Guidelines for the Use of Modified Health Care Protocols in Acute Care Hospitals During Public Health Emergencies

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Attribution

This report is based on the original work of an expert panel led by Gianfranco Pezzino, M.D., M.P.H. and Steven Q. Simpson, M.D.

Members of the panel are listed in Appendix A. The project was conducted in 2009-2010 by the Kansas Health Institute under contract with the Kansas Department of Health and Environment.

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BACKGROUND

For more than a half a century, laws of the State of Kansas have addressed issues of emergency preparedness for disasters. Most of those laws are codified in Article 9 of Chapter 48 of the Kansas Statutes Annotated. These laws provide for the declaration of state-wide disaster emergencies by the governor to declarations of local disaster emergencies by county commission chairs and mayors. The statutes address the duties of individuals during disaster emergencies, establishments of a mutual aid system, and the responsibilities of various political subdivisions to come to the assistance of others in the event of emergencies.

Through the Kansas Division of Emergency Management, under the authority of the Adjutant General, the state has established a state disaster emergency management plan that provides for the coordination of local, state, and federal emergency management activities. Described within the state disaster emergency management plan are the roles of medical facilities when a disaster occurs. Each medical facility is expected to have its own emergency management plan.

Disasters come in all shapes and sizes. A multi-vehicle collision on I-70 in western Kansas may present as a disaster for a small community hospital, whereas a similar event in an urban area of the state would not be considered so. A tornado destroying a town is clearly a disaster, and would likely activate the state's emergency management plan, calling in assistance from neighboring communities not impacted by the storm and from state resources. Disaster planning requires that individual medical facilities, local governments, regional coalitions and state resources consider the wide continuum of disaster scenarios and develop a strategy for addressing them.

At the extreme end of the spectrum is the disaster, the circumstances of which are so dire that either because of the specific circumstances of the disaster or because of the breadth of the disaster, insufficient resources exist to address the medical and health care needs of all the victims and all other options for relief have been exhausted. This report is intended to serve as a resource for hospitals and other health care providers for planning related to provision of care under disaster or other emergency health circumstances resulting in reduced or scarce resources. Its recommendations are voluntary guidelines and are not intended to establish a standard of care. [1]

These guidelines describe principles and practices that health care providers, acute care hospitals, and communities in Kansas can utilize for planning for the provision of care in the event that

[1] The recommendations contained in this report are not mandatory nor are they applicable in all instances. This document does not purport to be an official record pursuant to K.S.A. § 60-465, and no officer is authorized to attest to the accuracy of any copy, nor can the exception to hearsay of K.S.A. § 60-460(o) be applied.

resources become scarce during a disaster or public health emergency. The guidelines are the product of analysis conducted on behalf of the Kansas Department of Health and Environment (KDHE) by the Kansas Health Institute (KHI) and a panel of experts. In September 2009, KHI produced a report for KDHE that outlined possible general processes and ethical principles to apply when health care resources are scarce. The report also recommended that KDHE develop and distribute to providers guidelines that address potential lack of resource situations that may occur as a result of the influenza pandemic occurring at that time.

In response to the report, KDHE asked KHI to convene a group of medical experts to review and amend, as deemed necessary, four technical documents developed by other states that were identified as good references on the subject. In May, 2013, a re-analysis was undertaken by the KDHE's Clinical Resource Network (CRN), which included review and consideration of the recent report regarding crisis standards of care issued by the Institute of Medicine in 2012. In July, 2013, the Institute of Medicine released a toolkit for crisis standards of care indicators and triggers, which was also considered as this document was being finalized.

It should be noted that this document is a jumping-off place for the discussion of how health care providers faced with a dire health crisis can and should respond to such possibilities. The guidelines presented in this document represent the result of the expert panel review and of comments received from health care professionals. (The names and affiliation of the members of the review panel are listed in Appendix A of this document.) Significant issues still remain to be discussed and resolved as the public health and medical community grapples with and attempts to plan for that unforeseen and possibly unimaginable situation. Nonetheless, it is important for health care leaders in the state to spearhead the discussion, consider the proposals of this report, and incorporate applicable recommendations into their local emergency management planning.

Since this document's recommended guidelines are adapted from previous publications, the background information and detailed rationale for the guidelines have been considerably shortened since the review panel's goal was to produce a concise list of recommendations that clinicians in Kansas could rapidly review and implement. Those interested in more background information and further justification of the guidelines can review the original source documents, which are listed below:

"Minnesota Healthcare System Preparedness Program Standards of Care for Scarce Resources", [http://www.health.state.mn.us/oep/healthcare/index.html.]
"Summary of Suggestions from the Task Force for Mass Critical Care Summit", January 26−27, 2007, [http://www.chestjournal.org/content/133/5_suppl/1S.full.pdf+html.]

"Tertiary Triage Protocol for Allocation of Scarce Life-Saving Resources in V.H.A. During an Influenza Pandemic",
[http://www.ethics.va.gov/activities/pandemic_influenza_preparedness.asp.]

"NYS Workgroup on Ventilator Allocation in an Influenza Pandemic. Allocation of Ventilators in an Influenza Pandemic", March 15, 2007,
[http://www.health.ny.gov/diseases/communicable/influenza/pandemic/ventilators/docs/ventilator_guidance.pdf]

"Crisis Standards of Care: A Systems Framework for Catastrophic Disaster Response", March 21, 2012, [http://www.iom.edu/reports/2012/crisis-standards-of-care-a-systems-framework-for-catastrophic-disaster-response.aspx]

"Crisis Standards of Care: A Toolkit for Indicators and Triggers", July 31, 2013,
[http://www.iom.edu/Reports/2013/Crisis-Standards-of-Care-A-Toolkit-for-Indicators-and-Triggers.aspx]

GENERAL PRINCIPLES

- These modified triage protocols of care should be considered an integral part of good planning for the regional sharing of resources and surge capacity. Health care providers must alert state and local officials when emergencies threaten to stretch resources beyond capacity. The activation of the modified triage protocols should occur only after a declaration of emergency and only after other specified means of procuring additional resources and expanding surge capacity have been exhausted.

- These triage protocols address primarily hospital triage and should be integrated into broader emergency response plans. For example, the adoption of these triage protocols could require that some patients be moved after triage to reference hospitals to receive life-saving treatment or out of acute care hospitals if they do not qualify for life-saving treatment. This and similar issues should be addressed in local and state emergency response plans.

- Hospitals should work within the framework of regional networks, i.e. the Kansas Preparedness Healthcare Coalitions that are already in place. Resource deficiency may be a local or regional problem and could be mitigated by carefully drafted mutual aid and sharing protocols. Regional networks could also play a vital role in assuring that the modified triage protocols can be implemented throughout the state, with small and large hospitals working together to assure a uniform process of triage and allocation of resources.

- Before these modified triage protocols are implemented, all key stakeholders should be aware of the specifics to ensure that there is sufficient clarity and consensus to implement them.

- Small hospitals may have difficulty adopting some of the modified triage protocols proposed in this document. The review panel discussed this issue and concluded that, while modified triage protocols that provide for the same solution for all may not be always easy to implement, they have the advantage of promoting a fairer and more uniform distribution of resources throughout the state. When applicable, specific differences in implementation between small and large hospitals and communities are addressed and discussed in the triage protocols. Additional adjustments may be necessary based on new experiences and evidence. Issues concerning small hospitals are discussed further in a special section of this document.

- Because the field of modified triage protocols of care is so new, and interventions have not been widely tested, *the panel strongly recommends that all the triage protocols be labeled as "Interim Recommendations."* This will facilitate changing and updating the documents as new information becomes available.

- The panel recommends that KDHE issue the triage protocols as voluntary, not mandatory, guidelines.

SPECIAL ISSUES CONCERNING SMALL HOSPITALS

Small hospitals may have difficulty adopting some of the modified triage protocols proposed in this document. The review panel discussed this issue and tried to leave as much flexibility as possible in the triage protocols to account for local circumstances, while assuring a standardized approach to the use of scarce resources throughout the state. Modified triage protocols that provide for the same solution for all situations may not be easy to implement, but they promote a fairer and more uniform distribution of resources throughout the state. During the comment period, questions were raised about the feasibility of implementing the modified triage protocols in small hospitals, but no evidence surfaced suggesting that implementation in small hospitals would not be possible through careful planning and via the regional networks.

When small hospitals do not have the resources to triage or treat patients locally using the proposed modified triage protocols, we recommend that they work in close partnership with their referral institutions. It could be possible, for example, to appoint a triage officer in a large hospital who could conduct triage for patients admitted in a small hospital. The triage could be conducted remotely using teleconferences or, if necessary, telemedicine resources. It is important that triage decisions for critically ill patients occur at the local level, even if the decisions are made by a triage officer in a different institution. As one of the providers told us, “there is no sense in transferring patients who will be very low priority patients when they arrive at the referral center.” Some of these mechanisms of assisted remote triage may already be in place and used occasionally during localized emergencies.

Large hospitals should be ready to assist small hospitals with their triage needs, and to treat their patients and patients transferred from small hospitals using the same set of clinical priority criteria. In the absence of this uniform approach, it is likely that patients in rural areas and those closer to referral hospitals would be treated unequally, creating a situation of geographical disparity that would be in contrast with the principles of distributive justice endorsed in this document. Such a situation could also create uncontrolled movement of patients towards large hospitals, in the hope that they could be treated there, which would increase congestion in those institutions. To obviate such a one way flow of patients, it may be necessary for larger, referral facilities to send less critically ill patients, who are not requiring the specialized capabilities of the referral center, to the smaller hospitals for ongoing care and completion of hospitalization.

The adoption of clinical triage criteria specific to small hospitals also was examined. In particular, the use of a modified SOFA score that uses saturation of peripheral oxygen (SpO_2) instead of partial pressure of oxygen in arterial blood (PaO_2) was considered, since some hospitals do not

perform the Arterial Blood Gas analysis test (ABG) necessary to measure PaO_2. In the absence of convincing published evidence in support of the modified SOFA score the review panel decided to endorse the use of the unmodified SOFA criteria throughout the state. The panel recommends that hospitals review the requirements for the SOFA assessment and make provisions to assure that they have the capacity to perform the necessary laboratory tests.

APPENDIX A: EXPERT PANEL MEMBERS

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EXPERT PANEL MEMBERS

Original Version of Modified Health Care Protocols

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APPENDIX B: INTERIM GUIDELINES FOR TERTIARY TRIAGE PROTOCOL FOR ALLOCATION OF SCARCE RESOURCES IN ACUTE CARE HOSPITALS IN KANSAS[2]

I. GOAL

1. KDHE recommends that this protocol be used by hospitals throughout Kansas in their emergency planning to ensure that patients have equitable access to life-saving resources when the demand for these resources is greater than the supply, and when use of resources must be optimized.

2. The application of these guidelines in small hospitals may not be feasible due to the lack of specialized staff. In these cases, hospitals may consider modifying the implementation of these guidelines to fit their situation while preserving the overarching goal of assuring an objective, clinical set of criteria for the allocation of scarce resources. Small hospitals should also consider partnering with larger referral centers and delegate some functions described in this document to those centers. Communication between small and large hospitals can take place using the best and most appropriate means, such as telephone, radio, telemedicine, or face-to-face consultation.

3. While the protocol refers primarily to pandemic influenza, it is applicable to other public health emergencies that may cause a prolonged shortage of life-saving resources, such as chemical disasters, tornado or other weather-induced disasters, or acts of terrorism.

II. INITIATION OF THE TRIAGE PROTOCOL

1. Generally, the hospital medical director, in consultation with the hospital administrator, will apply the protocol throughout an affected hospital at his or her discretion. The medical director will take into consideration local or regional declarations of emergency (e.g., state-wide declaration of emergency by the governor).

2. Hospital medical directors must assure that the protocol is applied consistently and fairly whenever and wherever it is initiated.

3. Application of the triage protocols will take place only when augmentation efforts have been exhausted and demand for the life-saving resource exceeds supply. Triggers include (but are not limited to):

    a. Local or state declaration of emergency.

    b. Initiation of national disaster medical system and national mutual aid and resource management.

    c. Surge capacity fully employed within health care facility

    d. Attempts at conservation, reutilization, adaptation, and substitution are performed maximally

[2] Last revised: August 9, 2010

e. Identification of critically limited resources (ventilators, antibiotics)

f. Request for resources and infrastructure made to local and state health officials

g. Current attempt at regional, state, and federal level for resource or infrastructure allocation

4. The hospital medical director should rescind the application of the triage protocol when the supply of the life-saving resource is sufficient to meet the demand. This may occur either before or after a declared state of emergency has been rescinded.

III. RESPONSIBILITY STRUCTURE FOR TRIAGE DECISION MAKING

1. Scarce Resource Allocation Team:

   a. The scarce resource allocation team should be a functional team under existing Incident Command System (ICS)/Hospital Incident Command System (HICS)/Emergency Operations — it should not be a separate structure.

   b. The size and composition of the allocation team will vary depending on local circumstances, the nature of the emergency, and the size of the institution. Members may include (but not be limited to) critical care physicians, critical care nurses, respiratory therapists, pharmacists, human resource managers, hospital administrators and legal counsel.

   c. The scarce resource allocation team will:

      i. Acquire the information necessary to facilitate and oversee informed and ethical triage and scarce resource allocation decisions. Information could include resources (bed census, staffing, projected needs for care, existing medical resources, resource gaps, and projected availability of life-saving and hospice and palliative care resources) and guidelines for the management of the emergency (e.g., up-to-date treatment options and prognostic factors).

      ii. As part of Incident Command System (ICS)/Hospital Incident Command System (HICS)/Emergency Operations, make judgments in collaboration with health care organization leaders and staff to implement appropriate alternative standard protocols of care that address the special demands that an emergency imposes on the health care organization or demands that could imminently be expected.

      iii. Meet often, at least daily, during an emergency.

      iv. Advise and assist, as required, and make definitive decisions, if necessary, to resolve uncertainties and disputes that affect the health care organization's capacity to carry out its mission during a public health emergency.

      v. Be involved in the real-time appeals process regarding triage decisions described in this document (excluding decisions made by members of the triage team which should not be subject to appeal).

      vi. Prepare information briefs to the chief executive officer, chief of staff or designee(s) about the emergency's status and the health care organization's response so that the

information may be communicated to appropriate staff and stakeholders.

2. Triage Officer:

   a. The triage officer must be a qualified member of the medical staff who is, ideally, experienced and trained in intensive care and triage protocols.

   b. The triage officer will assess all patients, assign a level of priority for each, and direct attention to the highest-priority patients.

   c. The triage officer, with the assistance of the triage team (when available), will:

      i. Review all patients for inclusion and exclusion criteria, and facilitate discharge from critical care for patients no longer requiring it.

      ii. At least every 24 hours, evaluate all patients receiving critical care.

      iii. Evaluate all patients that have been recommended to receive critical care.

   d. The triage officer is not expected to examine patients, except under circumstances in which examination may be crucial in reaching a triage decision.

   e. The triage officer should not be involved in day to day care of the patients subjected to triage. Small hospitals unable to maintain this separation of roles should use a triage officer based in another institution. Such individuals may be identified by reference to the Regional Healthcare Coalition documents. Each hospital should pre-identify potential individuals for off-site triage for use in the event of disaster circumstances.

   f. The triage officer will make triage decisions based on the allocation protocol, assigning patients to triage categories based on a SOFA score or exclusion criteria (Tables 2 and 3), and on available resources.

3. Triage Team:

   a. In hospitals with sufficient staff resources, a triage team will be set up as a subcommittee of the scarce resource allocation team.

   b. The role of the triage team is to provide information to the triage officer and help facilitate and support his or her decision-making process.

   c. Members of the triage team may include (but not be limited to) an experienced critical care nurse, respiratory therapist, or clinical pharmacist. A representative from hospital administration may also be a part of the team to help organize resources and serve as a liaison to hospital leadership.

   d. In larger facilities, it may be necessary to have more than one triage officer and team, with each officer/team assigned to a designated ICU or hospital area and to specific operational periods or shifts. In such circumstances, triage personnel should designate time for mutual review and transition of ongoing triage issues. It is recommended that the triage officer and team members function in shifts lasting no longer than 12 to 16 hours, if feasible.

e. The triage officer and triage team will:

   i. Meet often (at least daily) to assess all patients who have clinical indications to receive scarce life-saving resources (e.g., critical care patients who require ventilators or hemodynamic support) and evaluate exclusion and inclusion criteria to determine the appropriateness of the initiation and continuation of scarce life-saving treatment.

   ii. Develop and maintain a record of triage decisions including the data upon which the decisions were based.

f. Decisions from the triage team/triage officer cannot be appealed.

4. Review Committee:

   a. In hospitals with sufficient staff resources, a review committee will be created to review the decisions of the triage team.

   b. The review committee (ideally a small group of no more than three individuals) may be composed of experienced professionals who typically no longer provide direct care, such as the chief nursing officer, chief medical officer, chief respiratory therapy supervisor, infection control director, or legal counsel.

   c. The review committee will bring to the attention of the triage officer any concerns about the application of the triage algorithm so that the triage officer may reflect on these concerns when approaching future decisions.

   d. The review committee does not have the authority to change a decision made by the triage officer, except when there is clear evidence that the triage protocol was not applied as planned.

5. Treating Clinicians:

   a. Should not have the responsibility of deciding whether to institute or remove a patient from life-saving resources. This decision is up to the triage team/triage officer. These functions should be kept separated to reduce the emotional impact of these decisions on health care providers.

   b. Will implement a treatment plan consistent with the triage team's decision regarding patient triage category.

   c. Will conduct a DNR discussion with patients who do not qualify under the triage protocol for scarce life-saving resources.

   d. Will offer palliative and other appropriate care.

6. Emergency Physicians:

   a. Because many patients will seek care at the emergency department during pandemic influenza, emergency department personnel should be prepared to apply the *"initial assessment tool"* (See Table 3) for patients who have clinical indications for critical

care.

b. Emergency physicians will:

i. Apply initial resuscitation, if applicable, with simple measures such as fluids oxygen by nasal cannula, mask, and control of bleeding, etc. (unless other exclusion criteria are present).

ii. Report initial assessment to the triage team.

IV. ALLOCATION CRITERIA

1. The overarching criterion is the degree of medical success or survivability determined by the application of established, objective clinical criteria, including SOFA scores. The guiding question of this assessment is whether the patient is likely to survive with the use of the scarce resource.

2. Once a determination has been made that a patient qualifies for the resource under the SOFA score, and a patient's priority category has been determined, within-category priority will be established on a first-come, first-served basis or on a random selection/lottery basis, depending on feasibility of implementation.

   a. This second step will be implemented only if resources are still insufficient to meet the needs of all who qualify for the resource, after applying the clinical allocation criteria.

3. Clinical Assessment

   a. Clinicians will thoroughly assess all patients who present for care.

   b. Patients with clinical indications for scarce life-saving resources (e.g., critical care patients who require ventilators or hemodynamic support) will be subject to the triage protocol described in this document, unless they elect not to be candidates for critical care.[3]

4. Exclusion Criteria

   a. Patients with clinical indications for scarce life-saving resources will be assessed for exclusion criteria to determine the appropriateness of the initiation or continuation of scarce life-saving treatment.

   b. Exclusion criteria are intended to identify and exclude patients with a short life expectancy irrespective of the current acute illness. If an exclusion criterion is present (Table 1), the patient is no longer a candidate for scarce life-saving resources, including scarce resources that may be needed for cardiopulmonary resuscitation.

   c. Clinicians should offer palliative and other supportive care to the patient and follow clinical standards for withdrawal of scarce life-saving resources.

[3] The triage of patients with a Do Not Resuscitate (DNR) order or other advance directives should take into account the patient's wishes and the likelihood of recovery after life-sustaining measures are applied.

V. RE-ASSESSMENT

1. Continued use of the scarce life-saving resources will be reviewed on an established schedule by the triage team (at least once every 24 hours). Patients that continue to meet criteria for inclusion will receive the resources until they either meet an exclusion criterion, or they are re-assessed according to the triage team schedule.

    a. Patients assigned to the same category will be allocated resources on a first-come, first-served basis or on a random selection/lottery basis, depending on the feasibility of implementation.

    b. Those that no longer meet the criteria after re-assessment will no longer be eligible for access to the scarce life-saving resources and should be informed of the need for withdrawal of these treatments.

VI. SPECIAL CONSIDERATIONS FOR VENTILATORS

1. Allocation of ventilators during a public health emergency will be subject to the same procedures described in this document for other scarce resources. Since ventilators are often an important life-saving resource, this section reviews some special issues related to ventilator allocation. For more details please refer to the following document, from which many of these guidelines have been abstracted:

    "NYS Workgroup on Ventilator Allocation in an Influenza Pandemic. Allocation of Ventilators in an Influenza Pandemic", March 15, 2007, [http://www.health.ny.gov/diseases/communicable/influenza/pandemic/ventilators/docs/ventilator_guidance.pdf]

2. Uniform policies are crucial; variations among facilities will lead to inequities. Equitable rationing systems, particularly ones that contemplate limiting access to lifesaving treatment, must assure that the same resources are available and in use at similarly situated facilities, i.e., all facilities in one city gripped by the pandemic or other disaster.

3. The establishment of regional stockpiles should be strongly considered, following the example in New York and other states. Leaders of facilities within a region should be encouraged to work out voluntary plans for loans of equipment and staff in a crisis.

4. As a public health emergency spreads, hospitals should limit the non-critical use of ventilators. Elective procedures that may require the use of ventilators should be canceled or postponed during the period of emergency. For an emergency that stretches from days to weeks, such as a pandemic, facilities will need a review system for procedures that decrease morbidity or mortality, but are not of an emergency nature.

5. The ideal interval for re-assessing patients in need of critical care and ventilators has not been well defined. Critical care experts point out that many patients will not show signs of improvement for several days after they start receiving intensive care resources such as ventilators; therefore a re-assessment schedule should allow for sufficient time to pass from when a patient first receives the resources, so that clinical improvement can become evident. Other experts point out that the greatest impact on survival is often made by aggressive action in the first hours of presentation, and a reassessment schedule that is conducted using long intervals may not identify early enough patients who fail to improve (and whose critical care resources should therefore be re-allocated). These are

factors that should be kept in mind when determining a re-assessment schedule. The decision should be based on the clinical characteristics of the emergency and on how acute the need for the re-allocation of resources is. The expert panel believes that hospitals should reassess this allocation every 24 hours.

6. Distinctions should be maintained between acute and chronic care facilities once triage begins, permitting chronic care facilities to maintain their specific mission. Patients using ventilators in chronic care facilities would not be subjected to acute care triage guidelines. If, however, such patients required transfer to an acute care facility, they would be assessed by the same criteria as all other patients, and might fail to meet criteria for continued ventilator use. Chronically ill patients will be vulnerable to the pandemic; chronic care facilities will have to provide more intensive care on site as part of the general process of expanding care beyond standard locations. Barriers to transfer are appropriate and likely during a phase in which acute care hospitals are overwhelmed.

7. Children in need of ventilators present unique challenges.

    a. In general, triage using SOFA scores should not be used for children (especially young ones), because the SOFA system has not been adequately tested in children.

    b. The use of the modified system described in Appendix C of this document (*Interim Guidelines for the Use of Pediatric Ventilators During a Public Health Emergency in Kansas)* is recommended as an alternative to the SOFA triage system for children.

    c. Special expertise, likely to be in short supply, is needed to care for children who may also be especially vulnerable to morbidity and mortality in a pandemic. The establishment of centers of excellence for pediatric patients, particularly during a pandemic, should be considered. Although a pandemic emergency is likely to affect most or all of the state, the required expertise will not be widely distributed and an attempt to concentrate severely ill children needing intensive care in specialized centers may make sense, if feasible. Transportation of pediatric patients to the referral centers may be problematic in the middle of a statewide emergency, when the emergency medical system could be under considerable pressure.

    d. Planning assumptions must adequately reflect the needs of infants and children. Many modern ventilators accommodate patients weighing as little as 10 kilograms, but will not support infants.

Table 1. **Exclusion Criteria**

Severe, advanced chronic disease with a short life expectancy (6 months or less)

Severe burns on patient with any two of the following:

- Age > 60 yr
- 40% of total body surface area affected
- Inhalational injury

Cardiac arrest:

- Un-witnessed cardiac arrest
- Witnessed cardiac arrest, not responsive to electrical therapy (defibrillation or pacing)

- Recurrent cardiac arrest or trauma-related arrest

Advanced untreatable neuromuscular disease

Metastatic malignant disease with poor prognosis

End-stage organ failure (except when caused by readily reversible volume overload or hypoventilation due to an exogenous agent, such as narcotic, benzodiazepine, or other procedural sedative):

- Cardiac: NY Heart Association class III or IV
- Pulmonary: severe chronic lung disease with FEV1** < 25%
- Hepatic: MELD*** score > 20
- Renal: dialysis dependent
- Neurologic: severe, irreversible neurologic event/condition with high expected mortality

Table 2. **Sequential Organ Failure Assessment (SOFA) Score***

Variable	SOFA Score				
	0	**1**	**2**	**3**	**4**
PaO2/FiO2 mmHg	> 400	301 – 400	201 – 300	101 – 200	≤ 100
Platelets, x 103/µL or x 106/L	> 150	101 – 150	51 – 100	21 – 50	≤ 20
Bilirubin, mg/dL (µmol/L)	<1.2 (<20)	1.2 − 1.9 (20 – 32)	2.0 − 5.9 (33 – 100)	6.0 − 11.9 (101 – 203)	>12 (> 203)
Hypotension	**None**	MABP < 70 mmHg	Dop < 5	Dop 6 – 15 or Epi < 0.1 or Norepi < 0.1	Dop >15 or Epi > 0.1 or Norepi > 0.1
Glasgow Coma Score	**15**	13 − 14	10 − 12	6 − 9	< 6
Creatinine, mg/dL (µmol/L)	< 1.2 (<106)	1.2 − 1.9 (106 – 168)	2.0 − 3.4 (169 - 300)	3.5 − 4.9 (301 – 433)	5 (> 434) or anuric

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

*Adapted from: Ferreira et al., 2001. Explanation of variables: PaO_2/FiO_2 indicates the level of oxygen in the patient's blood. Platelets are a critical component of blood clotting. Bilirubin is measured by a blood test and indicates liver function. Hypotension indicates low blood pressure; scores of 2, 3, and 4 indicate that blood pressure must be maintained by the use of powerful medications that require ICU monitoring, including dopamine, epinephrine, and norepinephrine. The Glasgow coma score is a standardized measure that indicates neurologic function; low score indicates poorer function. Creatinine is measured by a blood test and indicates kidney function.

Vincent JL, Moreno R, Takala J, et al: The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. Intensive Care Med 1996; 22:707-710.

Table 3. **Life-Saving Resources Triage Tool for INITIAL ASSESSMENT**

Initial Criteria	Priority	Action
Exclusion Criteria **OR** SOFA > 11	None	Do not use life-saving resources Use other resources including palliative measures
SOFA < 7 **OR** Single Organ Failure	Highest	Use life-saving resources, as available
SOFA 8−11	Intermediate	Use life-saving resources, as available
No requirement for life-saving resources	None	Use other medical management Re-assess as needed

Table 4. **Life-Saving Resources Triage Tool for 48-HOUR RE-ASSESSMENT***

48 Hour Criteria	Priority	Action
Exclusion Criteria **OR** SOFA > 11 **OR** SOFA 8 – 11 and increasing since last assessment	None	Discontinue life-saving resources Use other resources including palliative measures
SOFA < 11 and decreasing since last assessment	Highest	Continue life-saving resources, as available
SOFA < 11 and unchanged since last assessment **OR** SOFA < 8 and increasing since last assessment	Intermediate	Continue life-saving resources, as available
No longer requiring life-saving resources	None	Discontinue life-saving resources. Re-assess as needed

* Re-assessment should be conducted on a predetermined scheduled, at least every 24 hours.

APPENDIX C: INTERIM GUIDELINES FOR THE USE OF PEDIATRIC VENTILATORS DURING A PUBLIC HEALTH EMERGENCY IN KANSAS[4]

PELOD Scoring System [1]

Organ System	Variable	0	1	10	20	Maximum System Score
Neurologic						20
	Glasgow coma score	12-15	7-11	4-6	3	
		AND		OR		
	Papillary reaction	Both reactive		Both fixed		
Cardiovascular						20
	Heart rate					
	<12 y	≤195 bpm		>195 bpm		
	>12 y	≤150 bpm		>150 bpm		
		AND		OR		
	Systolic blood pressure					
	<1 mo	>65mm Hg		35-65 mm Hg	<35mm Hg	
	≥ 1 mo & < 1yr	>75mm Hg		35-75 mm Hg	<35mm Hg	
	≥1 yr & <12 y	>85 mm Hg		45-85 mm Hg	<45mm Hg	
	≥12 y	>95mm Hg		55-95 mm Hg	<55mm Hg	
Renal						10
	Creatinine					
	<7d	<1.59 mg/dL		≥1.59 mg/dL		
	≥7d & <1 y	<0.62 mg/dL		≥0.62 mg/dL		
	≥ 1 y & <12y	<1.13 mg/dL		≥1.13 mg/dL		
	≥ 12 y	<1.59 mg/dL		≥1.59 mg/dL		
Pulmonary						10
	Pa O_2/F10_2 ratio	>70 mm Hg		≤70 mm Hg		
		AND		OR		
	Pa CO_2	≤90 mm Hg		>90 mm Hg		
		AND				
	Mechanical vent	No	Yes			
Hematologic						
	WBC	≥4.5K	1.5-4.4 K	<1.5		10
		AND	OR			
	Platelets	≥35K	<35			
Hepatic						1
	AST	<950 IU/L	≥950 IU/L			
		AND				
	Prothrombin time	>60%	≤60%			

[1] Abbreviations: PELOD, Pediatric Logistic Organ Dysfunction: bmp, blood pressure monitor; Pa 0_2/F10_2, partial pressure of oxygen, arterial/fraction of inspired oxygen; Pa CO_2, partial pressure of carbon dioxide, arterial; WBC, w hite blood cells; AST, aspartate aminotransferase.

Development of a Pediatric Multiple Organ Dysfunction Score: Use of Two Strategies

Stéphane Leteurtre, Alain Martinot, Alain Duhamel, France Gauvin, Bruno Grandbastien, Thi Vu Nam, François Proulx Jacques Lacroix and Francis Leclerc *Med Decis Making* 1999 19: 399 DOI: 10.1177/0272989X9901900408

FIGURE

Critical Care Triage Tool - Pediatric Patients (<18y) (Top), and Exclusion Criteria (Bottom).

	Initial Assessment		48-h Assessment		120-h Assessment	
Color Code	Criteria	Priority/Action	Criteria	Priority/Action	Criteria	Priority/Action
Blue	Exclusion criteria **OR** PELOD≥ 33	Medical management +/- palliate & discharge from critical care	Exclusion criteria **OR** PELOD≥ 33 or PELOD 21-33 & no change	Palliate & discharge from critical care	Exclusion criteria **OR** PELOD >33 **OR** PELOD 21-33 & no change	Palliate & discharge from critical care
Red	PELOD ≤21 **OR** Single organ failure	Highest	PELOD <33 and decreasing	Highest	PELOD <33 and decreasing progressively	Highest
Yellow	PELOD 21-33	Intermediate	PELOD <21 no change	Intermediate	PELOD <21 minimal decrease (<3-point decrease in past 72 h)	Intermediate
Green	No significant organ failure	Defer or discharge, reassess as needed	No longer ventilator dependent	Discharge from critical care	No longer ventilator dependent	Discharge from critical care

Exclusion Criteria

Patient is excluded from admission or transfer to critical care if *any* of the following is present:	
A	Sever trauma
B	Severe burns of patient with any two of the following: • Age > 60 y • >40% of total body surface area affected • Inhalation injury
C	Cardiac arrest • Unwitnessed cardiac arrest • Witnessed cardiac arrest, not responsive to electrical therapy (defibrillation or pacing) • Recurrent cardiac arrest
D	Metastatic malignant disease with poor prognosis
E	Advanced and irreversible immunocompromise
F	Severe and irreversible neurologic event or condition with highly expected mortality
G	End-stage organ failure meeting the following criteria: *Heart* • NYHA class III or IV heart failure *Lungs* • Severe chronic lung disease with FEV_1 <25% predicted, baseline Pao_2 <55 mm Hg, or secondary pulmonary hypertension • Previously diagnosed primary pulmonary hypertension with NYHA class III or IV heart failure, or mean pulmonary arterial pressure >50 mm Hg *Liver* • Child-Pugh score 7 or MELD score of >20

NYHA New York Heart Association; FEV_1 forced expiratory volume in the first second of expiration; MELD, model for end-state liver disease

APPENDIX D: INTERIM GUIDELINES FOR STRATEGIES TO ADDRESS SCARCE RESOURCE SITUATIONS IN KANSAS [4] [5]

Core strategies that can be employed (generally in order of preference) during or in anticipation of a scarce resource situation are:

Prepare—pre-event actions taken to minimize resource scarcity.

Substitute—use an essentially equivalent device, drug, or personnel for one that would usually be available (e.g., morphine for fentanyl).

Adapt—use a device, drug, or personnel that are not equivalent but that will provide sufficient care (e.g., anesthesia machine for mechanical ventilation).

Conserve—use less of a resource by lowering dosage or changing utilization practices (e.g., minimizing use of oxygen driven nebulizers to conserve oxygen).

Re-use—re-use (after appropriate disinfection / sterilization) items that would normally be single-use items.

Re-allocate—take a resource from one patient and giving it to a patient with a better prognosis or greater need.

Examples of the application of these strategies are presented below. Some examples refer to situations that may take place outside of a public health emergency and may already be addressed by medical staff.

Oxygen

Conserve strategy—Use minimum liter flow to keep O2 saturation > target (85−95% depending on situation). Use O2 conserving cannulas (Oxymizer™). No oxygen driven nebs. Eliminate or reduce equipment with high O2 consumption.

Re-Use strategy—Appropriately disinfect and re-use cannulas, masks, and tubing.

Re-Allocate strategy— May have to base therapy on triage decision tool similar to ventilator allocation.

Medication Administration

Substitute strategy— Use alternative inexpensive medications (morphine, lorazepam, doxycycline) that are easily stockpiled prior to the event.

Adapt strategy—Use morphine and benzodiazepines for sedation drips, when possible. Run drips via gravity rather than IV pump, if needed. Administer more medications via a subcutaneous or

[4] Last revised: October 27, 2009

[5] Information adapted from: Patient Care Strategies for Scarce Resource Situations, published by the Minnesota Department of Health. Available at http://www.health.state.mn.us/oep/healthcare/scarcestrategies.html.

intramuscular route rather than intravenously.

Conserve strategy—Give adjunctive non-steroidal and other analgesics/medications including orally when possible.

Re-Allocate strategy—Re-allocation should be considered as the last resort. Re-allocation will increase demands for palliative care and adequate pain control/sedation—focus should be on stockpiling inexpensive options in advance of event.

Hemodynamic Support and IV Fluids

Substitute strategy—Use alternative vasopressor agents such as epinephrine (inexpensive).
Adapt strategy—May have higher threshold to initiate vasopressors, may use gravity drips (e.g., 1mg epinephrine in 100cc NS) instead of infusion pumps. Consider nasogastric fluid replacement rather than IV.

Conserve strategy—Minimize invasive monitoring.

Re-Use strategy— Consider reusing central venous catheters, other tubes and catheters with appropriate sterilization/disinfection.

Mechanical Ventilation

Adapt strategy—Use of anesthesia machines, BiPAP, short-term manual ventilation and other strategies.

Conserve strategy—Adjusted threshold for intubation, decrease elective surgeries to free up ventilators/anesthesia machines.

Re-Use strategy—Re-use of ventilator circuits after appropriate sterilization / disinfection.

Re-Allocate strategy—Re-allocation should be considered as the last resort. Ventilators should be allocated to patients who can most benefit, and allocation should follow a pre-planned process and use decision support tools and expert clinical judgment.

Nutrition

Adapt strategy—Have family or ancillary staff provide meals. Provide simpler meals and offer fewer choices to those that can take oral intake. Use tube feedings instead of total parenteral nutrition when possible. Delay feedings longer than usual.

Conserve strategy—See above.

Re-Use strategy—May need to re-use nasogastric and other feeding equipment with appropriate disinfection.

Staffing

Substitute strategy— Outside, equally-qualified staff brought in to institution via compact agreements or other mechanism (DMAT, Medical Reserve Corps, other local/regional/state/federal sources). Use family or non-professional staff to provide basic patient cares (non-clinical).

Adapt strategy—Less qualified staff from sources as above or volunteers provide basic patient care with critical care nursing and physician staff monitoring larger numbers of patients. Implement just-in-time training and orientation to job duties following pre-planned training programs. Change shift duration. Use family or non-professional staff to provide some clinical care with training/in-service.

Conserve strategy—Reduce administrative demands (teaching and administration, documentation, etc.).