/Family Satisfaction: Perceptions of the healthcare experience.</p>	<ul style="list-style-type: none"> <li>• Self-reported satisfaction</li> <li>• Complaints to administration</li> <li>• Focus on the healing aspects of care in family/patient surveys</li> </ul>



<b>Domains</b>	<b>Examples of Potential Indicators for Consideration</b>
<p><b>Staff Satisfaction</b></p> <p>Staff Satisfaction: Perceptions of the work experience.</p>	<ul style="list-style-type: none"> <li>• Learning environment</li> <li>• Number of grievances</li> <li>• Extent of absenteeism</li> <li>• Staff turnover (physicians, nurses, other professional staff)</li> </ul>
<p><b>Efficiency</b></p> <p>“Achieving the desired results with the most cost-effective use of resources.” (<i>CIHI Health Indicator Framework</i>)</p>	<ul style="list-style-type: none"> <li>• Severity adjusted LOS</li> <li>• Administrative practices</li> <li>• Care done as efficiently as possible (analysis of cost and time)</li> <li>• Training</li> <li>• Case costing of patients in ICU</li> <li>• Occupancy rate</li> <li>• Cost per patient day (% administrative overhead),</li> <li>• Direct care hours per patient day</li> <li>• Rates per hour</li> <li>• Overtime premiums</li> <li>• Use of agency staff</li> <li>• Percentage inappropriate stay in ICU</li> <li>• LOS in ICU</li> </ul>
<p><b>Governance</b></p> <p>Governance: Demonstrating responsibility for overseeing performance, supporting improvements, and being transparent.</p>	<ul style="list-style-type: none"> <li>• Regular review of performance measures by appropriate levels in the hospital, including the board of governors and management</li> <li>• Mechanisms in place to monitor changes in performance</li> <li>• Mechanisms in place to institute appropriate changes to ICU management, if performance consistently suboptimal</li> <li>• Reporting to the public</li> </ul>
<p><b>Surge</b></p>	<p><i>Individual Hospital</i></p> <ul style="list-style-type: none"> <li>• Number of critical care patients treated in a quarter</li> <li>• Average length of stay of people waiting in the emergency department for admission to critical care</li> <li>• Number of critically ill patients waiting in post-anaesthetic care unit for admission to critical care</li> <li>• Number of critically ill patients transferred to other hospitals due to a lack of capacity</li> <li>• Number of times (within a certain period) that the hospital had an acute surge of 10% beyond its normal critical care capacity</li> <li>• Evidence of procedures to try and accommodate all those who “come to your door.” (i.e., culture of trying to accommodate everyone)</li> <li>• Existence of an action plan that is triggered when a set number of critical care patients are waiting in emergency. The number of times that the plan is initiated in an established period of time</li> <li>• The extent to which a commitment to critical care as an organizational priority is reflected in the vision, mission and goals</li> </ul> <p><i>LHIN/Regional Level</i></p> <ul style="list-style-type: none"> <li>• Plan to find additional critical care beds in the region</li> </ul>

<b>Domains</b>	<b>Examples of Potential Indicators for Consideration</b>
	<ul style="list-style-type: none"> <li>• Plan to deal with surge. Number of times the plan has been enacted</li> <li>• LHIN’s surge capacity in terms of additional beds per hospital and location</li> <li>• Extent to which care can be rationalized before it becomes a cause for concern</li> </ul> <p><i>Provincial Level</i></p> <ul style="list-style-type: none"> <li>• Existence of LHIN “cross-border” agreements to assist each other in times of critical surge</li> <li>• Number of provincial simulations enacted that focused on surge</li> </ul>