Recommendations for NYC Pediatric Disaster Triage and Transport

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Created by the
NYC Pediatric Disaster Coalition &
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NYC Health

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Background

In the event of a disaster or Mass Casualty Event (MCE) within the New York City metropolitan region involving pediatric patients, the number of young victims could easily overwhelm existing pediatric resources in New York City hospitals. To accommodate the initial stabilization and treatment of these victims, the EMS system must have a triage system in place that will maximize the potential for pediatric patients being taken to a hospital that has the resources for adequate care. In addition, all hospitals will need to have a surge plan in place for an MCE, with the aim of increasing the pediatric bed capacity by an additional 200 Pediatric Intensive Care Unit (PICU) beds.

The New York City Department of Health and Mental Hygiene (DOHMH) recognized the need for a city-wide plan for pediatric triage and surge, and to that end, has funded a project called the New York City Pediatric Disaster Coalition (PDC). The primary goal of the PDC is to create a coalition of pediatric and emergency preparedness health care institutions and providers to develop an infrastructure that addresses gaps in the ability of the New York City regional health care system to provide effective and timely large scale pediatric care during MCEs. Such efforts necessitate collaborative efforts with representatives of the 26 New York City PICU hospitals, in partnership with key municipal and agencies and healthcare entities such as FDNY, OEM, REMSCO, and GNYHA.

The specific aims of the PDC are to recommend pediatric specific modifications of the New York City Disaster Plan that include the following elements:

1. Enhance its effectiveness and efficiency for all patients, adult and pediatric;

2. Maximize primary transport of pediatric disaster victims to pediatric disaster receiving hospitals (PDRHs) and minimize primary transport of pediatric disaster victims to non-pediatric disaster receiving hospitals (non-PDRHs), thus curtailing the need for secondary transport of pediatric victims to PDRHs;

3. Ensure sufficient surge capability in PDRHs to meet the needs of the pediatric population of New York City for PICU level care.

The narrative and appendices in this document address Element No. 2 above.

Principles of Mass Casualty Triage

Imagine how health care providers will feel when faced with numerous injured children and adults at a chaotic and potentially hazardous scene. With crying,

screaming—and a few ominously silent—small victims, will rescuers make objective decisions that will allow them and their colleagues to maximize survival for the greatest number of patients?

Without objective guidelines, health care providers consistently err on the side of over-triaging pediatric patients, because instinctively they want to give children every possible chance of survival. However, if all children are triaged into the most critical category, they are not really being triaged at all. Resources that will better benefit children—and adults—with survivable injuries may be consumed in fruitless resuscitative efforts for children in whom the probability of survival is low. Rational, objective guidelines help assure that resources are directed in the most effective and efficient manner.

Mass casualty triage should only be used in disasters when severe resource constraints mandate a change in the standard of care that can be realistically delivered. In routine medical practice, we attempt to give every patient the best possible care, often consuming numerous resources, even when the chances of survival are very low. However, in disasters, when resources are insufficient to meet needs, our approach must change from doing the best we can for each individual patient to using available resources to bring the greatest good to the greatest number of patients—even if that means some of the most critical patients will receive little to no medical care. Decisions about when to use mass casualty triage must be made on a system-by-system and an event-by-event basis, because they must take into account the relative amount of resources locally available at any given moment in time and place. A description of all currently available adult and pediatric Mass Casualty Triage tools is provided in **Appendix A**.

Genesis of Proposed New York City Regional Pediatric Disaster Triage Plan

Recognizing the shortcomings of all currently available adult or pediatric Mass Casualty Triage tools for use within the five boroughs of the City of New York, the New York City Department of Health and Mental Hygiene (NYCDOHMH) included as part of its Request for Proposals (RFP), development of a Regional Pediatric Disaster Plan with specific guidance directing the successful applicant to develop a mutually acceptable New York City Pediatric Disaster Plan. This plan would provide:

- Rapid and reliable triage of pediatric patients in accordance with established priorities, and
- Effective and efficient transport of high acuity pediatric patients to hospitals able to care for them.

This plan would be created in collaboration with representatives of the regional emergency management agency, the New York City Office of Emergency

Management (OEM); the regional Emergency Medical Services (EMS) system, including the Fire Department, City of New York (FDNY), the Regional Emergency Medical Services Council of New York City (REMSCO), the Regional Emergency Medical Advisory Committee of New York City (REMAC), and the Regional Trauma Advisory Committee of New York City (RTAC); and regional hospital system, including the Greater New York Hospital Association (GNYHA) and the New York City Health and Hospitals Corporation (NYCHHC).

The Schneider Children's Hospital of the North Shore LIJ Health System (SCH/LIJ) and The Center for Pediatric Emergency Medicine of the New York University School of Medicine (CPEM), in collaboration with the Morgan Stanley Children's Hospital of New York Presbyterian (CHONY) at the Columbia University Medical Center (CUMC) and the Komansky Center for Children's Health (KCCH) at the Weill Cornell Medical Center (WCMC) of the New York Presbyterian Hospital (NYPH), the Children's Hospital at Montefiore (CHAM), and the State University of New York (SUNY) Downstate Medical Center successfully competed for this RFP, and have created a Pediatric Disaster Coalition (PDC) for the NYCDOHMH to accomplish and perpetuate this task. The PDC has met semi-monthly since November of 2008 to prepare and present the proposed Regional Pediatric Disaster Plan to NYCDOHMH in May of 2009.

Structure of the Pediatric Disaster Coalition

SCH/LIJ and CPEM have partnered CHONY, KCCH, CHAM, and SUNY to build on previous activities involving CPEM and the SUNY CBPP Pediatric Task Force that have contributed to improving pediatric disaster preparedness in New York City. These centers of excellence in pediatrics have successful histories of working with NYC DOHMH. SCH/LIJ has worked extensively on Surge Capacity issues. CPEM has provided leadership to the Pediatric Disaster Advisory Group in the creation of *Children in Disasters: Hospital Guidelines for Pediatric Preparedness,* editions 1, 2 and 3, as well as the *Pediatric Tabletop Exercise Toolkit for Hospitals.* All the institutions have conducted pediatric tabletop exercises and disaster drills. NYPH has the largest number of PICU, general pediatric, and pediatric burn center beds in the New York City region, and their wholly owned EMS service performs the highest volume of pediatric critical care inter-hospital transports of any New York City EMS agency. New York City is fortunate to have such extensive resources available. Coordination will be the key to optimal care for children in disasters.

The overall project is directed by a *Central Leadership Council*. The Council is comprised of the two Principal Investigators (Michael Frogel, MD, SCH/LIJ, PI, and George Foltin, MD, CPEM, Co-PI), the Project Administrative Director (Marsha Treiber MPS), the Project Coordinator (Avram Flamm, B EMS EMTP)

and representatives from SCH/LIJ, CPEM/NYU, CHONY/CUMC, KCCH/WCMC, CHAM, and SUNY. A *Prehospital Field Triage Planning Committee* led by Dr. Foltin and a *Hospital Surge Capacity Planning Committee* led by Dr. Frogel have been established to meet the project objectives under the direction of the Central Leadership Council and representatives of the NYCDOHMH, with advice from representatives of REMSCO, FDNY, and OEM:

- Create the Leadership and Committee Structure;
- Evaluate the current status of the pediatric New York City Disaster Management Program and develop a plan that increases pediatric surge capacity, improves triage, transport and communications capabilities, and collects pediatric specific information for acute care and future planning;
- Begin the creation of a cadre of New York City Pediatric Critical Care trainers through the presentation of a Fundamentals of Pediatric Critical Care Course for Instructors in April of 2009;
- Collaborate with FDNY and REMSCO in the development of pediatric field triage and primary and secondary transport criteria;
- Request feedback on current planning documents from regional subject matter experts in pediatric emergency medicine, pediatric critical care medicine, and pediatric surgery at a special meeting of the New York Society of Pediatric Critical Care Medicine on July 9, 2009;
- Present progress and committee recommendations to date at the NYC DOHMH Children in Disasters Conference on September 15, 2009, and request feedback on current planning documents from additional regional subject matter experts; and
- Develop a plan to actualize PDC future implementation activities for years 2 and 3.

Prehospital Field Triage Operations

Patient care, both in the field and in the hospital, is normally delivered to one individual patient at a time by health care providers working as individuals or in one or more teams. Prehospital EMS professionals are accustomed to routinely rendering emergency care in this manner, at the scene and during transport, and typically do so independent of the direct involvement of other public health or safety professionals. By contrast, patient care in disasters is delivered to multiple patients by limited numbers of health care providers organized as small medical response teams. This requires extensive and ongoing collaboration with other public health and safety professionals, hence a coordinated incident management system (IMS).

While EMS agencies require administrative and operational support, few such agencies approach the complexity of modern hospital organizations. However, in true disasters, EMS agencies must do exactly what hospitals routinely do—bring to bear myriad healthcare resources to the aid of numerous patients more or less simultaneously, with efficiency and economy of effort, lest any salvageable life be lost.

Prehospital disaster medical systems range from simple organizations that manage single incidents with limited numbers of patients, to complex multi-agency, multi-jurisdictional organizations that manage expanding or complicated incidents involving large numbers of victims. In the United States, the National Incident Management System (NIMS)—through the National Response Framework (NRF)—provides a flexible, scalable, and readily adaptable system designed to address all hazards appropriately and consistently. The City of New York has adapted the NIMS to its unique geography, demography, and political and organizational structure to meet the needs of its citizens through the development and implementation of the City Incident Management System (CIMS)—within which all elements of Emergency Support Function (ESF) 8 (Public Health and Medical Services) must operate. However, it is incumbent upon all EMS providers to make this system a reality within their own agencies, through education and training, as well as constant drilling in its application to medical disasters.

Although our purpose is to focus upon the needs of children in disasters, catastrophic occurrences do not separate cleanly into those involving children and those involving adults. As such, children are best served by disaster systems that ensure their special needs are met at every level of system organization. There must be an organized system within which state-of-the-art pediatric care can provided. Otherwise, children will fare poorly in the medical response to disasters—an outcome neither the City of New York, nor the United States of America, cannot afford to allow to happen to their youngest, most vulnerable citizens.

Pediatric Prehospital Field Triage and Transport Recommendations

Note: The Pediatric Prehospital Field Triage and Primary and Secondary Transport Recommendations set forth below are based upon ongoing discussions and meetings that have been held among representatives of the PDC, REMSCO, FDNY, and OEM regarding the specific pediatric definitions, triage categories, and tier designations contained in this document. Agreement is now being reached among medical experts from all the aforementioned parties regarding these recommendations. It is expected that there will ultimately be agreement among the operational as well as medical experts from all the aforementioned parties before these recommendations are finalized.

The PDC Prehospital Field Triage Planning Committee makes the following four key recommendations regarding field triage of pediatric patients in disasters:

1. Apply pediatric specific field triage criteria in mass casualty events.

2. Implement expedited procedures for field triage of pediatric patients.

3. Facilitate primary transport of pediatric patients to pediatric disaster receiving hospitals (PDRHs).

4. Establish a system for pediatric consultation and secondary transport of pediatric patients to PDRHs when necessary.

Recommendation 1: Apply Pediatric Specific Field Triage Criteria in Mass Casualty Events

Recognizing the operational limitations of all currently existing pediatric disaster triage tools, described in detail in **Appendix A**, the PDC Prehospital Field Triage Planning Committee recommends a further simplified and modified version of the proposed draft Modified JumpSTART Triage Tool (see page 23 in the appendix) developed by CPEM and FDNY in 2005, yet which is compatible with the START Triage Tool currently being utilized by FDNY (see page 30 in the appendix). As with other MCE triage tools, including the START Triage Tool, ***it is intended for use only in true MCEs***. This proposed pediatric modification of the START Triage Tool currently being utilized by FDNY has been recently modified to include ***a novel "orange" triage category.*** This classification is for patients whose condition, ***while not truly immediate*** in the emergent sense (mild to moderate respiratory distress, altered mental status), nonetheless ***remains sufficiently "urgent" to warrant expeditious, instead of delayed, care***—is shown in **Table 1** below. The START Triage Algorithm from which it is derived, and the START Triage Algorithm modified for pediatric patients, are shown in **Appendix C, Figures B1-B2**. The following assumptions underlie the application of the START Triage Tool, as proposed to be modified for pediatric patients:

Note: Implementation of the orange triage category will require additional training for all prehospital personnel in New York City—municipal, hospital, commercial, volunteer—who previously have been trained using the START Triage Algorithm depicted in **Figure B1** and more fully described in **Appendix A**, which does not include an "orange" category, but green, yellow, red and black categories. It is further understood that both the START Triage Algorithm, and its proposed pediatric modifications, are intended for use by prehospital personnel in the field. This is not appropriate for use by health care providers in hospitals, who are expected to use pediatric specific triage systems they have selected for use in pediatric patients, whether their hospitals are Pediatric Disaster Receiving Hospitals (PDRHs) or non-Pediatric Disaster Receiving Hospitals (non-PDRHs).

- Pediatric patients are defined not by age, but by their visual appearance as infants, toddlers, preschoolers, or school agers. (Adolescent patients may be treated as young adults during disasters involving children, while young adults may be treated as adolescents, depending on beds available for adult and pediatric intensive care.)

- The first responding hazardous materials technician performing initial triage in, and evacuation from, a contaminated Search-And-Rescue (SAR) Area will attempt to maintain the airways of pediatric disaster victims open by keeping the head and neck as straight as possible during extrication, but they are neither equipped, nor able to provide, other emergency medical treatment.

- The first responding emergency medical provider performing initial triage of a pediatric disaster victim either in a clean Search-And-Rescue (SAR) Area or a Casualty Collection Point (CCP) will continue to provide emergency medical treatment and initiate rapid transport for that pediatric victim when emergency ambulance transport resources are readily available.

- The first responding emergency medical provider performing initial triage of a pediatric disaster victim either in a clean Search-And-Rescue (SAR) Area or a Casualty Collection Point (CCP) will perform initial triage on other disaster victims when emergency ambulance transport resources are not readily available, while continuing to provide emergency medical treatment and initiating rapid transport for all disaster victims within the staging area as time and resources permit.

Table 1. New York City Pediatric Disaster Triage Categories*

Pediatric Disaster Triage Category	Potentially Contaminated Search And Rescue (SAR) Area	Clean Search And Rescue (SAR) Area OR Casualty Collection Point (CCP)
Dead/Expectant (Black)	Decapitation OR multiple or severe dismemberment with NO signs of life	Non-ambulatory, P + R absent, does NOT respond to 5 BVM breaths
Immediate (Red)	Non-ambulatory ± signs of life	Non-ambulatory, P ± R present WITH: • Respiratory rate > 30 or < 10, and if 0, DOES respond to 5 BVM breaths, OR • UNable to follow simple commands, OR • Infant < 12 mo
Delayed (Yellow)	NONE	Non-ambulatory, P + R present WITH: • Respiratory rate < 30 and > 10, AND • ABLE to follow simple commands
Minor (Green)	Ambulatory AND breathing well	Ambulatory AND breathing and mentating well
Urgent (Orange)	NONE	Patient initially tagged Delayed (Yellow) or Minor (Green) who later develops signs of • Respiratory distress or failure, OR • Altered mental status, OR • Major injury to head or torso

*Note: When pediatric patients are co-triaged together with adult caregivers, they both will be assigned together to the higher of their two triage categories. In addition, every attempt will be made not to separate pediatric patients from their adult caregivers.

Rationale

Rescuers who initially enter the Search-And-Rescue (SAR) Area ("hot zone") are firefighters trained as Hazardous Materials ("HazMat") Technicians. As such, their emergency medical training is limited to the Certified First Responder (CFR) level, which includes only three hours in pediatrics. In addition, until the scene is determined and declared to be free of gross contamination by Chemical, Biological, Radiological, Nuclear, and Explosive ("CBRNE") hazards, such rescuers must don Level A Personal Protective Equipment (PPE), which affords them only limited visibility and minimal dexterity. Thus, rescue efforts in a contaminated SAR Area containing children have been limited to extrication and evacuation of pediatric patients who are not obviously dead, while maintaining the neck in as neutral a position as possible, to maximize airway opening. Life saving basic life support (BLS) and advanced life support (ALS) will not be performed prior to decontamination, which will take place in a decontamination corridor immediately adjacent to the nearest Casualty Collection Point (CCP).

For these reasons, rescuers in a contaminated SAR area need a simple system for primary pediatric disaster triage that requires little formal training in, and no special equipment for, pediatric prehospital emergency care—and is readily and reliably transferable and adaptable to the secondary pediatric disaster triage that will be performed by prehospital personnel in the CCP area as they initiate treatment. At the same time, the triage system to be utilized in the CCP area must be accurate enough to ensure priority treatment for children whose conditions require care that is, first, truly immediate, and second, truly urgent. Reliance upon standard "RPM" ("R"espirations-"Pulse"-best "M"otor response) criteria ensures that the proposed pediatric modifications of the START Triage Tool is based on sound physiologic principles. The addition of an "urgent" ("orange") triage category to the existing "immediate" ("red"), "delayed" ("yellow"), "minor" ("green"), and "expectant/dead" ("black") adds greater discriminatory power to the proposed pediatric modification of the START Triage Tool. This category level is both easily recognized by emergency medical personnel It is also fully consistent with the known propensity of pediatric patients to deteriorate chiefly via respiratory compromise that begins with respiratory distress, continues through respiratory failure, and ends with respiratory arrest leading imminently to cardiopulmonary arrest.

Recommendation 2: Implement Expedited Procedures for Pediatric Transport from the Field

Recognizing that children are at greater risk of sudden deterioration when their airways, breathing, or circulation are jeopardized by physiologic derangements caused CBRNE threats, the PDC Prehospital Field Triage Planning Committee

recommends that pediatric patients receive priority transport from the field vs. comparably triaged adult patients. The following assumptions underlie creation of policies, procedures, and protocols for such transport:

- The FDNY On-Scene Incident Commander will establish a Pediatric Staging Area within the CCP in close proximity to both the decontamination corridor and the transportation corridor, to expedite rapid evacuation of pediatric patients.

- Pediatric patients who are not breathing will be primarily triaged as "red" rather than "black", then rapidly evacuated from the SAR area by HazMat technicians to the decontamination corridor,

- Pediatric patients will be rapidly evaluated, secondarily triaged by prehospital personnel within the pediatric staging area, and have rescue breaths administered for any pediatric patient secondarily triaged as "red" yet not breathing on airway opening.

- The FDNY On-Scene Staging Coordinator will direct that pediatric patients be preferentially evacuated vs. comparably triaged adult patients, to pediatric hospitals, together with any seriously ill or injured family members, whenever possible.

Rationale

Children are known both to more vigorously compensate for respiratory and circulatory embarrassment than can adults, yet to more rapidly deteriorate once their more limited compensatory mechanisms are overwhelmed. This is particularly true with respect to compromise of ventilation, which leads rapidly to compromise of oxygenation, the common final pathway to cardiopulmonary arrest for the majority of pediatric medical and surgical emergencies. As such, early recognition and treatment of respiratory emergencies are essential to the successful management of critical illnesses and injuries in pediatric patients. Early evacuation to a pediatric staging area where rescue breaths, when needed, can be properly and quickly administered affords pediatric patients with critical respiratory compromise the best possible chance for survival.

In addition, pediatric patients require priority transport from the field vs. comparably triaged adults, so resuscitation and recovery can proceed in pediatric hospitals staffed and equipped to provide specialty pediatric care. Critically ill or injured children may become separated from critically ill or injured family members at the scene of a disaster, requiring extraordinary efforts to track and reunite them. Appropriate provisions should be made at the scene to prevent such separation, thereby facilitating medical care for all family members, while precluding the need for social services to expend scarce resources on family reunification, rather than sorely needed family support.

Recommendation 3: Transport Pediatric Patients to Pediatric Disaster Receiving Hospitals

Recognizing the operational limitations of EMS agencies during disasters, the PDC Prehospital Field Triage Planning Committee recommends a two-tier pediatric ambulance destination grid that matches patient need and available resources. This Pediatric Ambulance Destination Grid is shown in **Table 2** below. Tier One Pediatric Disaster Receiving Hospitals (PDRH-1s) are hospitals that provide comprehensive pediatric medical and surgical subspecialty services, including a Pediatric Intensive Care Unit (PICU). Tier Two Pediatric Disaster Receiving Hospitals (PDRH-2s) are hospitals that provide limited pediatric medical and consulting pediatric surgical subspecialty services, including pediatric inpatient services, but lack a Pediatric Intensive Care Unit (PICU)*. The following assumptions underlie the application of this Pediatric Ambulance Destination Grid in the field:

- Pediatric patients are defined not by age, but by their visual appearance as infants, toddlers, preschoolers, or school agers. (Adolescent patients will be treated as adult patients during disasters involving children.)

- Pediatric patients who are classified as requiring Immediate, Urgent, or Delayed treatment will receive care in Tier One Pediatric Disaster Receiving Hospitals (PDRH-1s) whenever possible.

- Pediatric patients meeting criteria for major trauma, as defined in the *New York City Regional Prehospital Basic Life Support Protocols* of the Regional Emergency Medical Advisory Committee (REMAC) of New York City, will receive care in Tier One Pediatric Disaster Receiving Hospitals (PDRH-1s) that are designated by the New York State Department of Health (NYSDOH) as Pediatric Trauma Receiving Hospitals (PTRHs) whenever possible; recognizing that operational considerations may not permit bypass of Tier One PDRH-1s that are not designated as PTRHs by the NYSDOH.

- Pediatric patients who are classified as requiring Minor treatment will receive care in Tier Two Pediatric Disaster Receiving Hospitals (PDRH-2s) whenever possible.

* Although the New York State Department of Health (NYSDOH) has established a four-tier system of designation for neonatal care services, it has not as of yet done so for pediatric care services. However, it did adopt regulations in 1991 that designate trauma centers as appropriate to receive pediatric trauma patients by ambulance. While there is no regulatory basis in the current *New York State Appropriateness Review Standards for Trauma Centers* (10 NYCRR 708.2 and 708.5) for administrative application of the term "Pediatric Trauma Center", it is commonly used by NYSDOH officials in referring to "free standing" children's hospitals that serve as pediatric-only trauma centers in New York State. This has served to confuse some health care providers as to which NYSDOH designated trauma centers are actually authorized to receive pediatric patients. [The Women's and Children's Hospital of Buffalo, the Morgan Stanley Children's Hospital of New York Presbyterian of the Columbia University Medical Center campus of the New York Presbyterian Hospital, and the Schneider Children's Hospital of the Long Island Jewish Hillside

Medical Center campus of the North Shore Long Island Jewish Health System are commonly recognized as the only three "free standing" children's hospitals in New York State, although technically, these hospitals are subdivisions of the larger general hospitals with which they are affiliated. All are currently designated by the NYSDOH to receive major pediatric trauma patients by ambulance.] In fact, all NYSDOH designated trauma centers are eligible to be authorized to receive major pediatric trauma patients by ambulance, and many have chosen to do so. At the time of this writing, the following trauma center hospitals in New York City are designated to receive major pediatric trauma patients by ambulance: Bronx—Jacobi Medical Center, Lincoln Medical and Mental Health Center; Brooklyn—Brookdale University Hospital, Kings County Hospital Center; Manhattan—Bellevue Hospital Center, Children's Hospital of New York Presbyterian, Harlem Hospital Center, Saint Vincent's Catholic Medical Center, Weill Cornell Medical Center; Queens—Elmhurst Hospital Center, Jamaica Hospital, New York Hospital of Queens, Schneider Children's Hospital; Staten Island—Staten Island University Hospital. However, a few of these trauma center hospitals have petitioned the NYSDOH to be removed from this list, while others have closed or modified the operations of their Pediatric Intensive Care Units (PICUs), hence are no longer eligible to be designated as trauma centers authorized to receive major pediatric trauma patients by ambulance, but have not officially notified the NYSDOH of their inability to provide pediatric intensive care on site to pediatric trauma patients. As the result of this confusion, the NYSDOH is currently reviewing pediatric trauma designations in New York City. In addition, it is currently in the process of revising the *New York State Appropriateness Review Standards for Trauma Center*s (10 NYCRR 708.2 and 708.5), in part to ensure greater clarity regarding the requirements to be designated as a "Pediatric Trauma Center". To avoid further confusion, the PDC has used the term "Pediatric Trauma Receiving Hospital" (PTRH) to refer to trauma centers officially designated by the NYSDOH to receive major pediatric trauma patients by ambulance. In addition, it will use the term "Pediatric Disaster Receiving Hospital" (PDRH) to refer to hospitals that will be recognized by the NYCDOHMH as qualified to receive pediatric patients requiring pediatric intensive care in the event of a disaster involving children.

Table 2. New York City Pediatric Disaster Receiving Hospital Tiers

Pediatric Disaster Receiving Hospitals	Key Elements	Qualifying Institutions By Borough Of Location (Designated As Pediatric Trauma Receiving Hospitals*)
Tier One Red, Orange, Yellow	• Committed to subspecialty pediatric care • Pediatric surgical service • Pediatric intensive care unit The following would be desired but may not be present at all Tier I hospitals • Pediatric emergency service • Comprehensive pediatric subspecialty support • Anesthesiology, neurosurgery, orthopaedic surgery with experience in management of children	Bronx: Bronx Lebanon Hospital-Concourse Children's Hospital at Montefiore Jacobi Medical Center* Lincoln Medical and Mental Health Center* Brooklyn: Brookdale University Medical Center* Brooklyn Hospital Center-Downtown Kings County Hospital Center* Long Island College Hospital Maimonides Medical Center New York Methodist Hospital SUNY Downstate Medical Center Manhattan: Bellevue Hospital Center* Beth Israel Medical Center Children's Hospital-New York Presbyterian* Harlem Hospital Center* Metropolitan Hospital Center Mount Sinai Medical Center Saint Luke's/Roosevelt-Roosevelt Site Saint Vincent's Medical Center-New York* Tisch Hospital-Langone Medical Center Weill Cornell-New York Presbyterian* Queens: Elmhurst Hospital Center* New York Hospital-Queens* Schneider Children's Hospital-LIJ* Staten Island: Richmond University Medical Center Staten Island University Hospital-North*
Tier Two Green	• Committed to general pediatric care • Pediatric surgical consultants • Pediatric resuscitation capable ED • Pediatric transfer agreement	Bronx: Montefiore Medical Center-North North Central Bronx Hospital Center Saint Barnabas Hospital* Brooklyn: Coney Island Hospital Center Lutheran Medical Center* Woodhull Hospital Center Manhattan: Saint Luke's/Roosevelt-Saint Luke's Site* Queens: Jamaica Hospital* Queens Hospital Center Staten Island: None

Note: The stated requirement for "Anesthesiology, neurosurgery, and orthopaedic surgery with experience in management of children" is not meant to imply need for pediatric board certification.
In addition, every attempt will be made to equally distribute pediatric patients among nearby PDRHs.

Rationale

Seriously ill or injured pediatric patients require treatment in facilities that are specifically designed, staffed, equipped, and available to meet their unique medical and surgical needs. This is especially true for Children with Special Health Care Needs (CSHCN), and Technologically Assisted Children (TAC). Detailed lists of the resources necessary to care for children with critical conditions have been developed by numerous professional organizations. Among these, institutional commitment to comprehensive specialty pediatric

care, comprehensive pediatric medical and surgical subspecialty support, a fully and appropriately staffed and equipped PICU, a Pediatric Emergency Service, a pediatric surgical service, and pediatric capable surgical subspecialty support (including anesthesiologists, neurosurgeons, and orthopaedic surgeons experienced in the management of surgical problems in children) are most important, although pediatric social services and child life programs are also important to the overall well being of the ill or injured child.

However, the key element cited by all such documents is the presence of a PICU staffed by pediatric medical and/or pediatric surgical intensivists and pediatric critical care nurses. Such units typically exist in hospitals that have made an institutional commitment to specialty pediatric care, including comprehensive pediatric subspecialty support (i.e. pediatric emergency medicine and pediatric surgery). The locations of hospitals with pediatric capabilities, mapped against pediatric population density and primary school density, are shown in **Appendix C, Figures C1-C4**. With few exceptions, hospitals with pediatric capabilities are located in strikingly close proximity to the pediatric population of New York City as a whole, making primary and secondary transport to such hospitals operationally feasible.

Recommendation 4: Establish a System for Pediatric Secondary Transport and Consultation

Recognizing the operational limitations of all currently existing and proposed pediatric disaster triage tools, the PDC Prehospital Field Triage Planning Committee recommends that formalized systems be developed to ensure that adequate pediatric ambulance resources are available for secondary transport of pediatric patients to PDRHs, including a Pediatric Coordinator officially authorized to assist with consultation regarding the need for secondary transport, and to catalogue available PDRH beds, to rapidly identify the appropriate ambulance destinations. The following assumptions underlie the creation of such systems:

- An adequate number of pediatric ambulances will be made available through a collaborative network consisting of all hospital-based and commercially contracted ambulance services that regularly provide pediatric inter-facility transport, to which critically ill or injured pediatric patients will have priority access.

- A reliable mechanism will be in place to catalogue the number of PICU and other inpatient beds available in PDRHs in New York City on a daily basis, to allow FDNY to efficiently organize pediatric ambulance transport within the 911 Emergency Response System.

- A Pediatric Coordinator will be officially authorized to assist the FDNY Office of Medical Affairs (OMA) in determining the need for pediatric secondary transport.

- The Pediatric Coordinator will be a Pediatric Intensivist at a Tier One PDRH not otherwise assigned to clinical duties.

Rationale

Any large scale event that results in an MCE involving pediatric patients will require multiple PICU beds. This would require FDNY Incident Command to have access to a centralized system of triage for PICU beds in New York City, which does not currently formally exist. Upon declaration of a disaster involving significant numbers of critically ill or injured pediatric patients, all PICUs in New York City would ideally close their units to transfers from outside their hospitals. Based on field priorities, FDNY would then attempt, whenever possible, to ensure primary transport of all seriously ill or injured pediatric patients to Tier One PDRHs and all other pediatric patients to Tier Two PDRH as defined under Recommendation 3, based upon field triage decisions made in accordance with the proposed Pediatric Triage Tool (defined under Recommendation 1), according to reports of available pediatric beds provided daily to FDNY.

However, both under-triage and change in patient condition may result in primary transport of seriously ill or injured pediatric patients to facilities less than ideally prepared to care for them. Should such patients require secondary transfer, mechanisms must be in place to ensure both timely identification of available PICU beds, and expert guidance as to whether inter-facility transfer is needed, and if so, what special resources may be required for such transfer. These mechanisms will necessitate a centralized process under the control of FDNY, based on preapproved inter-facility transfer criteria, as well as the input of one or more duly authorized and empowered senior Pediatric Intensivists from Tier One PDRHs in New York City. While overseeing a disaster, these intensivists will not overburdened with other clinical duties during the hours when they are on call to FDNY, and will have both intimate knowledge of, and direct linkages to, the regional PICU network and the regional EMS system.

Next Steps

Recommendations in this document will be modified based on input from City agencies, peers, and focus group participants‡. FDNY recently initiated the process of providing additional training in the "PedSTART" Triage Algorithm and expects that this training will have been completed in approximately six months. The PDC is currently surveying pediatric specialized transport resources in New York City. The New York Presbyterian Hospital Network (CHONY and KCCH), the North Shore/Long Island Jewish Health Care System (SCH/LIJ), and the Montefiore (CHAM) all currently deploy such specialized vehicles. The PDC plans also to determine the existence of other independent

services, as well as how many teams and how many vehicles would actually be available in a disaster. Agreements must be obtained from all tiered hospitals to participate in their proposed roles. Finally, development of reliable, redundant communications systems linking FDNY with PDRHs to identify the PICU beds available in the event of an MCE has recently been initiated. This will continue throughout the coming year, since it is recognized that without such reliable redundant communications systems, the recommendations contained within this document will be difficult if not impossible to fully implement.

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‡ A " Children in Disasters" Conference, sponsored by NYCDOHMH, had initially been planned for May of 2009, and scheduled to be held at Baruch College on May 20, 2009, at which participant feedback regarding these recommendations was to have been sought. However, the worldwide Novel Influenza A Virus H1N1 pandemic that struck New York City in the last week of April of 2009 forced postponement of this conference, at the time of this writing, until September 15, 2009. As such, interim feedback was sought from a broad based group of regional experts in pediatric critical care medicine, pediatric emergency medicine, and pediatric surgery, provided with this document in advance, at a special PDC-sponsored meeting organized by the New York Society of Pediatric Critical Care Medicine which was held on July 9, 2009.

APPENDIX A—CURRENTLY AVAILABLE MCE TRIAGE TOOLS

Why We Need Pediatric Mass Casualty Triage Tools

The methods we use every day to make medical triage decisions in the pre-hospital and in-hospital environments are primarily based on observations of physiology. Numerous such triage tools and scores have been developed to date derived from this premise. Assessment of respiratory function, circulatory function, and mental status are included in every triage decision. Patients who are able to maintain a compensated physiologic state are usually triaged at a lower priority level than those who have decompensated.

However, the physiology of children is different from that of adults. They have different physiologic strengths and vulnerabilities, as well as different injury patterns, due to their immature anatomy and unique mechanisms of injury. It therefore stands to reason that physiology-based triage tools must take into account the differences between adult and pediatric physiology, and the need for such pediatric-specific triage criteria has been previously demonstrated.[1,2] Thus, adults and children must be triaged based on age-appropriate guidelines. If this is true in daily practice, it is even more so in disasters.

How Pediatric Mass Casualty Triage Tools Address Pediatric Physiology

Table A1 lists some of the ways triage tools could be structured to account for pediatric physiology. Thresholds for vital signs must be appropriate for the wide ranges of normal found in children of different ages or stratified according to age groups. The parameters assessed must be quickly and accurately obtainable and commonly evaluated as a part of the normal medical practice of the providers performing triage. Two particular physiologic differences should be addressed.

Table A1. Triage tool modifications for children

Body system	*Vital pediatric differences*	*Needed changes to tools*
Airway	Airway is vulnerable to obstruction. Apnea due to obstruction may be reversible if caught quickly.	Prioritize airway opening maneuver(s)
Breathing	Normal respiratory rate range is higher	Alter respiratory rate thresholds
	Slow breathing is more ominous than tachypnea	Include low respiratory rate threshold
Circulation	Normal heart rate range is higher	Alter heart rate thresholds
	Vulnerable to cool environments	Capillary refill may be unreliable
	Difficult and time consuming to obtain accurate blood pressure	Don't use BP as an assessment parameter
	Heart dies after a period of anoxia. Circulation may be sustained for a brief time before the heart is irreversibly damaged	Check for circulation in an apneic child
Neuro	Ability to verbalize and obey commands varies with age	Use Best Motor Score
	Ability to ambulate is developmentally dependent	Don't use the ability to walk as the only determinant of nonurgent status

First, children usually die from primary respiratory causes rather than the circulatory causes usually seen in adults. Pediatric hearts often do not stop until they have been irreversibly damaged due to anoxia. Except when there is acute blood or fluid loss, circulatory collapse follows respiratory failure. Adult hearts,

by contrast, most often stop because of lack of circulation to the cardiac muscle. Respiratory arrest usually follows circulatory deterioration. Apnea in an adult is more often an endpoint, whereas a child with apnea has a good chance of having circulation restored if bolstered immediately by effective ventilation and adequate oxygenation.

Second, appropriate pediatric neurological responses are dependent both on age and on developmental status. If the abilities to ambulate, or follow commands, are the only neurological parameters specified by the triage tool, all very young children—and many older children with chronic disabilities and special health care needs—would be triaged to more critical categories simply because they were not judged by appropriate neurological standards. Although it is often better to over-triage than to undertriage, over-triage may result in children being subjected to stresses such as unnecessary treatments (vascular access procedures, spinal motion restriction) or terrifying separation from their guardians and loved ones. At least two studies of trauma triage algorithms, one adult, one pediatric, suggest that the Best Motor Response component of the Glasgow Coma Score and the Unresponsive component of the AVPU Score are valid reflections of severity of injury in pediatric trauma patients.[2,3] Because these elements of both scores can be easily applied to children, they may be the most appropriate measures of neurological status to use in a pediatric disaster triage tool.

Limitations of Currently Available Trauma and Mass Casualty Triage Tools

Numerous emergency medical service (EMS) systems in the United States use their daily triage protocols or adult-oriented Mass Casualty Triage tools to prioritize the care of children in disasters. Trauma triage protocols in daily use often utilize the Revised Trauma Score, Pediatric Trauma Score, mechanism of injury, or other elements to determine which children need to go to recognized trauma centers. These tools were not developed to be used in medical disasters, and presume that adequate resources are available to meet the needs of all patients, no matter how gravely injured. This is a faulty assumption in a true disaster, since most trauma triage protocols involve the use of checklists or scoresheets that create trauma triage scores based on measured vital signs. In a true disaster involving numerous injured patients, there is rarely time to obtain complete and accurate sets of vital signs for individual patients. As such, trauma triage scores that are designed to determine whether an individual patient may require care available only at a trauma center—even those trauma triage scores explicitly designed for children—do not lend themselves to the severe resource constraints faced by EMS personnel in a true disaster. To address such concerns in the adult population, several Mass Casualty Triage tools have been developed to date. Even so, few such tools make useful distinction between disasters that involve small numbers of casualties and those that involve large numbers.

For reasons stated above, the *Advanced Trauma Life Support®* Course of the American College of Surgeons makes a distinction between *multiple casualty incidents* (MCIs) and *mass casualty events* (MCEs).[4] In the former, EMS resources are strained, but not outstripped. A good example might be a motor vehicle crash involving five or more victims for whom care must be prioritized, but is most often available within minutes. In the latter, not only local EMS resources, but also regional EMS resources, are completely overwhelmed. In such circumstances, additional EMS resources may not be available for hours, or even days. As such, existing EMS resources must decide which patients will receive care first, and who must wait for care.

Such decisions may be among the most difficult EMS professionals will ever be called upon to make, especially when they involve children. Indeed, it is for this reason that mass casualty triage tools are of such great importance to EMS professionals in medical disasters—***they help EMS professionals make good decisions under bad circumstances.*** In actual practice, the terms "MCI" and "MCE" are erroneously used interchangeably in most EMS systems. However, while mass casualty triage tools may useful even in MCIs, where it may be somewhat more obvious which patients require priority care, they are absolutely indispensible in MCEs, when decisions must be made quickly, with a minimum of evidence, yet ideally with more than a modicum of accuracy.

Currently Available "Adult" Mass Casualty Triage Tools

START Triage

The most common adult-based mass casualty triage tool triage tool in use in the United States and in areas around the world is START, an acronym for ***S****imple* ***T****riage* ***A****nd* ***R****apid* ***T****reatment*, which as developed as a collaborative effort between staff at Hoag Hospital and the Long Beach Fire and Marine Department in Long Beach, California.[5] The tool assigns field triage categories based on the ability to walk, presence of spontaneous breathing and respiratory rate, palpable pulses or capillary refill, and the ability to obey commands. Reliance on the ability to walk and obey commands, and a respiratory rate threshold of 30 breaths per minute, make this tool suboptimal for use for pediatric patients, even in MCIs. For more information, go the START website at www.start-triage.com.

MASS Triage

The National Disaster Life Support (NDLS) Courses of the American Medical Association and the National Disaster Life Support Foundation—which include *Core Disaster Life Support* (CDLS), *Basic Disaster Life Support* (BDLS), and *Advanced*

Disaster Life Support (ADLS)—all address the concerns critical in MCEs, based on a two-step triage process.[6] In the first step, "MASS" triage is applied. "MASS" is an acronym that stands for ***M****ove*, ***A****ssess*, ***S****ort*, ***S****end*. To apply MASS triage in the field, the Incident Commander uses a megaphone or similar device to direct all patients within the sound of his or her voice to *Move* to a specified location, usually a staging area adjacent to the area of operations, for transport to a distant health care facility. Disaster victims who respond to this call have intact mentation, respiration, circulation, and ambulation; hence do not require immediate care. Once the scene has been declared safe, the Incident Commander then directs small teams of properly garbed EMS professionals to briefly *Assess* the remaining victims based on physiologic status, using a scientifically vetted triage tool (discussed below), while simultaneously providing the minimum acceptable care to address the patient's most immediate need, such as manual airway opening and/or external hemorrhage control. EMS professionals next *Sort* the victims based on both the acuity, and the severity, of their conditions, hence the urgency of the ongoing treatment needed – ***I****mmediate*, ***D****elayed*, ***M****inor*, or ***E****xpectant* ("IDME") – then *Send* them via an appropriate transport vehicle, either ambulance, multiple emergency response vehicle (MERV), ambulette, or bus, to the closest health care facility appropriate to provide adequate care. The "Sort" step is the step when triage actually occurs, and for purposes of simplicity and convention, the four steps are typically color-coded as follows: *Immediate* = red, *Delayed* = yellow, *Minor* = green, *Expectant* = black. In some EMS systems, a fifth triage category is added for patients who are obviously dead, and will still be color-coded black, in which case *Expectant* patients are color-coded blue.

Other adult-based MCE triage tools used around the world but not commonly utilized in the United States include the Triage Sieve (United Kingdom) and the Homebush Method (Australia), also called CareFlight Triage.[7,8]

Sacco Triage Method

The Sacco Triage Method (STM) is the only MCE triage tool currently available that is based on trauma patient outcome data. Named for its originator, William Sacco, PhD, a renowned mathematician with extensive background in trauma scoring, the STM was derived from analysis of retrospective data from several hundred thousand trauma patients of all ages reported to the Pennsylvania Trauma Outcome Study.[9,10] Scores derived from an RPM assessment range from 0-12, with the lower scores indicating the most critically injured and, ultimately, those with the lowest probability of survival. An age-specific STM is now under development.[11] Age adjustments are made after the RPM assessment. Infants and children gain 1-2 additional points and older patients lose 1-2 points. Traditional triage category color designations are not used. Instead, a proprietary software program dynamically analyzes and matches resources and

patient needs to formulate a transport plan that designates which category patients are transported, in what order, where they should go and by what transport means. As additional resources become available or are saturated, the analysis can be repeated and an adjusted transport plan composed. There are also "rule-based" versions of the STM that do not require communication from the scene or software. The Sacco Triage Method is gaining in acceptance in the United States, and is under scrutiny by agencies around the world. For more information, go to the Think Sharp website at http://www.sharpthinkers.com.

SALT Triage

Recently, under the auspices of the Federal Centers for Disease Control and Prevention (CDC), a work group was convened at the behest of several large EMS organizations across the nation to decide which of the available multicasualty triage tools was best suited to use in the field by EMS. This action is analogous to that which led to the development of a single national model Incident Command System for common use in the United States, which is now taught by the Department of Homeland Security (DHS) in all its Incident Command System (ICS) courses. Known as "SALT" triage, for ***S****ort*, ***A****ssess*, ***L****ife Saving Interventions*, including hemorrhage control, airway opening, chest decompression, as well as autoinjector antidote administration, and ***T****ransport*, this novel approach—which has not as yet been scientifically validated by EMS professionals in the field—seeks to combine the best features of all currently available triage tools, giving EMS professionals nationwide a single, standardized approach to field triage.[12] In fact, most triage tools currently in use already comport with the SALT paradigm, so there may be little need to retrain of large numbers of EMS professionals in what is in reality an accurate mnemonic for the steps of EMS disaster care.

Currently Available Pediatric Mass Casualty Triage Tools

JumpSTART Triage

The JumpSTART Pediatric MCI Triage Tool was developed by Lou Romig, MD, FAAP, FACEP, a pediatric emergency physician with field experience in EMS and disaster medicine at the Variety Children's Hospital in Miami, Florida.[13] Designed to follow the same template as the START triage tool, which the designers state is to be used for patients weighing more than 100 pounds, JumpSTART can be used for children from birth to adolescence. Dr. Romig recommends that patients appearing to be "young adults" be triaged with an adult tool such as START, and patients appearing to be less mature be triaged using JumpSTART. She avoids a strictly defined age cut-off because it is often difficult to accurately estimate the age of unconscious adolescent patients and

anticipates that most EMS providers would define a "young adult" as being in the mid-teens, where the physiologic transition to adulthood is accomplished.

Figure A1. The JumpSTART Pediatric MCI Triage Tool (used with permission)

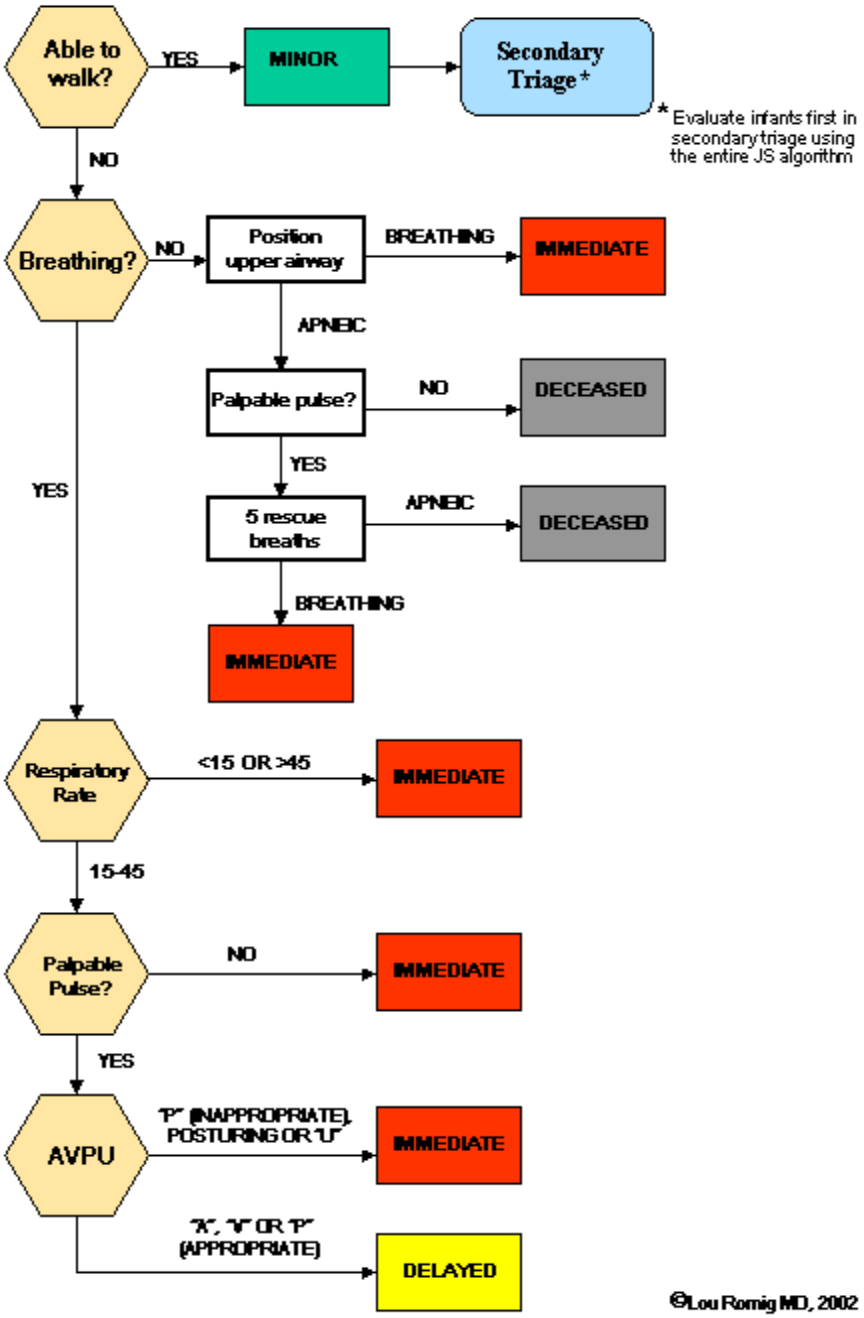


Figure A1 shows the JumpSTART algorithm. Pediatric patients are triaged into the conventional four color categories of Red (Immediate), Yellow (Delayed), Green (Minor) and Black (Deceased or Expectant). Triage designations are based

on an assessment of respirations, perfusion, and mentation (RPM) that should take up to 30 seconds to perform. Triage begins by directing all ambulatory victims to move to a designated site for further evaluation. As with START, all patients who can walk are initially tagged or otherwise designated in the Green category. Note that children may be carried into the Green triage area by other ambulatory victims. These children must be triaged individually in the Green area as quickly as possible using JumpSTART because they have not proven their physiologic stability by walking.

Nonambulatory victims remaining in place are triaged by responders as they come to them. The next step in both the JumpSTART and START algorithms is to assess the patient for spontaneous respirations. The upper airway is positioned by the triage provider if the patient is apneic. Per START, adults who remain apneic after upper airway opening are tagged Black without a pulse check. In JumpSTART, children who remain apneic are quickly checked for the presence of a pulse because they may be in the brief stage where they still have detectable circulation. Children without a detectable pulse are tagged Black. Apneic children with a pulse receive five rescue breaths via a barrier device (or a bag-valve-mask device, if available) as a lower airway opening maneuver. The five breath ventilatory trial/lower airway opening maneuver is the "jumpstart" part of the triage tool. Some systems have chosen to waive the pulse check and give a "jumpstart" to all apneic children. Patients who begin to breathe spontaneously with the ventilatory trial are tagged Red. The triage provider moves on to the next patient without stopping to provide treatment. In some systems, triage providers carry oral airways and may use them on these "Red" patients to try to maintain an airway without active support. Patients who remain apneic after both upper and lower airway opening are tagged Black, as it is unlikely they will be able to continue to generate adequate circulation without ventilatory support. In small incidents with additional resources becoming quickly available such support may be possible. In large incidents or those with scant resources it will not. These patients, although not yet dead, are not expected to survive under the resource constraints of a disaster.

Children breathing at a rate of 15-45 breaths per minute are then assessed for perfusion. Those breathing faster than 45 or slower than 15 breaths per minute are tagged Red and not assessed further by the triage provider. The adult threshold for "Red" designation is 30 breaths per minute. Therefore, the combined JumpSTART/START respiratory rate thresholds are 15-30-45, easy-to-remember multiples of 15.

Children with acceptable respiratory rates are assessed for the presence of a pulse. Although a peripheral pulse is preferable, responders should assess whatever pulse they are most confident in assessing. Children with no palpable

pulse or a weak pulse are tagged Red and the provider moves on, pausing only to quickly attempt to control active bleeding. Mental status is assessed next in those patients with good pulses.

AVPU is the gauge of mental status used by JumpSTART. Children who have adequate respiratory rates, good pulses, and who are either Alert, responsive to Verbal stimulus, or who respond appropriately to Pain with a localizing response are tagged Yellow. Those who have good respirations and perfusion, but who have an inappropriate generalized response to Pain, who are posturing, or who are truly Unresponsive, are tagged Red. Note that the threshold of appropriate vs. inappropriate response to pain corresponds to a break between levels 4 and 5 in the Motor Response portion of the Glasgow Coma Score. Children who ordinarily cannot walk because of age, developmental delay, or disability are addressed using a modification of the JumpSTART algorithm. Such "normally- nonambulatory" children who meet Yellow criteria are quickly scanned for external signs of significant injury such as significant burns or tissue avulsions/amputations, penetrating injuries, or abdominal distention. Those with these signs remain tagged Yellow. Those without external signs of significant injury are tagged Green, even though they cannot walk.

JumpSTART is in wide use throughout North America and is taught in many areas internationally. In 2006 it was recommended by a national advisory committee for adoption throughout Israel.[14] JumpSTART has also been adopted by numerous hospitals for use in their Emergency Departments when disasters result in large numbers of incoming victims not already triaged on scene by EMS. A modified version of JumpSTART has also been developed for use by rescue personnel working in a Search ad Rescue area where the ability to access and apply bag-valve-mask (BVM) devices may be limited.[15] For more information, go the START website at www.jumpstarttriage.com.

Israeli Pediatric MCE Triage

Prior to the recommendation for use of JumpSTART, another system had been proposed, and was in wide use, throughout Israel for MCE triage of pediatric patients. Described by Mor and Waisman in 2002, this method closely follows the START Triage method previously described for adults, but simplifies it for more rapid application in the field.[16] However, as with START itself, it makes no special provision for ventilatory support of ill or injured children, ignoring their greater propensity of children to deteriorate from respiratory embarrassment.

Figure A2. Israeli Pediatric MCE Triage Tool (used with permission)

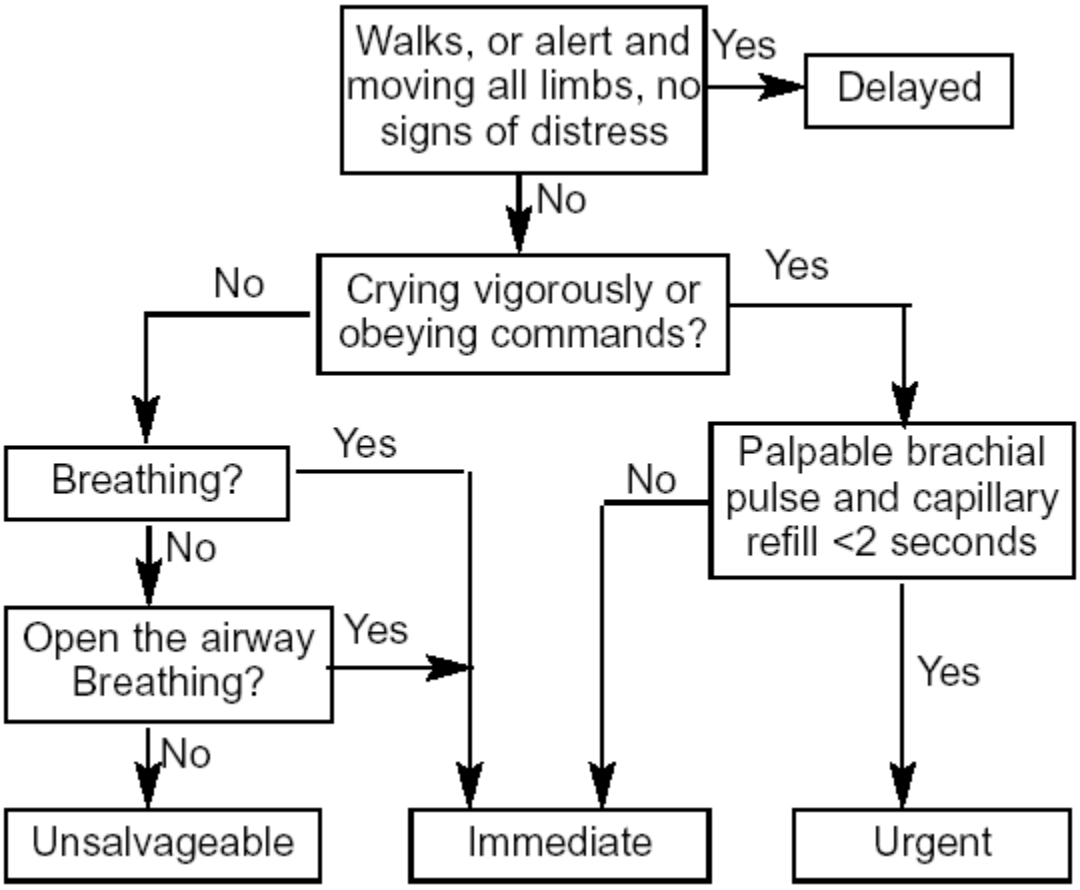


Figure A2 depicts the previously recommended Israeli Pediatric MCE Triage Algorithm. As with START, children with no signs of distress who can walk, or are alert and can move all limbs, receive what is termed "delayed" treatment, but within the context of the nearly universally recognized Red (Immediate)-Yellow (Delayed)-Green (Minor)-Black (Expectant or Dead) acuity-severity color scheme, this category refers to patients with minor injuries. Patients who do not fall into this category are then divided into two groups, dependent upon their ability to cry vigorously (infants and young children) or obey commands (older children and adolescents). Those who cry or follow commands are provided with Immediate care if the brachial pulse (infants or young children) is not palpable and capillary refill time is more than 2 seconds, and with "Urgent" (Delayed) care if the brachial pulse is palpable and capillary refill time is less than 2 seconds, while those who do not cry vigorously or follow commands are briefly checked to determine if they are breathing. Those who are observed to breathe, either spontaneously or upon airway opening, are categorized to receive Immediate care at the scene and in transport, while those who do not breathe even upon airway opening are categorized as "Unsalvageable" (Expectant or

Dead). Note that provision is made in this algorithm to provide rescue breaths at the scene to patients who do not breathe despite airway opening, either via a barrier device or a bag-valve-mask device, and they do not undergo transport.

Smart Tape

The Smart Tape™, designed and distributed by TSG Associates in Great Britain, is in use in New York, Connecticut, Massachusetts, Illinois and North Carolina, as well as other locations around the world.[17] This device is also referred to as the Pediatric Triage Tape (PTT). This length-based tool defines the standard triage categories based on an MRP or RPM (Mobility/Motor, Respiratory, Perfusion/Pulse) assessment, with age-adjusted parameters in four length/age groups. The three "true" pediatric groups are: 1) 50-80 cm/3-10 kg, 2) 80-100 cm/11-18 kg, and 3) 100-140 cm/19-32 kg. The fourth group, treated based on adult protocols, is: >140 cm/>32 kg. Each compartment length/age section has a triage algorithm with vital signs corrected for age 10.

The triage approach is divided into three assessments: 1) mental status and walking; 2) breathing; and 3) circulation, including capillary refill and heart rate. The first decision point is based on mental status and mobility. If the child is alert and moving all limbs or walking they are triaged to a low priority (Green). If not, the tape is opened and the assessment of breathing is performed. The second decision point is based on breathing. If the child is not breathing, the airway is opened. If the child is still not breathing, the child is considered deceased (Black). If the child begins to breathe after the airway is opened, the child is considered highest priority (Red). If the child is breathing, the respiratory rate is counted. The "normal" pediatric respiratory rates based on length/age are: 1) 3-10 kg – 20-50 breaths per minute; 2) 11-18 kg – 15-40 breaths per minute; and 3) 19-32 kg – 10-30 breaths per minute. Over 32 kg, children are assessed based on adult norms. If the respiratory rate is above or below normal bounds for age, the child is given the highest priority (Red). If the rate is within the normal bounds, capillary refill (forehead or chest) or pulse rate is assessed.

If the capillary refill is > 2 seconds, the child is given a middle level priority (Yellow). If the capillary refill is < 2 seconds, the pulse rate is assessed. The "normal" pediatric pulse rates based on length/age are: 1) 3-10 kg – 90-180 beats per minute; 2) 11-18 kg – 80-160 beats per minute; and 3) 19-32 kg 70-140 beats per minute. Over 32 kg, children are again assessed based on adult norms. If the pulse rate is above or below normal bounds for age, the child is given the highest priority (Red). If the rate is within the normal bounds, the child is assigned a middle priority (Yellow). Thus, the third decision point is based on circulation.

The Pediatric Triage Tape has been validated against standard trauma scoring in an emergency department setting.[18,19] Three thousand four hundred sixty one children presenting to a children's hospital in Cape Town over a nine month period were triaged using the Pediatric Triage Tape. The Pediatric Triage Tape category was compared to the Injury Severity Score (ISS), the New Injury Severity Score (NISS), and the pediatric intervention score developed by Garner. Compared to an ISS > 15 the Pediatric Triage Tape had a sensitivity of 37.8%, specificity of 98.6%, overtriage rate of 38.8%, and an undertriage rate of 3.5%. The performance was similar comparing to the NISS and Garner criteria. Thus, while the Pediatric Triage Tape has a low sensitivity at identifying immediate priority children by these criteria, the specificity (identify non high priority patients) is excellent. The overtriage and undertriage rates are within the range deemed unavoidable by the American College of Surgeons.[20] Additional information can be obtained from the TSG Associates website at http://www.tsgassociates.co.uk.

Further Limitations of Currently Available Mass Casualty Triage Tools

Because of the infrequent need to use disaster triage and the difficulty of collecting accurate data in disasters, none of the existing triage tools have been clinically validated in the disaster setting. Several small studies based on drill data and simulations have suggested that START and START-like tools such as JumpSTART lack sufficient sensitivity, specificity and inter-rater reliability to yield significant advantage. Research is needed to determine if any of the tools currently in use are clinically valid and reliable. Triage is a dynamic process because patient conditions and needs change over time. Most triage tools are meant to be used only in primary triage, as a gross sorting mechanism in the field or outside the hospital. Subsequent patient and resource assessments may result in up- or down-triaging of patients at any time. The "Secondary Assessment of Victim Endpoint" or "SAVE" method is the only standardized tool available to direct triage after more detailed secondary assessments of disaster patients have been made on-scene or at other points of care.[4] However, SAVE has also not been clinically validated.

Finally, the currently used MCI triage tools were developed chiefly to prioritize the care of victims with conventional trauma. They are likely not adequate for use for patients of any age with potentially more diverse and complex medical conditions. Triage tools for mass casualty incidents involving catastrophic medical disasters and complex humanitarian emergencies such as Hurricane Katrina, pandemic influenza, industrial disasters, and the deployment of weapons of a chemical, biological, radiological, or nuclear nature must still be developed, especially for pediatric patients, but progress is now being made.[21,22]

APPENDIX B Mass Casualty Triage Tools Utilized or Proposed by FDNY

Figure B1. The START MCI Triage Algorithm (used with permission)

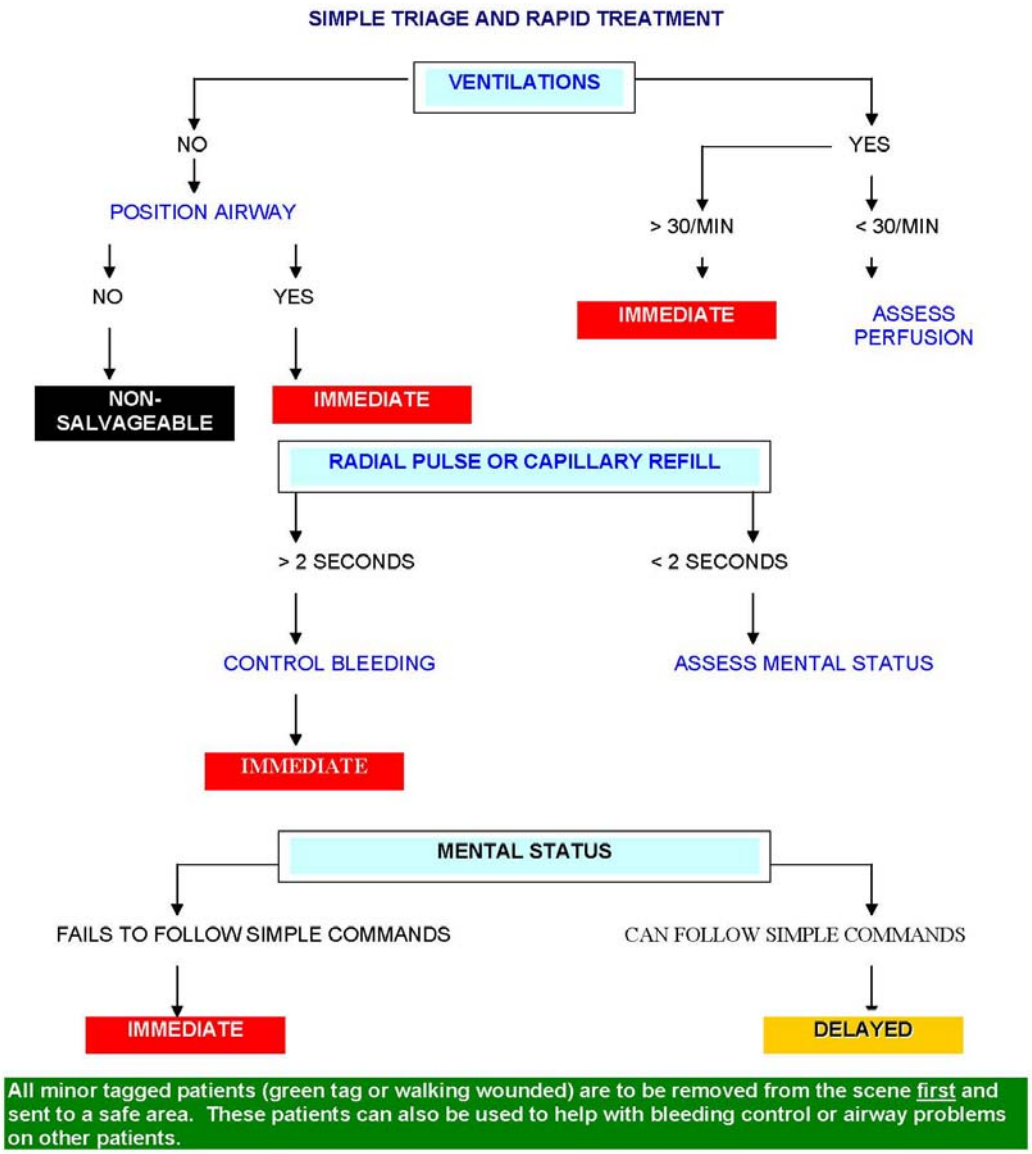
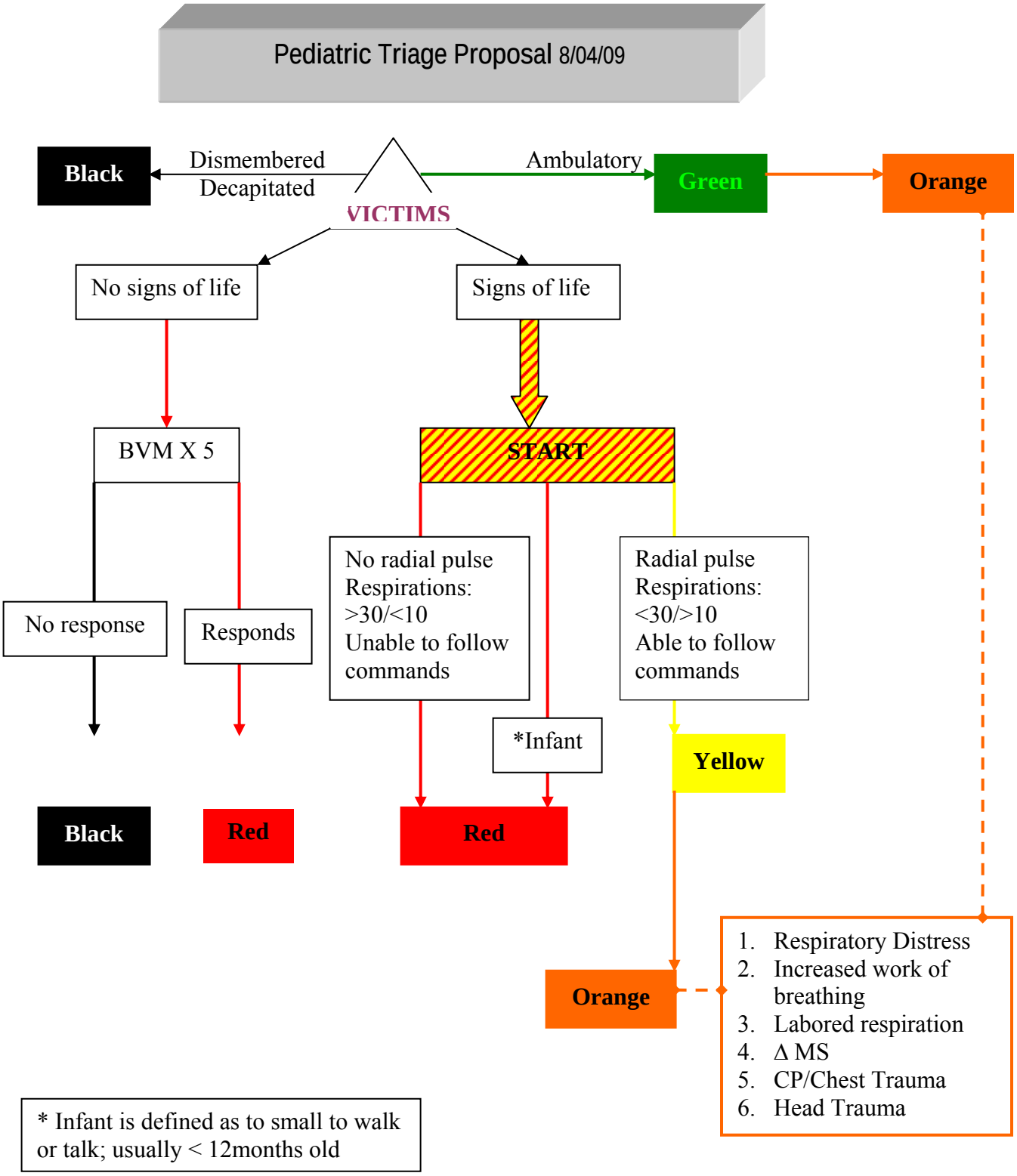
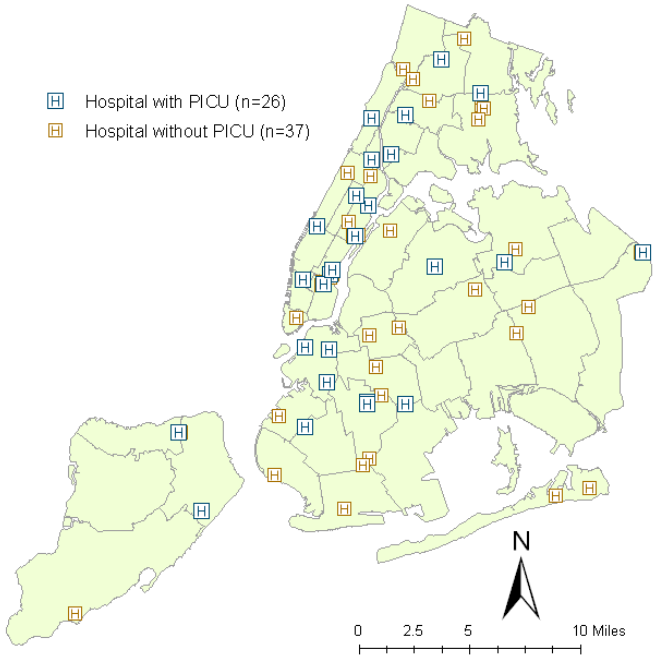


Figure B2. The START MCE Triage Algorithm (modified for pediatric patients)



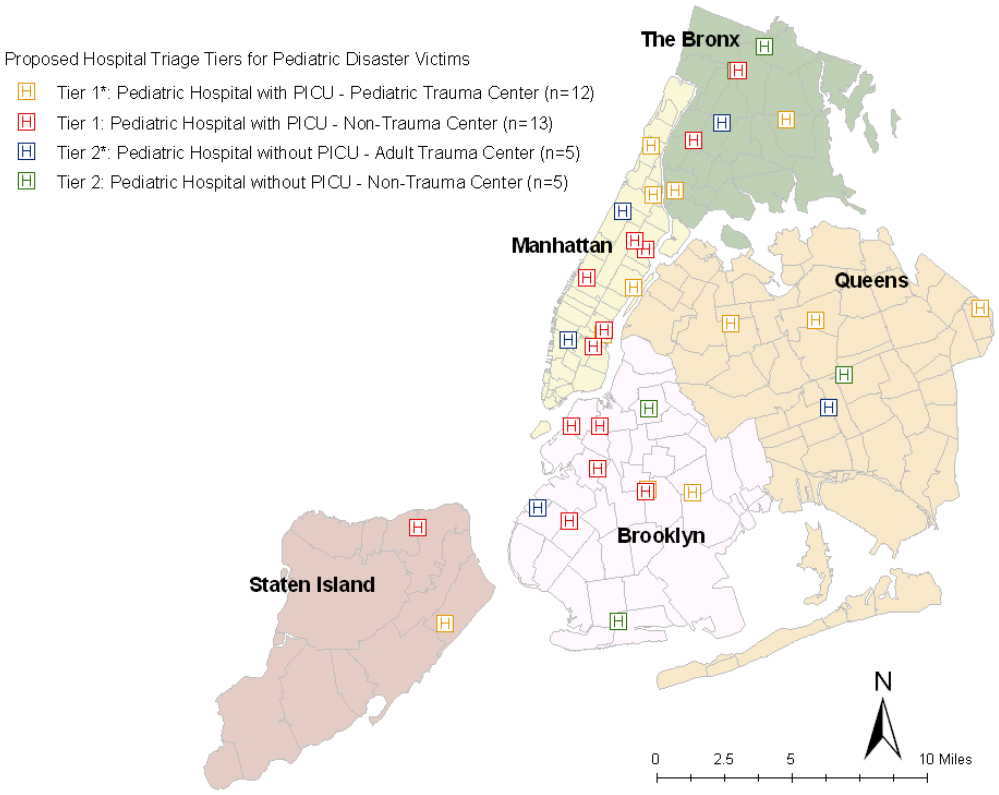
APPENDIX C—MAPS SHOWING PEDIATRIC HOSPITAL TIERS

Figure C1. New York City hospitals (n = 63)



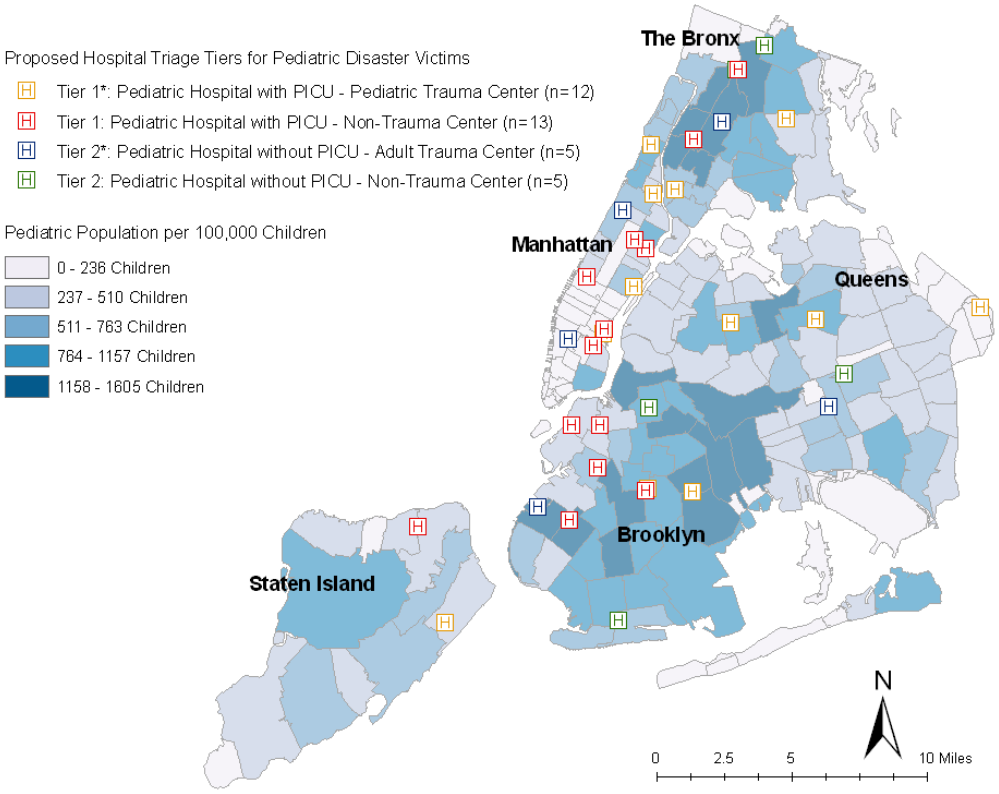
Source: Dana Meranus, NYCDOHMH, April 2009.

Figure C2. Proposed hospital triage tiers for pediatric disaster victims



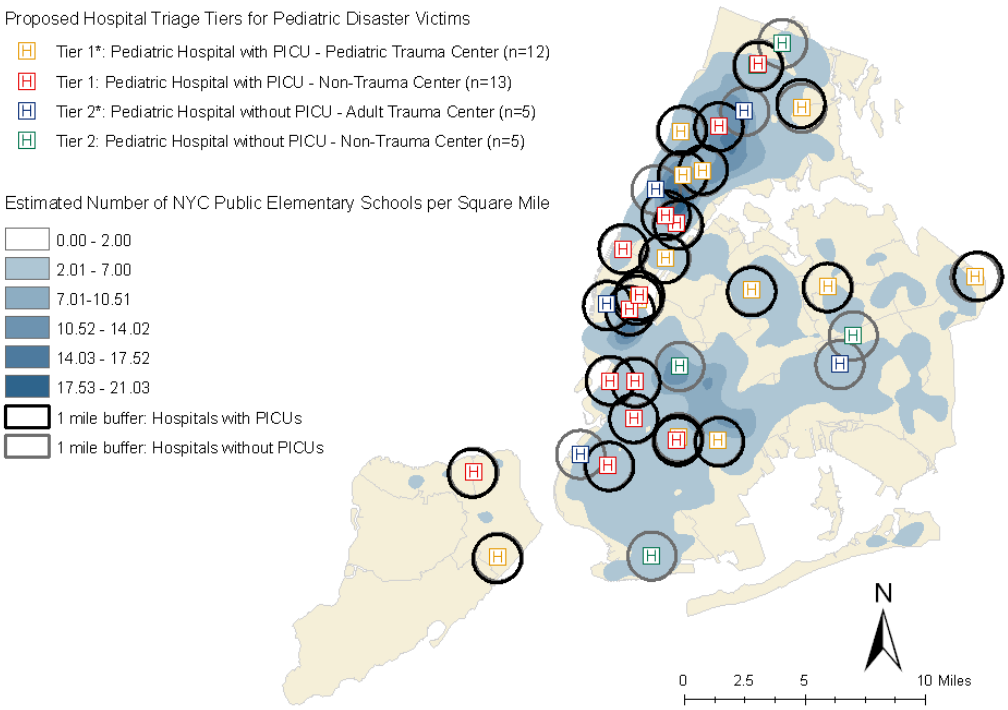
Source: Dana Meranus, NYCDOHMH, April 2009.

Figure C3. Proposed hospital triage tiers for pediatric disaster victims mapped against pediatric population density



Source: Dana Meranus, NYCDOHMH, April 2009.

Figure C4. Proposed hospital triage tiers for pediatric disaster victims mapped against primary school density



Source: Dana Meranus, NYCDOHMH, April 2009.

APPENDIX D – PEDIATRIC DISASTER COALITION MEMBERS

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ACRONYMS

ALS Advanced Life Support
BLS Basic Life Support
CBPP Centers for Bioterrorism Preparedness Planning
CBRNE Chemical, Biological, Radiological, Nuclear, and Explosive
CCP Casualty Collection Point
CFR Certified First Responder
CHAM Children's Hospital at Montefiore
CHONY Morgan Stanley Children's Hospital of New York Presbyterian
CIMS City Incident Management System
CPEM Center for Pediatric Emergency Medicine
CSHCN Children with Special Health Care Needs
CUMC Columbia University Medical Center
ESF Emergency Support Function
EMS Emergency Medical Services
FDNY Fire Department of New York
GNYHA Greater New York Hospital Association
HazMat Hazardous Materials
HICS Hospital Incident Command System
IMS Incident Management System
KCCH Komansky Center for Children's Health
MCE Mass Casualty Event
MCI Mass Casualty Incident
NIMS National Incident Management System
NRF National Response Framework
NYCDOHMH New York City Department of Health and Mental Hygiene
NYCHHC New York City Health and Hospitals Corporation
NYPH New York Presbyterian Hospital
NYSDOH New York State Department of Health
OEM New York City Office of Emergency Management
OMA Office of Medical Affairs
PCC Pediatric Critical Care
PDC Pediatric Disaster Coalition
PDRH Pediatric Disaster Receiving Hospitals
PICU Pediatric Intensive Care Unit
PPE Personal Protective Equipment
REMAC Regional Emergency Medical Advisory Committee of New York City
REMSCO Regional Emergency Medical Services Council of New York City
RFP Request for Proposal
RPM Respirations/Pulse/Motor response
RTAC the Regional Trauma Advisory Committee of New York City
SAR Search and Rescue
SCH/LIJ Schneider Children's Hospital of the North Shore LIJ Health System
SUNY State University of New York
TAC Technologically Assisted Children
WCMC the Weill Cornell Medical Center