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Resource-Poor Settings: Response, Recovery, and Research: Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

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Additional information: The e-Appendix can be found in the Supplemental Materials section of the online article.

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Abstract

BACKGROUND: Planning for mass critical care in resource-poor and constrained settings has been largely ignored, despite large, densely crowded populations who are prone to suffer disproportionately from natural disasters. As a result, disaster response has been suboptimal and in many instances hampered by lack of planning, education and training, information, and communication.

METHODS: The Resource-Poor Settings panel developed five key question domains; defining the term resource poor and using the traditional phases of the disaster cycle (mitigation/preparedness/response/recovery). Literature searches were conducted to identify evidence to answer the key questions in these areas. Given a lack of data on which to develop evidence-based recommendations, expert-opinion suggestions were developed, and consensus was achieved using a modified Delphi process.

RESULTS: The five key questions were as follows: definition, capacity building and mitigation, what resources can we bring to bear to assist/surge, response, and reconstitution and recovery of host nation critical care capabilities. Addressing these led the panel to offer 33 suggestions. Because of the large number of suggestions, the results have been separated into two sections: part I, Infrastructure/Capacity in the accompanying article, and part II, Response/Recovery/Research in this article.

CONCLUSIONS: A lack of rudimentary ICU resources and capacity to enhance services plagues resource-poor or constrained settings. Capacity building therefore entails preventative strategies and strengthening of primary health services. Assistance from other countries and organizations is often needed to mount a surge response. Moreover, the disengagement of these responding groups and host country recovery require active planning. Future improvements in all phases require active research activities.

Summary of Suggestions

1. We suggest developing countries or health-care systems employ an appropriate incident command system to organize the pre-hospital, transportation and in-hospital response effort.
2. We suggest early in the response effort that attempts be made to estimate the needs beyond acute care and to inform and guide providers of rehabilitation and prolonged care needs.
3. We suggest host nation rehabilitation and pro-longed care capabilities that are likely to exist following the disaster be considered when determining the appropriateness of initiating critical intensive care.
4. We suggest only critical care providers with previous training or expertise in disaster response, or those who are aligned with experienced groups (eg, foreign medical teams), and invited by the host nation deploy to support a disaster.
5. We suggest if not available at the time of a disaster, critical care be instituted using an intensive care model with providers skilled in critical care medicine.
6. We suggest government and non-governmental organizations (NGOs) collaborate with military health-care systems (with their experience in operating in austere conditions) for process and procedure sharing as well as to establish linkages to facilitate the sharing of patient care.
7. We suggest all deploying response teams employ simple, pre-established, and standardized data collection tools in order to meet the needs of local authorities, increase accountability of care, and facilitate review of care provided during the event.
8. During strategic disengagement of surge resources and reconstitution of emergency and critical care services in resource-poor settings post-disaster, we suggest:
 - 8a. Forming partnerships and close coordination between surge teams and pre-existing stakeholders (local government officials, medical and surgical care providers, rehabilitation-related NGOs, local and national public health) to ensure a successful transition,
 - 8b. Assessing the access to and capacity of local emergency and critical care services once the surge resources leave,
 - 8c. Addressing the disaster's impact on health-care providers' and surviving patients' short and long-term mental health needs,
 - 8d. Developing and using standardized data collection instruments to facilitate assessment and validation of best practices for effective disengagement and reconstitution, and to monitor on-going long-term health needs,
 - 8e. Implementing a tailored approach to disengagement and reconstitution based on the identified local community's needs,
 - 8f. Addressing local logistical challenges to deliver emergency and critical care routinely and during disasters,

8g. Ensuring that public health programs are restored and improved and that reconstitution efforts do not displace essential public health activities, which may have greater impact upon the overall community's health, especially for children,

8h. Integrating emergency and critical care services with the delivery of all other medical care and public health programs in the community,

8i. Including long-term follow-up care to the maximum extent possible in planning for the medical needs of survivors; and

8j. Incorporating the training and staffing needs for provision of all needed post disaster services, including medical, nursing, social workers, mental health providers, community and public health.

9. We suggest research focus on health monitoring/ syndromic surveillance, needs assessment, prognostication, and cost effectiveness to help establish care priorities.
10. We suggest cost-effectiveness studies on critical care in developing countries to justify the need and ability to advocate for resources to provide basic critical care.
11. We suggest developing countries and health-care organizations institute quality improvement programs, in part to justify to donors, population, and government that increases in investment in health systems provide cost effective benefits.
12. We suggest professional critical care societies advise and support research that brings new technologies and diagnostic tools to resource-poor settings and stress adapting diagnostic and treatment modalities to this environment in a cost effective and efficient manner.
13. We suggest professional critical care societies advise and guide the development of disaster related protocols to study pressing issues relating to diagnosis, treatment, and systems improvement and have these vetted through ethics committees and other groups a priori in order to rapidly deploy them during or following an event.

Introduction

Planning for mass critical care (MCC) in resource-limited settings has been largely ignored, despite large densely crowded populations who are prone to suffer disproportionately from natural disasters. In these settings, crisis standards of care are a regular if not a daily reality. Addressing MCC in these settings has the potential to benefit large populations and to also inform planning in better-resourced areas. In addition, an approach that works well in one country may work less well in another, and not all approaches are equally acceptable to all governments or their multiple constituencies. There is no one blueprint for an ideal health-care system, nor is there a panacea that will automatically elicit improved performance.¹ This is hardly surprising: Health-care systems are complex social systems, and the success of any one approach will depend on the system into which it is intended to fit as well as on its consistency with local values and ideologies. In fact, the need to modify World Health Organization (WHO) protocols and the need to work cooperatively within an integrated model with local authorities, especially when local infrastructure is even partially intact, is highlighted by the recent experience with Typhoon Yolanda in the Philippines.² Thus, how

these suggestions are implemented is best left to the local authorities. Given this background, the Resource-Poor Settings group of the Task Force for Mass Critical Care examined support to natural crises or pandemics. In “Resource-Poor Settings: Infrastructure and Capacity Building” by Geiling et al³ in this consensus statement, we addressed definitions and preparation for disasters. In this article, we address response and recovery phases as well as research. Although these issues primarily relate to clinicians, administrators and policy makers, engagement is important for success, and hence this manuscript is directed at all involved. Moreover, the involvement of ethicists in all stages is an absolute necessity to ensure care priorities are ethical and fair.

Materials and Methods

The Resource-Poor Settings panel developed five key question domains, and literature searches were conducted to identify an evidence base on which to answer the key questions (see e-Appendix 1 for search terms and literature results if sufficient evidence found). Searches were limited to 2007 to 2013; English-language and non-English-language papers were included. Given the lack of data upon which to develop evidence-based recommendations, expert-opinion suggestions were developed, with consensus achieved using a modified Delphi process. This process was in adherence with the American College of Chest Physicians (CHEST) Guidelines Oversight Committee’s methodology; full details of the methodology used may be found in the “Methodology” article by Ornelas et al⁴ this consensus statement.

Results

The term “developing country” is used throughout this manuscript to indicate a developing or underdeveloped country. Progress in health-care response, rehabilitation, and recovery in developing countries has been slow or even regressed because of many barriers external to health care, such as the presence of war, conflict, economic strife, environmental changes, or other socioeconomic catastrophes.⁵ Response is further limited by poor infrastructure and lack of trained staffing, capacity, and coordination. Critical care under these circumstances differs significantly from that in developed countries and involves the provision of care for life-threatening illness without regard to the location, including the prehospital, emergency outpatient care, and hospital wards, and likely without ICUs and capabilities.

Response

1. We suggest developing countries or health-care systems employ an appropriate incident command system to organize the pre-hospital, transportation and in-hospital response effort.

Greater resiliency in the health-care system prior to a large-scale natural disaster or pandemic facilitates a mass casualty response. Hence, improving primary and basic emergency care and building public health capacity can improve disaster response.⁶ Capacity building and improved basic care are especially important in resource-poor areas where intensive care is limited. The international community has a role to play in pre-disaster preparedness, as demonstrated in the 2010 Haiti earthquake, where this involvement was

sorely needed. Indeed, predisaster planning can maximize the results of international assistance and decrease the seemingly inevitable human and material tolls from disasters.⁷

Response efforts also require resources to be available in a timely manner. As previously noted in the “Resource-Poor Settings: Infrastructure and Capacity Building” article by Geiling et al³ in this consensus statement, prepositioned, stored emergency materials and teams may effectively streamline disaster response efforts. Especially in events in which critical care needs are surgical, prepositioned resources and infrastructure to support integration of foreign medical teams (FMTs) with existing surgical teams improves overall surgical services and overall public health.⁸

The international response to the earthquake in Bam, Iran, in 2003 was substantial but inefficient, partly because of lack of an international incident command system to orchestrate the response effort.^{9,10} In comparison, at the 1998 US Embassy bombings in Kenya and Tanzania, effective response efforts were partially attributed to an organized hospital response, which included an appropriate incident command system.¹¹

2. We suggest early in the response effort that attempts be made to estimate the needs beyond acute care and to inform and guide providers of rehabilitation and prolonged care needs.

3. We suggest host nation rehabilitation and pro-longed care capabilities that are likely to exist following the disaster be considered when determining the appropriateness of initiating critical intensive care.

Often the intensive care capabilities of responding groups exceed those of the resource-poor host nation. As a result, patients may survive the acute event but require prolonged rehabilitation and special requirements (such as chronic ventilation or dialysis) that the host nation is unable to support. In this situation, critical care responders face the dilemma of continuing care indefinitely or choosing to withdraw care. Thus, rehabilitation needs and availability must be considered before initiating advanced intensive care support.^{12–15} Although “dialyzer reuse protocols” have been useful during disasters such as the Haiti earthquake, this approach does not address the long-term needs of patients (see the “Special Populations” article by Dries et al¹⁶ in this consensus statement).

4. We suggest only critical care providers with previous training or expertise in disaster response, or those who are aligned with experienced groups, and invited by the host nation deploy to support a disaster.

Disaster response to critical care needs in a developing country occurs at the behest of the affected nation or region and comes from a variety of governmental, nongovernmental, foreign national, faith-based, and other organizations. The response usually is driven by disaster-specific injury patterns and is requested by assessment groups at the scene, as occurred in Haiti.^{17,18} However, FMTs rarely arrive in time to provide immediate trauma care. Additionally, disaster relief and health donations typically do not follow WHO guidelines, and often local medical volunteers are available but are not linked to medical supplies and logistic support.¹⁹ Thus, an appropriate response requires a systematic

approach to coordinating the care.²⁰ The WHO Regional Organization establishes a Health Cluster in which FMTs register and report on a regular basis. Other recognized Clusters, such as water, sanitation, and shelter, fall under the auspices of the United Nations Secretariat's Office for the Coordination of Humanitarian Affairs.

Many disaster responders come from academic medical centers or groups without prior experience and arrive ill prepared to function in a resource-poor setting. For instance, although skilled in the provision of trauma care, many do not know how to adjust or adapt those skills to an austere environment or appreciate the complexities of care in patients with tropical diseases; understand the political, historical, or cultural back-ground contributing to the disaster; or understand humanitarian core competencies, such as international humanitarian law. Professionalism in disaster response calls for flexibility; training and coordination rather than good intentions are highlighted in response to the recent experience during Typhoon Haiyan in the Phillipines.^{2,21} Prior to deploying, responders must undergo specific training in unique injury patterns as well as the cultural setting and the nuances of disaster relief to ensure personal and group safety.²²

5. We suggest if not available at the time of a disaster, critical care be instituted using an intensive care model with providers skilled in critical care medicine.

In the 2010 earthquake in Haiti, the highest proportion of deaths occurred in children, and admission to an ICU, either with or without trauma, was significantly associated with a high risk of death.²³ In such a setting, critical care needs may be substantial and may divert scarce resources from other areas. The use of intensivist-directed teams of critical care providers has been shown to improve mortality in resource-poor settings.²⁴ However, critical care providers should be skilled to practice in a resource-poor environment where equipment and supplies may be unfamiliar or in short supply. A quick primer guide, in addition to other organization training as noted in suggestion 20 of in the "Resource-Poor Settings: Infrastructure and Capacity Building" article by Geiling et al³ in this consensus statement, is useful.²⁵

6. We suggest government and NGOs collaborate with military health-care systems (with their experience in operating in austere conditions) for process and procedure sharing as well as to establish linkages to facilitate the sharing of patient care.

Military critical care in wartime provides critical care in austere settings using trained personnel, standardized practices, and equipment, supported where possible with aeromedical evacuation.²⁶ Military forces also provide subject matter experts (including communications, engineering, logistics, transportation, security, and medical) in the immediate chaos that often follows a disaster.^{27,28} The military also may be the only resource available to assist in medical evacuation of critically ill patients.²⁹

7. We suggest all deploying response teams employ simple, pre-established, and standardized data collection tools in order to meet the needs of local authorities, increase accountability of care, and facilitate review of care provided during the event.

Complete, efficient, and standard documentation of patient care data, especially surgical data collected by FMTs, exists in the larger NGOs, such as the International Committee of the Red Cross and Médecins Sans Frontières (Doctors Without Borders).²⁵ Standardized data collection would ensure all teams contribute relevant information to meet the needs of local authorities and the WHO Health Cluster and would increase accountability of care, thereby facilitating review of care provided.³⁰

Reconstitution/Recovery of Host Nation Critical Care Capabilities and Disengagement

8. During strategic disengagement of surge resources and reconstitution of emergency and critical care services in resource-poor settings post-disaster, we suggest:

8a. Forming partnerships and close coordination between surge teams and pre-existing stakeholders (local government officials, medical and surgical care providers, rehabilitation-related NGOs, local and national public health) to ensure a successful transition,

8b. Assessing the access to and capacity of local emergency and critical care services once the surge resources leave,

8c. Addressing the disaster's impact on health-care providers' and surviving patients' short and long-term mental health needs,

8d. Developing and using standardized data collection instruments to facilitate assessment and validation of best practices for effective disengagement and reconstitution, and to monitor on-going long-term health needs,

8e. Implementing a tailored approach to disengagement and reconstitution based on the identified local community's needs,

8f. Addressing local logistical challenges to deliver emergency and critical care routinely and during disasters,

8g. Ensuring that public health programs are restored and improved and that reconstitution efforts do not displace essential public health activities, which may have greater impact upon the overall community's health, especially for children,

8h. Integrating emergency and critical care services with the delivery of all other medical care and public health programs in the community,

8i. Including long-term follow-up care to the maximum extent possible in planning for the medical needs of survivors; and

8j. Incorporating the training and staffing needs for provision of all needed post disaster services, including medical, nursing, social workers, mental health providers, community and public health.

Reconstitution of emergency and critical care services after a disaster is extremely challenging in developing countries. Indeed, recovery may take several years following major disasters, even in high-resource settings.³¹ The lack of adequate baseline emergency

and critical care services in resource-poor environments further impedes critical care service recovery after a disaster.^{5,32} In fact, access and capacity of preexisting emergency and critical care medical practice may be further limited with disengagement and withdrawal of supply chains.^{33–35} Before a disaster, such services may have been supported by NGOs or other international groups rather than by local providers.^{36,37} These parties may not be available in the aftermath of a disaster, highlighting the need to identify partners to help with reconstitution and disengagement.^{38,39}

Mental health care or mental and physical rehabilitation services may also be nonexistent or restricted even at baseline in resource-poor settings.^{40–43} Thus, postdisaster treatment of emotional and psychologic trauma and physical rehabilitation are less likely to be offered, with long-lasting deleterious consequences.

Evidence to guide emergency and critical care services' disengagement and reconstitution in resource-poor settings is scant and derived mostly from high-resource settings.⁴⁴ Accordingly, it is prudent to initiate efforts to establish an evidence base. Yet emergency and critical care services are just one of competing needs in the health-care system that must be prioritized. The success of preventative and primary care programs also relies on confidence in acute care services.^{32,45} The recovery and reconstitution phase, therefore, is an opportunity to expand and improve basic emergency and critical care services.

Research Considerations

9. We suggest research focus on health monitoring/syndromic surveillance, needs assessment, prognostication, and cost effectiveness to help establish care priorities.

10. We suggest cost-effectiveness studies on critical care in developing countries to justify the need and ability to advocate for resources to provide basic critical care.

To improve country-specific education and training in developing countries, research should focus on needs assessment, prognostication, and cost-effective treatments and methods of caring for critically ill patients.⁴⁶ Unfortunately, research in small hospitals may be difficult.⁴⁷ With this lack of information, critical care services are often considered too costly or complicated for resource-poor settings. Yet some of the most effective critical care interventions, including oxygen, fluid resuscitation, early antibiotics, and patient monitoring, are relatively inexpensive.³² In the developing world, where many critically ill patients are younger and have fewer comorbidities, critical care presents a remarkable opportunity to provide significant incremental benefit, more so than in the developed world.³² Integrating emergency care into existing health-care systems will ideally rely on modest investments to augment current models of primary health-care delivery.⁴⁸

These research suggestions focus on general critical care rather than MCC in resource-poor settings. However, research in the noncrisis period has a dual effect of enhancing both nondisaster, everyday critical care as well as improving all aspects of MCC during a crisis.⁴⁹

Quality Improvement Factors: 11. We suggest developing countries and health-care organizations institute quality improvement programs, in part to justify to donors,

population, and government that increases in investment in health systems provide cost effective benefits.

Health-care leaders have suggested that quality improvement (QI) activities have the potential to optimize the use of limited resources targeted at achieving shared aims. For example, simple QI tools, including plan-do-study-act cycles and process maps, were useful in rural Africa in improving performance and resource aid decisions.⁵⁰ The WHO has developed a field-tested toolkit that contains adaptable instruments, including a framework for QI, evidence-based clinical guidelines in the form of the *Pocket Book of Hospital Care for Children*.⁵¹ QI activities may also encourage greater investment in the health systems of developing countries by increasing donor, population, and governmental confidence that resources are being used appropriately.⁵²

Innovative Treatments and Technologies: 12. We suggest professional critical care societies advise and support research that brings new technologies and diagnostic tools to resource-poor settings and stress adapting diagnostic and treatment modalities to this environment in a cost effective and efficient manner.

13. We suggest professional critical care societies advise and guide the development of disaster related protocols to study pressing issues relating to diagnosis, treatment, and systems improvement and have these vetted through ethics committees and other groups a priori in order to rapidly deploy them during or following an event.

Research into the most cost-effective treatments and methods of caring for critically ill patients is urgently needed. Professional critical care associations in the developed world should support operational research that brings new technologies and diagnostic tools and adapts crucial diagnostic and treatment modalities to this environment. This should be done by developing simplified tools and guidelines, ensuring engagement with regulatory bodies, and mobilizing community health workers. In the developing world, prevention should be a high priority. Development assistance from wealthier nations must therefore shift away from its present donor-driven agendas to country-driven, sector-wide approaches to development with sufficient accountability and sustainability.⁵³ Arguably, a strong political will is necessary at all levels of government.^{54,55}

Areas for Future Research/Interventions/Limitations

MCC responders should receive special training. The professionalization of humanitarian health workers is a regionally supported, worldwide movement that relies on competency-based curricula provided by academic-affiliated training centers and trainers.^{56–58} Completion of the accredited training results in a certificate of completion that is placed in a professional registry available to NGOs and international organizations that employ and deploy health workers. The system also allows the health-care provider to add new training and field experiences to their personal registry “passport.”^{49–52} Competencies and crisis standards of care for health specialists being developed in anesthesia, mental health, physical medicine and rehabilitation, critical care (see the “Engagement and Education” article by Devereaux et al⁵⁹ in this consensus statement), surgery, and other such activities must

include ways to adjust and adapt their specialty skills to the resource-poor setting and learn the humanitarian core competencies that are crucial when working in an environment with multiple NGOs, international organizations, national agencies, and FMTs, among others^{60,61} (Fig 1).⁶²

Conclusions

Resource-poor settings offer a unique challenge to the provision of MCC to vulnerable victims. However, by better defining those at risk, we can begin to build greater capacity and resilience. In these settings, recovery and reconstitution capabilities may be severely limited. Knowing these limitations early in a disaster response will guide patient-care activities that can be supported once response groups disengage. Future MCC efforts in resource-poor settings require more evidence-based actions and quality improvement initiatives. Only through the application of such research and process improvement tools can the victims of large-scale disasters or pandemics garner the benefits of the response and recovery efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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ABBREVIATIONS:

FMT	foreign medical team
MCC	mass critical care
NGO	nongovernmental organization
QI	quality improvement
WHO	World Health Organization

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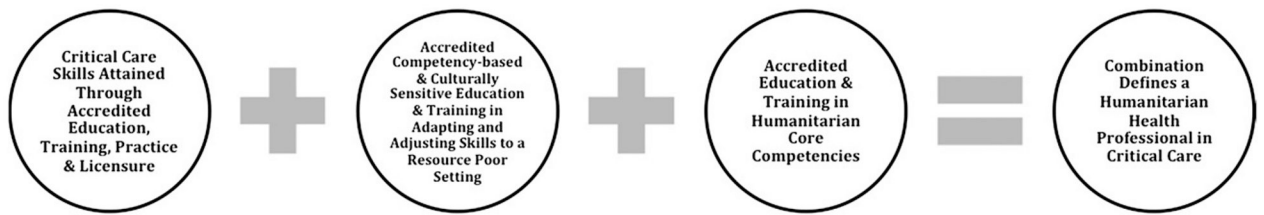


Figure 1 –.

Humanitarian health workers without prior field experience responding to crises in developing countries should have attained accredited education and training in adapting and adjusting their skills to a resource-poor country as well as a knowledge base in humanitarian core competencies. Such training is available from many accredited academic centers and professional specialty associations and societies. (Adapted with permission from Johnson et al.⁶²)