Medical Care of Children in Disasters
Ready or Not, Here They Come!

Yale New Haven International Congress
Disaster Medicine and Emergency Management

New Haven, Connecticut
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Columbia University/Harlem Hospital

Most Pediatric Disasters Are Disasters Involving Physical Trauma And Burns

- 12/14 reports of disasters affecting children published to date in the English language pediatric literature involve physical trauma and burn related injuries
  - 5 bomb blasts
  - 2 earthquakes
  - 1 airplane crash
  - 1 bus crash
  - 1 dynamite blast
  - 1 hurricane
  - 1 lightning strike

Lightning-Strike Disaster Among Children

Myers GJ, Colgan MT, VanDyke DH: *JAMA* 1977;238:1045-1046

- 47 children and counselors aged 3-21 years involved in lightning strike while standing under trees after exiting a swimming pool near Rochester, New York on 7/25/75
- 16 children knocked to ground, emergency assistance within minutes
- 15 children taken to emergency department, 4 admitted, 1 died
- Four cases demonstrate common and serious pathology
  - 14 year old girl who sustained cardiopulmonary arrest → died
  - 7 year old girl sustained traumatic brain injury → persistent vegetative state
  - 15 year old girl sustained severe burns and transient paraparesis → recovered
  - 10 year old boy sustained minor burns → recovered

Blast Trauma in a Child

Knapp JF, Sharp RJ, Beatty R, et al: *Ped Emerg Care* 1990;6:122-126

- 4 year old boy injured in the explosion of an illegal firecracker equivalent to one third of a stick of dynamite
- Force of the blast broke all the kitchen windows, collapsed the ceiling, and blew the front porch off the house
- Paramedics found the child in the rubble, unconscious but breathing, died within hours in neurosurgical operating room
- Presented in respiratory failure, decompensated shock, and traumatic coma with numerous life threatening injuries
  - Deformity and tissue loss of the left side of the head and face
  - Massive, extensive, irreparable brain injuries, massive cerebral edema
  - Deep laceration of left neck, large avulsion of skin over left shoulder
  - Left pulmonary contusion, small intestinal contusion
  - Traumatic amputation of left forearm and tips of toes of left foot
  - Multiple avulsions, lacerations, contusions of skin, including scrotum

The Avianca Plane Crash: Emergency Medical System Response to Pediatric Survivors of the Disaster

van Amerongen RH, Fine JS, Tunik MG, et al: *Pediatrics* 1993;92:105-110

- 22 of 25 children (80%) survived jetliner crash in Nassau County, New York on 1/25/90 vs. 70 of 132 adults (52%); 3 children died
  - 3 month old boy with intracranial bleeding and aortic rupture
  - 5 year old boy with massive hemothorax
  - 7 year old boy with severe traumatic brain injury
- 7 of 22 children sustained high risk injuries
  - 6 with traumatic brain injury
  - 5 with hypotensive shock
  - 3 with femur fractures with hypotensive shock or traumatic brain injury
- Pediatric patients were inadequately triaged and transported
  - Of 7 children with PTS $\leq$ 8, only 1 was taken to a Level I Pediatric Center
  - Of 5 high risk children initially taken to a Level III Pediatric Center, only 2 were subsequently transported to a higher level Pediatric Center
  - 2 high risk patients and 1 low risk patient transported by helicopter
- State, regional, and county disaster plans did not address pediatrics

A Review of the Management of a Major Incident Involving Predominantly Pediatric Casualties

Wass AR, Williams MJ, Gibson MF: *Injury* 1994;25:371-374

- 40 of 42 casualties taken to a local emergency department following a double decker bus crash on 9/27/93 were children
- “Prenotification” was provided just as the first victims arrived
- Hospital disaster plan was immediately implemented
- 38 of 42 patients had ISS < 11, 39 of 42 patients had ISS < 16
- Most had soft tissue injuries/lacerations to head & face/upper & lower limbs, some had fractures of upper limb > lower limb > head & face
- 4 had serious head injuries, 2 required neurosurgical intervention

Hurricane Andrew and a Pediatric Emergency Department

Quinn B, Baker R, Pratt J, et al: *Ann Emerg Med* 1994;23:737-741

- 1,389 patients treated in the Miami Children's Hospital emergency department during the first week after Hurricane Andrew struck south Florida 8/15/92 vs. 987 the week before (41% increase)
- 1,004 patients treated during the second week (no increase)
- Diagnoses were significantly different during the first week
  - AGE, impetigo, open wounds seen more often
  - GU problems, abdominal pain, ST injuries seen less often
- Diagnoses were significantly different during the second week
  - Dermatologic problems, cellulitis, injuries, open wounds seen more often
  - Respiratory problems including URIs seen less often
- Trend toward increased number of hydrocarbon or bleach poisonings
- Trend toward decreased number of psychiatric complaints

The Spectrum of Pediatric Injuries After a Bomb Blast

Quintana DA, Jordan JB, Tuggle DW, et al: *J Pediatr Surg* 1997;32:307-311

- 66 of 816 casualties of the Alfred P. Murrah Federal Building bombing in Oklahoma City, Oklahoma on 4/19/95 were children
- 20 children were seated by window in day care center
- 19 children injured in bombing died, 16 in day care center
  - 90% had skull fractures, most with skull capping
  - Associated injuries: 37% trunk, 31% amputations, 47% arm fractures, 26% leg fractures, 21% burns, 100% soft tissue injuries
- 47 children injured in bombing survived
  - 15% required hospitalization
  - Documented injuries: 2 open depressed skull fractures with partially extruded brain, 2 closed head injuries, 3 arm fractures, 1 leg fracture, 1 arterial injury, 1 splenic injury, 5 tympanic membrane perforations, 4 burns (1 burn > 40% TBSA)

Analysis of 33 Pediatric Victims in the 1999 Marmara, Turkey Earthquake

Iskit SH, Alpay H, Tugtepe H, et al: *J Pediatr Surg* 2001;36:368-372

- Retrospective review of the medical records of 33 children 14 days-16 years old who reached the hospital alive
- All but 3 cases were evacuated from under the debris of collapsed buildings after a mean 30±6 hr (range, 1-110 hr)
- 78% reached the hospital within 3 days
- 15 (45%) had crush injuries, of whom 10 (67%) had ARF
- 18 (55%) had other injuries, mostly soft tissue and CNS injuries, as well as extremity, spine, and pelvic fractures
- No correlation between crush syndrome and time under rubble, time before admission, number of crushed limbs

Pediatric Surgical Emergencies in the Setting of a Natural Disaster: Experiences from the 2001 Earthquake in Gujarat, India

Jain V, Noponen R, Smith BM, et al: *J Pediatr Surg* 2003;38:663-667

- 1,142/12,634 (9%) of patients at field hospital were admitted
- ~300/1,142 (~25%) of admitted patients were ≤ 17 years old
- 62 (~20%) underwent surgery for various conditions
  - 26 (42%) orthopaedic trauma
  - 26 (42%) soft tissue trauma
  - 6 (10%) burn injuries
  - 4 (6%) miscellaneous injuries
- Even distribution of operations by age (0-5, 6-12, 13-17 years)
- Orthopaedic and soft tissue operations predominated early on
- Soft tissue and burn operations predominated later on

The Day The World Changed

Issues in Children's Hospital Disaster Preparedness

Freishtat RJ, Wright JL, Holbrook PR: *Clin Pediatr Emerg Med* 2002;3:224-230

- Describes the first person recollections and reflections of the Children's National Medical Center medical director on 9/11/01
- "The disasters occurred and the [disaster] plan was invoked. More than 50 children were discharged from inpatient services. All non-urgent activities ceased and dozens of [staff] stood by."
- "What if the plane had hit the day care center? Were we *really* ready for 100 critically injured children ? Were we ready for radiation injuries? What would we do if the emergency department became contaminated?"
- "All our news came from television . . . . Our best medical information came from our own dedicated radio system. How do you communicate and who do you believe?"

Epidemiology of Terror-Related vs. Non-Terror Related Traumatic Injury in Children

Aharonson-Daniel L, Waisman Y, Dannan YL, et al: *Pediatrics* 2003;112:e280

- 138 of 8,501 children <15 yr in Israeli National Trauma Registry were admitted for terror-related vs. non-terror-related injuries
  - Mean age: 12.3 yr terror vs. 6.9 yr non-terror
  - Body region: 0.5x fewer TBI, 2.5x greater other head and body injuries
- Terror-related injuries more severe, needed more acute care
  - Internal truncal injuries: 11% terror vs. 4% non-terror
  - Open head wounds: 13% terror vs. 6% non-terror
  - Critical injuries (ISS ≥25): 25% terror vs. 3% non-terror
  - Use of ICU: 33% terror vs. 8% non-terror
  - LOS: 5 days terror vs. 2 days non-terror
  - Need for rehabilitation: 17% terror vs. 1% non-terror

The Impact of Terrorism on Children: A Two-Year Experience

Waisman Y, Aharonson-Daniel L, Mor M, et al: *Prehosp Disast Med* 2003;18:242-248

- 41 MCEs involving children in Israel from 9/00 through 12/02
- Average 32 BLS, 9 ALS units; 93 EMT-Bs, 19 EMT-Ps, 8 MDs
- First responders, volunteer off duty professionals also helped
- "Scoop and run" on scene field management approach
- Evacuation time: 5-10 min, urban; 10-20 min, rural
- Victims were evacuated to multiple facilities in most cases
  - Most injuries caused by blasts and penetrations by foreign objects
  - Two thirds of children had multiple injuries
  - High proportion of critical to fatal injuries
  - Higher rate of surgical interventions than nonterror injuries
  - Longer hospital stays than nonterror injuries
  - Greater need for rehabilitation than nonterror injuries

The Special Injury Pattern in Terrorist Bombings

Kluger Y, Peleg K, Daniel-Aharonson L, et al: *JACS* 2004;199:875-879

- Review of Israeli National Trauma Registry from 10/00 to 6/03
- 906 of 16,438 (1.6%) of injuries (all patients) were terror-related
- 62 of 16,438 (0.4%) of injuries (ped patients) were terror-related
- Terror injuries 3x (61% vs. 23%) more often multiple
- Terror injuries 3x (29% vs. 10%) more often severe (ISS >15)
- Terror injuries 3x (6% vs. 2%) more often lethal
- Terror injuries 4x (26% vs. 7%) more often needed ICU care
- Terror injuries 5x more often required surgical intervention

Five Likely Bomb Threats

VADM Richard H. Carmona, MD, MPH, FACS, United States Surgeon General

- Single 1-5 kg confined space bomb
  - Bus, shop, disco, fast food restaurant
- Single 100 kg TNT-equivalent car bomb
- Many synchronized bombs – simultaneous, sequential
  - Multiple 5 kg bombs aboard subways and trains
  - Several large 100-500 kg car and truck bombs
  - Mixed adulterants using firebomb or CBRN
  - Inside 100 office buildings across the United States
- Ambulance truck bomb collapses a hospital
- Tanker ship explosion consumes a city

Planning for Pediatric Blast Trauma

- Primary blast injury
  - Caused by blast wave
  - Ears, lungs, intestines
- Secondary blast injury
  - Caused by flying debris
  - Penetrating body injuries
- Tertiary blast injury
  - Caused by victim impact
  - Blunt head injuries
- Quaternary blast injury
  - Caused by secondary events
  - Inhalations, burns, crushes

Blast Physics 101

- Stage 1
  - Detonation (μsec)
  - “One tenth of the blink of an eye”
- Stage 2
  - Fireball → air shock wave (msec)
  - High pressure, low temp → low pressure, high temp

Planning for Pediatric Blast Trauma

- Pediatric injuries are to be expected following blast trauma, with most children injured in closed or confined, rather than open, spaces, greatly increasing the magnitude of forces of injury
- As with adult blast terror injuries, most patients will either die at the scene, or sustain minor injuries, leaving only a small number in the “penumbra” of the blast wave who will sustain major injuries and survive to require hospital care, but who typically will not begin to arrive at the trauma center until some 30-60 minutes after the terror event
- Most survivors with major injuries will require early operation and subsequent care in a pediatric critical care unit, followed by lengthy hospitalization and rehabilitation, both physical and psychological

Mitigation of Pediatric Blast Trauma

- In contrast to military ordnance, environment rather than shrapnel determines the pattern of injury
  - Open air: 70% of fatalities die at the scene; 10% of survivors die, 20% are admitted, 70% are treated & released
    - Rescue is straightforward
    - Nails cause occult injuries out to 100 m – x-ray every scratch
  - Closed space: 80% of fatalities die at the scene; 20% of survivors die, 20% are admitted, 60% are treated & released
    - Rescue is straightforward with buses, but complicated with trains
    - Blast lung is a serious problem – mortality exceeds 70%
  - Building collapse: 90% of fatalities die at the scene; 30% of survivors die, 5% are admitted, 65% are treated & released
    - Rescue is complicated, so consider buddy and passerby rescue
    - Crush, blunt, penetrating, and burn injuries predominate

Mitigation of Pediatric Blast Trauma

- The approximate number and likely destination of casualties can be predicted
  - Half arrive during the first 60 min
  - Half go to the closest 3 hospitals
  - Half go to other hospitals
- Surge capability depends upon the rate limiting step for maximum victim throughput
  - Numbers of ORs & RNs, and ICU beds & RNs, determine hospital capability to care for critically ill patients
  - Numbers of x-ray machines & x-ray technologists determine hospital capability to care for all other patients
  - Regional hospital capacity for blast trauma is likely adequate in most areas unless a regional resource trauma center is a primary or secondary target

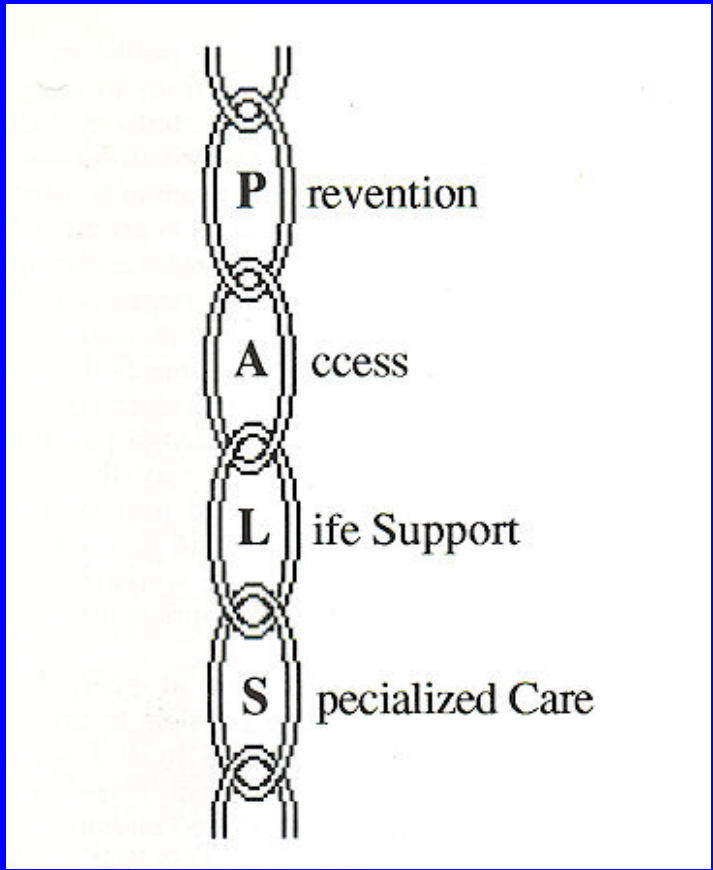
Early Care of Pediatric Blast Trauma

- Airway
  - Recovery position for blast facial trauma not involving spine
- Breathing
  - Needle decompression for blast lung causing tension ptx
- Circulation
  - Tourniquets for active bleeding from traumatic amputations
  - Critosan, QuikClot for active bleeding from soft tissues
  - Hypotensive resuscitation to SBP 60 + 2x age in yr
  - Damage control laparotomy/thoracotomy for hemorrhage
  - Completion amputations for unsalvageable mangled limbs
  - Fasciotomy/escharotomy to avoid compartment syndromes
  - Active/passive rewarming to avoid coagulopathies
  - Fresh whole blood for treatment of coagulopathies
  - Recombinant factor VIIa for treatment of coagulopathies
  - Judicious use of crystalloid in combined blast lung/major burns

Late Care of Pediatric Blast Trauma

- Compartment syndrome despite fasciotomy
  - Often develops during aeromedical transport
- Wound management
  - Many closed wounds must be reopened
- Tertiary survey
  - Should be performed by different team
- Vascular surgery
  - Intimal tears caused by shock wave
- Documentation
  - Essential for subsequent echelons of care
- Feedback
  - All providers must learn of outcome

Pediatric Chain of Survival



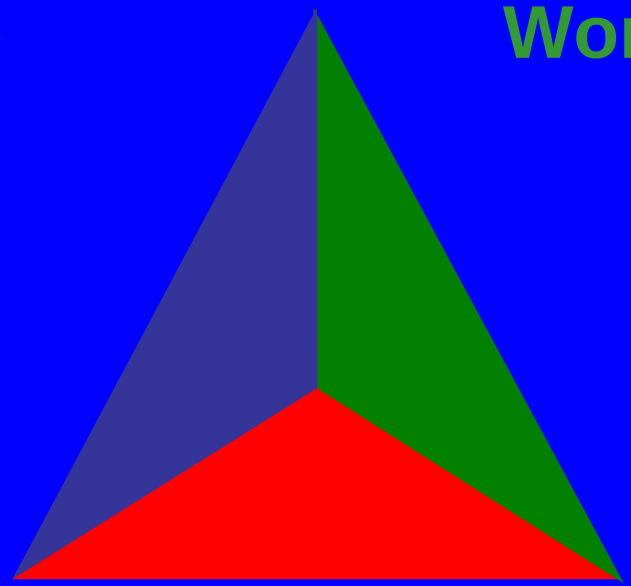
Pediatric Assessment Triangle

Appearance

- alertness
- distractibility
- consolability
- eye contact
- quality of cry
- spontaneous movement

Work of Breathing

- retractions
- flaring
- head bobbing
- see-saw resps
- grunting
- stridor



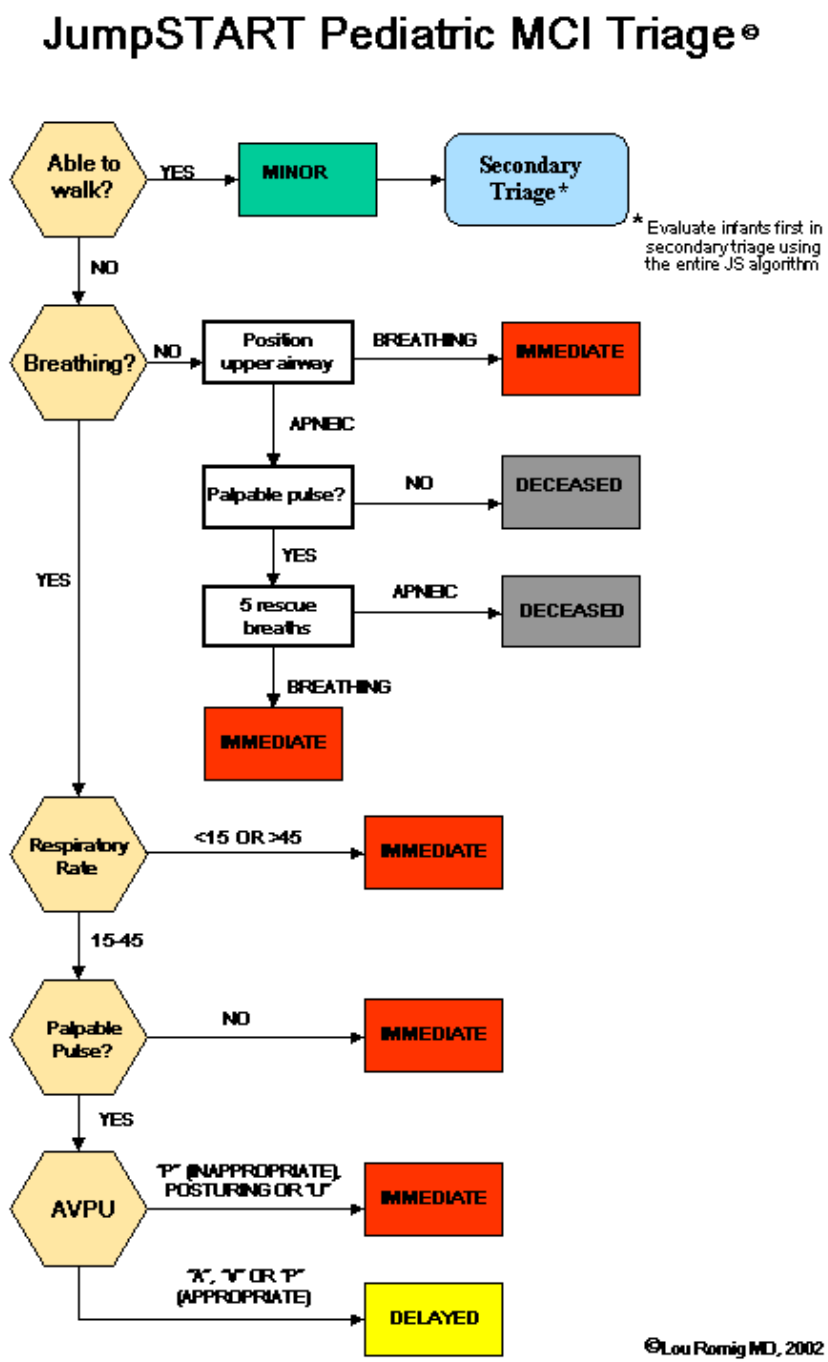
Circulation to Skin

- pale
- mottled
- blue
- gray

Pediatric Triage in MCIs

www.jumpstarttriage.com

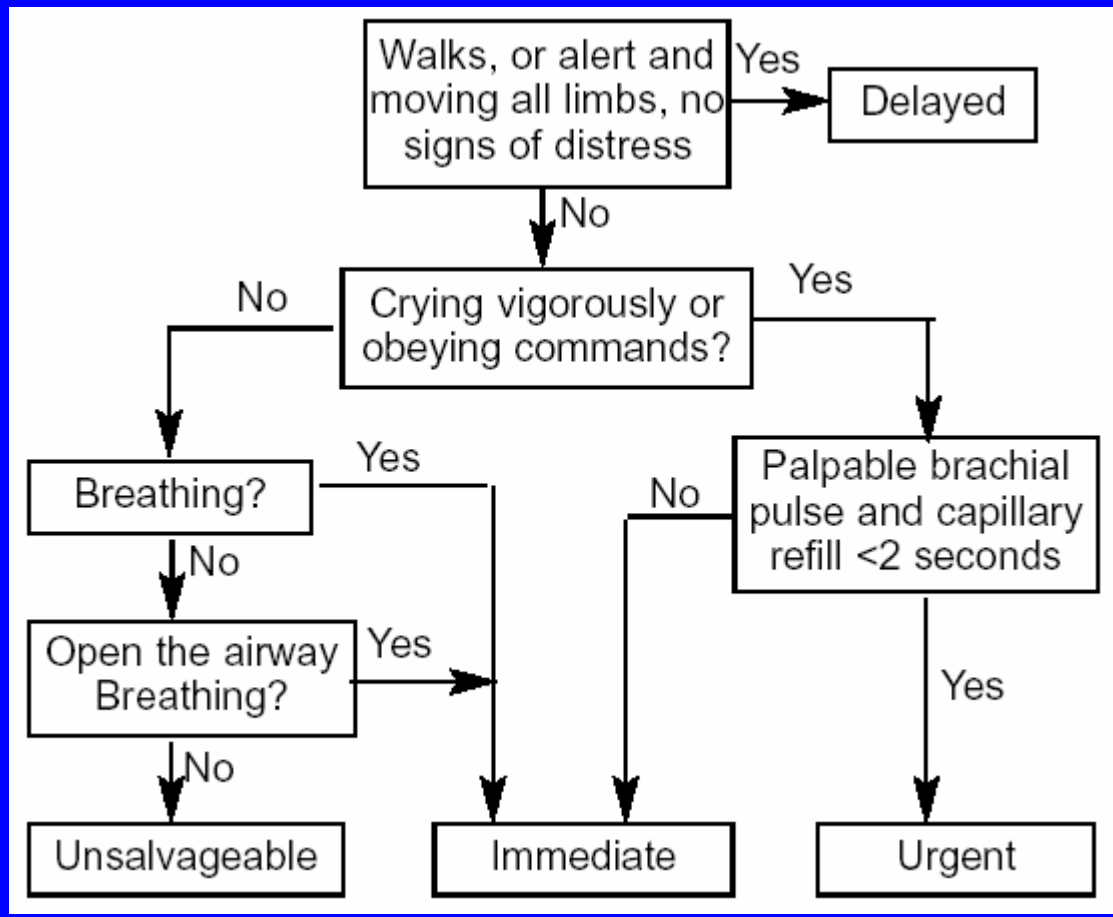
- Developed & designed by Lou E. Romig, MD, FAAP
- Design modeled on MCIs (multiple casualty incidents)
- Uses standard categories (immediate, urgent, delayed)
- Adds five rescue breaths to Adult START Triage Algorithm



Triage Principles in Mass Casualty Situations Involving Children – The Israeli Experience

Mor M, Waisman Y: Pediatric Emergency Medicine Database, Internal Review Article Section, August 2002, www.pem-database.org

- Developed & designed by Israeli Pediatric EM Group
- Design modeled on MCEs (mass casualty events)
- Uses simplified approach, standard triage categories
- Omits five rescue breaths included in JumpSTART



A Modification of JumpSTART For Use In A Large American City

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Introduction

- The JumpSTART Triage Algorithm developed by Lou E. Romig, MD, substitutes bag-valve-mask (BVM) ventilation for airway repositioning as used in the Simple Triage and Rapid Treatment (START) Algorithm
- However, use of BVM will not be feasible within a Search And Rescue (SAR) area, or even in the triage and staging area of a Casualty Collection Point (CCP)
- We developed a modification of the JumpSTART Algorithm for children < 5 year of age that may be operationally necessary under field conditions when BVM may not be readily available

Methods

- The following principles guided development of the New York City Pediatric Triage Algorithm
  - It must embrace all hazards as part of the existing triage process for the general population
  - It must be able easily and quickly to be incorporated into the existing municipal disaster triage process
  - It must make special provision for the pediatric population and its higher proportion of respiratory emergencies
  - JumpSTART cannot be used as it currently exists due to the lack of resuscitation equipment in the SAR area
  - The Israeli approach cannot be used as it currently exists since it does not address respiratory emergencies

Results I – SAR Area

- Based on the foregoing, the following approach has been developed for pediatric triage in New York City
  - All pediatric patients must be removed from the SAR area via a decontamination area prior to definitive triage at a staging area within the CCP
  - Only obviously dead or mortally injured patients will remain in the contaminated zone
  - Pediatric patients able to ambulate are tagged GREEN
  - Pediatric patients unable to ambulate are initially tagged RED if breathing either occurs spontaneously or upon airway repositioning, but are initially tagged BLACK if breathing is absent

Results II – CCP Area

- Based on the foregoing, the following approach has been developed for pediatric triage in New York City
  - Patients initially tagged RED continue to be tagged RED if respiratory rate remains < 20 or > 40
  - Patients initially tagged RED are definitively tagged YELLOW if respiratory rate if > 20 but < 40, pulse is palpable, and movement is present and purposeful
  - Children definitively tagged RED or YELLOW then receive expedited off site transport
  - However, definitive BLACK tagging and mortuary transport cannot occur until a child initially tagged BLACK has failed to respond to 2 breaths via BVM, administered as soon as possible once in the CCP

Conclusions

- The proposed approach will facilitate more rapid identification of critical pediatric patients and more rapid transport from the scene
- The proposed approach will give very child judged unsalvageable based upon absence of respiratory effort a second opportunity for confirmation of this status before it is finalized

Where We Are Now

- Despite numerous descriptions of systems responses to pediatric trauma disasters in the medical literature:
  - No states or regions have pediatric specific disaster plans
  - Few if any EMS agencies or general hospitals have pediatric specific disaster plans
  - Few emergency physicians have disaster training or experience
  - Even fewer pediatricians have disaster training or experience

Where We Want To Be

- Based on facilitated programs designed to improve system and provider responses to pediatric disasters:
  - All states and regions have pediatric specific disaster plans
  - All involved EMS agencies and hospitals have pediatric specific disaster plans
  - All emergency providers have disaster training and experience
  - All pediatric providers have disaster training and experience

How To Get There

- Pediatric emergency and trauma professionals, in collaboration with key professional stakeholder organizations, should:
  - Encourage all EMS agencies and hospitals to develop and implement pediatric specific disaster plans based upon existing model plans
  - Encourage all emergency providers and agencies to obtain appropriate pediatric disaster training through targeted curriculum development
  - Encourage all EMS agencies and hospitals to obtain vicarious disaster experience through mock pediatric exercises

Institute of Medicine: Tools for Evaluating the Metropolitan Medical Response System Program Phase I Report

"It appears that . . . 'relationship building' across disciplines and communities may be a critical element . . . and may be the key to sustaining preparedness."

Joint Commission on the Accreditation of Healthcare Organizations (JCAHO)

- Standard EC.1.4
  - Emergency preparedness management plan
- Standard EC.2.9.1
  - Emergency preparedness drills
- Standard EC.1.4
  - Security management plan
- Standard EC.1.5
  - Hazardous materials and waste management plan

Commission on Accreditation of Ambulance Services Standards

- Organization (includes disaster plan, drills)
- Management
- Community relations and public affairs
- Mutual aid agreements
- Human resources
- Clinical services
- Safety
- Equipment and facilities
- Communications

Systems Design 101

- Needs and resource assessment
- Identify strengths and weaknesses
- Build upon the strengths
- Then address the weaknesses
- First pick the low hanging fruit
- Let the system believe in itself

Education Vs. Efficacy

- Cognitive
  - Courses
- Psychomotor
  - Labs
- Affective
  - Scenarios

- Verbal Experience
  - Group discussion
- Vicarious Experience
  - Tabletop exercises
- Mastery Experience
  - Disaster drills

Talkin' the talk… *Vs.* *…Walkin' the walk*

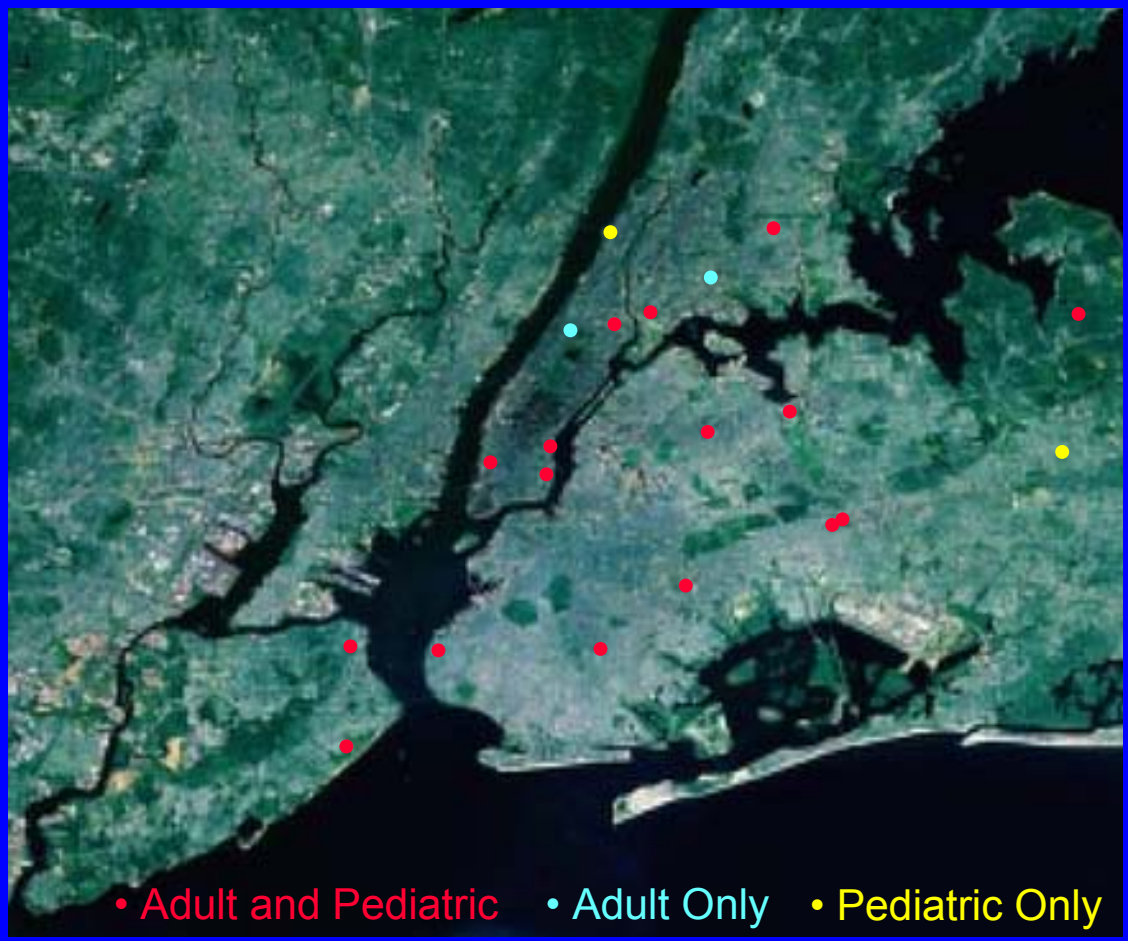
How To Succeed

- Update the plan
- Get everyone involved
- Explain everyone's role
- Get everyone's support
- Plan the drill
- Make it fun

New York City Regional Trauma System

Regional Trauma Centers

- **The City of New York**
  - Pop. 8,008,278
  - Area 303 mi^2
  - P.D. 26,402/mi^2



- **Bronx**
  - Pop.1,332,650
  - Area 42 mi^2
  - P.D. 31,708/mi^2
- **Brooklyn**
  - Pop. 2,465,650
  - Area 71 mi^2
  - P.D. 34,917/mi^2
- **Manhattan**
  - Pop.1,537,195
  - Area 23 mi^2
  - P.D. 66,939/mi^2
- **Queens**
  - Pop.2,229,379
  - Area 109 mi^2
  - P.D. 31,708/mi^2
- **Staten Island**
  - Pop.443,728
  - Area 58 mi^2
  - P.D. 7,605/mi^2

Disaster Medical Incident Response System

- Initial response to disaster is a local response
- NDMS DMATs may take 24-72 hours to arrive
- Surge in needed care ≠ surge in needed staff
- Trauma system must provide surge capacity
- Red wedge = ramp up time until fully deployed
- Ancillary resources must provide interim care
  - Must not supplant existing trauma resources
  - Must not cause trauma system disruption

Disaster Medical Incident Response System

- Developed by Regional Trauma Advisory Committee*
- Voluntary participation by Regional Trauma Centers
- Creates Disaster Medical Incident Response Teams (DMIRTs) in participating Regional Trauma Centers
  - Teams mobilized from distant trauma centers
  - Limited numbers of staff are involved
- DMIRTs are deployed only upon request of the duly authorized Medical Incident Commander (MIC)
  - To DOH-designated Regional Trauma Centers
  - To MIC-operated deployable medical facilities

*RTAC acknowledges and supports the lead agency roles of DOHMH, OEM, FDNY

Disaster Medical Incident Response Teams (DMIRTs)

- Composition of DMIRTs
  - 1 or 2 trauma surgeons, 1 or 2 trauma/OR/TICU nurses
  - 1 or 2 emergency physicians, 1 or 2 emergency nurses
  - 1 orthopaedic surgeon
  - 1 anesthesiologist
- Deployed from trauma center of origin in < 1 hour
- Transportation to be provided by FDNY or NYPD
- Equipment provided by facilities requesting DMIRTs
  - DOH-designated Regional Trauma Centers
  - MIC-operated deployable medical facilities

Disaster Medical Incident Response Teams (DMIRTs)

- Training of DMIRTs
  - Nationally recognized program in disaster medicine
- Credentialing of DMIRTs
  - Web based file lists all credentialed DMIRT members*
- Indemnification of DMIRTs
  - By requesting entity – FDNY or hospital
- Responsibility of DMIRTs
  - Provide consultations/accept referrals upon request

*Minimum requirements = credentialed trauma team member at hospital of origin, successful completion of disaster medicine course; must display hospital ID

Disaster Medical Incident Response Teams (DMIRTs)

- Advantages of DMIRTs
  - Organized medical response to a disaster
  - Already familiar with regional trauma system
  - Can be rapidly mobilized and deployed
  - Cause little service disruption at hospital of origin
  - All volunteer, no expectation of reimbursement
  - Work together every day, little need for drills
- Disadvantages of DMIRTs
  - Teams work in an unfamiliar environment
  - Relief depends upon fresh team availability
  - Possibility of serious illness or injury
  - Conflicts about roles, responsibilities

New York City Department of Health and Mental Hygiene Pediatric Emergency Preparedness Guidelines: An Idea Whose Time At Last Has Come?

- Develop model pediatric disaster plans for hospitals to adopt and adapt, depending on needs and resources
- Coordinate pediatric emergency disaster response with regional trauma and burn disaster responses
- Identify pediatric critical care centers but ensure all emergency departments' pediatric capabilities
- Consider development of pediatric component for disaster medical incident response teams

NYC DOHMH CBPP PDAG
Pediatric Component DMIRS – Phase I
Pediatric Trauma Surge Requirements

	Ped TC	Adult TC	CH -Trm	GH + Ped
Pediatric Trauma Service	E	D	-	-
Pediatric Surgeon Trauma Director	E	D	-	-
Pediatric Surgeon Trauma Staff	E	D	E	D
Pediatric Emergency Medicine Physicians	E	D	E	D
Pediatric Critical Care Physicians	E	D	E	D
Pediatric Medical / Surgical Specialists	E	D	E	E
Pediatric Medical / Surgical Nursing	E	D	E	E

NYC DOHMH CBPP PDAG
Pediatric Component DMIRS – Phase I
Pediatric Trauma Surge Requirements

	Ped TC	Adult TC	CH -Trm	GH + Ped
ATLS/ATCN/TNCC Training for All Staff	E	E	-	-
All Hazards Decon Training for ED Staff	E	E	E	E
Blast Trauma / PALS Training	E	E	E	E
Blast Trauma / PALS Drills	E	E	E	E
Pediatric Emergency Care Area / Beds	E (Area)	D (Area)	E (Area)	D (Beds)
Pediatric Intensive Care Area / Beds	E (Unit)	D (Beds)	E (Unit)	D (Beds)
Pediatric Acute Care Area / Beds	E	D	E	E

NYC DOHMH CBPP PDAG
Pediatric Component DMIRS – Phase I
Pediatric Trauma Surge Requirements

	Ped TC	Adult TC	CH -Trm	GH + Ped
Ped Resuscitation Equipment Available	E	E	E	E
Child Life / Family Support Programs	E	D	E	D
Ped Social Work / Child Protective Svc	E	D	E	D
Ped Injury Prev / Community Services	E	D	D	-
Pediatric Trauma Education Programs	E	D	D	-
Pediatric Trauma Research / PI & PS	E	D	D	-
Pediatric Trauma Manager / Registrar	E	D	-	-

NYC DOHMH CBPP PDAG
Pediatric Component DMIRS – Phase II
Pediatric DMIRTs

- Composition of Pediatric DMIRTs
  - 1 or 2 pediatric emergency medicine physicians & nurses
  - 1 or 2 pediatric critical care medicine physicians & nurses
  - 1 or 2 pediatric surgeons
  - 1 or 2 pediatric anesthesiologists
- Deployed from pediatric center of origin in < 1 hour
- Transportation to be provided by FDNY or NYPD
- Equipment provided by facilities requesting DMIRTs
  - DOH-designated Regional Adult Trauma Centers
  - General hospitals with pediatric acute care only

Plans are nothing.
Planning is everything.

Dwight David Eisenhower

Chemical Exposures

- Effective pediatric antidotes are available only for nerve agent poisoning
- Dosage and administration are controversial as little data is currently available

Pediatric Nerve Agent Poisoning: Medical and Operational Considerations For A Large American City

A Cooper, G Foltin, M Tunik, J Pyun, L Marshall, J Bove, M Guttenberg, P Hew, R Van Amerongen, A Cherson, Y Langsam, N Richmond, B Kaufman, G Asaeda, J Freese, D Gonzalez, J Clair

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Regional Emergency Medical Advisory Committee of New York City

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Introduction

- Most public recommendations for treatment of pediatric nerve agent poisoning are based upon standard resuscitation doses for these agents
- Certain medical and operational considerations suggest that an alternative approach may be warranted for treatment of children by EMS
  - Suprapharmacologic doses may be necessary
  - Side effects from overdosage can be tolerated
  - EMS personnel may be unable to determine age
  - EMS personnel may be unable to recognize symptoms

Methods

- Review of scientific literature
- Review of operational guidelines
- Proposal by pediatric expert committee
- Discussion by regional medical control
- Adoption of regional pediatric protocol
- Development of regional training program

War Souvenir Poisoning

Secord E, Shari S, Newton C: AJDC 1991;145:724

- Case report of a 4 year old boy who injected himself with a 2 mg Atropen
- Emergency treatment consisted of two consecutive doses of activated charcoal
- Child was admitted and observed for 24 hours following treatment
- Developed only minor symptoms of tachycardia, mydriasis, dry mouth

Atropine Poisoning in Children During the Persian Gulf Crisis

Amital Y, Almog S, Singer R, et al: JAMA 1992;268:630-632

- National survey of Israeli emergency department care of children following self injection with 2.0 mg Atropen
- 268 cases reported over 4 months, of which 240 were clinically evaluated
- Doses of atropine were up to 17 fold higher than standard doses for age
- 116 (48%) showed systemic effects of atropine, 20 (8%) had severe atropinization
- Seizures and life threatening arrhythmias were not reported, and there were no fatalities
- Serum atropine levels were much higher than those observed after therapeutic doses

Results

Tag Color	Exposure, Resp Dist, SLUDGEM	Atropine and Pralidoxime Dosing/Interval	Repeat Atropine Dosing
RED (Pediatric)	Yes	Age <1 y: 1 Ped Atropen (0.5 mg); No 2-PAM	Atropine q 3 m as needed
		Age 1-8 y: 1 Adult Atropen (2.0 mg); 1 2-PAM (600 mg)	
GREEN (Pediatric)	No	None	Monitor q 10 m for exposure

Note: Treatments listed above are for pediatric patients <8 y only

Discussion

- Proposed doses are comparable to those currently being administered to adults with severe symptoms
- Proposed doses are within limits deemed tolerable following accidental nerved agent overdose in children

Conclusion

- The proposed approach is likely a safe and effective alternative to weight based dosing of children, which will be nearly impossible to obtain under field conditions

Radiation Exposures

- Only readily available effective pediatric antidote is oral potassium iodide
- Dosage is age dependent, proportionately higher in infancy than in childhood
  - 130 mg tab older adolescents and adults
  - One half tab ages 13 yr – 18 yr
  - One quarter tab ages 1 mo – 3 yr
  - One eighth tab for infants < 1 mo