AUGMENTING CRITICAL CARE CAPACITY DURING DISASTERS

The term **SURGE CAPACITY** refers to a healthcare delivery system's ability to rapidly accommodate an increased demand for services under extenuating circumstances. The three (3) most commonly identified components of surge capacity are the **3S's:**

STAFF

SUPPLIES & EQUIPMENT (STUFF)

SPACE

Critical Care STAFF

Ideally, when disaster strikes, the right people with the right skills will be available and empowered to respond to their highest potential. As the situation evolves, attaining such a goal may be difficult. In addition to staff shortages, we will assuredly face logistical challenges related to clinician utilization. Vacations will be postponed, complex shift rotations may have to be implemented, and mechanisms for contacting out-of-hospital staff might have to be engaged.

Cross-Privileges

Cross-privileging of providers, during times of disaster, among otherwise unaffiliated institutions may save valuable time. Organization wide privileges for providers must be addressed by the CMO at each entity. Refer to policy (BHSF 247.52 Credentialing and Privileging of Healthcare Providers in the Event of a Disaster/Emergency). Tiered systems affecting a range of healthcare providers may have to be implemented. Specified durations of crossed-privileges may be determined as the situation evolves or worsens. A specific date may be delayed and not be decided upon until regulatory agencies allow.

According to the Society of Critical Care Medicine "based on the demands of the critically ill COVID-19 patient, the intensivist deficit will be strongly felt. Additionally, there are an estimated 34,000 critical care advanced practice providers (APPs) available to care for critically ill patients. Other physicians with hospital privileges, especially those with previous exposure to critical care training or overlapping skill sets, may be pressed into service as outpatient clinics and elective surgery are suspended. All other ICU staff (e.g., APPs, nurses, pharmacists, respiratory therapists) will also be in short supply. Without these key members of the ICU team, high-quality critical care cannot be adequately delivered. Moreover, an indeterminate number of experienced ICU staff may become ill, further straining the system as need and capacity surge."

Delineation of Privileges

Delineation of privileges is subject to appointment and approval by entity Chief Medical Officer.

Tiers

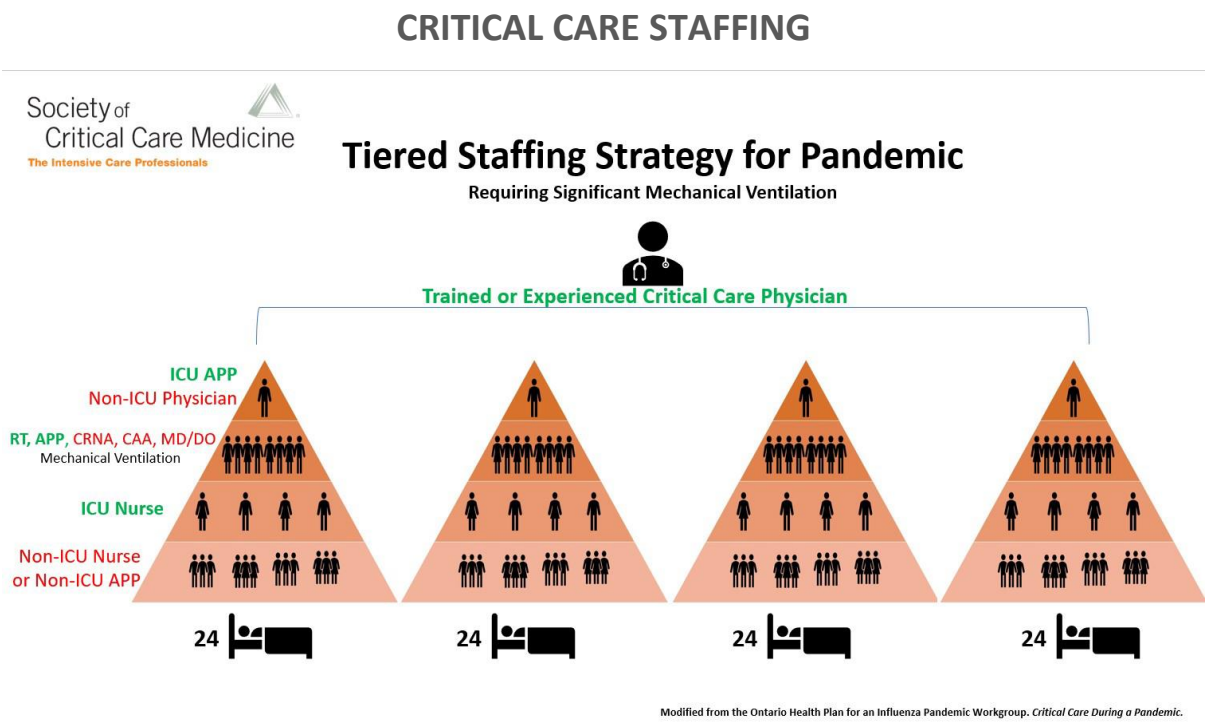

Figure 1. From the Society of Critical Care Medicine "U.S. ICU Resource Availably for COVID-19" Accessed March 24, 2020

The Society of Critical Care Medicine denotes "in the crisis model presented here, care for each of the four groups of 24 patients is provided by a team managed by a physician who is trained in critical care and/or regularly manages ICU patients. One team cares for 24 patients. A physician trained in critical care and/or regularly manages ICU patients oversees 4 teams. A non-ICU physician who ideally has had training but does not regularly perform ICU care is inserted as a way of extending the trained and experienced ICU physicians' knowledge while working alongside APPs who regularly care for ICU patients. Similarly, to augment the ability to mechanically ventilate more patients, experienced ICU respiratory therapists and APPs are amplified by adding clinicians such as physicians (either MD or DO), nurse-anesthetists, and certified anesthesiologist assistants who are experienced in managing patients' ventilation needs.

The model above, originally developed by the Ontario Health Plan for an Influenza Pandemic, was adapted for SCCM's Fundamental Disaster Management program as an effective strategy to incorporate non-ICU-trained staff of all disciplines (physicians, nurses, APPs, and others [in red] to greatly augment the trained and experienced ICU staff [in green]). While pharmacists, dietitians, rehabilitation specialists, and other professionals are also key members of the ICU team, this model speaks to staff needed to address a pandemic requiring a dramatic increase in need for mechanical ventilation. As elective procedures are curtailed, experienced perioperative clinical staff (e.g. anesthesiologists, certified registered nurse anesthetists, operating room and post-anesthesia care unit nurses) may be available to support critical care services in hospitals with and without intensivists. The operating room and perioperative teams may be especially valuable if operating rooms or post-anesthesia care unit beds are converted to ICU beds, or operating room ventilators are moved to other venues to supplement the limited supply of mechanical ventilators. While this model focuses specifically on hospitals with intensivists, 48% of U.S. hospitals have no intensivists. In these hospitals, the critical care team may

be directed by anesthesiologists, pulmonologists, hospitalists, or others with experience caring for critically ill patients. This model recommends adding staff dedicated to the management of multiple ventilators, while other staff (experienced and additive) support the patient overall. While the ratios shown in the figure depict generally accepted models of critical care staffing augmentation, each hospital will need to adjust to its own demands for critical care while using its available supply of personnel. While the level of care may not be the same as in the typical ICU in non-crisis times, having care directed by trained and experienced intensivists or others with critical care clinical experience is an effective way to maximize care for large numbers of critically ill patients. SCCM offers free online training resources (www.sccm.org/covid19) to help these non-typical ICU staff as they prepare to care for critically ill patients during a pandemic crisis.

Provider-to-Patient Ratios

Provider-to-patient ratios will change depending on the scope of the disaster. Refer to policy (BHSF 247.52 Credentialing and Privileging of Healthcare Providers in the Event of a Disaster/Emergency). Other disciplines (e.g. Respiratory Therapy, Pharmacy, etc.) use of augment staffing should follow their entity guidelines.

CAPACITY VS CAPABILITY

- Capacity: ***enough*** staff, supplies & equipment, and space for event
- Capability: ***right*** type of staff, supplies & equipment, and space for needs

Intensivist

- Telemedicine capable facilities will use remote intensivists to also manage teams and coordinate care.

- Intensivists manage acute emergencies and ventilator-patient interaction, conduct bedside procedures (line insertions, bronchoscopy, etc.), consult on general critical care issues

Non-Intensivist

- One (1) non-intensivist One (1) APP for 12-24 patients; Four (4) non-intensivists/APPs to one (1) intensivist
- Collaborating with Anesthesia to create intubating teams
- Non-intensivists are responsible for general care of patients
  - Respond first to changes in patients' conditions
  - Document care and care plan
  - Most noncritical care medical issues
  - Critical care issues after consulting intensivist or implementing standardized order sets

Nursing Staff

Critical Care Nursing

Critical care nurses are assigned the following primary responsibilities:

- Supervise and advise noncritical care nurses on critical care issues:
  - Simplification of documentation for non-critical care nurse
- Titration and management of critical care specific medications
- Ventilator associated patient care (suctioning, oral care, etc.)
- Ventilator management with RT oversight

- Suggested ratios:
    - One (1) critical care nurse and (1) noncritical care nurse to three (3) patients; (1:3)
    - Two (2) noncritical care nurses collaborating with one (1) critical care nurse; (2:1)

Non-critical Care Nursing

Non-critical care nurses are assigned the following primary responsibilities and are to work within their scope and training:

- Patient assessment
- Documentation
- Administration of medications (non-critical care medications)
- Bedside care (Basic ADLs, comfort needs, cleaning rooms, etc.)

Just in time training of non-critical care nurses will be provided within their scope of practice to ensure the ability to care for critical care patients. This includes, but is not limited to, safely turning patients while on mechanical ventilation, providing respirations to a patient on a vent via bag mask valve, oral suctioning a patient on a ventilator. Critical care nurses will determine at the time the ability of the non-critical care nurse to provide the care.

Critical Care SUPPLIES & EQUIPMENT

Critical Care Supplies & Equipment includes, but is not limited to, any and all equipment, non-human resources, or medical supplies:

- Ventilators include basic, portable, on demand pediatric that are adaptable to adult, and can expand to anesthesia machines.
- Oxygen regulators connectors in non-ICU settings
- US Strategic National Stockpile (SNS)[4] (Uni-vent Impact Eagle 754, Carefusion LTV 1200, and Puritan Benett LP-10)

- PPE equipment and re-use (beyond manufacturer recommendations
- IV Pumps
- Pulse Oximeters
- Standardized Order Sets
  - Reduce variability and errors of omission
  - May be modified for specific diseases (e.g. pandemic influenza, inhalational anthrax)

Critical Care SPACE

Critical Care Space includes, but is not limited to, locations within the medical facility.

1. Post Anesthesia Care Unit (PACU)
2. Emergency Department (ED)
3. Progressive Care Units (PCU)
4. Ambulatory Service Center (ASC)

Physical Requirements

The minimum space required to safely complete three (3) frequent, high-risk tasks[5]:

- Lifting a patient using a mechanical lift
- Transferring a patient between two (2) beds
- Resuscitating a patient
- Using an Bag Mask Valve to provide ventilation
- Bedside procedures (Transesophageal endoscopy, Bronchoscopy, line placements, etc.)

Other Considerations

- Ensure rapid discharges
- Using triage requirements – daily Sequential Organ Failure Assessment (SOFA) score considerations
- Use Telemedicine carts to increase access to intensivists to non-ICU areas

Sequential Organ Failure Assessment (SOFA) Score*

Variable	SOFA Score				
	0	1	2	3	4
PaO2/FiO2 mmHg	> 400	301 – 400	201 – 300	101 – 200	≤ 100
Platelets, x 10_3/µL or x 10_6/L	> 150	101 – 150	51 – 100	21 – 50	< 20
Bilirubin, mg/dL (µmol/L)	<1.2 (<20)	1.2-1.9 (20 – 32)	2.0-5.9 (33 – 100)	6.0-11.9 (101 – 203)	>12 (> 203)
Hypotension	None	MABP < 70 mmHg	Dop ≤ 5	Dop 6 – 15 or Epi ≤ 0.1 or Norepi ≤ 0.1	Dop >15 or Epi > 0.1 or Norepi > 0.1
Glasgow Coma Score	15	13 - 14	10 - 12	6 - 9	< 6
Creatinine, mg/dL (µmol/L)	< 1.2 (<106)	1.2-1.9 (106 – 168)	2.0-3.4 (169 - 300)	3.5-4.9 (301 – 433)	> 5 (> 434) or anuric

Note: Clinicians will determine the total SOFA score for each patient by summing the scores for each variable. Dopamine [Dop], epinephrine [Epi], norepinephrine [Norepi] doses in ug/kg/min. SI units are noted in parentheses ( ).

*Adapted from: Ferreira et al., 2001. Explanation of variables: PaO2/FiO2 indicates the level of oxygen in the patient's blood. Platelets are a critical component of blood clotting. Bilirubin is measured by a blood test and indicates liver function. Hypotension indicates low blood pressure; scores of 2, 3, and 4 indicate that blood pressure must be maintained by the use of powerful medications that require ICU monitoring, including dopamine, epinephrine, and norepinephrine. The Glasgow coma score is a standardized measure that indicates neurologic function; low score indicates poorer function. Creatinine is measured by a blood test and indicates kidney function.

*For long term established ESRD patients on Dialysis, Score 2 points for Creatinine variable

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