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Subject Matter Experts Advisory Panel for the
Governors Expert Emergency Epidemic Response Committee on
Crisis Standards of Care Guidelines for Hospitals for the COVID-19 Pandemic

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Table of Contents

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I. General Principles and Framework

This document is meant to serve as a guide and template for crisis care during the SARS-CoV-2 (COVID-19) pandemic. The Institute of Medicine defines "Crisis Standards of Care" as "a substantial change in usual healthcare operations and the level of care it is possible to deliver, which is made necessary by a pervasive (e.g., pandemic influenza) or catastrophic (e.g., earthquake, hurricane) event."[1] When patients must receive care that substantially deviates from the usual standard of care due to a lack of resources, a new standard of care is created, a crisis of standards of care (CSC).[2] Based on experiences with COVID-19 from other cities and countries, Colorado might experience one or more surges in patient demand where there could be insufficient resources (such as intensive care unit (ICU) beds and ventilators) to provide these services to patients in Colorado who might benefit from them.

As a state, our first aim must be to avoid such a situation. However, we must be prepared for the *extreme situation* where there are insufficient resources to care for everyone who needs them. In such a situation, the goal will be to provide the best care for the most people, and to do so in ways that sustains social cohesion, trust in the healthcare system, and our ability as a community to come together and heal in the wake of the pandemic.

All triage systems for CSC are meant for the *extreme situation* in which the number of sick individuals far exceeds the health system's resources and difficult decisions must be made as to who receives certain types of care. A triage system does not always need to decide between providing a specific service and providing no service. For the COVID-19 pandemic, a crisis could exist when fully functional critical care ventilators ("full ventilators") become a scarce resource, but less than optimal alternative forms of ventilation such as anesthesia machines, some non-invasive (NIV) machines, and disposable resuscitators ("partial ventilators") are still available and thus could be provided to a patient.

This triage framework for CSC gives priority for critical care resources to patients with the highest likelihood of near-term survival (e.g. 1-year survival) were they to receive critical care interventions.[3] It also addresses the possibility of re-allocating scarce critical resources like ventilators from patients with minimal chances of survival to those with higher likelihood of survival. This triage framework has strong ethical underpinnings. Should there be a declaration of CSC for hospitals in Colorado, the goal would be to maintain equity between hospitals and reduce institutional variation in implementation of CSC. A few key principles guided the development of this document:

1. A CSC Triage System needs to be transparent, consistent, equitable, respectful, and fair to ALL individuals.
2. The clinical care team (e.g., physician, nurse, respiratory therapist) should NOT be involved in initial triage decisions about their own patients to enhance objectivity, avoid conflicts of interest and maintain the therapeutic relationship between clinical care teams and their patients.
3. A structure for triaging patients should be adopted at the highest level to reduce variation within and between institutions across the state.
4. No categorical exclusionary criteria based on factors clinically and ethically irrelevant to the triage process (e.g. age, race, ethnicity, ability to pay, disability status, national origin, primary language, immigration status, sexual orientation, gender identity, HIV status,

religion, veteran status, "VIP" status, housing status, income, or criminal history) will be used to make triage decisions.

5. The triage framework employs multiple clinically relevant considerations but does not include any single categorical exclusionary criteria such as age or specific comorbidities. *This is a fundamental change from prior Colorado triage guidance in 2018*.
6. Patients who are triaged such that they do not receive a given resource (e.g. do not receive a ventilator if needed) should receive optimal care within the triage framework, including expert palliative care if appropriate and available.
7. The triage process will be used for ALL patients who may require critical care resources, not just those who suffer from COVID-19.
8. The triage process will be iterative in order to account for changes in need for scarce resources, resource availability and new information learned.

II. Key Principles Prior to Implementation of Crisis Standards of Care

In dire circumstances where resources become limited, the Governor or a designated public health official may declare a Public Health Emergency where upon CSC may be authorized, sanctioning the provision of medical care that would otherwise be significantly less than optimal. The declaration of CSC for hospitals can provide liability protection to healthcare workers who comply with the specifications enumerated in the hospital CSC executive order. Prior to a declaration of CSC, the care of all individuals should follow practice standards that existed prior to the current pandemic. As such, prior to a declaration of CSC, decisions regarding withholding CPR or intubation and mechanical ventilation should be based on usual standards of care, including institutional policies on not providing non-beneficial care.

Under normal circumstances, no CPR or intubation should take place without use of adequate personal protective equipment (PPE), as these are high-risk activities for exposure; this holds true even if donning PPE will delay the initiation of CPR.

In the period prior to and during CSC, **all efforts must be made to determine a patient's goals of care prior to the need for CSC**. It is critical to know whether a given patient wants to receive aggressive critical care interventions such as ICU admission or mechanical ventilation. For a patient with decision-making capacity, the individual's preferences to refuse hospitalization, life support (such as mechanical ventilation), and resuscitative efforts should be respected regardless of CSC. In current circumstances, ALL hospitalized patients should be asked about Advance Directives (ADs), goals of care, and strongly encouraged to appoint a proxy decision-maker (e.g. medical durable power of attorney (MDPOA)). Patients in nursing homes, skilled nursing facilities, and other long-term care settings should also be asked about ADs, and encouraged to appoint a proxy who is aware of their wishes regarding hospitalization and critical care. These actions can help prevent the healthcare system from being overwhelmed with patients who do not want critical care interventions.

III. Crisis Standards of Care Triage Team Structure

Institutional CSC Triage Teams

Each institution or health care system should implement one or more CSC Triage Teams to make decisions about scarce resource allocation. Bedside providers (the Clinical Team) should not make triage decisions, assuring that they maintain an effective therapeutic relationship with their patient. A CSC Triage Team can also ensure consistent and equitable decision-making during a

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crisis. If possible, a CSC Triage Team should consist of (1) an expert on ethics or palliative care, (2) an attending physician familiar with critical care (e.g. hospitalist or critical care physician), (3) a representative of nursing staff, and (4) a representative of the hospital's leadership. However, it is recognized that some smaller institutions may need to alter the structure of the triage team based on local resources. Members should be respected leaders within the institution capable of making difficult decisions under pressure and should be nominated by their division, departmental, or institutional leaders. A CSC Triage Team Leader should be assigned by the Chief Medical Officer of the institution. The CSC Triage Officer will be the primary person to communicate with Clinical Teams; however, decisions will be made by the entire CSC Triage Team. In certain situations, the CSC Triage Team can consult with a subject matter expert not involved in the care of the patient for further information. No one on the CSC Triage Team should have direct patient care responsibilities for any patient that is being triaged (i.e. they should not be "on service"). A CSC Triage Team and/or CSC Triage Officer should be on-call 24 hours a day and 7 days a week in rotating shifts whenever CSC for hospitals are in effect. Given the anticipated need for frequent consultations, multiple individuals should likely be assigned to the CSC Triage Team and rotate call duties.

The CSC Triage Team will:

1. Assign CSC Triage Scores (see Section IV) to patients. Patients with lower CSC Triage Scores have higher expected survival and should receive higher priority for scarce resources.
2. Determine the "CSC Triage Score Cutoff" based on the available resources for that day. CSC Triage Scores less than the triage score cutoff would receive critical care interventions such as a ventilator whereas scores that are equal to or higher may not.
3. At a minimum, meet daily to review cases near the cutoff score and provide updated CSC Triage Scores for patients at high risk of decompensation/needing a ventilator (see Section IV).
4. Be on call 24 hours a day, 7 days a weeks for urgent evaluations of patients who are decompensating but have not yet received a CSC Triage Score (Emergent Triage).
5. Be the lead in any discussion about re-allocating critical care resources such as ventilators or critical care beds. The final decision for removal of ventilator support will reside with the CSC Triage Team (unless ventilation or life support is requested to be removed by the patient or proxy or is removed using institutional non-beneficial care or futility policies).
6. To the greatest degree possible, be blinded to potential biases that are neither clinically nor ethically relevant to triage decisions including, but not limited to age, race, ethnicity, ability to pay, disability status, national origin, immigration status, primary language, sexual orientation, gender identity, HIV status, religion, veteran status, "VIP" status, housing status, income, or criminal history except as required by the triage process. Institutions should consider assigning the role of abstracting the necessary data to calculate a CSC Triage Score to persons not on the CSC Triage Team with sufficient medical knowledge to perform this task (e.g., medical students, medical librarians, or other medical professionals who cannot provide direct patient care). Some health systems may have the ability to automate part or all of the CSC Triage Score calculation based on data from the electronic health record.

The institutional CSC Triage Team structure, membership, and team leaders should be determined prior to a declaration of CSC if timing allows. **We recommend that the CSC**

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Triage Team practice assigning CSC Triage Scores and review mock cases to determine how they would make decisions in the setting of scarce resources.

Regional Coordination

A key aspect of dealing with scarce resources such as ICU beds and ventilators is regional coordination. The goal is to avoid a circumstance in which a patient presents to one hospital lacking available ventilators while a second hospital nearby has the necessary equipment and resources to care for that patient. The manner with which such a system can reallocate resources across a region or facilitate transfers between hospitals to maximize resource utilization and equity is a priority focus of the state Unified Command Center (UCC), Medical Operations Command. The COVID-19 Communications Center (720-947-5000) will operate out of the State's Unified Command Center and utilize the EMResource system to maintain situational awareness of ICU bed and ventilator availability throughout the state. Currently this system has information on available critical care beds and ventilators at each institution, updated daily. The Communications Center will be able to identify where resources may be available to make more rapid decisions about transferring patients between hospitals. Institutional CSC Triage Teams must have direct and ongoing communication channels to their local/institutional Incident Command Officers/Leaders with having access to the EMResource and the Unified Communications Center. Only through cooperation across multiple institutions can the best possible care be provided for the greatest number of patients.

IV. Crisis Standards of Care Triage Scoring System

When a triage process for critical care resources such as ICU beds or ventilators is required, the core set of ethical principles used to determine the allocation of scarce resources must reflect concepts of fairness to ALL patients, maximizing benefit to the greatest number of patients, maximizing survivability in the near-term, and ensuring the safety of healthcare workers and first responders. Ventilators are used as the primary example of triaging scarce resources throughout this document but the triage process below can be adapted to triage critical care beds, medications shortages, or other types of resource shortages.

The triage process will involve a multi-tiered system to determine which patients will receive scarce resources and which patients may have their resources re-allocated to other patients (Figure 1). The first tier involves calculation of an objective CSC Triage Score. In the event of a CSC Triage Score tie between 2 or more patients in need of the same resource, the CSC Triage Team will sequentially consider tiers 2, 3 and 4 as necessary. The tiered system is meant for allocation of resources. When considering re-allocation of ventilators or other critical care resources, the CSC Triage Score will be reassessed and additional information may be considered including trajectory (improving, stable, worsening) and likelihood of recovery.

Patients with chronic respiratory failure already on a ventilator should be triaged in the same fashion as other patients. However, if they were to be triaged not to receive a full critical care ventilator (See Ventilator Type below), they could continue to use their home ventilator and receive other hospital-based care as appropriate. *At no point should a patient with a home ventilator have it confiscated from them.*

Tier One: CSC Triage Score

The first tier of the triage framework is an objective scoring system based on severity of acute and chronic illness, to assess likelihood of short (30-day/hospital) and near-term (1-year) survival. No perfect scoring system exists, so the development and implementation of any triage

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score is based on the principle of using the best-available clinical information at the time. The recommended Colorado CSC Triage Score combines an objective measure of acuity of illness and short-term mortality (Sequential Organ Failure Assessment (SOFA), Appendix A) with an objective measure of near-term mortality (modified Charlson Comorbidity Score (mCCI), Appendix B).[4-10] Some institutions with access to more advanced resources may augment the recommended scoring system but new scores should be internally validated prior to use and be based on the same ethical principles. The goal is to create, as much as possible, a uniform standard to reduce variation and ensure equity in triage processes between hospitals, while encouraging innovation and learning to improve triage scoring systems as the crisis evolves. The aim is that the CSC Triage Score should combine the likelihood of surviving days/weeks with the likelihood of surviving 1 year. A recommended CSC Triage Scoring system that combines SOFA with mCCI is described below:

TABLE 1

Purpose	**Specification**	**Point System[A]**				
		0	**1**	**2**	**3**	**4**
Likelihood of surviving days/weeks if given critical care resources	SOFA score[B]: Validated measure of acute survival	X	1-5	6-9	10-12	>12
Likelihood of surviving 1 year if given critical care resources	Modified Charlson Comorbidity Index Score[C]: Validated measure of 1-year survival	0	1-2	3-5	6-7	≥8

[A]CSC Triage Scores range from 1-8. Persons with lower CSC Triage Scores have better short and near-term survival and would be given higher priority to receive scarce resources in a crisis situation.
[B]SOFA = Sequential Organ Failure Assessment, see Appendix A for calculation. A Modified Pediatric SOFA (Appendix D) or PELOD-2 (Appendix E) score can be used for patients ≥1 and ≤17 years old.
[C]See Appendix B for Modified Charlson Comorbidity Index calculation.

The CSC Triage Score is the sum of the assigned points from the SOFA score and the assigned points from the mCCI.[A] A patient with a SOFA score of 9 and a mCCI score of 7 would have a CSC Triage Score of 5 (2+3). The CSC Triage Score ranges from 1-8 with lower numbers indicating higher likelihood of survival and therefore higher prioritization for receiving critical care resources. Higher numbers indicate patients with lower likelihood of survival despite critical care interventions. Again, the CSC Triage Score estimates both short-term and near-term mortality. An alternative scoring system based on the same ethical principles can be found in Appendix C.

For pediatric patients ≥1 and ≤17 years, the Modified Pediatric SOFA (MPSOFA) score (Appendix D) or Pediatric Logistic Organ Dysfunction Score (Appendix E) could be used instead of the adult SOFA score.[11,12] A similar CSC Triage point allocation scheme should be used with the MPSOFA or the PELODS-2. Consultation with a pediatrician, dedicated pediatric hospitals, and pediatric critical care specialists should be considered if triaging pediatric patients becomes necessary. Specific scoring systems and approaches to triaging of neonatal patients

[A]Visit https://redcap.njhealth.org/redcap/surveys/?s=KXJCAJ9XP9 for an online calculator for the CSC Triage Score in Table 1

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(infants <12 months) is beyond the scope of the state guidelines. We recommend consultation with neonatal critical care specialists should the need to make triage decisions for neonates arise.

What constitutes a tie in the CSC Triage Score for Tier 1 will depend on the heterogeneity of the patient population at a given institution. Individual institutions can define a tie as the same CSC Triage Score or +/- 1 point difference. The definition of a tie may also shift as the specific demands and needs in a crisis evolve.

Tier Two: Pediatrics, Healthcare Workers, and First Responders as Tiebreakers

For generations society has placed a special emphasis on the survival of children as the most extreme extension of the life-cycle principle of life years saved. Pediatric patients ($\geq$1 and $\leq$17 years of age) are a special consideration. Most will have a very low CSC Triage Score and therefore take priority for resources like ventilators. However, pediatric patients also have the unique ability to be transferred emergently to a pediatric hospital where ventilators may be available. Given the societal worth ascribed to children and the life-cycle principle, we recommend that pediatric patients be given consideration in Tier 2 should there be a tie in Tier 1. As stated above, neonatal patients are a separate special consideration and consultation with a neonatal critical care specialist should guide any neonatal triage decision.

Healthcare workers and first responders (EMS, firefighters, and law enforcement) have the potential to save other lives should they recover (multiplier effect) and they are at increased risk of exposure to a potentially lethal infection by virtue of being on the front lines of the COVID-19 response. We recommend healthcare workers and first responders with a role in the COVID-19 response receive a scarce resource over individuals not in one of these categories if all have the same initial Tier 1 CSC Triage Score.[B]

Tier Three: Special Considerations as Tiebreakers

Based on expert and community engagement, several other factors should be considered when a patient has a tie for both Tier 1 and 2 (e.g., a nurse and a firefighter, both with a CSC Triage score of 6). In no particular order these include:

- Pregnancy – priority for a scarce resource may be given to a patient with a confirmed pregnancy over a non-pregnant patient.
- Life Years Saved - priority for a scarce resource can be given to a patient with more near and intermediate (1-5 years) life years to be saved. The life-years principle is NOT a categorical age exclusion criterion as a 35 year old and 70 year old patient *could* have similar 1-year survival predictions. The life-years saved principle is the place where more disease-specific prediction models *could* be used to provide greater insight on near and intermediate-term mortality (1-5 years).[C] For example, even with the same CSC Triage Score (Tier 1), some consideration may be given to a 35 year old patient with no comorbidities over an 80 year old with metastatic pancreatic cancer. Similarly, a 70 year

[B]We recommend that "healthcare workers" be defined as any individual who has a direct role in caring for patients with COVID-19 in a healthcare setting. This would broadly include physicians, advanced practice providers, nurses, medical assistants, respiratory therapists, medical technicians, chaplains, phlebotomists, housekeepers, etc. if they work in a COVID-19 area.. Each institution should carefully decide how they want to define healthcare workers and use a consistent definition throughout a crisis.

[C]Some of examples of disease specific models include the Modified End-Stage Liver Disease (MELD) score, BODE Index for COPD, cancer survival curves, etc. could be used for specific patients. The use of disease-specific models is a suggestion is not mandatory but can be used by triage teams.

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old with no comorbidities may receive consideration over a 40 year old with end stage liver disease with an extremely high Model for End-Stage Liver Disease (MELD) score.

- Multiplier Effect - priority for a scarce resource may be given to patients who are the sole caregiver to a dependent child or dependent adult.

Each institutional CSC Triage Team will have to decide how they wish to prioritize Tier 3 considerations but consistency across cases, accurate and complete record keeping and transparency in the decision-making process are required.

Tier Four*: *Random Allocation as Tiebreaker

In the event of a tie at Tiers 1, 2, and 3, we recommend the use of random allocation to decide which patient should receive a scarce resource.

For patients who are triaged not to receive a scarce resource such as a full ventilator, alternative treatment considerations including early palliative care consultation should be provided.

In sum, the tiered process is designed to focus initially on calculating a clinical score to assess each patient's likelihood of experiencing acute or near-term survival, and then to address the possibility of 2 or more patients having the same clinical prognosis (i.e. a tie). A tie in the CSC Triage Score (Tier 1) could be the same exact CSC Triage Score or +/- 1 point depending on institutional needs/resources. Ties in Tier 2 and/or Tier 3 can also arise when 2 or more patients that have the same special considerations (e.g. both are pregnant) or if no patient being a triaged has a special consideration (e.g. no one is pregnant). For example, if 2 adult patients are being triaged at the same time, have the same CSC Triage Score and are both healthcare workers (a Tier 2 tie), Tier 3 considerations would then be considered. Similarly if neither of the patients are a healthcare worker or first responder (also a Tier 2 tie), then Tier 3 considerations would be next. A similar approach should be applied to Tier 3 ties with subsequent Tier 4 random allocation

V. The Triage Process

When a hospital CSC is declared, some institutions may have sufficient resources to continue to provide certain critical care resources to all eligible patients. For core critical care resources like critical care beds and ventilators, each institution must determine its minimum operating capacity (MOC) number, which is the absolute minimum number of a resource (e.g. ventilators) needed to continue core operations. For example, some hospitals may reserve a ventilator for trauma, another for emergency C-sections and another for the transportation of patients. Hospitals may decide to use alternative ventilators for this purpose (e.g. anesthesia machines or some NIV machines). When a hospital approaches or goes below the MOC, the crisis triage system should be activated.

CSC Cutoff Score: A core process in triaging patients for scarce critical care resources is determining the CSC Cutoff Score for a given day. In some situations, patients will arrive over time and the CSC Triage Team will not be deciding on resource allocation for two patients at the same time. Rather, triage decisions will have to be made based on what the anticipated need for the day (e.g. a very sick person may not receive a scarce resource if many more patients who are less sick are anticipated later in the day). Patients with a CSC Triage Score lower than the CSC Cutoff Score would receive a scarce resource. Those with a CSC Triage Score equal to or higher than the CSC Cutoff Score would be triaged to an alternative care plan. For ventilator triage, the CSC Cutoff Score will be based on the number of ventilators available plus the number of

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ventilators expected to become available that day through extubations. This total availability must then be compared to the total need which would be the MOC plus the anticipated number of new intubations. This requires detailed situational awareness and communication between the CSC Triage Team, institutional incident command team, and the clinical team who would have the most knowledge about anticipated extubations. The CSC Triage Team will then be the final group that determines the CSC Cutoff Score for the day. As more information becomes available (e.g. there are more extubations on a given day) the CSC Triage Team can then update the score as needed See Appendix F for some examples on determining the CSC Cutoff Score.

Types of Triage: In the setting of hospital CSC, there are 3 time points at which triage might need to take place. For this section, we will focus on the example of ventilators, but the framework should apply to any scarce resource such as ICU beds.

1. Emergent Triage: Emergent triage addresses patients for whom generating a CSC Triage Score is not possible prior to a decision to administer treatment. These patients could be "found down" by emergency medical services, patients who present to the ED in extremis, out of hospital or ED cardiac arrest, severe trauma, or acute decompensation or cardiac arrest of a hospitalized patient who does not have a pre-existing CSC Triage Score (e.g., recently admitted, otherwise stable, or observation patients). For these patients healthcare workers should provide these patients with all appropriate treatment including intubation, mechanical ventilation or bag valve mask ventilation through the endotracheal tube, as examples. The CSC Triage Team should be notified immediately and provide an assessment as soon as possible. If the patient has a CSC Triage Score lower than the current triage cutoff, the critical care intervention should continue. However, if the patient has a CSC Triage Score equal to or higher than the cutoff, the CSC Triage Team will decide to discontinue mechanical ventilation, transition the patient to a partial ventilator system, or reassess existing patients for possible re-allocation (see below). In very specific situations, such as severe non-survivable brain injury, massive burns, etc. the CSC Triage Team or the emergency physicians can decide to terminate resuscitative efforts without a triage score. Additionally, in the rare circumstance where an extremely rapid triage decision is required for a patient newly presenting to the ED, a qualified emergency physician may calculate and act on a CSC Triage Score in the absence of the triage team. Such action would require that the emergency physician has situational awareness of the CSC Triage Score Cutoff, resources available, resources that are strained, etc. in order to make an appropriate triage decision. In the event that an emergency physician makes a triage decision, the CSC Triage Team should still be notified and the process documented.
2. Prospective Triage: Prospective triage involves calculating a daily CSC Triage Score for a set group of patients at the time of admission and recalculating that score on a daily basis. For resources like ventilator allocation, this would likely require calculating a CSC Triage Score for every patient in the ICU/Intermediate Care Unit (IMC) on a daily basis. Other physicians or care providers may also identify other patients at high risk of decompensation who should be assigned a daily CSC Triage Score. In such a situation, the medical team would notify the CSC Triage Team to assign the patient a CSC Triage Score. This process is prospective in nature and aims to reduce the need for emergent evaluations and prevent delays in appropriate care. If electronic health record resources allow, the CSC Triage Score should be an automated calculation on all patients in the

hospital including those in the Emergency Department. See below about how this process specifically drives ventilator allocation.

3. Re-Allocation Triage: In the setting of activated hospital CSC, patients may reach a point where they have shown a failure to improve or are progressively worsening. If a sufficient therapeutic trial has been completed (based on the specific disease the patient has) or the patient shows progressive deterioration despite appropriate medical therapy and there is a need for the scarce resource (e.g., a ventilator or ICU bed), the CSC Triage Team will determine if removal/transition of that resource in favor a patient with a lower CSC Triage Score is warranted. See below for specifics related to ventilators.

Ventilator Allocation (See Figure 2 & 3)

We recommend that at a minimum the CSC Triage Team provide a CSC Triage Score for every patient receiving critical care (regardless of COVID-19 status) daily based on the most recent labs and vital signs (Prospective Triage). The reason to repeat CSC Triage Scores on an ongoing basis is to account for changes in acuity of illness but also shifts in availability of resources (e.g. purchasing of new ventilators, recoveries or deaths that make ventilators newly available). If possible, the system (e.g. SOFA + mCCI) should be automated once an assessment of comorbidity status is made. Ventilator allocation would then be based on comparing a patient's CSC Triage Score to the CSC Cutoff Score calculated for that day. If the CSC Triage Score is less than the CSC Cutoff Score, the patient should receive the ventilator. If it is equal to or higher than the CSC Cutoff Score, the patient should be triaged to an alternative care plan. If the actual need exceeds the anticipated availability of ventilators, re-allocation of ventilators should be considered (see below). Should a patient be triaged not to receive a ventilator but additional resources become available, a reassessment should occur.

In the setting of Emergent Triage, if there is not enough time to notify the CSC Triage Team (e.g. sudden cardiac arrest outside of the ICU), then the care team should err on the side of caution and **perform all necessary interventions including intubation and manual bag valve mask ventilation with appropriate PPE protection**. As soon as the patient is stabilized, the CSC Triage Team should be notified. The CSC Triage Team should calculate a triage score for the patient based on the best available data and compare it to the CSC Triage Score Cutoff. The following outcomes are possible:

1. A ventilator is available and the patient's CSC Triage Score is sufficiently low such that mechanical ventilation should continue;
2. A ventilator is not available but the patient's CSC Triage Score is low enough that possible re-allocation of a ventilator from a patient that has failed a sufficient therapeutic trial should be considered; manual ventilation should be continued until a ventilator becomes available;
3. A ventilator is not available but the patient's CSC Triage Score is low enough that urgent transfer to a center with resources should be considered;
4. No ventilator is available and the patient's CSC Triage Score is greater than the cutoff. In such a case termination of artificial ventilation is warranted.

The CSC Triage Cutoff Score is based on the best available data at the time. If more resources become available on a given day through successful extubations or deaths, the CSC Triage Team can decide to re-calculate the cutoff score.

Re-Allocation of Ventilators (see Figure 4)

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If ventilator scarcity reaches the point of a declaration of hospital CSC, consideration must be given to patients who have failed a therapeutic trial. There is no uniform definition of treatment failure as it is specific to each condition. Based on experiences around the world, the majority of patients with COVID-19 associated respiratory failure require mechanical ventilation for prolonged periods, often longer than 12 days.[13,14] Some patients that require longer periods of mechanical ventilation can recover, but there is clear evidence that the chances of successfully coming off a ventilator and surviving decreases the longer someone is on a ventilator.[15-18] If re-allocation is required, all intubated patients should receive a new CSC Triage Score and an assessment of therapeutic failure (e.g. prolonged duration of ventilation without improvement or progressive multi-system organ failure). Patients with non-COVID-19 disease should also be considered for re-allocation but the definition of an appropriate therapeutic trial will vary by disease. The CSC Triage Team must then decide which patients, if any, should be considered for re-allocation. Re-allocation may mean removal from the ventilator with a transition to palliative care. However, if all full ventilators have been utilized but partial ventilators (e.g. NIV ventilator or disposable resuscitators) are available, re-allocation could mean transitioning the patient whose respiratory failure has stabilized to a partial ventilator for an additional period of possible recovery. The full ventilator should be used for patients with lower CSC Triage Scores who have a higher likelihood of survival and receiving benefit from full critical care resources. If the institution is at or below its MOC, then re-allocation of a ventilator would mean transitioning a patient who has failed treatment to palliative care.

CSC Triage Scores and the following data should be considered by the CSC Triage Team for re-allocation decisions:

1. **Duration of mechanical ventilation.** Average duration of mechanical ventilation varies based on the cause of respiratory failure. Some conditions like COPD exacerbations tend to require shorter periods of mechanical ventilation. However, patients with COVID-19 have been shown to require extended periods of mechanical ventilation prior to improvement. Given the prolonged needs for ventilation for COVID-19 patients, even among those who recover, we recommend that re-allocation of ventilators for patients with COVID-19 only be considered after 14-21 days of mechanical ventilation. For non-COVID conditions, the clinical team must provide insight as to whether a patient has completed an adequate therapeutic trial for that disease process. If a patient is progressively worsening despite maximal ventilator support, consideration for re-allocation can be made earlier based on the CSC Triage Team's assessment.
2. **Trajectory of illness.** Intubated patients who are worsening, such as those with progressive multi-system organ failure (MSOF) (shock, acute renal failure, etc), and not improving with appropriate therapy may be considered for re-allocation.
3. **Intensity of Resource Utilization**. Some patients on a ventilator require significantly higher levels of care than other patients receiving mechanical ventilation. For example, patients on continuous renal replacement therapy or extracorporeal membrane oxygenation (ECMO) often require a single nurse assigned to a single patient. For ECMO, even more personnel are directly assigned to a single patient. If re-allocation is required, the intensity of resource utilization combined with trajectory of illness should be considered.

These decisions will require collaboration between the CSC Triage Team and the Clinical Team. **Given the potential for re-allocation of scarce resources during a pandemic, which is very**

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different from usual critical care, the concept of a time-limited therapeutic trial should be introduced to patients/surrogates early in the course of mechanical ventilation.

If a decision is made to re-allocate (remove) a ventilator from a patient who has failed treatment, the decision must be communicated to the patient's proxy or medical durable power of attorney (MDPOA). If the proxy or MDPOA wishes to discuss this decision with a dedicated Communication Team or a designated member of hospital administration (see Section VII), all efforts must be made to facilitate this conversation. However, given the speed with which the CSC Triage Team needs to make decisions and potentially re-allocate resources, a lengthy formalized appeals process may not be practical. The family can request a reconsideration, but, within the framework of CSC, the CSC Triage Team will retain the final decision (see discussion immediately below).

Accountability Mechanisms

To ensure the fairness, justice, and trustworthiness of the process for making critical and potentially controversial decisions about resource allocations, mechanisms for accountability in the process are required.

- *Transparency:* Each institution must create a process by which the CSC Triage Team can document their decision-making process for review.
- *Case-based due process mechanisms:* Decisions about triage for critical care resources are, by their very nature, urgent. The time and resource constraints envisioned in the triage process were it invoked do not allow for a lengthy appeals mechanism.
    - The only permissible "appeals" are those based on the claim that the CSC Triage Score was calculated incorrectly (e.g. a patient is recorded as having leukemia when calculating the mCCI but they actually had childhood leukemia that has been "cured" for decades). These appeals will come from the Clinical Team. Appeals based on objections to the overall allocation framework will not be allowed.
    - The process of evaluating the appeal will consist of the CSC Triage Team verifying the accuracy of the triage score by re-calculating the score.
    - If an appeal results in a scoring dispute, the appeal will proceed to the hospital leadership (e.g. Chief Medical Officer) for re-scoring and rapid decision.

Special Considerations for Ventilators

- Ventilator Type – For COVID-19 induced acute respiratory failure, the optimal and standard treatment is intubation and use of a fully functional critical care ventilator ("full ventilator"). *Routine use of any alternative ventilators including NIV, anesthesia machines, and disposable respirators ("partial ventilators") due to insufficient full ventilators, will be an indicator that hospital CSC may need to be declared by the State.* Within the framework of the CSC Triage Scoring process, an individual with the lowest CSC Triage Score would receive the scarce resource that would otherwise be considered the usual standard of care (i.e. full ventilator). A patient with a higher CSC Triage Score may be considered for a partial ventilator or the partial ventilators could be reserved for the re-allocation process. If the institution is at or below its MOC for ventilators, early palliative care discussions should be initiated.
- As of March 26, 2020 the use of a single ventilator for multiple patients has been discouraged by experts in a joint statement from the Society of Critical Care Medicine (SCCM), American Association for Respiratory Care (AARC), American Society of

Anesthesiologists (ASA), Anesthesia Patient Safety Foundation (ASPF), American Association of Critical-Care Nurses (AACN), and American College of Chest Physicians (CHEST).[19] Prior to the implementation of CSC, we do not recommend placing multiple patients on a ventilator. **Should CSC be enacted, each institution and CSC Triage Team will need to weigh the feasibility and safety of multiple patients on each ventilator for their institution.** While it is functionally feasible to place more than 1 patient on a single ventilator, there are many technical, staffing, and ethical considerations. From an ethical perspective, patients placed on the same ventilator should have similar CSC Triage Scores and be at similar points in the trajectory of their illness. Multiple patients on a single ventilator involves weighing suboptimal care for 2+ patients vs optimal care for 1 patient and no critical care for others.

Hospital Transfer CSC Triage Score

Prior to the declaration of CSC, if an individual hospital experiences significant resource shortages, the priority on their part should be transferring patients to institutions with the needed resources. Hospitals cannot enact a hospital CSC triage process without a State declaration and incident command access to information about available resources at nearby facilities.

In the setting of hospital CSC, the CSC Triage Score can also be used to determine who should be eligible for transfer to another institution. In this situation, there will be a limited number of critical care beds and ventilators within a region, and the need within a region may exceed the regional resources. Each institution can determine an additional CSC Triage Score cut off for possible transfer to another institution. For example, if resources are very limited at Hospital A, only patients with a CSC Triage Score <3 might receive a ventilator. If other institutions near Hospital A have more resources, then the CSC Triage Team could create another cutoff where patients with a score between 3 and 5 are considered for rapid transfer. In such a situation, patients with a CSC Triage Score $\geq$ 6 would not be considered for a ventilator or transfer to another institution due to the high resource utilization and low chances of survival. Guidelines for transfer CSC Triage Score cutoffs will be institution specific and sensitive to regional availability of resources.

Admissions to Critical Care Units

While a similar scoring process could be used for triaging critical care admissions, additional contingency plans should be implemented. For example, some treatments usually requiring an ICU bed (such as diabetic ketoacidosis requiring an insulin infusion) may be transitioned out of the ICU (e.g. allowing insulin drips on the floor). Furthermore, the number of critical care beds and where critical care services can be provided will shift throughout the pandemic as hospitals expand their ICUs. In short, under hospital CSC, if critical care beds become a scarce resource, some patients who may have otherwise received ICU level care under usual conditions may be ineligible for ICU admission. More strict ICU admissions criteria such as refractory hypoxia requiring mechanical ventilation and/or shock may be employed. As with ventilator allocation, considerations should be made regarding acuity of illness, likelihood of near-term survival, and possible benefit from and duration of critical care services. We recommend using a similar process as the allocation of ventilators to the allocation of critical care beds led by the CSC Triage Team. This will involve having a separate CSC Triage Score cutoff for critical care admission. The CSC Triage Team will need to evaluate all patients who are acutely decompensating on the regular ward as well as the emergency department to determine which patients will receive critical care services if it becomes a limited resource. If critical care bed

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shortage becomes a major theme of the pandemic, further guidelines may be provided, which could include the additional consideration of the anticipated duration of critical care needs.

V. Personal Protective Equipment

Sufficient and appropriate PPE is critical to ensuring the safety of healthcare workers and first responders. In the setting of an infectious pandemic, PPE can become a scarce resource. While health professionals have a duty to provide care even when doing so presents some risk to themselves (e.g. needle sticks), this duty is not without limit. Health professionals are not obligated to provide care that creates a very high risk of contracting a life-threatening illness. Strict rules for different levels of PPE required for caring for patients with confirmed or suspected COVID-19 are not possible given variability in PPE availability and evolving recommendations on the optimal PPE for specific situations. However, when sufficient and appropriate PPE is not available healthcare workers may have to change their practices to ensure their own safety. For patients with confirmed or suspected COVID-19 specifically, this may first affect aerosolize-inducing procedures such as laryngoscopy, bronchoscopy, endoscopy, intubation, etc., which are high risk and require higher levels of PPE. If CSC for PPE is specifically declared, further mandates may be required. CSC for PPE should provide legal protections to healthcare workers in the setting of care being delayed or not provided due to appropriate PPE not being available.

VI. Cardiopulmonary Resuscitation (CPR) Guidance

CPR presents multiple issues during the current COVID-19 pandemic. CPR can be time consuming and the provision of maximal care for one patient with poor chances of survival may negatively affect the care of other patients. Survival following in-hospital cardiac arrest is poor in usual circumstances. In COVID-19 patients, CPR has the potential to increase viral exposure to healthcare workers and utilizes a large amount of PPE. Prior to the declaration of hospital CSC, current practice standards should be maintained. Patients who wish to receive resuscitation efforts with CPR should receive it except in accordance with institutional non-beneficial care or futility policies. *Even under CSC, unilateral declarations to withhold CPR for all COVID-19 patients are inappropriate.* Rather, there are specific issues regarding CPR that should be considered. First, adequate PPE must be available to protect healthcare workers (see Section V). After a CSC declaration, we recommend the following cardiac arrest guidelines:

1. For all patients, every effort MUST be made to understand and respect ADs prior to cardiac arrest. Cardiac arrest procedures should not be initiated if they are not wanted by the patient/surrogate.
2. **CPR should not be performed if adequate PPE is unavailable given the high risk of infection to healthcare workers.** In view of wide community transmission, this standard should apply to all patients, not just those known to have COVID-19.
3. Emergent presentations (such as to the ED in cardiac arrest) should adhere to the normal standards and indications for resuscitation if proper PPE is available.
4. For cardiac arrests, a restricted code team should enter the room with appropriate PPE including N95 or equivalent masks and eye coverings. A proposed reduced code team could consist of 2 physicians capable of airway management, 1 respiratory therapist, and 2 RNs. The recorder, pharmacist, and other chest compression rotators should wait outside of the room with the door closed and communication by phone. Based on the

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WHO guidelines, the most experienced airway manager should attempt intubation, which could include an anesthesiology attending on the code team.

5. Consideration should be given to early intubation to avoid aerosolization during chest compressions.
6. All code carts and airway carts should contain a HEPA/viral filter that can be attached to the bag valve mask to prevent aerosolization of viral particles when bagging through the endotracheal tube. The filter should be attached between the tube and the bag valve mask. We do not recommend a HEPA filter be placed with every bag valve mask as that could quickly deplete a limited resource.
7. Many COVID-19 patients with severe hypoxemia will need to be placed in a prone position. While CPR and defibrillation is technically possible in the prone position, in a crisis situation there may be insufficient resources to perform effective CPR in this population.
8. For patients who are already intubated, the risk of exposure to healthcare workers is reduced but not zero. A major risk of exposure would occur if the endotracheal tube is disconnected from the ventilator and attached to bag valve mask as is typically done during a code situation. Several steps can be taken to minimize this risk. A clamp can be placed on the endotracheal tube to seal it, after which the ventilator circuit is disconnected and a bag valve mask is attached with a HEPA/viral filter. Once the bag valve mask is attached, the clamp would be removed. A second option would be to use manual breaths from the ventilator (run by the RT) during CPR. A third option would be to allow normal ventilation from the ventilator but increasing the pressure trigger to prevent the delivery of spontaneous ventilations during chest compressions. For any process that uses the ventilator, careful attention must be given to prevent any disconnection in the circuit.

In summary, in the event of a declaration of hospital CSC, ethical standards, resource availability, and likelihood of survival will affect decisions on emergent resuscitation including CPR. These standards should apply to all patients, not just COVID-19 patients.

1. Not performing CPR is justified if the risk to healthcare workers is too high. In the setting of the COVID-19 pandemic, this standard will likely focus on the availability of sufficient PPE. **If adequate PPE is not available, healthcare workers should not perform CPR.**
2. Not performing CPR is justified if CPR is physiologically futile and death is imminent. The CSC /Clinical Team could consider a unilateral DNR for patients with refractory shock, refractory hypoxia, or worsening multi-system organ failure despite appropriate support.
3. The Clinical Team/CSC Triage Team could consider an informed assent approach for DNR orders for critically ill patients based on severity of illness and premorbid status.
4. CPR should not be performed if there are insufficient resources such as healthcare workers, ICU beds, or ventilators.

VII: **Communication**

If CSC are declared, the medical team should make patients and families aware of the declaration as early as possible in the admissions process and if possible, prior to admission to an ICU. The

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Colorado Hospital Association has resources to answer patient and family questions about CSC.[D] Communication between the hospital and family members of a patient in the ICU is critical. COVID-19 presents a unique challenge as the majority of patients are in isolation and not allowed any visitors. Additionally, as the volume and acuity increase over the course of the pandemic, the ICU care team may not have sufficient time to discuss triage decisions with the family. Institutions should consider forming triage communication teams, comprising care providers with expertise in communicating bad news who are not "on-service," such as palliative care, ethics, and ICU attendings who are off service. This team should be available to support the bedside Clinical Team and should communicate triage related decisions to families. This communication strategy will need to be collaborative between the communication team, the CSC Triage Team and the Clinical Team, to ensure the communication team has sufficient clinical information. In institutions that do not have the resources for a separate communication team, the Clinical Team should communicate triage decisions to the patient and family.

Triage decisions may not strictly follow a clinician's or patient's preference. They are enacted only in the time of crisis. However, at all times patients and surrogates should be treated with respect and compassion regardless of CSC triage decisions. Whenever a decision that a patient will not receive a resource that is in shortage needs to be made without patient consent, assent should be sought. Refusal of assent will not change the triage decision but the opportunity to assent should be offered if time and resources allow.

[D]https://cha.com/wp-content/uploads/2020/04/CHA.196-CSC-Handout_Families.pdf

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Appendix A: Adult SOFA Score[4-6,20-22]

Adult SOFA Score (Adults ≥18 years)

	POINTS				
Variables	**0**	**1**	**2**	**3**	**4**
Respiratory **P_aO_2/FiO_2, mmHg** **OR** **S_pO_2/FiO_2[A]**	**>400** **>400**	**≤400** **≤400**	**≤300** **≤315**	**≤200[B]** **≤235**	**≤100[B]** **≤150**
Coagulation **Platelets x $10^3/\mu L$**	**>150**	**≤150**	**≤100**	**≤50**	**≤20**
Liver **Bilirubin, mg/dL**	**<1.2**	**1.2-1.9**	**2.0-5.9**	**6.0-11.9**	**>12.0**
Cardiovascular **Hypotension[C]**	**No Hypotension**	**MAP<70 mm Hg**	**Norepinephrine ≤0.03 Dopamine≤ 5 OR Dobutamine any dose**	**Norepinephrine ≤0.1 OR Epinephrine≤0.1 OR Dopamine >5**	**Dopamine ≥15 OR Epinephrine >0.1 OR Norepinephrine >0.1**
Central Nervous System **Glasgow Coma Scale**	**15**	**13-14**	**10-12**	**6-9**	**<6**
Renal **Creatinine, mg/dL OR UOP (mL/day)**	**<1.2**	**1.2-1.9**	**2.0-3.4**	**3.5-4.9 OR UOP<500**	**>5 OR UOP <200**

Abbreviations: P_aO_2 - partial pressure of oxygen in the arterioles, FiO_2 – fraction of inspired oxygen, S_pO_2 – peripheral oxygen saturation. MAP – mean arterial pressure, UOP – urine output

[A]Cutoffs adapted from the modified SOFA (MSOFA) score[21,22]

[B]With mechanical ventilation or other form of artificial ventilation

[C]On vasopressor for at least 1 hour. Doses are given as µg/kg/min

Adult Predicted Mortality

Initial Adult SOFA Score	30-Day Mortality
0-1	0.0%
2-3	6.4%
4-5	20.2%

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6-7	**21.5%**
8-9	**33.3%**
10-11	**50.0%**
12-14	**95.2%**
>14	**95.2%**

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Appendix B: Modified Charlson Comorbidity Index[A,7-9]

Variable	Score
Age	
<50	**+0**
50-59	**+1**
60-69	**+2**
70-79	**+3**
≥80	**+4**
Chronic Heart Failure[B]	**+2**
Dementia[C]	**+2**
Chronic Pulmonary Disease[D]	**+1**
Connective Tissue Disease[E]	**+1**
Liver Disease[F]	
Mild	**+2**
Moderate or Severe	**+4**
Diabetes Mellitus with Chronic Complications[G]	**+1**
Hemiplegia/Paraplegia due to CVA[H]	**+2**
Renal Disease[I]	**+1**
Metastatic Solid Tumor[J]	**+6**
Any active malignancy including leukemia/lymphoma[K]	**+2**
AIDS[L]	**+4**

Abbreviations: CVA – cerebrovascular accident, AIDS – acquired immunodeficiency syndrome. mCCI – modified Charlson Comorbidity Index. NYHA – New York Heart Association. LVEF – left ventricular ejection fraction. FEV1 – forced expiratory volume in the first second. TLC – total lung capacity.

[A]The committee has modified the definitions of the comorbidities in the mCCI to identify severity of a specific comorbidity that would be more strongly associated with 1-year mortality. The modifications likely increase the specificity of the mCCI in predicting 1-year mortality.

[B]NYHA Class III or IV symptoms, LVEF <45%, of mean pulmonary artery pressure >25 mmHg on right heart catheterization.

[C]Chronic cognitive deficit requiring assistance with instrumental activities of daily living / activities of daily living.

[D]Any pulmonary disease requiring chronic supplemental oxygen therapy, FEV1<40% predicted, TLC <60% predicted. History of intubations related to underlying lung disease in prior 12 months

[E]Inherited or autoimmune process such as systemic lupus erythematous, rheumatoid arthritis, scleroderma, mixed connective tissue disease, etc.

[F]Severe=cirrhosis, portal hypertension, history of variceal bleeding. Moderate=cirrhosis, portal hypertension, Mild=chronic hepatitis or cirrhosis without portal hypertension

[G]Insulin dependence for Type 2 diabetes (not Type 1 diabetes). Presence of neuropathy, retinopathy, nephropathy in any patient with diabetes.

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[H]Hemiplegia specifically related to an ischemic stroke or hemorrhage. Congenital or trauma related hemi/paraplegia would not be considered.
[I]Moderate to severe renal disease could include serum Creatinine ≥3 mg/dL, uremic syndrome, dialysis after a kidney transplant
[J]Excludes non-melanomatous skin cancers and in situ cervical carcinoma.
[K]CML, CLL, AML, ALL, polycythemia vera, non-Hodgkin's lymphoma, Hodgkin's lymphoma, multiple myeloma, Waldenstrom's Macroglobulinemia (active disease undergoing therapy or s/p bone marrow transplant),
[L]AIDS: Current CD4 count<200, Opportunistic infection in the last 1 month, active AIDS defining illness such as Kaposi's Sarcoma

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Appendix C: Alternative Crisis Standards of Care Triage Scoring Systems[3,23]

Purpose	Specification	Point System[A]				
		0	1	2	3	4
Likelihood of surviving days/weeks if given critical care resources	SOFA score[B]: Validated measure of acute survival	X	1-5	6-9	10-12	>12
Likelihood of surviving 1 year if given critical care resources	Prognosis for near-term (1-year) survival after hospital discharge	No comorbidities that increase likelihood of death within 1-year		Moderate likelihood of death within 1-year despite treatment of acute illness		High likelihood of death within 1-year despite treatment of acute illness

[A]CSC Triage Scores range from 1-8. Persons with lower CSC Triage Scores have better short and near-term survival and would be given higher priority to receive scarce resources in a crisis situation.
[B]SOFA= Sequential Organ Failure Assessment (See Appendix A)

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Appendix D: Modified Pediatric SOFA Score[11]

Modified Pediatric SOFA (≤17 years of age)

	POINTS				
Variables	**0**	**1**	**2**	**3**	**4**
Respiratory					
P_aO_2/FiO_2, mmHg	**≥400**	**300-399**	**200-299**	**100-199[A]**	**<100[A]**
OR					
S_pO_2/FiO_2	**≥292**	**264-291**	**221-264**	**148-220[A]**	**<148[A]**
Coagulation					
Platelets x $10^3/\mu L$	**≥150**	**100-149**	**50-99**	**20-49**	**<20**
Liver					
Bilirubin, mg/dL	**<1.2**	**1.2-1.9**	**2.0-5.9**	**6.0-11.9**	**>12.0**
MAP by age group or vasoactive infusion, mmHg or µg/kg/min[B]					
<1 mo	**≥46**	**<46**	**Norepinephrine**	**Dopamine >5 OR**	**Dopamine ≥15 OR**
1-11 mo	**≥55**	**<55**	**≤0.03**	**Epinephrine≤0.1**	**Epinephrine >0.1**
12-23 mo	**≥60**	**<60**	**Dopamine≤ 5 OR**	**OR**	**OR**
24-59 mo	**≥62**	**<62**	**dobutamine any dose**	**Norepinephrine**	**Norepinephrine**
60-143 mo	**≥65**	**<65**		**≤0.1**	**>0.1**
144-216 mo	**≥67**	**<67**			
>216 mo	**≥70**	**<70**			
Central Nervous System					
Glasgow Coma Scale[C]	**15**	**13-14**	**10-12**	**6-9**	**<6**
Renal, Creatinine by age group, mg/dL					
<1 mo	**<0.8**	**0.8-0.9**	**1.0-1.1**	**1.2-1.5**	**≥1.6**
1-11 mo	**<0.3**	**0.3-.04**	**0.5-0.7**	**0.8-1.1**	**≥1.2**
12-23 mo	**<0.4**	**0.4-0.5**	**0.6-1.0**	**1.1-1.4**	**≥1.5**
24-59 mo	**<0.6**	**0.6-0.8**	**0.9-1.5**	**1.6-2.2**	**≥2.3**
60-143 mo	**<0.7**	**0.7-1.0**	**1.1-1.7**	**1.8-2.5**	**≥2.6**
144-216 mo	**<1.0**	**1.0-1.6**	**1.7-2.8**	**2.9-4.1**	**≥4.2**
>216 mo	**<1.2**	**1.2-1.9**	**2.0-3.4**	**3.5-4.9**	**≥5.0**

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Abbreviations: P_aO_2 - partial pressure of oxygen in the arterioles, FiO_2 – fraction of inspired oxygen, MAP – mean arterial pressure

[A]With mechanical ventilation or other form of artificial ventilation

[B]MAP was used for scores 0 and 1, vasoactive infusions were used for scores 2-4. The maximum continuous vasoactive infusion was administered for at least 1 hour.

[C]Calculated using the pediatric scale.

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Appendix E: Pediatric Logistic Organ Dysfunction 2 Score (PELOD-2)[12]

Organ Dysfunctions and Variables	0	1	2	3	4	5	6
Neurologic[A]							
Glasgow Coma Scale	≥11	5-10			3-4		
Pupillary reaction	Both Reactive					Both Fixed	
Cardiovascular							
Lactate (mmol/L)	<5.0	5.0-10.9			≥11.0		
MAP (mm Hg)							
<1 mo	≥46		31-45	17-30			≤16
1-11 mo	≥55		39-54	25-38			≤24
12-23 mo	≥60		44-59	31-43			≤30
24-59 mo	≥62		46-61	32-44			≤31
60-142 mo	≥65		49-64	36-48			≤35
≥144 mo	≥67		52-66	38-51			≤37
Renal							
Creatinine (mg/dL)							
<1 mo	≤0.78		≥0.79				
1-11 mo	≤0.25		≥0.26				
12-23 mo	≤0.39		≥0.40				
24-59 mo	≤0.57		≥0.58				
60-142 mo	≤0.67		≥0.67				
≥144 mo	≤1.04		≥1.05				
Respiratory							
P_aO_2/FiO_2	≥61		≤60				
P_aCO_2	≤58	59-94		≥95			
Invasive ventilation	No			Yes			
Hematologic							
WBC ($x10^3/\mu L$)	>2		≤2				
Platelets ($x\ 10^3/\mu L$)	≥142	77-141	≤76				

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Abbreviations: MAP – mean arterial blood pressure. Mo – month. P_aO_2 – partial pressure of oxygen (mmHg). FiO_2 – fraction of inspired oxygen. P_aCO_2 – partial pressure of carbon dioxide (mmHg). WBC – white blood cells.
[A]If the patient is sedated record the estimated Glasgow Coma Score before sedation. Assess only patients with known or suspected acute central nervous system disease. Nonreactive pupils must be >3mm. Do not assess pupil response after iatrogenic pupillary dilation.

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Appendix F: An Example of Calculating the Crisis Standards of Care Triage Score Cutoff

Determining the CSC Triage Score Cutoff is a difficult inexact process. In calculating the triage cutoff, the CSC Triage Team must of have total situational awareness of the minimum operating capacity (MOC) for the institution, anticipated need for resources, anticipated availability for resources, and the average acuity of patients presenting over the previous days. The number of ventilators needed for the day would the MOC + the anticipated need for ventilators for the day. The number of ventilators available for the day would be the number of ventilators not in use and functional at the beginning of the day + the number of ventilators expected to become available through extubations. This number will shift over the course of the day as patients already on a ventilator are weaned and potentially extubated. This requires close communication between the CSC Triage Team, the clinical team, and the incident command team at every institution. The CSC Triage Score Cutoff would then be based on the gap between the need and availability, taking into account the average CSC Triage Score for those intubated in recent days. At the same time as the CSC Triage Score Cutoff is being calculated, a daily assessment of individuals already on a ventilator should occur to determine if any patients would be appropriate for consideration of re-allocation of the need exceeds the availability.

Example 1:

Minimum Operating Capacity	**2**
Average Number of Patients Intubated Per Day in Last 3 days	**4**
Number of Critical Care Ventilators Available	**4**
Number of Critical Care Ventilators Expected to Become Available	**3**
Average CSC Triage Score of Patients at Time of Intubation in last 3 Days	**4**

In this scenario, the ventilator need for the day is anticipated to be 6 (MOC 2 + Average intubations/day 4 = 6). The anticipated availability for the day would 7 ventilators (available 4 + expected to become available 3 = 7). Therefore, there is an anticipated surplus of 1 ventilator for the day even after accounting for the MOC. If the rates for intubation are stable or slightly increasing, a CSC Triage Score cutoff could be set at 5 as the average CSC Triage Score for patients placed on a ventilator in previous days was 4. Patients with a score of 5 and above (much sicker than those presenting in the prior 3 days) would either be triaged to a less standard ventilator. At the same time as the cutoff is determined, an assessment should be made of all those already on a ventilator to determine if any patients would be eligible for re-allocation should the need for ventilators be higher than anticipated.

Example 2:

Minimum Operating Capacity	**2**
Average Number of Patients Intubated Per Day in Last 3 days	**4**
Number of Critical Care Ventilators Available	**2**
Number of Critical Care Ventilators Expected to Become Available	**1**

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Average CSC Triage Score of Patients at Time of Intubation in last 3 Days	**5**

In this scenario, the ventilator need for the day is anticipated to be 6 (MOC 2 + Average intubations/day 1 = 3). The anticipated availability of ventilators is 3 (available 2 + expected to become available 1 = 3). The anticipated deficit in ventilators is 3 (need 6 – availability 3). Given the anticipated deficit, the CSC Triage Team should evaluate all patients already on a ventilator for possible re-allocation should the need arise. If the rates for intubation are stable or slightly increasing, a CSC Triage Score cutoff could be set at 3 or 4 as the average CSC Triage Score for patients placed on a ventilator in previous days was 5. The reason the CSC Cutoff Score is lower than the average score for patients admitted in previous days is that there are insufficient resources to provide a ventilator to everyone who is anticipated to need one. As a CSC Triage Score = 4 still has a reasonable survival chance, patients that tie the cutoff score may be considered for rapid transfer should the need arise. Additionally, additionally patients already on a ventilator may be considered for re-allocation and/or transition to a partial ventilator if possible to meet the need. If transfer or re-allocation are not possible, patients with a CSC Triage Cutoff of 4 and higher would be transitioned to a palliative approach.

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Appendix G: Committee Members

Anuj B Mehta, MD Pulmonary and Critical Care Medicine Assistant Professor of Medicine National Jewish Health Denver Health & Hospital Authority University of Colorado	Patrick J Gaughan, RN, BSN, MBA, MHA Senior Vice President, Chief Values Integration Officer Centura Health Centennial, CO
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Stephen V. Cantrill, MD, FACEP Emergency Physician Denver Health Medical Center Member, Governor's Expert Emergency Epidemic Response Committee, CDPHE	Jeffrey Sankoff, MD Assistant Medical Director Emergency Department, Denver Health Medical Center Associate Professor of Emergency Medicine University of Colorado School of Medicine
Aseel Dalton, RPh, LLM, PhD Visiting Scholar – Senior Research Fellow Yale Interdisciplinary Center for Bioethics Ethics Committee Denver Health & Hospital Authority	Darlene Tad-y, MD, SFHM Vice President, Clinical Affairs, Colorado Hospital Association Associate Professor of Medicine University of Colorado School of Medicine
Thom M Dunn, PhD Staff Psychologist / Ethics Committee Denver Health & Hospital Authority	Matthew Wynia, MD, MPH, FACP Professor of Medicine and Public Health Director, Center for Bioethics and Humanities University of Colorado School of Medicine
Eric France MD MSPH Chief Medical Officer Colorado Department of Public Health & Environment	

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Appendix H: References

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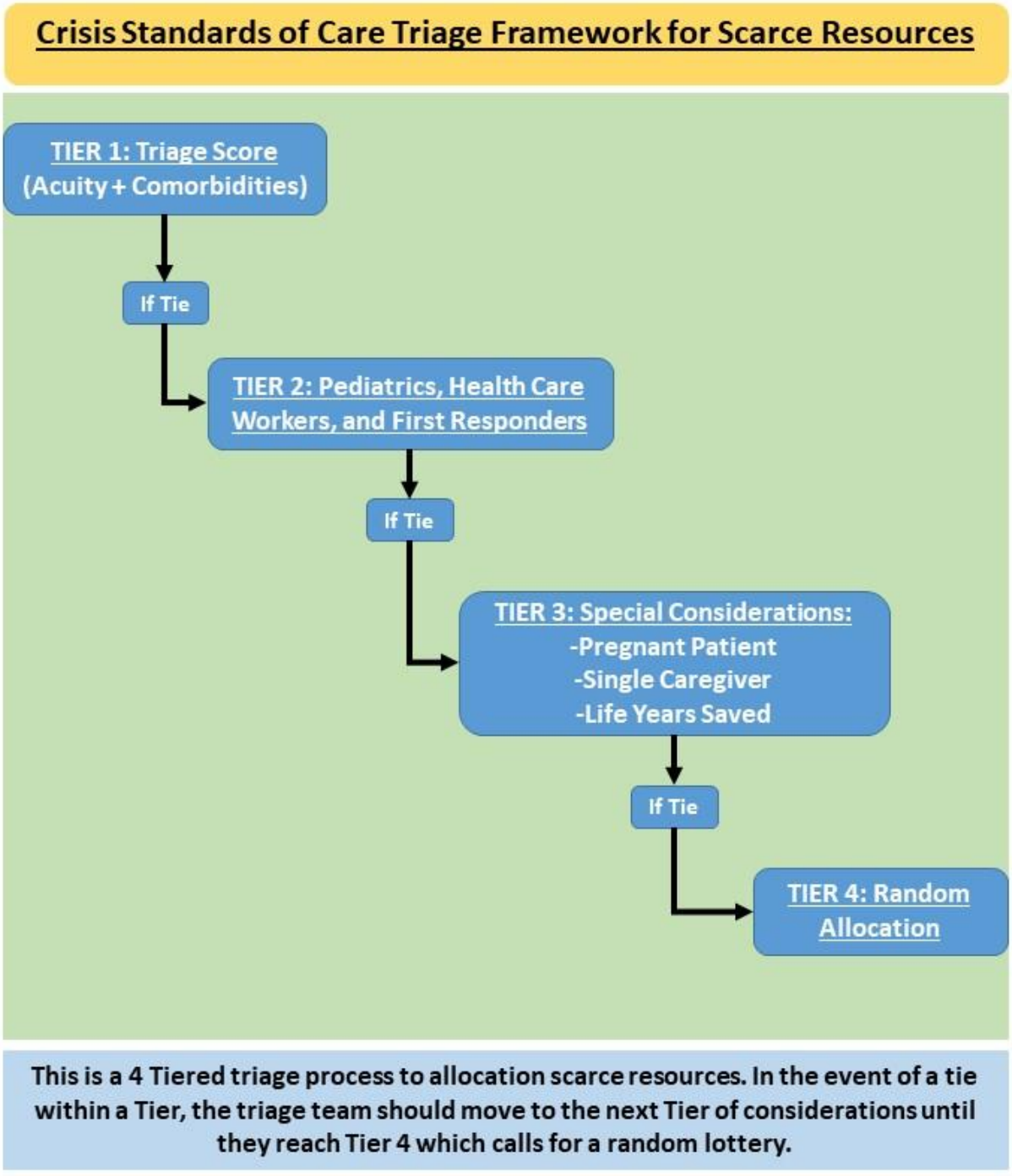

Figure 1

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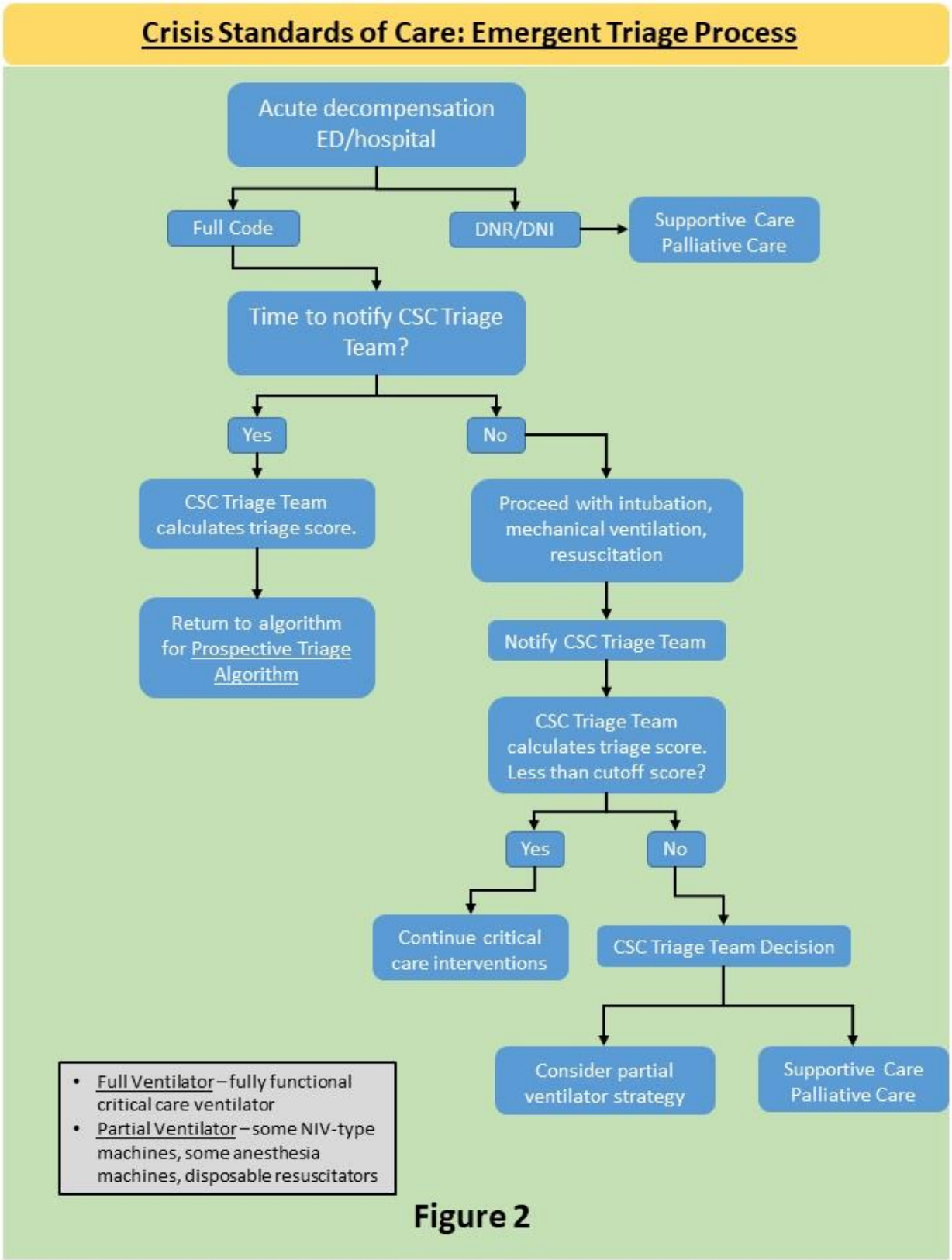

Figure 2

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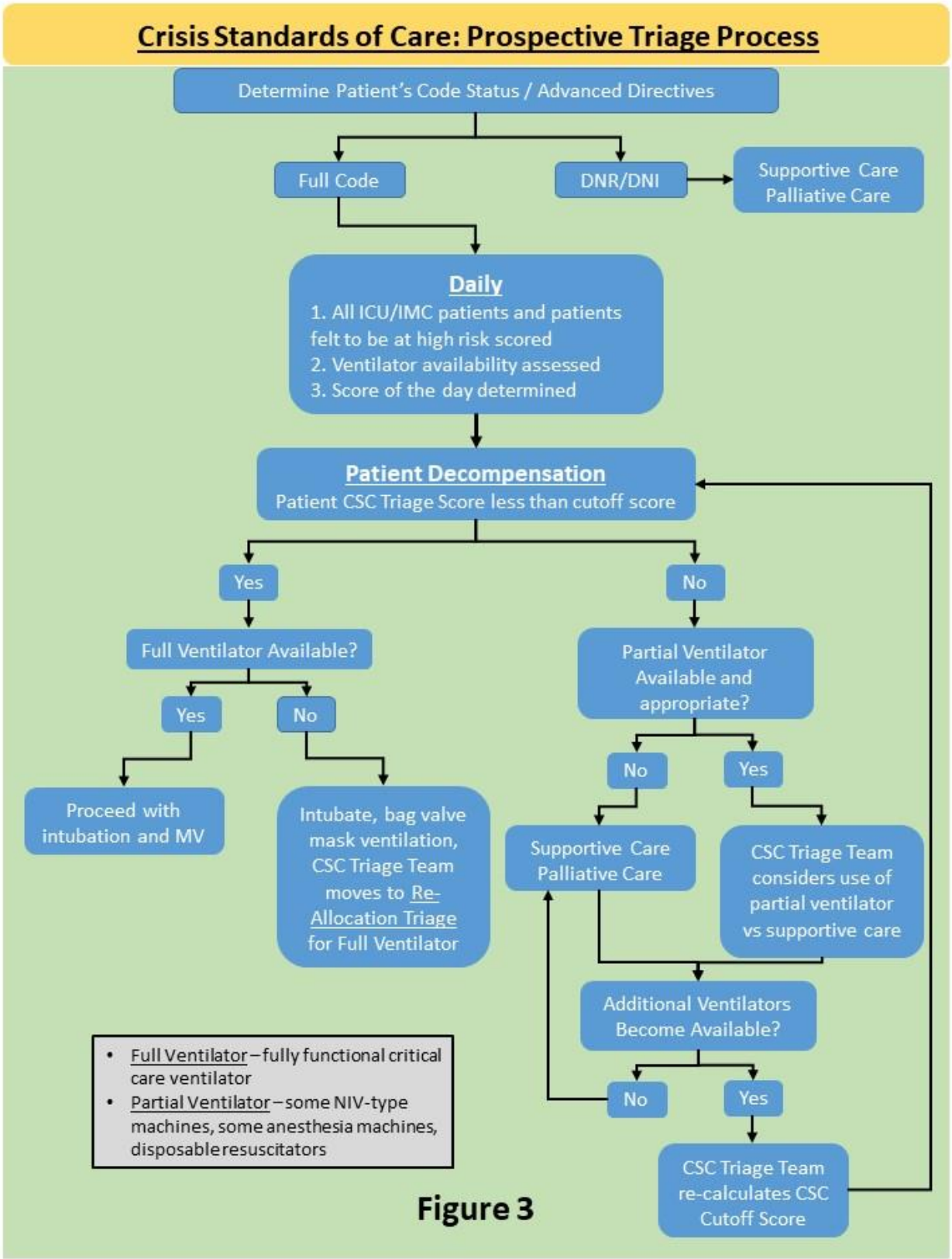

Figure 3

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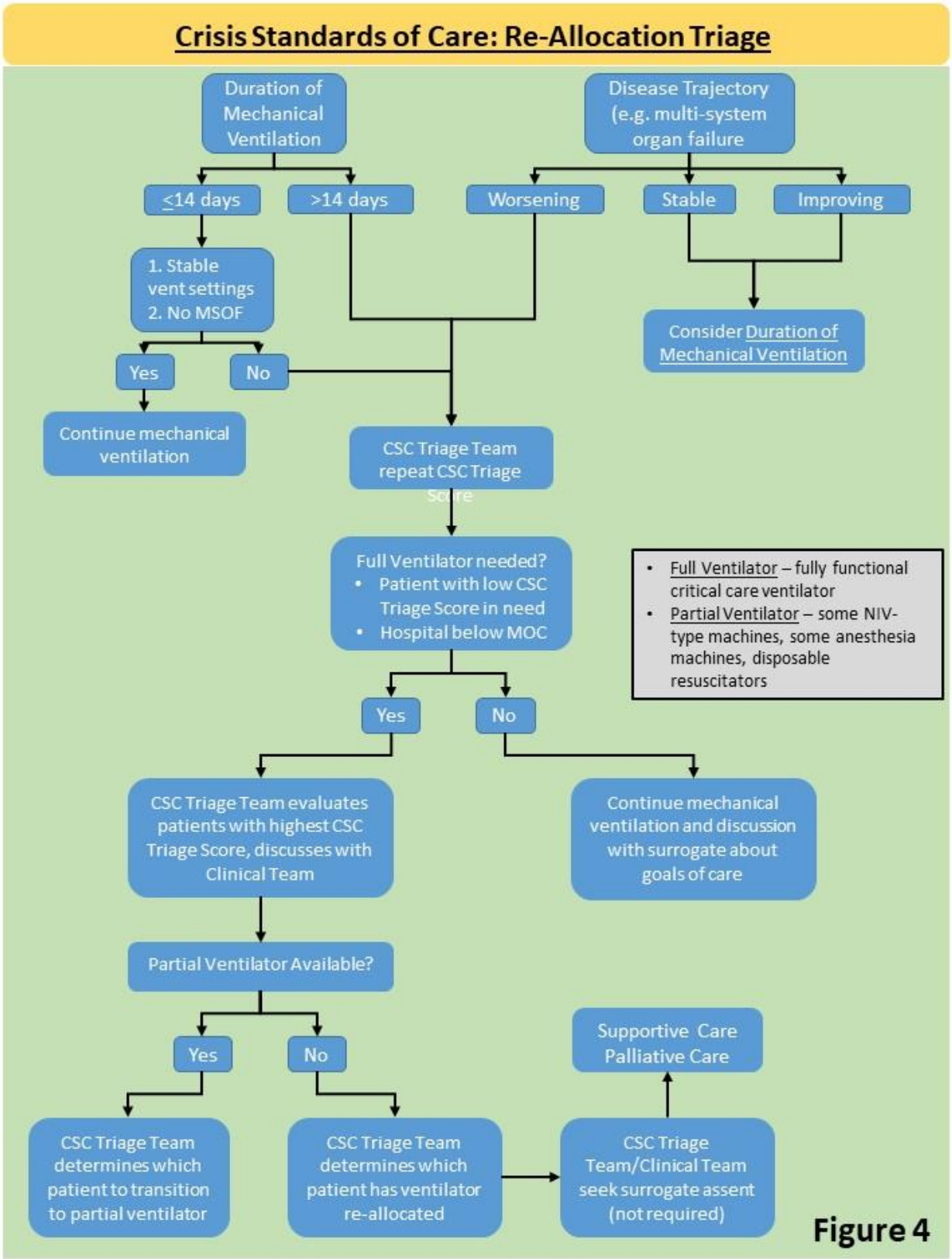

Figure 4