Criminal justice paper

Bombings: Injury Patterns and CareBlast Injuries SeminarCurriculum Guide[pic] [pic] [pic]The Bombings: Injury Patterns and Care curriculum was developed through the Linkages of Acute Care and EMS to State and Local Injury Prevention Programs project that was funded by the Centers for Disease Control and Prevention (CDC). The American College of Emergency Physicians (ACEP) served as the lead grantee for the project along with the following six other organizations: American Medical Association (AMA)American Trauma Society (ATS)National Association of EMS Physicians (NAEMSP)National Association of EMT??™s (NAEMT)National Association of State EMS Officials (NASEMSO)National Native American EMS Association (NNAEMSA)A task force was established with representative experts from emergency medicine including physicians, surgeons, nurses, and EMS. Core competencies and knowledge objectives were developed using a consensus approach.

A writing group then developed teaching objectives and course content based on the core competencies. The Bombings: Injury Patterns and Care curriculum is designed to be the minimum content that should be included in any all-hazards disaster response training program. This content is designed to update the student with the latest clinical information regarding blast related injuries from terrorism. American College of Emergency Physicians (ACEP) Grant StaffKathryn H. Brinsfield, MD, MPH, FACEP, Chair, Curriculum on Traumatic Injuries from TerrorismTaskforce (CO-TIFT)Rick Murray, EMT-P, EMS and Disaster Preparedness Director, Principle InvestigatorMarshall Gardner, EMT-P, EMS and Disaster Preparedness ManagerDiana S. Jester, EMS and Disaster Response CoordinatorCynthia Singh, MS, Grants

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Release date: 12/06Table of ContentsContent Design3Content Topics3Target Audience3Goals3Time Requirements3Learning Objectives3Background Information: Explosives and Terrorist Bombings3Blast Injuries3Crush Injuries3Compartment Syndrome3Military Experience in Blast Injury Care3Special Considerations3Psychological Issues3Patient Cases3Appendix A: Curriculum on Traumatic Injuries from Terrorism Task Force (CO-TIFT)3Appendix B: Curriculum Writing Group3 | Content Design | This content covers eight main topic areas designed to educate emergency medical personnel in the || | assessment and initial management of patients who are injured during an explosive event. The content || | builds on existing knowledge developed in HAZMAT and WMD training courses and is designed

to be integrated|| | into courses and other training experiences using an all-hazards approach. The emphasis for each topic is || | the unique characteristics of an explosive event, such as a terrorist bombing, that results in mass || | casualties. || | || | The content for each topic is accompanied by slides. A few teaching tips are provided in the Curriculum || | Guide. || | || Content Topics | Background (Explosives and Terrorist Bombings) || | Scene Safety || | Triage || | Blast Injuries || | Crush Injuries and Compartment Syndrome || | Military Experience || | Special Considerations || | Psychological Issues || | || Target Audience | Emergency physicians || | Emergency nurses || | Emergency medical service personnel || | Other healthcare personnel who would be involved in a mass casualty event || | || Goals | In general, the goal of this content is to cover the unique knowledge and skills required to effectively || | respond to a mass casualty explosive or bombing event. The content can be integrated into existing || | materials or taught as a stand-alone course. The content includes: (1) the uniqueness of blast injury, || | including blast physics, (2) the most common types of blast injuries, and (3) the appropriate treatment || |(prehospital and initial hospital) for injures that result from blasts.

|| | || Teaching Tips | These topics can be most successfully taught using real-life scenarios, cases, and examples to facilitate || | an interactive instructional strategy??” one that focuses on active learning. Active learning requires that || | learners are involved in the learning process. || | || | To provide an active learning environment, learners must interact or become involved with realistic || | situations and knowledge. By incorporating techniques that encourage participants to discuss, question, || | and clarify,

instructors can increase retention and encourage the use of problem solving skills. || | || Time Requirements | The basic content can be completed in approximately three hours. However, the topics are designed for || | flexibility and can be adapted to presentations that vary in length by increasing or decreasing the amount|| | of detail and the level of learner interaction. || | || | For a 3-hour session, the following times are suggested: || | Background 10 minutes || | Explosive Events 10 minutes || | Blast Injuries 40 minutes || | Crush Injuries 30 minutes || | Military Experiences 10 minutes || | Special Considerations 10 minutes || | Psychological Issues 10 minutes || | Patient Cases 60 minutes || | || Learning Objectives | The following learning objectives cover all of the content. They are intended as a blueprint for what || | learners should know after the content has been taught.

(There are no learning objectives for the || | background content.) || | || Scene Safety | Describe common hazards that could be encountered in an explosive event. || | Recognize the personal protective equipment (PPE) appropriate for use during explosive events.

|| | || Triage | List the factors common to explosive events that may complicate effective triage. || | Explain the possible effect of overtriage at explosive events. || | Explain the issues related to patient self-referral in explosive events. || | || Blast Injuries | Describe the unique aspects of blast injury, including blast physics and the pattern of injuries.

|| | List the factors affecting severity (morbidity and mortality) of injuries in an explosive event. || | Explain the pathophysiology of blast injuries. || | Define the four categories of blast injuries. || | List the most common types of

injuries in each category??” primary, secondary, tertiary, and quaternary || | (miscellaneous). || | || Primary Blast Lung Injury | Describe the pathophysiology of blast lung. || | Describe the clinical manifestations of blast lung injury.

|| | Explain the appropriate treatment (prehospital and initial hospital) for blast lung injury. || | Explain why tympanic membrane rupture may or may not be an indicator for blast lung injury. || Additional Primary Blast Injuries | Describe the presentation and clinical manifestations of other primary blast injuries, including ear, || | abdominal, and head injuries. || | Explain the appropriate treatment (prehospital and initial hospital) for other primary blast injuries, || | including ear, abdominal, and head injuries. || | Explain the treatment priorities (prehospital and initial hospital) for combined injuries, including blast|| | lung injury and burn injury; blast lung injury and crush injury. || | || Crush Injuries | Define crush injury, crush syndrome, and compartment syndrome.

|| | Explain the pathophysiology of crush injury. || | Describe the clinical presentations common with crush injury. || | List the potential complications for crush injury. || | Explain the treatment (prehospital and initial hospital) for crush injury. || | || Compartment Syndrome | Explain the pathophysiology of compartment syndrome. || | Describe the clinical presentation common with compartment syndrome.

|| | Explain the treatment (prehospital and initial hospital) for compartment syndrome. || | Describe the procedural skills needed for management of compartment syndrome, including measuring || | compartment pressures,

use of ketamine, and fasciotomies. || | Describe the unique treatment of an entrapped patient. || | Describe the indications (potential need) for field amputation. || | || Military Experiences | Discuss current military experiences in blast injury care, such as hemorrhage control and use of || | tourniquets.

|| | || Special Considerations | Describe the considerations that should be addressed for special needs patients such as children, women || | who are pregnant, the elderly, the disabled, and those with language barriers. || | || Psychological Issues | Describe factors that affect mental health during an explosive event. | | | || Background Information: Explosives | This topic provides a brief history of recent explosions and bombings used by terrorists. The types of || and Terrorist Bombings | explosives used, the characteristics of explosives, and explosive classification are also included. There || | are no specific learning objectives related to this topic, since it is designed to provide background and || | context to the subsequent topics.

|| | || | Explosive devices are a rather inexpensive and easy method for terrorists to trigger major disruptions to || | our everyday lives. Terrorists have used everything from a small backpack to large trucks and even || | commercial jet airliners to deliver the explosive agent. Injuries can vary from various forms of trauma || | and burns to amputations or even immediate death. || | || | Even though an all-hazards approach is used, the content covered in this curriculum is focused on || | terrorist events that result in mass casualties. Most disaster training experiences cover the definition || | and types of terrorism.

This information is included here as a review, if it is needed. || | || Key Elements of Terrorism | Terrorism can be defined as containing four key elements. || | It is premeditated??” planned in advance, rather than an impulsive act of rage. || | It is political??” not criminal but designed to change the existing political order. || | It is aimed at civilians??” not at military targets or combat ready troops. || | It is carried out by sub-national groups??” not by the army of a country. || | || Types of Terrorism | Nationalist terrorism??” seeks to form a separate state for their own national group. These terrorists use || | violence to capture national attention and to alienate those not supporting their movement.

Examples || | include the Irish Republican Army (IRA), Palestine Liberation Organization (PLO), and Kurdistan Workers??™ || | Party (KWP). || | || | Religious terrorism??” uses violence to further their purpose targeting broad categories of enemies. || | Religious terrorists come from major faiths as well as small cults. The more extreme sects use an almost || | limitless amount of violence against anyone who is not part of their religious group, and they are || | considered some of the most dangerous terrorists. Nearly half of the 56 known international terrorist || | groups are religiously motivated. Examples include Osama bin Laden??™s al-Qaeda network and the Aum || | Shinrikyo doomsday cult in Japan. || | || | State-sponsored terrorism??” use of terrorist groups or surrogate warriors by radical states as a foreign || | policy tool. With enhanced state funded resources at their disposal, they are often able to carry out || | larger and more deadly attacks including commercial airliner bombings.

One example is the Iranian || | government sponsorship of young militants to seize the American embassy in Tehran in 1979. || | || | Suicide terrorism??" used throughout history but it has become much more common in the last 20 years. Both || | religious and secular terrorist groups use this form of terrorism. Some feel suicide terrorists are crazy,|| | but many experts say such terrorists are just deeply committed to their cause and see themselves as || | martyrs who can inspire imitation. || | || | These types of terrorism are not mutually exclusive. For example, terrorism that is achieved through || | suicide bombings is often both religiously and nationalistically motivated.

|| | || Recent Terrorist Explosive Events | Mumbai bombing, India July 11, 2006 ??" Seven bombs were placed on commuter trains during rush hour. 209 || | were killed and over 700 were injured. || | || | Tel Aviv, Israel, January 19, 2006??" A suicide bomber in a small fast food restaurant killed himself and || | wounded 20 others. Most customers were outside the restaurant, but the bomber went inside and detonated || | the bomb. || | || | Iraq hotel bombing, Baghdad, October 24, 2005??" Three car bombs were detonated at the Palestine and Sheraton|| | hotels. Six people were killed and 15 others were wounded.

|| | || | London Subway Bombing, July 11, 2005??" Three bombs on the underground trains and one bomb on a bus killed 56|| |(including the 4 terrorists) and injured over 700; 350 required hospital treatment; 22 were admitted in || | serious or critical condition. || | || | Madrid Train Bombing, March 11, 2004??" Ten bombs exploded in 4 commuter trains, killing 177 instantly and || | injuring more than 2000. Fourteen people died later. Total casualties were 191 people. || | || | World Trade Center, September 11,

2001??” Total dead and missing 2, 992; 2749 in New York, 184 at the || | Pentagon, 40 in Pennsylvania, and 19 hijackers. || | Tel Aviv Disco, June 1, 2001??” A suicide bomber killed 20 and injured 120.

The terrorist mingled with a || | large group of teenagers, who were standing in line to enter a disco. While still in line, he detonated || | the explosives strapped to his body. The explosive charge contained a large number of metal objects, || | including balls and screws, designed to increase the extent of injuries. || | Centennial Olympic Park, Atlanta, GA, July 27, 1996??” A shrapnel-laden pipe bomb hidden in a backpack || | exploded during the Summer Olympics. Two people were killed and 111 were injured. || | Murrah Federal Building, Oklahoma City, OK, April 19, 1995??” A rented truck containing about 5, 000 pounds || |(2, 300 kg) of explosive material exploded killing 168 people, including one person who died in the rescue || | effort. Over 800 people were wounded.

The bomb was composed of ammonium nitrate (an agricultural || | fertilizer) and nitromethane (a highly volatile motor-racing fuel) in a mixture also known as ANFO || |(ammonium nitrate/fuel oil) or Kinepak. || | || | World Trade Center, February 26, 1993??” A car bomb exploded in a basement garage, killing 6 and injuring || | 1040 others. The complex 1300 lb (600 kg) bomb was made of urea pellets, nitroglycerin, sulfuric acid, || | aluminum azide, magnesium azide, and bottled hydrogen.

Sodium cyanide had been added to the mix so that || | the vapors could go through the ventilation shafts and elevators of the towers. || | || | Pan Am 103, Lockerbie, Scotland, December 21, 1988??” A terrorist bomb exploded

in flight killing 259 || | passengers and 11 people who were on the ground. Twelve to 16 oz (340 to 450 g) of plastic explosive was || | detonated in the plane??™s forward cargo hold, triggering a sequence of events that led to rapid destruction|| | of the aircraft. || | || | Unabomber (Theodore John Kaczynski, PhD) ??“ The Unabomber was convicted of murder for sending mail bombs to|| | various people over almost 18 years from the late 1970??™s through the early 1990??™s.

His bombs killed three || | and wounded 29. He justified his crimes as a fight against the evils of technological progress. || | || Types of Explosives | Car and truck bombs are very powerful weapons in the terrorist??™s arsenal, especially for suicide attacks.

|| | Terrorists also employ letter and parcel bombs, explosive and incendiary bombs, and a few groups are known|| | to possess either rocket-propelled grenades (RPGs) or surface-to-air shoulder-fired missiles that can || | bring down civilian or military aircraft. || | || Improvised explosive devices | Improvised explosive devices (IEDs) are handmade or improvised bombs used by terrorists. They can be made || | from stolen explosives, commercial blasting supplies or fertilizer, fuel oil, and other household || | ingredients. || | || | Examples of IEDs: || | || | Pipe Bomb || | This is the most common type of terrorist bomb and usually consists of low-velocity explosives inside a || | tightly capped piece of pipe.

Pipe bombs are very easily made using gunpowder, iron, steel, aluminum, or || | copper pipes. They are sometimes wrapped with nails to cause more harm. || | || | Molotov Cocktail || | This improvised weapon is used by

terrorists world-wide. Molotov cocktails are extremely simple to make || | and can cause considerable damage.

They are usually made from materials such as gasoline, diesel fuel, || | kerosene, ethyl or methyl alcohol, lighter fluid, and turpentine, all of which are easily obtained. The || | explosive material is placed in a glass bottle, which breaks upon impact. A piece of cotton serves as a || | fuse, which is ignited before the bottle is thrown at the target. || | || | Fertilizer Bomb || | Fertilizer bombs consist of ammonium nitrate.

Hundreds of kilograms may be required to cause major damage.|| | The Irish Republican Army, Tamil Tigers, and some Middle Eastern groups use the ammonium nitrate bomb. || | This type bomb was used in the Oklahoma City bombing. || | || | Barometric Bomb || | The barometric bomb is one of the more advanced weapons in the terrorist??™s arsenal. The detonator of the || | bomb is linked to an altitude meter, causing the explosion to occur during flight.

|| | || Fuel-air explosives | Also called high-impulse thermobaric weapons (HITs) and enhanced blast explosives, fuel-air explosives use|| | atmospheric oxygen, instead of carrying an oxidizer in their explosives. They produce more explosive || | energy for a given size than do other explosives. || | ||??? Dirty??? bombs | The term dirty bomb is used to refer to a Radiological Dispersal Device (RDD), a radiological weapon that || | combines radioactive material with conventional explosives.

A dirty bomb kills or injures through the || | initial blast of the conventional explosive and spreads airborne radiation and contamination. || | || Incendiary

bombs | Also known as fire bombs, incendiary bombs are designed to start fires or destroy sensitive equipment || | using materials such as napalm, thermite, chlorine trifluoride, or white phosphorus. || | || Military munitions | Military munitions are ammunition products and components produced for or used by the armed forces. They || | include explosives, pyrotechnics, riot control agents, smokes and incendiaries, bulk explosives, rockets, || | guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms || | ammunition, grenades, mines, torpedoes, depth charges, cluster munitions, dispensers, and demolition || | charges. || | || Classification of Explosives | Explosives are categorized as high-order explosives (HE) or low-order explosives (LE). || | || | HE produces a defining supersonic over-pressurization shock wave. Examples of HE include TNT, C-4, Semtex,|| | nitroglycerin, dynamite, and ammonium nitrate fuel oil (ANFO).

|| | || | LE creates a subsonic explosion and lack HE??™s over-pressurization wave. Examples of LE include pipe bombs,|| | gunpowder, and most pure petroleum-based bombs such as Molotov cocktails or aircraft improvised as guided || | missiles. || | || | HE and LE cause different injury patterns due to the presence or absence of the over-pressurization wave. || | || | Explosive and incendiary (fire) bombs are further characterized based on their source. ??? Manufactured??? || | implies standard military-issued, mass produced, and quality-tested weapons. ??? Improvised??? describes || | weapons produced in small quantities, or use of a device outside its intended purpose, such as converting || | a commercial aircraft into a guided missile. Manufactured (military) explosive weapons are exclusively || | HE-based. Terrorists will use whatever is available ??“ illegally obtained manufactured

weapons or || | improvised explosive devices (IED) that may be composed of HE, LE, or both.

|| | || | Manufactured and improvised bombs cause markedly different injuries. || | || | Blast wave refers to the intense over-pressurization impulse created by a detonated HE. Blast injuries are|| | characterized by anatomical and physiological changes from the direct or reflective over-pressurization || | force impacting the body??™s surface. The HE ??? blast wave??? (over-pressure component) should be distinguished || | from ??? blast wind??? (forced super-heated air flow). Blast wind may be encountered with both HE and LE. || | || | || Background Information: Criminal | The entire scene at an explosive event is considered a crime scene and preserving evidence is important.

|| Investigation and Evidence | The principles of criminal investigation and evidence preservation should guide responders. || Preservation | || | Be aware of: || | Indicators of a crime scene || | Evidence preservation and chain of custody || | Avoid disturbing or compromising evidence || | Possible suspects or perpetrators || | || Scene Safety | || | || Objective | Describe common hazards that could be encountered in an explosive event. || | || Common Hazards | secondary devices || | possible places for secondary devices || | shrapnel || | building collapse/structural damage || | air-borne contaminants || | contaminated patients and scene/environment || | terrorists as patients || | || Teaching Tip | Use examples from previous events to teach these hazards. || | || Objective | Recognize the personal protective equipment (PPE) appropriate for use during explosive events. || | || PPE for Explosive Events | Coveralls || | heavy coat || | heavy gloves || | steel-toed boots || |

hard hat || | eye protection || | dust particle mask || | breathing apparatus for toxic fumes || | || Triage | || Objective | List the factors common to explosive events that may complicate effective triage. || Factors Complicating Effective | Severe internal injuries caused by the blast wave may not be initially apparent during triage.

|| Triage | In most victims, death from explosive events is the aftermath of combined blast, ballistic, and thermal || | effect injuries. || | Terrorist bombs often contain nails, bolts, and other sharp objects that produce unique injury patterns. || | Bombs or explosive devices are often detonated in enclosed spaces such as buses or buildings, resulting in|| | an increase in the effects of the pressure wave. || | || Objective | Explain the possible effects of overtriage at explosive events. || | || Overtriage | Terrorist bombing events usually result in large numbers of patients who are not critically injured. || | Studies report around 20% of those involved have critical injuries. This causes medical resources to be || | overwhelmed when they are faced with hundreds of patients who do not need immediate attention. This || | overtriage may delay recognition and treatment of the smaller numbers of patients with urgent and || | salvageable life threatening injuries.

|| | || | Accurate and efficient triage is extremely important. Mortality of critically injured patients may be || | related to the level of overtriage. || | || Objective | Explain the issues related to patient self-referral in explosive events. || | || Patient Self-referral | Up to seventy-five per cent of victims at a blast event will self-refer to a hospital, arriving by private|| | transportation. These patients may need decontamination and will need to be triaged prior to receiving || | care.

Hospitals need to be prepared to decontaminate and triage large numbers of patients who arrive on || | their own. || | || Teaching Tip | This is a place where data from real events is important. Information from events in Israel could be used || | to help learners understand the impact of self-referred patients.

|| | || Blast Injuries | || | || Objective | Describe the unique aspects of blast injury, including blast physics and pattern of injuries. || | || | Explosions from terrorist bombs can produce unique and unusual patterns of injury. These can even be || | unique when compared to military-type wounds encountered on the battlefield. Bombs often inflict || | multi-system injuries on large groups of people simultaneously, causing many life-threatening injuries. || | || Blast Physics | Blast injuries are the result of the rapid chemical conversion of a solid or liquid into highly || | pressurized gasses that expand rapidly and compress the surrounding air. This generates a pressure pulse, || | which spreads as a blast wave in all directions. || | || | The effects of the blast wave are more intense in a confined space like a building or bus.

The shock wave || | is amplified as it is reflected off walls, floors, and the ceiling. If the blast occurs outside, the blast|| | wave will dissipate rapidly. || | || | Example: Murrah Federal Building, Oklahoma City, OK, 1983 || |(See graphic in slide presentation.) || | || Pattern of injuries | The injury patterns related to explosive events depend on variables such as the environmental setting, || | amount of explosives, and type of device used. Blast injuries should be suspected no matter how far a || | patient was from the center of the blast. || | || | In the 1983 bombing in Beirut, there were 346 casualties??” 234 (68%) were killed immediately. Among the 85 || | survivors, there were

62 soft tissue injuries, 43 bone fractures, 37 head injuries (4 deaths), 15 chest || | trauma (2 deaths), 5 burns (2 deaths) 5 abdominal trauma, 5 eye injuries, and 9 peripheral nerve injuries || |(Lee, Survey of Terrorist Bombing Tactics and How They Influence Patterns of Injury).

|| | || | Among the 83 patients hospitalized after the 1995 Oklahoma City bombing, 98% suffered soft tissue || | injuries, 24% had severe lacerations, 57% were treated for fractures or dislocations, 53% were treated for|| | head injuries, 37% had eye injuries, and 11% were treated for burns. For the people who were treated and || | released from emergency departments, 88% had soft tissue injuries and 15% were treated for head injuries, || | 11% had eye injuries, and 8% had fractures or dislocations (Shariate, Mallonee, and Stidham, Summary of || | Reportable Injuries in Oklahoma: Oklahoma City Bombing Injuries). || | || | Most injuries are non-critical soft tissue and skeletal. Head injury accounts for approximately 50-70% of || | the deaths. However, most head injuries are non-critical (98.

5%). Most blast lung injuries cause immediate|| | death. || | || | Most types of injuries occur in bombing events.

Injuries include primary blast injuries (pulmonary, || | auditory, and abdominal), serious penetrating injuries (abdominal and vascular) solid abdominal organ || | injuries (liver or spleen), and serious intracranial injuries (open or depressed skull fractures, || | intracranial hemorrhage). In bombing incidents that include structural collapse, patients may experience || | inhalation injuries, crush injuries, and fractures. In bombings that occur in confined spaces, there is a || | higher incidence of pneumothorax, blast lung

injury, tympanic membrane rupture, as well as burns, and || | hepatic or splenic injury. In open air explosive events, the predominant injury is penetrating soft tissue|| | injuries caused by shrapnel. (Arnold, Halpern, Tsai, and Smithline, Mass Casualty Terrorist Bombings: A || | Comparison of Outcomes by Bombing Type). || | || Objective | List the factors affecting the severity (morbidity and mortality) of injuries in an explosive event.

|| | || Factors Affecting Severity | magnitude of the blast || | composition of the explosive e. g., presence of shrapnel or other material that can be propelled, || | radiological or biological contamination || | environment of the blast??" open space vs. closed space, underwater, urban, existence of protective barriers|| | distance between the victim and the blast || | structural collapse || | triage accuracy || | available medical resources || | triage efficiency || | || Objective | Explain the pathophysiology of blast injuries.

|| | || Pathophysiology of Blast Injuries | The shock waves from a blast are believed to affect tissues and organs in a number of different ways. || | These four proposed mechanisms are believed to have the following impacts*: || | || | spalling??" caused by a shock wave moving between tissues of different densities as in the lungs or internal || | organs. || | implosion??" caused by entrapped gasses contained in hollow organs compressing then expanding causing them to|| | rupture. || | shearing??" this is caused when tissues with different densities respond by moving at different speeds || | irreversible work ??" caused by forces exceeding the tensile strength of the tissue. || | || | *Spalling, implosion and shearing are thought to be three mechanisms that cause blast injuries.

|| | Irreversible work is currently being researched as a more likely mechanism of injury. || | || Objective | Define the four categories of blast injuries. || | || Categories of Blast Injuries | Primary blast??” unique to high-order explosives; results from the impact of the over-pressurization wave || | with body surfaces. || | || | Secondary blast??” results from flying debris and bomb fragments. || | || | Tertiary blast??” results from individuals being thrown by the blast wind. || | || | Quaternary blast??” all explosion-related injuries, illnesses, or diseases not due to primary, secondary, or || | tertiary mechanisms??” includes exacerbation or complications of existing conditions.

|| | || Objective | List the most common types of injuries in each category??” primary, secondary, tertiary, and quaternary || |(miscellaneous). || | || Common Primary | The most common primary blast injuries include: || Blast Injuries