

**Fog of Care
Epidemiology of Blast Trauma
and
Asymmetric War (Terrorism)**

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"He's one of our downtown doctors."

Test Questions

BOTTOM LINE UPFRONT

1. Civilian blast / ballistic injuries closely follow Vietnam era patterns
2. Fatalities with survivable injuries
 - 60+% - die from arm / leg hemorrhage
 - 30+% - die from tension pneumothorax
 - 2-6% - die from airway compromise
 - < 1% - all other survivable deaths
3. Mumbai 2008 is the modern hallmark attack
 - Small, Light, and Heavy weapons.
 - Cafes, theater, transportation system, media, university.
 - Women & Children's hospital, and religious institutions

Test Questions

4. Triage expectant decisions haunt hardened military providers
5. We are better-prepared for blast-ballistic mass cal than any other CBRNE (+/- burns)
6. Definitions – rate of chemical reaction
 - HE – detonation – supersonic – pressure trigger
 - LE – deflagration – sub-sonic – pressure trigger
 - Incendiary – conflagration – spark trigger
7. Mechanism (only HE)
 - over-pressure (1°)
 - penetrating (2°)
 - blunt / crush (3°)
 - all other (4°) – burn, suffocation, toxicants, asthma, MI, anxiety.

Test Questions

8. TNT-equivalence – maybe ...
- There are 7 formulas to calculate TNT-equivalence.
 - Final step is to cube³ the product (10-fold difference)
 - Incomplete detonation in open space
 - Confined space = up to x 9 the yield
 - Ground burst x 2 the yield greater relevant for nukes
9. Casualty patterns are determined more by environment & proximity, than yield. Benchmarks:
- Open space 10% killed, 20% admitted, 2/3rd outpt
 - Confined space 20% DOS, 10% admit, 2/3rd outpt
 - Confined w/ collapse 30% DOS, 3% admit, 2/3rd outpt

Test Questions

10. Use TCCC, Theater Trauma Guidelines, & damage Control Surgery for highest survivor rate
- Stop the bleeding
 - Decontaminate
 - Re-vascularise
11. Crisis Standards Simplified
- Patient – an individual with a health need treated independently of outside influences
 - Casualty – an individual with an injury or illness whose triage, transport, or treatment decision affect the care and outcomes of a larger group.
12. Starboard - right – Port - left

Epidemiology

- Who – What – When – Where – Why
- Boring
- Unless it provides insight
 - Plausible (vs. possible) targets
 - Injury patterns and prioritization
 - Treatment that makes a difference
 - Resource requirements
 - Staff utilization / pacing of staff
 - Quality Benchmarks

WHO – At-risk Populations

A. Historical Risk (case-based, E-B risk)

1. Worldwide – 60-70% = 15-29 y.o.
 - 10% < 15 y.o. // 10% > 45 years // 10-20% 30-44 years
2. U.S. Experience – Gov workers / buildings
 - Postal workers, Fire, Police, EMS, military, judges
 - Congressional staffers, visitors to gov buildings
 - Murrah Building (OKC), WTC, Pentagon, Post Offices, Hart Senate Building

B. Proximity Risk (hazard-based risk)

3. Live or work near major targets (urban dwellers)

C. Theoretical Risk (vulnerability-based risk)

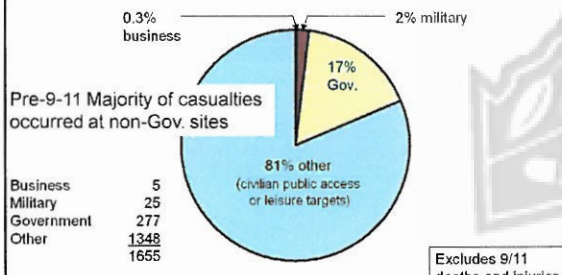
4. Limited only by imagination

WHO – At-risk Populations

A. Evolution (case-based, E-B risk)

1. Mil / Law Enforcement – > Civ gov targets
 - Buildings
 - Personnel
2. Non-gov targets as gov targets harden
 - Transportation systems
 - Areas of density
3. Revered social institutions
 - Hospitals
 - National / international events

Where? 2001 Total U.S. Worldwide Terror Casualties



**Selected Causes of Deaths,
United States, 1988-1997**

Cause	Count	Data source
Floods	903	NOAA
Bombs	830	NCHS
Lightning	712	NCHS
Tornadoes	437	NOAA
Earthquakes	276	NCHS
Hurricanes	224	NOAA

When – any pattern?

- Murrah Federal Building 9 AM
- Atlanta Olympic Park – midnight
- ATL Buckhead nightclub – 10 PM
- ATL Woman's Clinic – 7 AM
- Birmingham Clinic – 7 AM
- Nairobi Embassy bombing – 11 AM
- 9-11 – 9-10 AM
- Chechen tourist train – 8 AM
- Moscow Commuter Train – 7 AM
- Madrid Commuter Train – 7:30 AM
- London Commuter Train and bus – 8 AM
- Boston Marathon – 9 AM

Where is Terror Used?

- Terrorism targets free-press countries
 - Representative governments
- Russia
 - Chechens use suicide tactics against free-press Russia – not against totalitarian USSR
- Kurds – “Kurdistan” – parts of Iran, Iraq, and Turkey
 - Terror tactics only against Turkey
 - Not used against Iran or Iraq

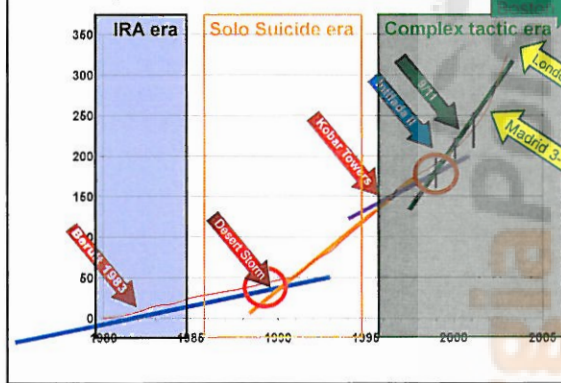


Why Is Terror Growing?

Because it works

- 6 of 11 suicide campaigns successful (55%)
 - terrorists achieved at least partial victory
 - airpower or economic sanctions < 15% success
- Targeted states
 - Fully or partially withdrew from territory
 - Began negotiations
 - Released a terrorist leader
- Suicide campaigns - successful against even hawkish governments
 - Reagan
 - Netanyahu } Succeeded despite military raids to kill or arrest terrorist leaders

Why? Success Breeds Escalating Trends



Three Distinct Evolving Tactics

The 1980s – The “IRA era”

- Large placement bombs
- “Gentlemen’s agreement” - limits casualties
- > advanced warning - evac, & staging of medical assets

The 1990s – The Suicide bomber era

- Small, but deadly, human “smart bomb”
- maximum casualties, against “soft” civilian targets

The 2000+ – Complex tactics era

- couples mega-bombs with multiple synchronized attacks
- often suicide – pioneered in 1983 Beirut
- large or multiple suicide “smart” bombs vs. “soft” targets
- herds masses to kill zone or targets staging areas

CYL Ordun-TE Davis

Why?

Because it works

- Democratic leaders publicly confirmed terror attacks forced concessions
- Examples
 - U.S. left Lebanon after 1983 - Marine barracks bombing
 - Israel followed in 1985 after > 800 IDF deaths / 18 mo.
 - Spain left Iraq after March 2004 Madrid bombings

"We couldn't stay there and run the risk of another suicide attack on the Marines."
-- Ronald Reagan, *An American Life*

How? – circa 2002 Threat Analysis

1. Single 1-5 kg confined space bomb
2. Single 100 kg TNT-equivalent car bomb
3. "Complex-Synchronized" – multiple coordinated sequential explosions
 - Herd crowd to a "killing zone"
 - 2nd hit at hospital or staging area
 - Single explosions at multiple US cities
4. Ambulance truck bomb collapses a hospital
5. Tanker ship explosion consumes a port city

CY Lee Ordun – TE Davis

How?

– only a click away.

Poor Man's James Bond: Homemade Poisons, Explosives, Improvised Firearms by Kurt Saxon Price: \$600.00



"All items ships for FREE with Super Saver Shipping"





How?
Terrors' Perfect Storm

1. Available – 5 billion pounds legally made in U.S.
2. Low tech – Literacy helpful
3. Scalable – 1 kilogram to 1 kiloton TNT-equivalents
4. Simple delivery - hand-carried, truck, plane, train, ship
5. Simple Guidance – placed, thrown, or suicide
6. Human factors – available financing and volunteers

Understanding Terrorism

- 1. Induce fear** in someone other than its casualties
– goal to change an entity's political behavior.
- 2. Independent** of the cause that motivates it
– unjust or righteous – the end justifies the means.
- 3. NOT spontaneous or random**
– staged psychological act conducted for an audience
- 4. No DIRECT personal gain** – targets may be \$\$\$
– political, religious, or ideological objectives.
- 5. Requires escalating "shock and awe"**
to maintain sense of helplessness

Traditional Public Health Applied to Asymmetric War

- 1. Assess needs**
 - a. acute - immediate post-event needs
 - b. long-term - Gap analyses
– information and management needs
- 2. Assure access** to health care & vital services
 - a. at-risk and special needs populations
 - b. Resources – e.g., SNS, training, surge capacity
- 3. Collect, analyze, and report** information
 - a. Decision-makers and managers
 - b. Providers and the Public

Bomb-Injury Threat Model



History must be Interpreted

	Military Combatant	Civilian
Host	Mostly male, healthy, athletic, 18-35 years	More young, older, female, poor health
Personal Protective Equipment (PPE)	Helmet, armored vest, armored vehicles	No PPE or armor
Agent (weapon type)	Manufactured high-order (HE) military ordnance	Makeshift low- and high-order bombs
Injury Patterns	Well-studied High tech shrapnel	Poorly studied Nails, bolts, glass
Access (Environment)	Organized trauma care - long-term rehab. comp., life-long assist. Pres.-Cabinet advocate	Variable access to care, rehabilitation, and assistance Ad hoc advocacy

TE Davis, CY L. Ordun

From the Israeli Trauma Registry

- Higher ISS scores than other trauma
 - ISS ≥ 16 in 30% vs. 10%, and
 - blast ISS grossly under-estimates resources
- Higher death in-hospital (mil DOW)
 - Terror 6.2% DIH vs. non-terror 3% DIH
 - Terror peak DIH day 4-5 vs. < 24 hours non-terror
- \uparrow surgical interventions
 - Multiple surgeries, multiple days, multi-specialties
 - Terror peak DIH day 4-5 vs. non-terror < 24 hrs
- \uparrow ICU requirements, Length of stay (LOS), & rehab

Other Observations

1. 80% of immediate casualties self- or buddy transport to the 3 closest hospitals.
2. Half of all casualties arrive over a 60 minute period
3. Israeli 20-20-60 rule
 - 20% killed, 20% admitted, 60% treat and release
4. Davis-Ordun-Hopmeier rule – 1/3rd, 2/3rd outpt
 - 1/3rd critical – mixed DOS, DIH, and admitted
 - Access to care is a determinant
 - 2/3rd non-critical – treat and release

Martinez Phenomenon – tendency for the insecure to apply their name to some disease or rule in a veiled attempt to gain immortality – Ric Martinez

Other Observations

5. Bottleneck for immediate admitted care is number of Operating Rooms
 - Number of major cases for 20 surgeons in 5 ORs?
6. Bottle neck for outpatient care is Radiology capacity – 5 plan films per X-ray per hour?
7. ED is cleared out in 4-6 hours
8. Economic loss is not due to uncompensated care – but rather cancelled, no-shows, and discretionary care going elsewhere.

Other Observations

9. Immediate needs
 - Standard practice "decon", screening for perps
 - Trauma providers – Triage Czar, Surgeons, EM, nurses, RTs, paramedics, mental health
 - Inter-hospital transport teams & monitors
 - ORs, radiology capacity
 - casualty / family locators
10. Less needed – neurosurgeons, vascular surgeons, administrators in the clinical areas

Questions ?



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