COVID-19 Pandemic Patient Surge: Preparing for Crisis Care

The coronavirus disease 2019 (COVID-19) pandemic has generated a surge of patient volume and acuity across the New York City (NYC) health care system. The pandemic has significantly disrupted outpatient, emergency medical services (EMS), acute care, long-term care, and home health with shortages of personal protective equipment (PPE), lack of medical countermeasures, and limitations on ventilator capacity (both the numbers of ventilators and staff who can safely operate them). NYC has experienced large increases in the volume of patients in need of critical care and ventilator support leading to the exploration of strategies for care of patients in resource-limited settings (e.g., shortages of space and medical supplies like PPE, ventilators, and staff). New York State (NYS) has provided waivers to increase access to care and the ability of staff to manage the influx of patients. Additionally, the federal, NYS, and NYC governments are working to procure and distribute needed supplies to meet the increased demand and prevent disruptions in the standard of care and rationing of care.

Because of the ongoing impact of the COVID-19 pandemic, NYC Department of Health and Mental Hygiene (Health Department) recommends hospitals that have not done so establish a crisis care committee to expand their ability to provide care at the highest levels throughout the pandemic. Additionally, the NYC Health Department outlines crisis care considerations for COVID-19 when available resources may not meet demands and alterations to the conventional standard of care becomes necessary. Crisis care committees ideally include representatives from administrative leadership, chief medical officers, chief nursing officers, facilities, pharmacy, respiratory therapy, infection prevention and control, critical care, emergency medicine, pediatrics, ethics and legal counsel. Per the Institute of Medicine Crisis Standard of Care Framework,[1] ethical considerations and the legislative and regulatory waiver environment must be the foundation of plans to ensure the process is fair, equitable, and just. Additional components include provider engagement, community engagement (including with patients and families), and development of indicators and triggers for the implementation of clinical processes and operations. All efforts should be made to maintain the highest level of care, given current resources; thus, decisions and guidance during a disaster need to be continually reassessed and restored to the conventional standard whenever possible.

However, attempting to develop a crisis care plan for a hospital during a disaster may not be feasible given current and possible future resource limitations. Hospitals must develop a mechanism to address crisis care decisions and prevent these decisions from being made at the individual provider level. The NYC Health Department has developed this resource to introduce the continuum of care provided during a disaster, from conventional to crisis. Included are tools and tips for conceptual understanding and practical response to resource shortages. The final section highlights the ethical and practical considerations of triage.

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I. Surge Capacity and Continuum of Care

Overview

All hospitals in NYC have activated their Hospital Incident Command Systems (HICS), helping facilitate communication between EMS, emergency departments (EDs), inpatient and outpatient departments, intensive care units (ICUs), the NYC Health Department, the NYS Department of Health (DOH), and community-based care sites such as skilled nursing facilities (SNFs) and adult care facilities (ACFs).

Hospitals should be using HICS structure to advance along a continuum from conventional care to contingency care and potentially crisis care, as needed, and to prepare for a possible second wave of transmission. This process involves:

- Establishing monitoring and decision-making organizational structure
- Determining resource needs to meet patient surge
- Assessing available resources (e.g., staff, space and supplies)
- Requests for additional resources
- Conservation of resources
- Transition to a state of providing a functionally equivalent standard of care with limited resources
- Limited periods of sufficiency of care in which population health takes priority due to resource limitations
- Return to standard of care as rapidly as possible

Definitions

Surge capacity: The ability to evaluate and care for a markedly increased volume of patients, exceeding normal operating capacity.[2]

Surge capability: The ability to manage patients requiring highly specialized medical evaluation and care. Requirements include expertise, information, procedures, equipment or personnel usually provided in specialized medical facilities or settings; and may also include special interventions to protect medical providers and other patients.[3]

Conventional capacity: The spaces, staff and supplies used are consistent with daily practices within the institution. These spaces and practices are used during a major mass casualty incident that triggers activation of the facility emergency operations plan.[4]

Contingency capacity: The spaces, staff and supplies used are not consistent with daily practices but provide care that is functionally equivalent to usual patient care. These spaces or practices may be used temporarily during a major mass casualty incident or on a more sustained basis during a disaster when the demands of the incident exceed community resources.[4]
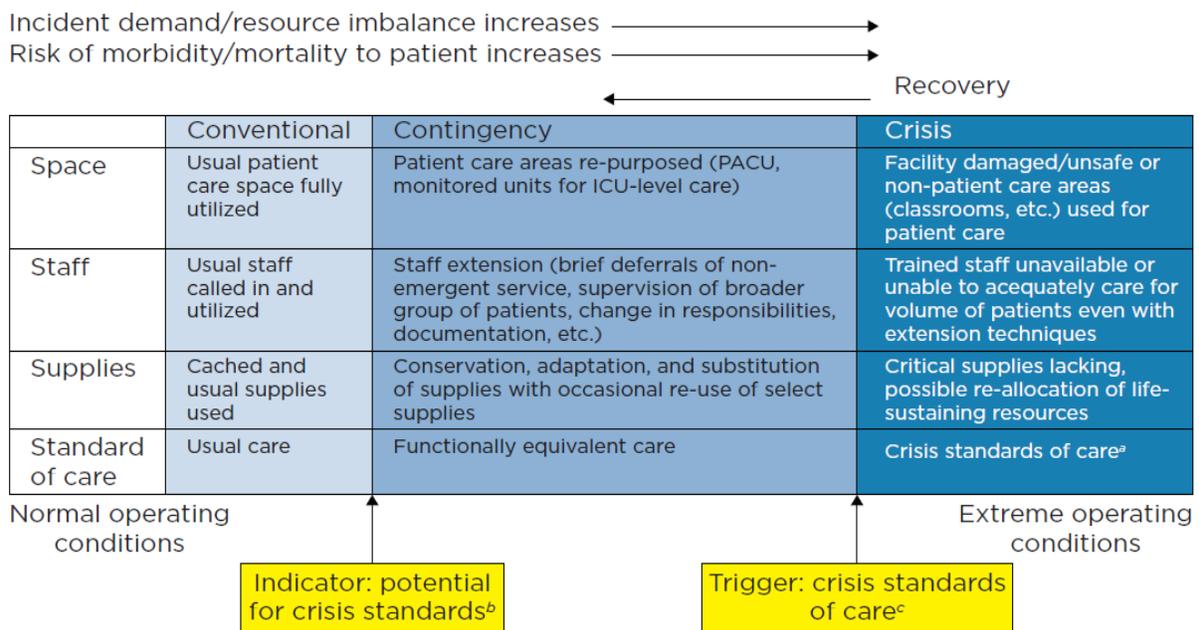
Crisis capacity: Adaptive spaces, staff and supplies are not consistent with usual standards of care but provide sufficiency of care in the context of a catastrophic disaster (i.e., provide the best possible care to patients given the circumstances and resources available). Crisis capacity activation constitutes a significant adjustment to standards of care.[4]

Indicator: Measurements, predictions or events that represent changes in demand or resource availability suggesting transition to contingency capacity.[1]

Trigger: Decision points along continuum of care indicating transition to crisis capacity.[1]

When approaching a patient surge event, the incident command structure should include roles designated to monitor resource availability, including space, staff and supplies. Designees should report to the incident commander on potential indicator events when conventional capacity is no longer possible and resource scarcity forces a transition to contingency capacity.

Indicators and Triggers in Conventional, Contingency and Surge Phases

Incident demand/resource imbalance increases ⟶
Risk of morbidity/mortality to patient increases ⟶

Recovery ⟵

	Conventional	Contingency	Crisis
Space	Usual patient care space fully utilized	Patient care areas re-purposed (PACU, monitored units for ICU-level care)	Facility damaged/unsafe or non-patient care areas (classrooms, etc.) used for patient care
Staff	Usual staff called in and utilized	Staff extension (brief deferrals of non-emergent service, supervision of broader group of patients, change in responsibilities, documentation, etc.)	Trained staff unavailable or unable to adequately care for volume of patients even with extension techniques
Supplies	Cached and usual supplies used	Conservation, adaptation, and substitution of supplies with occasional re-use of select supplies	Critical supplies lacking, possible re-allocation of life-sustaining resources
Standard of care	Usual care	Functionally equivalent care	Crisis standards of care[a]

Normal operating conditions — Extreme operating conditions

Indicator: potential for crisis standards[b]   Trigger: crisis standards of care[c]

Allocation of specific resources along the care capacity continuum.[1]

Potential Crisis Indicators[5]

Hospitals should track inventory of resources that are likely to be scarce in a disaster. These resources may serve as indicators of contingency capacity and impending crisis, and include:

- Ventilators and components
- Oxygen and oxygen delivery devices
- Vascular access devices
- Health care providers, particularly critical care, burn and surgical/anesthesia staff (nurses and physicians) and respiratory therapists
- ICU beds
- Hospitals
- Specialty medications or intravenous fluids (sedatives, analgesics, specific antibiotics, antivirals, etc.)
- Vasopressors and inotropes
- Medical transportation

II. Preparation for Surge

Although not an exhaustive list, the NYC Health Department highlights the following strategies and tools that could be used as hospitals attempt to establish surge capacity for the COVID-19 pandemic.

Examples of Surge Capacity Strategies for Resource Allocation[6]

1. Conserve:
    a. Restrict use of N95 masks and oxygen
    b. Limit waste by establishing a cohorted COVID-19 unit (e.g., only don/doff PPE at entry or exit to the unit and not outside of every patient room)
2. Substitute:
    a. Use benzodiazepines instead of propofol for sedation of a tracheally intubated patient
3. Adapt:
    a. Use an anesthesia machine or non-invasive positive presure ventilation (NIPPV) machine as temporary ventilator
    b. Use an oxygen saturation monitor with high/low rate alarms instead of cardiac monitor
4. Reuse:
    a. After appropriate cleaning, disinfection, or sterilization, the majority of material resources can be reused, as can some PPE (see NYC Health Department guidance on reuse and extended use of PPE: nyc.gov/assets/doh/downloads/pdf/imm/strategies-for-the-conservation-of-respiratory-ppe.pdf)
5. Reallocate (crisis care):
    a. Certain critical resources (e.g., ventilators and extracorporeal membrane oxygenation (ECMO)) may have to be allocated to patients most likely to benefit; in extreme situations, this may involve removal of a resource from one patient to give a substantially better chance of a survival to another patient – this is a last resort and should be done only when no other options exist (see the section Crisis Capacity).

The U.S. Department of Health and Human Services (HHS) Assistant Secretary for Preparedness and Response (ASPR) comprehensive planning checklist for COVID-19 response is a helpful tool to help hospitals organize their preparedness efforts with regard to resources,: phe.gov/Preparedness/COVID19/Documents/COVID-19%20Healthcare%20Planning%20Checklist.pdf.[7]

Additional strategies to optimize health care supply of PPE and equipment can be found at cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html.

Resource Allocation Planning Tools[8]

[Surge capacity tools](#) are available from the Minnesota Department of Health for support in defining contingency and crisis management of:

- Oxygen
- Staffing
- Nutritional support
- Medication administration
- Hemodynamic support and IV fluids
- Mechanical ventilation

- Blood products
- Renal replacement therapy
- Burn therapy
- Pediatrics
- Palliative care
- Extracorporeal membrane oxygenation (ECMO)

These can be found at [health.state.mn.us/communities/ep/surge/crisis/standards.pdf](#).

Bed Management and Surge Space[9]

The NYC Health Department recommends efficient, safe bed management and patient discharge as a first line of defense against patient surge. To this end, the NYC Health Department created "Patient Surge in Disasters: A Hospital Toolkit for Expanding Resources in Emergencies": [nyc.gov/site/doh/providers/emergency-prep/hospitals.page](#). These tools should be employed in the Key Surge Response Steps below to facilitate surge capacity expansion.

Bed Surge Capacity Expansion Tool (BSCET): Designed to assist hospital administrators and emergency managers in preparing for and responding to unexpected increases in patient volume by pre-identifying expansion opportunities in existing clinical and non-clinical areas. See [nyc.gov/assets/doh/downloads/pdf/em/bscet.pdf](#).

Rapid Discharge Tool (RDT): Assists hospital administrators and emergency managers in preparing for and responding to unexpected increases in patient volume by providing them with adaptable plans for rapid discharge based on promising bed surge capacity practices. See [nyc.gov/assets/doh/downloads/pdf/em/hcp-hospitals-rpdt.pdf](#).

Rapid Patient Discharge Assessment Tools (RPDA): Assists hospitals in evaluating potential discharges and planning to meet patient post-discharge care needs. Additionally, in the context of COVID-19, hospitals should consider discharge to alternate care sites if hospitalization is no longer necessary but patient is unable to safely return home (see [nyc.gov/assets/doh/downloads/pdf/em/hcp-hospitals-rpda.pdf](#) and [nyc.gov/assets/doh/downloads/pdf/imm/contingency-surge-methods-alternate-care-sites.pdf.](#)

Emergency Department Capacity Expansion Tool (EDCET): Assists emergency planners in creating hospital-specific plans that identify and support expansion areas within and (preferably) nearby the ED. See [nyc.gov/assets/doh/downloads/pdf/em/edce-tool.pdf](#). Additional considerations for ED surge in the context of COVID-19 can be found at [nyc.gov/assets/doh/downloads/excel/em/surge-capacity-expansion-tool-emergency-departments.xlsx](#).

Intensive Care Unit Capacity Expansion Tool (ICUCET): Assists identification and creation of additional staffed and supported critical care beds during immediate and sustained phases of public health emergencies. See nyc.gov/assets/doh/downloads/pdf/em/icuce-tool.pdf. Additional considerations for ICU surge in the context of COVID-19 can be found at nyc.gov/assets/doh/downloads/pdf/imm/covid-19-critical-care-crisis-planning.pdf.

Key Surge Response Steps[9]

1. Convene Bed Management Committee (BMC)
2. Assess current and anticipated demand for inpatient beds
3. Activate Rapid Discharge Plan (see link for the RDT above)
4. Aggregate and transfer census and inpatient demand data from the Emergency Census Tool to the Response tools to obtain bed vacancy profiles for all inpatient areas (see nyc.gov/assets/doh/downloads/pdf/em/bscet.pdf).
5. Re-evaluate inpatient bed needs
6. Implement internal bed capacity expansion policies and procedures, as appropriate
7. Adjust pre-defined RN and RN-extender staffing ratios when and if required
8. Assess current and anticipated patient care staffing needs
9. Implement internal staffing capacity expansion policies and procedures, as appropriate
10. Assess facilities preparedness of needed expansion areas
11. Implement internal facility expansion policies and procedures, as appropriate
12. Assess equipment and supply needs using BSCET tools (see link above)
13. Assure timely delivery of equipment and supplies to expansion areas
14. Implement internal equipment and supply capacity expansion policies and procedures, as appropriate
15. Repeat above steps as often as necessary

III. Contingency Capacity

Following assessment of all resources and projected needs, the NYC Health Department recommends conservation of resources as the first modification to carry out in a state of contingency capacity, including COVID-19.

Modification of Outpatient Services[6,7]

- Close specialty clinics.
- Develop a process for screening and triage of phone and email messages to limit ED visits.
  - The public can be directed to the NYC Health + Hospitals COVID-19 nurse triage line by calling 311.
- Create "fast-track" or other workflows for rapid evaluation and treatment of minor illnesses.
- Consider designating specific clinics or locations for evaluation of potential COVID-19 cases.

- Increase telemedicine capacity.
- Develop care plans that reduce the number of staff caring for suspected or confirmed COVID-19 cases.
- Extend hours, designating time for closer follow-up of patients with COVID-19-like illness with risk factors for severe COVID-19.
- Increased vigilance for residents of congregate housing to facilitate isolation and care, as these settings are at increased risk for COVID-19 transmission.
- Ensure access to care for individuals with the following risk factors for severe COVID-19 presentation:[10]
  - Age 50 or older (those 65 or older are at the highest risk)
  - Chronic lung disease
  - Immunocompromised: cancer treatment, transplant recipients, chronic corticosteroid use, poorly controlled HIV, immunomodulator use, immune deficiencies
  - Diabetes mellitus
  - Morbid obesity
  - Chronic kidney disease
  - Liver disease
- Template electronic medical record (EMR) notes or switch to paper charts.
- Develop a plan for medication refills.

Contingency Supply and Equipment Management[7,11]

Supply chain
Anticipate supply shortages and coordinate with vendors, the New York City Healthcare Coalition (NYC HCC), NYC Emergency Management, Greater New York Hospital Association and the NYC Health Department to coordinate resource supply, distribution and scarce resource strategies.

Gloves[12]
Use gloves that are beyond the manufacturer-designated shelf life for training or demonstration in which broad barrier protection is not needed.

Facemasks[13]
- Consider only making facemasks available to symptomatic patients.
- Implement extended use of facemasks (e.g., wearing the same facemask for repeated close contact encounters with several different patients, without removing the facemask between patient encounters).
  - The facemask should be removed and discarded if soiled, damaged or difficult to breathe through.
  - Personnel must immediately perform hand hygiene after touching their facemask.

- Restrict facemasks to use by health care personnel, rather than patients for source control.
- Have patients with symptoms of respiratory infection use scarves, clothing, tissues or other barriers to cover their mouth and nose.

N95 Respirators[14]
- Limited reuse of N95 respirators for COVID-19 patients — this practice may contribute to contact transmission and caution should be used.
- Prioritize the use of N95 respirators and facemasks by activity type — this can be coupled with other measures to reduce availability of infectious particles (e.g., masking symptomatic patients as resources permit).
- Implement fit testing protocols and trainings when N95 respirators are received in greater quantities and additional staff begin using them.
- Cohort patients in COVID-19 units to limit the need for repeated donning and doffing throughout a work shift.
- Consider mechanisms such as ultraviolet radiation towers to sterilize respirators for reuse.

See also NYC Health Department (nyc.gov/assets/doh/downloads/pdf/imm/strategies-for-the-conservation-of-respiratory-ppe.pdf) and CDC (cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html) guidance on reuse and extended use of PPE.

Ventilators
Additional ventilators may be made available by using anesthesia and recovery room ventilators that become available as elective procedures are canceled during a pandemic surge.

Positive pressure ventilation equipment purchased for surge capacity should at a minimum accomplish the following:
- Be able to oxygenate and ventilate most pediatric and adult patients with either significant airflow obstruction or acute respiratory distress syndrome (ARDS)
- Be able to function with low-flow oxygen and without high-pressure medical gas
- Accurately deliver a prescribed minute ventilation when patients are not breathing spontaneously
- Have alarms to alert the operator to apnea, circuit disconnect, low gas source, low battery and high peak airway pressures

Cohorting Inpatients[6,15]

The NYC Health Department recommends preparation of a staged plan for isolation and cohorting of COVID-19 patients. When necessary, patients can be cohorted based on confirmed diagnosis or by syndrome. However, if patients are on assigned isolation precautions for another reason (e.g., influenza, *Candida auris*), they should not be cohorted with patients without that diagnosis or syndrome.

Examples of phases include:

1) Isolation of individual COVID-19 patients in airborne infection isolation rooms (AIIR)
2) Cohorting COVID-19 patients in isolation rooms
3) Cohorting COVID-19 patients on specific units (e.g., this may require the adjustment of ventilation to create negative airflow and the creation of temporary partitions in hallways or entryways)
4) Cohorting patients and providers by the following categories:
   a) Patients who are exposed and asymptomatic
   b) Patients who are exposed and meet COVID-19-like illness case definition
   c) Patients who have confirmed COVID-19
   d) Unexposed patients (In the setting of widespread community transmission, newly admitted non-COVID-19 patients may later develop symptoms and should thus be monitored closely for symptoms).
5) Conversion of hospital floors to cohort COVID-19 units
6) Conversion of hospital to COVID-19 hospital

Contingency Hospital Space Use[7,16]

Additional steps for substitution and adaptation of hospital resources include alternate uses of space:

- Develop procedure for notifying the NY State Division of Hospitals and Diagnostic and Treatment Centers if licensed bed availability or capacity changes as a result of COVID-19.
- Downgrade space used for all levels of care (e.g., accommodate NIPPV on monitored floor bed)
- Cancel elective procedures and assess spaces such as pre- and post-anesthesia care, same-day surgery and other monitored procedural areas such as gastroenterology labs, intermediate care, and monitored or step-down units for ICU expansion (see also ICUCET pages 11 to 12 in nyc.gov/assets/doh/downloads/pdf/em/icuce-tool.pdf and nyc.gov/assets/doh/downloads/pdf/imm/covid-19-critical-care-crisis-planning.pdf)
- Convert private rooms to double occupancy
- Use hallway areas to board inpatients
- Consider providing portable x-ray equipment in the COVID-19 cohort area
- Select adult patients may receive care on pediatric wards or in children's hospitals
- Determine if the fatality management plan is sufficient for an increased volume of decedents at the facility
- Develop a plan for implementing a supplemental facility-controlled access plan (which may be phased), particularly during the peak pandemic weeks to assure controlled campus ingress and egress and monitoring

See also the NYC Health Department surge tools at nyc.gov/site/doh/providers/emergency-prep/hospitals.page.

Contingency Staffing[7,11,17]

In a pandemic there are multiple factors that contribute to workforce shortages including illness, family responsibilities, fear of contracting illness, poor morale (which may be exacerbated by the high morbidity and mortality rates in a pandemic), and concern for personal safety and safety of family. Strategies to mitigate shortfalls include:
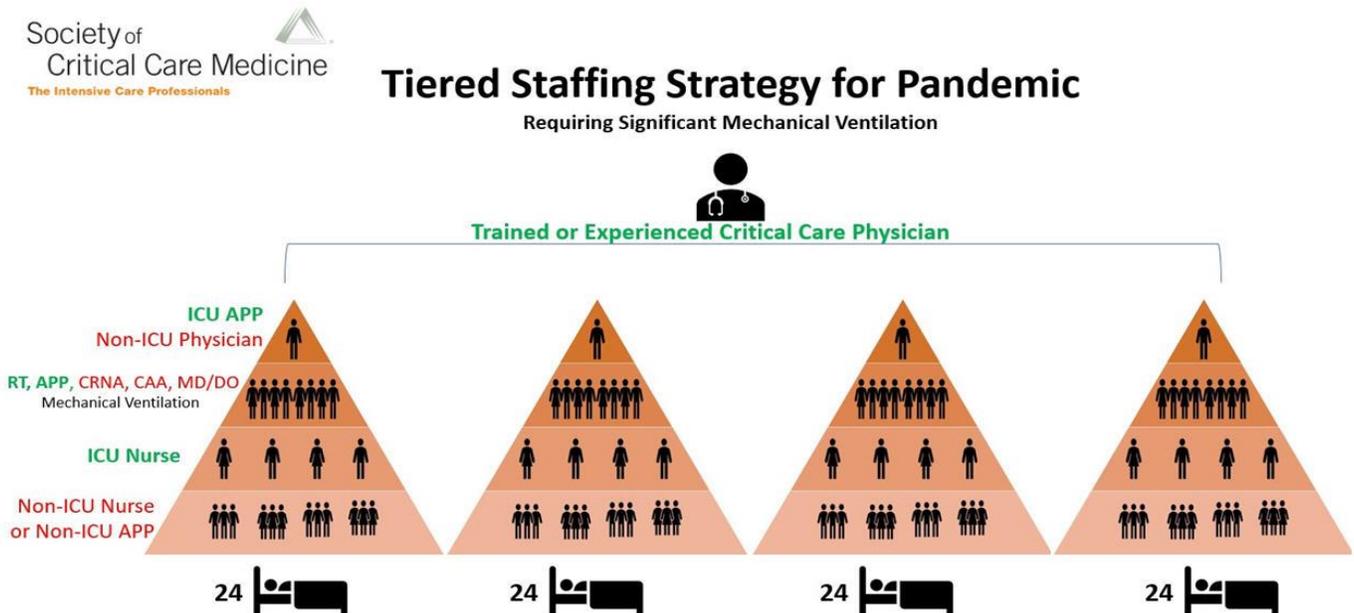
Internal Resources
- Address the barriers that may prevent staff members from being able or willing to report to work:
    - Consider staff needs around transportation, and personal and family care (childcare, elder care, pet care, etc.)
    - Consider offering hazard pay
- Relax staff-patient ratios in coordination with appropriate agencies and authorities.
- Re-deploy staff from administrative positions and canceled elective procedures.
- Re-deploy residents, hospitalists, emergency medicine physicians, and hospital-based physician groups to areas where staffing is needed the most and employ a "buddy-team" system to pair inexperienced staff with experienced staff.
- Use trainees, such as medical and nursing students.
- Consideration should be made to preferentially utilize staff without comorbid conditions that have recovered from a COVID-19 syndrome (although it is unclear if presence of SARS-CoV-2 antibodies results in durable protection from reinfection), or immunized staff, once an vaccine is available.
- Develop service restriction plans in case of staff shortages or increased demand (e.g., respiratory care, nutritional support, pharmacy, laboratory, radiology, elective surgeries, and procedures) – ensure ethical and legal considerations are addressed to maintain equitable and just health care delivery.
- Evaluate the plan for providing just-in-time staff education via electronic and other non-classroom means including information about COVID-19 transmission, prevention, usual clinical symptoms and course, risk factors and complications.
- Develop contingency staffing plans for all categories of staff.
- Modify staff responsibilities and shifts as required (e.g., supervisory staff work clinically, suspend most education and other administrative burdens, determine where less-trained staff can safely provide support and the extent of family member support).
- Engage union and labor leaders in relevant discussions of staff responsibilities, working hours, and protections during pandemics.
- Provide patients and staff with information about stress responses, resilience and available professional mental health resources.
- Develop staff monitoring for those exposed to high levels of cumulative stress or specific severe stressors (e.g., co-worker illnesses and death).
- Consider ways to maintain staff resilience and morale when congregate gatherings and close physical contact are discouraged; this may include memorial services for staff members.

External resources
- Use screened volunteers under a "buddy-team" system (e.g., administrators, researchers, retired clinicians, dentists, veterinarians, emergency medical technicians, nonclinical hospital personnel, and nonclinical outside personnel).
- Grant emergency privileges to qualified health care providers from unaffected areas.
- Use mutual aid agreements such as Memoranda of Understanding (MOUs) to re-allocate certain specialty staff from regional hospitals.

Tiered ICU Staffing[17]

To maintain staffing of increased number of ICU beds in the face of intensivist shortages, consider a tiered staffing strategy. The capacity of a single intensivist can be multiplied by overseeing multiple non-intensivists (e.g., anesthesiologist, pulmonologist, hospitalist) attending physicians, as reflected below. In the figure, titles listed in green are experienced ICU staff and titles in red have minimal ICU experience.

Society of Critical Care Medicine Tiered Staffing Model

Discharge to Alternate Care Sites

As hospitals move from contingency capacity toward crisis capacity, an important measure to increase the number of available hospital beds will be discharge to alternate care sites. These may include skilled nursing facilities that have surged to take additional patients, or field hospital facilities that can accept a range of patient acuity levels (i.e., convalescent, low acuity, moderate acuity, high acuity, critical care). Patients who would remain hospitalized in the setting of conventional capacity can be transferred to these alternate care sites to increase the hospitals capacity for ICU level care of COVID-19 patients.

IV. Crisis Capacity

Triggers for Crisis Standard of Care

In the event that strategies to maintain contingency capacity are inadequate to meet health care demands, hospitals may need to transition to strategies for crisis capacity. The suggested strategies in this section are not commensurate with the conventional standard of care and should be employed only after review of state regulatory guidance and waivers. If crisis or altered care approaches are employed, these should remain in effect for the shortest possible period of time and only after resource conservation, adaptation, and reallocation efforts have failed to meet increased needs.

Triggers that may indicate a transition to crisis capacity include:[18]

- Availability of <5% of hospital beds
- No hospital beds available for >12 hrs
- No available ICU beds
- Availability of <5% of ventilators
- On divert >12 hrs
- Specific critical resource shortage (e.g., oxygen)
- Staff illness rate >10%
- ED wait time >12 hrs
- EMS call volume more than doubled
- Syndromic predictions signal ED wait time is exceeding capacity
- Contingency capacity with inability to rapidly address shortfalls

Once our health care system is operating in crisis capacity, with limited resources forcing altered care practices, **all efforts must be made to return to the conventional standard of care as rapidly as possible**. Only patients requiring sophisticated care should remain in hospitals, and alternate care sites should be maximally utilized to preserve hospital resources for individuals most likely to benefit from a higher level of care.

Hospitals should define crisis care triage protocols to identify clear triggers and guidance on allocation of limited resources that are equitable and just. See below for ethical and practical considerations in making crisis triage decisions.

Public Health Ethics Focused on Population-Based Outcomes

In crisis capacity, the priority of the health care mission shifts substantially. Whereas conventional clinical care is usually patient-centered, crisis standard of care aims to promote the health of the population by improving survival and minimizing mortality in a situation of scarce resources. If the duty to care remains foundational to our health care mission (i.e., non-abandonment of the patient, relief of suffering, respect for the rights and preferences of patients), our priority during a disaster is to promote public safety, protect community health, and equitably allocate limited resources. Therefore, difficult decisions— such as triage decisions about level of care, initiation and withdrawal of life-sustaining treatment, and referral to palliative care— will need to be made. Public health ethics guide us in balancing the needs of the individual and those of the population. See also the Hasting Center Ethical Framework for Health Care Institutions and Guidelines for Institutional Ethics Services Responding to the Coronavirus Pandemic (thehastingscenter.org/ethicalframeworkcovid19) and COVID-19: Supporting Ethical

Care and Responding to Moral Distress in a Public Health Emergency (thehastingscenter.org/guidancetoolsresourcescovid19/).

Ethical Principles of Crisis Standards of Care[18]

- **Fairness**: Care standards protocols must be, to the highest degree possible, recognized as fair by all affected parties and responsive to the specific needs of the individual and the population.
- **Duty to care**: Even during disasters, health care professionals' primary duty is to patients in need of medical care, including when providing care entails some risk to the clinician. Patients who will not receive life-sustaining technologies are still under providers' care and will receive alternate forms of medical intervention that are available including appropriate palliative management. The duties of patient non-abandonment and relief of suffering remain foundational for health care practice.
- **Duty to steward resources**: Health care professionals must balance the duty to care for each individual patient with a duty to steward limited communal resources. The level of scarcity in a disaster exacerbates this tension, making it essential to establish ethical processes for making triage decisions.
- **Transparency**: Ethically sound decisions reflect technical expertise and values. Public engagement in establishing protocols is critical. If that is not possible, leaders must rely on clear, honest, real-time communication with communities and after-the-fact review.
- **Consistency**: Treating clinically similar groups alike (i.e., analogous clinical situations must receive the same clinical response) and avoiding discrimination are essential to promoting fairness and fostering public trust.
- **Proportionality**: Limitations on services provided should be necessary and commensurate with the scale of the disaster.
- **Accountability**: All decision-makers should be accountable for a reasonable level of situational awareness and for incorporating evidence into decision-making, including revising decisions as new data emerge.

Selection of Triage Committee or Officer[19]

Alternate care decisions should not be left to individual providers. Hospitals should make a plan that includes who will make triage decisions, the process that will be used, how communication will be maintained and the factors considered by triage decision-makers.

The New York State Task Force on Life and the Law (2015) recommends that individual institutions should determine whether a triage officer or a triage committee is appropriate (see health.ny.gov/regulations/task_force/reports_publications/docs/ventilator_guidelines.pdf). For either a triage officer or committee model, the individual(s) should have the appropriate background and training to apply the protocol with confidence. The benefits and drawbacks of both paradigms differ, and each hospital should determine which model best suits its needs.

The triage officer model has advantages as it reflects the current admission process to ICU determined by the intensivist on duty. The National Academy of Medicine recommends[20] that consultative decision should be made by at least two peer providers allowing for a dispassionate degree of clinical decision-making based on prognosis and other accepted factors. The NYS Task Force also notes that a triage officer is more exposed to burnout and overwhelmed in the context of a crisis.

The triage committee model has great advantages as it contributes to decreased provider moral distress by sharing the burden for decision-making. It also promotes fairness and consistency in the process. Moreover, inclusion of individuals outside of the medical community (e.g., medical ethicists) could foster public trust. However, it may be difficult for small local hospitals to convene a triage committee due to staff shortages and time constraints. When there is disagreement between members of the committee, procedures to resolve the conflict may be difficult to put in place given the need for quick decision-making.

Whether individual institutions choose a triage committee or a triage officer, no member of the triage committee should be actively taking care of patients that they are evaluating. Members with a conflict of interest should recuse themselves, if possible, from any evaluation and decision-making about that patient.

Triage Protocol

Existing guidance documents and other resources for allocating ventilators and scarce resources will help hospitals prepare for crisis capacity. Teams need to be familiarized in advance with the existing guidelines and have their questions answered. Preparing, coaching, and coordinating with clinical teams about crisis standard of care prior to its implementation will increase the likelihood of success.

Principles and Goals of the Triage Protocol[19]
Saving the greatest number of lives during a disaster is a top priority. Patients with the highest chance of surviving without ventilator support and patients with the lowest chance of surviving with ventilator support have the lowest level of priority to ventilator therapy. This strategy increases the number of survivors by providing ventilator support to those who have the highest chance of surviving because they received ventilator therapy. Combined with the patients who are most likely to survive without ventilator therapy, the overall number of survivors is increased.

The 2015 Task Force triage protocol for allocation of ventilators directly excludes socio-demographic factors like race, ethnicity, sexual orientation, socio-economic status, education, religion, ability, and quality of life, focusing on immediate chance of survival in time of disaster. Members of marginalized groups face stigma and discrimination, which can be exacerbated in public health emergencies characterized by fear and distrust. Ensuring that all individuals will be treated fairly and ethically, with standardized procedures to address bias, is a prerequisite for any triage protocol. However, the impacts of structural discrimination, including inequity in the distribution of risk factors for severe COVID-19 illness, are not addressed by the 2015 protocol.

Caveats:
- The definition of survival is based on the short-term likelihood of survival of the acute medical episode and **NOT** on whether a patient may survive a given illness or disease in the long-term (years after the pandemic). Triage should not be influenced by subjective assessment of long-term prognosis.
- The triage protocol applies to all patients in need of ventilator therapy during an acute medical episode and not only to patients with COVID-19. It ensures that all patients are treated with consistency and fairness.

The NYS Task Force Guideline of 2015 proposes three steps:

Step 1: Exclusion criteria
Exclusion criteria identify patients with a short life expectancy and prioritize patients who are more likely to survive with ventilator therapy. **The list of exclusion criteria must only include conditions that result in immediate or near immediate mortality, even with ventilators.** If a patient meets exclusion criteria, they will receive any alternative treatments available and/or palliative care.

Examples of Exclusion Criteria[19]
Step 1 – List of Exclusion Criteria for Adult Patients

Medical Conditions that Result in Immediate or Near-Immediate Mortality Even with Aggressive Therapy
- Cardiac arrest: unwitnessed arrest, recurrent arrest without hemodynamic stability, arrest unresponsive to standard interventions and measures, trauma-related arrest
- Irreversible age-specific hypotension unresponsive to fluid resuscitation and vasopressor therapy
- Traumatic brain injury with no motor response to painful stimulus
- Severe burns: where predicted survival ≤ 10% even with unlimited aggressive therapy
- Any other conditions resulting in immediate or near-immediate mortality even with aggressive therapy

Step 2: Evaluate Mortality Risk Using Sequential Organ Failure Assessment (SOFA) Score

The NYS Task Force (2015) uses SOFA score as a proxy for calculating mortality risk. A color code is attributed to patients depending on their level of priority for ventilator therapy.

Example of guidance for using SOFA score (adults only) during a pandemic:[19]

Step 2 – Mortality Risk Assessment Using SOFA*	
Color Code and Level of Access	**Assessment of Mortality Risk/Organ Failure**
Blue No ventilator provided. Use alternative forms of medical intervention and/or palliative care or discharge. Reassess if ventilators become available.	Exclusion criterion OR SOFA > 11
Red Highest Use ventilators as available	Sofa < 7 OR Single organ failure[#]
Yellow Intermediate Use ventilators as available.	SOFA 8-11
Green Use alternative forms of medical intervention or defer or discharge. Reassess as needed.	No significant organ failure AND/OR No requirement for lifesaving resources

* If a patient develops a condition on the exclusion criteria list at any time from the initial assessment to the 48-hour assessment, change color code to blue. Remove the patient from the ventilator and provide alternative forms of medical intervention and/or palliative care
[#] Intubation for control of the airway (without lung disease) is not considered lung failure.

Step 3: Time Trials

The NYS Task Force recommends clinical reassessment at 48 and 120 hours to evaluate whether the patient should continue to receive life-saving technologies. The decision to keep a patient on a ventilator is based on their current SOFA score and the magnitude of change in the score in comparison to the first clinical assessment.

Example of guidance for ventilator time trials (adults only):[19]

Step 3- Ventilator Time Trials (48 Hours Assessment)*	
Color Code and Level of Access	**Assessment of Mortality Risk/Organ Failure**
Blue No ventilator provided.# Use alternative forms of medical intervention and/or palliative care or discharge. Reassess if resources become available.	Exclusion criterion OR SOFA > 11 OR SOFA 8-11 and No Change in SOFA Score Compared to the Initial Assessment◊
Red Highest Use lifesaving resources as available	SOFA < 7 and Decrease in SOFA Score Compared to the Initial Assessment• OR SOFA < 11 and Decrease in SOFA Score Compared to the Initial Assessment Single organ failure□
Yellow Intermediate Use lifesaving resources as available	SOFA < 7 and No Change in SOFA Score Compared to the Initial Assessment
Green Use alternative forms of medical intervention or defer or discharge. Reassess as needed.	No longer ventilator dependent/ Actively weaning from ventilator

* If a patient develops a condition on the exclusion criteria list at any time from the initial assessment to the 48-hour assessment, change color code to blue. Remove the patient from the ventilator and provide alternative forms of medical intervention and/or palliative care.

A patient assigned a blue color code is removed from the ventilator and alternative forms of medical intervention and/or palliative care are provided.

◊ The patient remains significantly ill.

• These criteria apply to a patient who was placed into the red category at the initial assessment.

□ These criteria apply to a patient who was placed into the yellow category at the initial assessment but because a ventilator was available the patient began ventilator therapy.

Step 4- Ventilator Time Trials (120 Hours Assessment)*	
Color Code and Level of Access	**Assessment of Mortality Risk/Organ Failure**
Blue No ventilator provided# Use alternative forms of medical intervention and/or palliative care or discharge Reassess if resources become available	Exclusion criterion OR SOFA > 11 OR SOFA <7 and No Change in SOFA Score Compared to the Initial Assessment
Red Highest Use lifesaving resources as available	SOFA < 7 and Progressive Decrease in SOFA Score Compared to the Initial Assessment
Yellow Intermediate Use lifesaving resources as available	SOFA < 7 and Minimal Decrease in SOFA Score (<3 Points Decrease in Previous 72 Hours) Compared to the Previous Assessment
Green Use alternative forms of medical intervention or defer or discharge. Reassess as needed.	No longer ventilator dependent/ Actively weaning from ventilator

* If a patient develops a condition on the exclusion criteria list at any time from the 48-hour assessment to the 120-hour assessment, change color code to blue. Remove the patient from the ventilator and provide alternative forms of medical intervention and/or palliative care.

A patient assigned a blue color code is removed from the ventilator and alternative forms of medical intervention and/or palliative care are provided.

As noted above, once plans for rationing or triage are implemented, resources must be constantly reassessed across jurisdictions to ensure consistency of care and equity of access. Returning to the conventional standard of care is a priority.

Discussions About Tiebreakers

In cases of severe shortage of critical resources, the triage officer or committee may have few ventilators to offer to a number of eligible patients with the highest priority (red color code) and the same chance of survival (same SOFA score). If so, decision-making rules must be decided prior to this event.

The previous observation remains valid: only clinical criteria will be considered. Non-clinical factors are not appropriate criteria for allocating scarce resources, such as race, ethnicity, sexual orientation, gender, socio-economic status, education, religion or quality of life. Assessing quality of life is inherently subjective and biased. Consequently, patients with disabilities must be reassured that disability is *not* a criterion for allocating scarce resources.

If only clinical criteria are considered, the question is whether age should be considered as a clinical factor for assessing the likelihood of survival, given that increased likelihood of COVID-19 mortality seems to be directly correlated with advanced age.

In assessing chance of survival, the NYS task force guideline of 2015 chose to not use age as a *direct* criterion to assign color code. Using SOFA score was a way to reflect patient age (as the likelihood of multi-organ failure increases with age) in *an indirect manner without falling into ageism* (as an older patient may have a better SOFA score than a younger patient and a greater likelihood to survive the acute event). Thus, in the context of COVID-19, the argument could be made that SOFA score is sufficiently valid to assess likelihood of survival without referring to patient age. However, given what we know clinically of the current COVID-19 pandemic, age may appropriately be used as a tiebreaker in situations of extreme scarcity among patients within the same color code category.

Focusing or Refocusing on Palliative Care
Current guidelines recommend focusing on palliative care for patients who: meet exclusion criteria, are assigned code blue due to their SOFA score during their first clinical assessment, or are reassigned with code blue after a ventilator trial period.

Communication with Patients and Families about Trial of Initiation or Withdrawal of Life-Saving Technology (LST)[21,22]
When triage to "palliative care only" in disasters is not by patient choice but dependent on available resources, management of expectations and transitions is critical to the physical and mental well-being of patient, family and providers. Anticipating patient and family questions, explaining resource allocation and acknowledging their frustration and feeling of injustice may help them accept the protocol.

Depending on the circumstances:

- If LST is initiated, it will be crucial to explain that LST is only provided for a trial period of critical care (i.e., 48 hours) and will be reassessed by the triage officer or committee.
- If LST is not initiated, it will be crucial to explain that alternative available treatment and/or palliative care (care to help with pain and make them comfortable) will be provided.
- If after the trial period of critical care, the patient is improving with critical care interventions, it will be crucial to explain that LST will be kept for an additional trial period until reassessment.
- If after reassessment, the triage officer or committee decide to withdraw LST, it will be crucial to explain that alternative available treatments and/or palliative care will be provided.

Resources, including communication tips, are available to prepare clinicians to explain resources allocation to a patient or family and caregiver. See, e.g., COVID-Ready Communication Skills: A Playbook of Vital Talk Tips at vitaltalk.org/guides/covid-19-communication-skills/.

Preparing for Palliative Care Needs[8]

The need for palliative care must be anticipated in terms of staff and supplies. In crisis situations, there may be a large number of patients who receive palliative care only, due to the shortage of life-saving technologies.

The Minnesota Health Care Preparedness Program offers a useful resources card to help institutions to prepare for those needs. Among their recommendations:

- Physician and nursing staff expected to provide disaster palliative care should receive pre-incident palliative care training.
- Location should be optimized for palliative care depending on the constraints of the incident (e.g., patients may be triaged to home, other facilities, inpatient units or other locations).
- Institutions should increase their supplies for pain management. The availability of adequate pain and symptom relief should be a key area of disaster planning.
- In case of staffing shortage, staff who do not regularly provide palliative care, may be called upon in a disaster after receiving training and orientation to facility resources.

See also Center to Advance Palliative Care COVID-19 Response Resources at capc.org/toolkits/covid-19-response-resources/.

Alternative Equipment Management

As in the contingency setting, Minnesota Department of Health Strategies for Scarce Resources Situations Tools[8] can be applied to crisis capacity management of:

- Oxygen
- Staffing
- Nutritional support
- Medication administration
- Hemodynamic support and IV fluids
- Mechanical ventilation
- Blood products
- Renal replacement therapy
- Burn therapy
- Pediatrics
- Palliative care
- ECMO

See health.state.mn.us/communities/ep/surge/crisis/standards.pdf and CDC guidance on strategies to optimize of PPE supply at cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html.

Gloves[12]

- Use medical gloves beyond the manufacturer-designated shelf life — visually inspect the gloves for discoloration or holes before use.
- Use the same gloves between patients with the same infectious disease diagnosis or exposure and no other infections — gloved hands can be cleaned when hand hygiene would normally be performed but glove should be changed if damaged or contaminated with body fluids or hazardous material. Thus, the same gloves can be used if tending to multiple COVID-19 patients in a row, assuming no damage or contamination.
- Consider using radiographic protective gloves or radiation attenuating surgeon's gloves that can be cleaned following the manufacturer's labeling.
- Consider using non-medical gloves, such as those used for food service, embalming, cleaning or other industrial-grade gloves, that most closely align with the American Society for Testing and Materials standards for medical gloves as outlined in the FDA Medical Glove Guidance Manual (see fda.gov/media/90612/download).

Facemasks[13]

Implement extended and re-use measure as outlined by the CDC (https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html) and the New York City Health Department (https://www1.nyc.gov/assets/doh/downloads/pdf/imm/strategies-for-the-conservation-of-respiratory-ppe.pdf).

- Prioritize facemasks for selected activities such as:
  o Provision of essential surgeries and procedures
  o During care activities where splashes and sprays are anticipated
  o During activities where prolonged face-to-face or close contact with a potentially infectious patient is unavoidable
  o For performing aerosol-generating procedures, if respirators are no longer available

When no facemasks are available, options include:
- Excluding health care workers who may be at higher risk of getting COVID-19 or of adverse COVID-19 outcomes from caring for patients with confirmed or suspected COVID-19 infection, such as health care workers of older age, people with certain medical conditions or those who may be pregnant
- Designate health care workers who have had COVID-19 for provision of care to known or suspected COVID-19 patients, though degree and duration of convalescent protective immunity has not been confirmed
- Use a face shield that covers the entire front (that extends to the chin or below) and sides of the face with no facemask
- As a last resort strategy in situations where facemasks are unavailable, use homemade masks (e.g., bandana, scarf), with the understanding that *they are not PPE* and their capability to protect personnel is unknown — homemade masks should ideally be used in

combination with a face shield that covers the entire front (that extends to the chin or below) and sides of the face

Consider engineering tools to enhance the efficacy of available PPE:
- Portable fan devices with high-efficiency particulate air (HEPA) filtration that are carefully placed can increase the effective air changes per hour of clean air to the patient room, reducing risk to individuals entering the room without respiratory protection
- Ventilated headboards that draw exhaled air from a patient in bed into a HEPA filter, decreasing risk of HCP exposure to patient-generated aerosol

N95 Respirators[14]
When N95 supplies are running low:
- Use respirators beyond the manufacturer-designated shelf life for health care delivery, though they may not perform to the requirements for which they were certified as the straps and nose bridge material degrade
- Use respirators approved under standards used in other countries that are similar to NIOSH-approved N95 respirators; these are expected to be suitable alternatives to provide protection during the COVID-19 response when supplies are short (see cdc.gov/coronavirus/2019-ncov/hcp/respirators-strategy/crisis-alternate-strategies.html)
- Limit reuse of N95 respirators when caring for patients with COVID-19 as necessary, in accordance with NYC Health Department (nyc.gov/assets/doh/downloads/pdf/imm/strategies-for-the-conservation-of-respiratory-ppe.pdf) and CDC (cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html) guidance
- CDC has also developed additional guidance for suggested facemask or respirator use based on distance from patient with suspected or known COVID-19 (see cdc.gov/coronavirus/2019-ncov/hcp/respirators-strategy/crisis-alternate-strategies.html)

Ventilator Alternatives[11]
The following "ventilator alternatives" are not the conventional standard of care but could be considered in a crisis capacity setting. One should only implement these strategies in consideration of state regulatory guidance and waivers, and ensure conventional ventilation is implemented immediately when available.

Ventilator Alternative	Comments
Non-invasive ventilator	- Readily available - In the setting of an influenza pandemic, not recommended by many as it is unlikely to provide significant benefit to patients with ARDS and may increase the risk of airborne transmission
Portable ventilator	- Battery or pneumatic power - Reasonable alternative
Disposable emergency ventilator	- Powered by pressure of oxygen tank and can run indefinitely on hospital's oxygen supply - Can deliver oxygen at various pressures - Relatively inexpensive (cost approximately $50-$100 each) - Limited to no role for seriously ill patients
Automatic resuscitators	- Entails the use of family members or volunteers to manually ventilate intubated patients with bag-valve mask - Physically exhausting technique - Not optimal for use in patients with significant air flow obstruction or low compliance - Hyperventilation, lung overexpansion and acute respiratory alkalosis can occur - May be considered in select cases for short periods of ventilation - Likely increases risk of transmission to volunteers and staff and is not recommended by many
Experimental	A 2006 pilot study looking at a simple, rapidly deployable modification of one emergency department ventilator to provide ventilation for four adults simultaneously found four 70kg adults could be ventilated this way, for a short period of time.[23]

Additional Concerns

Supporting Patients, Families, and Staff During and After Disaster
Moral distress — the feeling of being unable to "do the right thing" — is foreseeable when severe resource limitations impact patient care and clinician safety. Support must be offered during and after disaster.

- Identify available support services, such as employee assistance programs (EAPs), spiritual care or chaplaincy, and counseling, available on-site and remotely
- Coordinate psychiatry staff to provide on-site counseling or planning for post-disaster debriefing
- Use clinical ethics support if the hospital has a clinical ethics consult service

See also Center for the Study of Traumatic Stress Sustaining the Well-Being of Healthcare Personnel during Coronavirus and Other Infectious Disease Outbreaks at cstsonline.org/assets/media/documents/CSTS_FS_Sustaining_Well_Being_Healthcare_Personnel_during.pdf.

New York City resources:
- Visit the "App Library" at nyc.gov/nycwell for online tools to help you manage your health and emotional wellbeing.
- New York State's COVID-19 Emotional Support Helpline at 844-863-9314 is available 8 a.m. to 10 p.m., seven days a week. The phone line is staffed with specially trained volunteer professionals who are there to listen, support and refer if needed.
- If symptoms of stress become overwhelming, you can connect with trained counselors at NYC Well, a free and confidential mental health support service that can help New Yorkers cope. NYC Well staff are available 24/7 and can provide brief counseling and referrals to care in over 200 languages. For support, call 888-NYC-WELL (888-692-9355), text "WELL" to 65173 or chat online by visiting nyc.gov/nycwell.

Increasing Security Procedures During Crisis Standard of Care
Hospitals may have to severely limit visitors to reduce transmission and increase their security protocols to deal with the surge of patients and maintain the speed and safety of providers' workflow.

The NYC Health Department may change recommendations as the situation evolves.   4.26.20

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