

Unusual Chemical Hazards

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- Situational Awareness
- Homemade Chemical Bombs
- Chemical Assisted Suicide
- “Shake n Bake” Meth Labs
- Notes on Selected Chemicals
- PPE/Decontamination/Triage

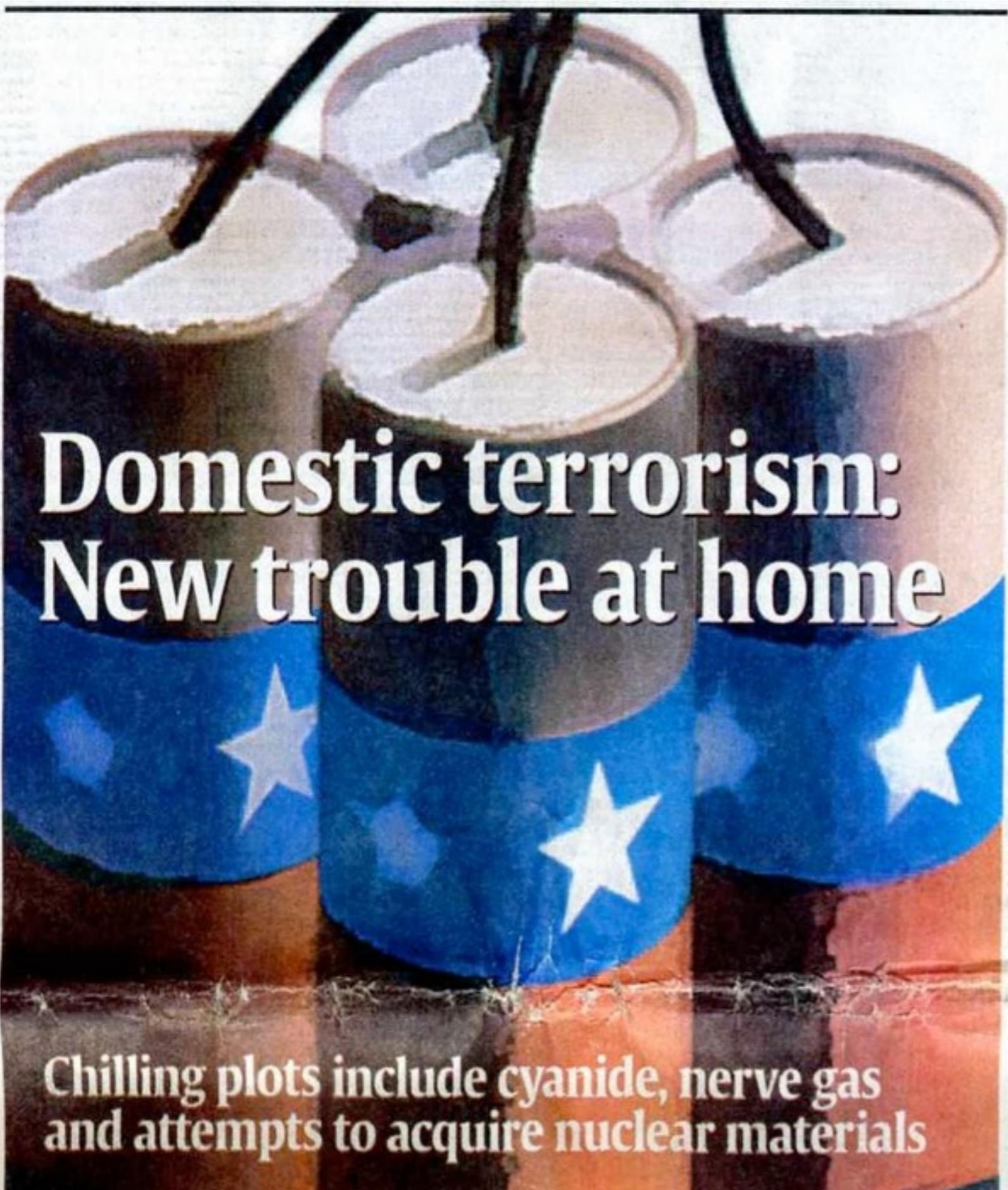
...increasingly in American society, legal liability has been attached to planners and managers if they do not have a program or take an action about certain kinds of disaster possibilities...



E.L. Quarantelli, 1988

Situational Awareness

- Creative use of everyday materials
- Optimism Bias...“It CANT happen here”
- It's NOT “terrorism”...Doesn't have to be!
- Rule of Outcomes thinking



Domestic terrorism: New trouble at home

Chilling plots include cyanide, nerve gas
and attempts to acquire nuclear materials

Case Study I

- 24 year-old NY man
- Large quantities of hydrogen peroxide
- Large quantities of nail polish remover
- Chemicals+bomb instructions+hotel room
- Acetone Peroxide Bomb

Case Study 2

- Homeowner attempting to clear sink drain
- Liquid Plumr, Roto Professional Drain Opener, sulphuric acid, Comet, bleach

Case Study 2

- Liquid Plumr: Sodium Hypochlorite and Lye
- Bleach + Acid = Chlorine Gas
- Bleach + Ammonia = Chloramines
- Lye(oxidizer) = caustic = defatting/
soapification
- Severe inhalation and contact hazard

Case Study 2

- Homeowner died
- Wife and son overcome
- responders overcome
- “paramedics didn’t wear masks...they thought they were there for an asthma attack...”

Homemade Chemical Bombs (HCB's)

HCB Construction

- Mixing various liquids in pressure vessel
- Often dismissed as a prank
- Can result in serious trauma
- Need for PPE and decontamination

Explosive Material

- NFA definition:

“A substance or mixture which when subjected to heat, impact, friction or other initial impulse, undergoes very rapid chemical transformation...”

- NFPA:

“A rapid release of high pressure gas into the environment”

Explosive Material

- Results in a physical damage
 - Yield/order
 - Shock wave
 - Overpressure
- Detonation v. Deflagration
 - 70% of terrorist events are explosive
 - Profile of home bomb maker: young white male.

Detonation v. Deflagration

- Detonation:
 - Faster than speed of sound
 - (1250 feet/second)
 - Average 3300 to 29,900 feet/second
 - Result of high yield explosives
 - Produce a true shock wave
 - Vaporization

Detonation v. Deflagration

- Deflagration
 - Less than 1250 feet/second
 - Overpressure
 - Oklahoma City, WTC 1993

Blast Injuries

- Type One, Primary injuries
 - Results directly from the sudden pressure changes caused by the blast (overpressure) wave.
 1. Ears
 2. Lungs
 3. Gut

Pulmonary Trauma

- Blast Lung:

Respiratory distress and hypoxia in the *absence of penetrating or blunt trauma* to the chest, cardiogenic pulmonary edema, smoke, or toxic inhalation.

- Pulmonary “Snowstorm”

The combination of pulmonary *contusion* and pulmonary *edema*.

Pulmonary Trauma

- Clinical Evaluation:
 - Confusion
 - Disorientation
 - Associated chest trauma
 - Pneumo/Hemothorax
- Treatment:
 - Oxygen
 - Fluids
 - Decompression
 - Serial examination

Pulmonary Trauma

- Alveolar rupture causes hemorrhage, dyspnea, chest wall pain, hemoptysis, and cyanosis.
- Low PaO₂, low SpO₂, high CO₂, respiratory acidosis is primary cause of death.

Chemicals Involved

- Sodium hypochlorite
- Sodium hydroxide
- Hydrochloric Acid
- Chlorine Gas

HCB Indicators

- Schools, residential areas, shopping area
- Summer and after school hours
- Reports of “explosion” or “fireworks”

HCB Outcomes

- Injury to the person making the bomb
- Mucous membrane/GI burns
- Acid/Alkali injury
- Inhalation injury
- Mechanical Trauma

Choking Agents

Chlorine

Phosgene

- Stresses respiratory tract
- Causes severe edema in lungs
- Results in asphyxiation resembling drowning



Blast and Overpressure

- Difficult scene – collapse, explosion, MCI
- Hidden yet devastating injuries
- Why did this occur? Scene safety:
 - Secondary collapse danger?
 - Secondary device threat?
 - Additional Hazardous Materials?

Case Studies

- 7-ounce mix of potassium chlorate, sulfur, sugar and a baby bottle capable of causing catastrophic failure of aircraft (2003)
- 2010 - Trash can and under a stage at a Clearwater, Florida restaurant...acid bomb



43°F
Mostly
Cloudy
Forecast »



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Two charged in bomb blast

By Patrick Flanigan and Meaghan M. McDermott
Staff writers

(April 22, 2004) — Rochester police have arrested two teenagers in connection with a Tuesday night homemade-bomb explosion that exposed two patrol officers to chemical fumes and liquid.

Charles Harris Jr., 17, of 59 Custer St. and Naazim Freeman, 16, of 84 Winbourne Road



ANNETTE LEIN STAFF PHOTOGRAPHER

Rochester firefighters and emergency personnel work on decontamination Tuesday after three cherry bombs were thrown. [Day in Photos]

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**ROCHESTER'S
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AWARDS**

2004 Spring



Chemical Assisted Suicide

Japan Style

- A Japanese girl killed herself by mixing laundry detergent with liquid cleanser
- Hydrogen sulfide gas escaped sickened 90 other people in building
- Warning sign "Gas being emitted"
- A 31-year-old man outside Tokyo killed himself inside a car by mixing detergent and bath salts

Huge Potential

- Decontamination
- PPE
- Multi/Mass Casualty and Fatality



- Anyone who enters the space without proper protection may quickly become a victim.
- New York events involved suicides inside a vehicle.
- Warnings if any, may/may not be obvious



Hydrogen Sulfide
gas, or (H_2S)
inside. Extremely
Toxic. Need
Hazardous Materials
crew before
opening.



KCTV
5
NEWS

- situations commonly occur in vehicles, residential bathrooms and other small spaces where a small amount of gas can quickly reach lethal concentrations.
- Confined Spaces...Public areas
- warn callers not to approach, or enter, vehicles, rooms or apartments where unresponsive people may have attempted chemical suicide.

Case Studies

- In Arizona one individual manufactured hydrogen cyanide instead of hydrogen sulfide.
- Oregon - man mixes chlorine, bleach, ammonia and Drain-O and heats on Hibachi grill

Materials Involved

- Toilet/bathroom cleaner
- Lime Sulphur/Pesticides
- Laundry Detergent
- Bath Salts
- Heating/Mixing containers

Material Details

- Strong Acid + Calcium Polysulfides = Hydrogen Sulfide
- Acid Source: Toilet/bathroom cleaners
- Sulphur source: Pesticides 28-35% calcium polysulfides

Results

- With less than a gallon of material...
 - Quick Knock Down
(faster than Cyanide)
 - ≥ 2000 Parts Per Million Hydrogen Sulphide

Other Issues

- Bad Copycats:
 - Chlorine Gas, Cyanide
 - Inhalation injury
- Rescue or recovery?
- Cyanide and Hydrogen Sulphide respond to cyanide antidote kits

Shake n Bake Meth

Main Chemicals

- Nitrogen and Hydrogen - nitrogen fertilizer
- Anhydrous ammonia
 - Strong odor at 50ppm and deadly at 5000ppm
- Ammonium hydroxide

Ammonium Hydroxide

- Result of anhydrous ammonia and water
- Rapid tissue attack-strong alkali, basic burns
- Most dangerous labs use ammonium hydroxide...

Pressurized Tanks

- Old propane tanks
- Brass valve assembly
- Anhydrous destroys valve
- Rupture/exposure hazard



Materials

- Two-liter bottle
- Precursor - Ephedrine
- Reagent - anhydrous ammonia
- Solvent - white gas, Coleman fuel
- Catalyst - red phosphorus, lithium, hydrogen, sodium metals

Process

- Precursor, Reagent, Solvent, Catalyst are mixed by shaking
- No flame required
- Discarded bottle retains hazardous waste
- Bottle can rupture/blast (HBC style)



Doing Decon at Health Care Facilities

Challenges for 2014 and Beyond

(not so) Recent History

- Tokyo Subway 1995
- NYC September 11, 2001



1995 Tokyo Subway

Tokyo Subway 1995

- Major lesson - impact on hospitals
- Realized the need for
 - Recognition and Awareness
 - Protect Hospitals from contaminated self-referring victims

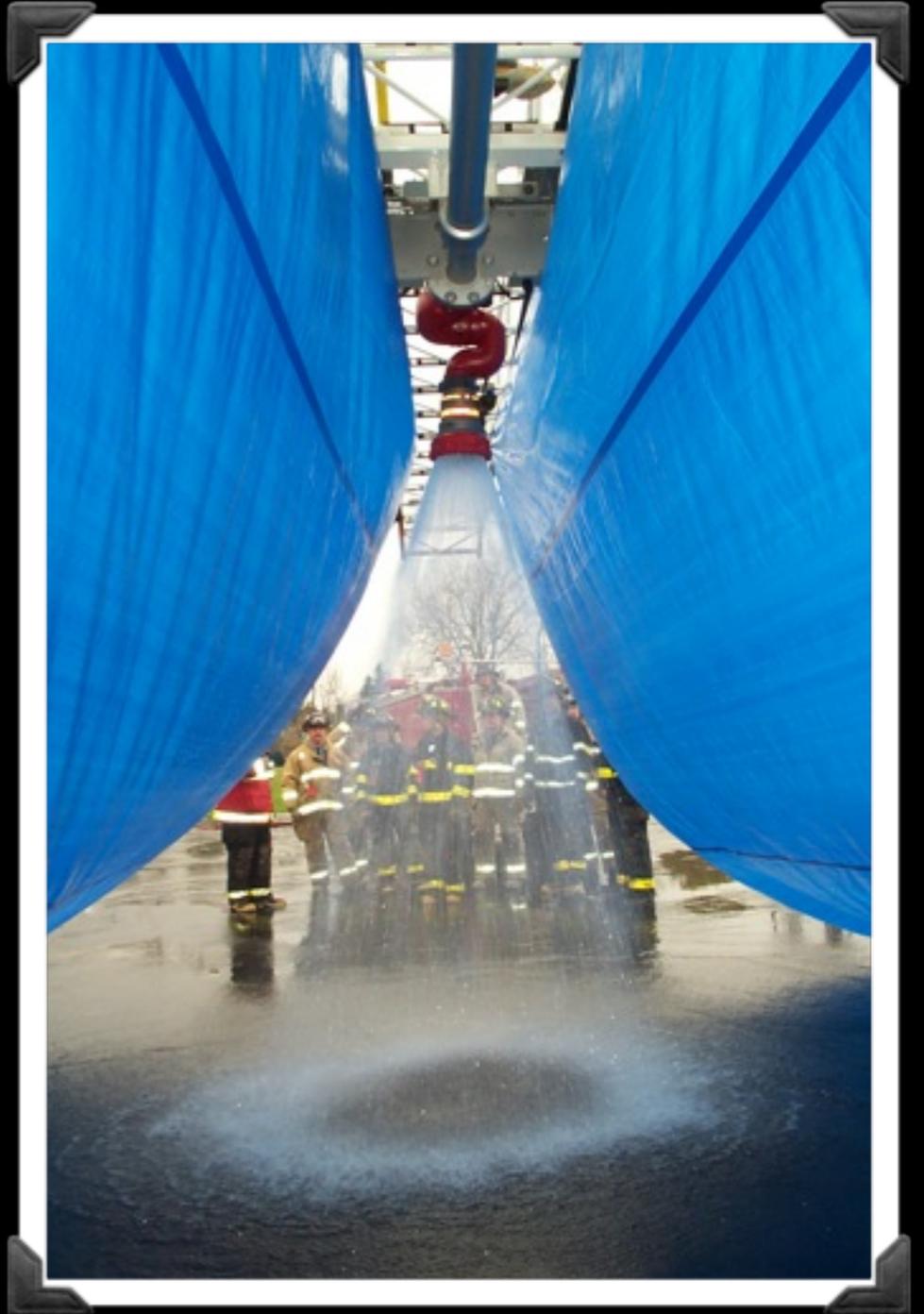
How much preparation
occurred between 1995
and...



...2001

September 11, 2001

- Introduced the need for “WMD” training
- People would self-refer to hospitals
- Hospitals would be overrun/contaminated







And then someone said...

“Traditional responders
would be overwhelmed
and not able to assist
hospitals...”

Hospitals, you're on
your own...

The Result...

- Salesmen and vendors
- Tents/showers of every shape and size
- \$\$\$\$ for training and material

The Result...

- Hospital “Decon” teams
- Purchase of SCBA and PPE
- “Hospitals, you’re on your own...”

Critical Thinking

- What hospital staff is going to “do” decon
- Who is going to do their job
- What is the retention of skills needed

Limited study on retention
of critical knowledge/skill
among traditional
responders...

No published data on
retention of critical
knowledge/skill among
hospital personnel...

As we go forward...

- A false sense of security...preparedness
- Potential for contaminated casualties...
- Intentional acts and everyday accidents

Fast Forward to 2014

- “WMD” \$\$ limited
- Interest in decon is wavering
- Perception that the “WMD” threat is gone

Hospitals...

public health or public safety?

The public expectation is...

Hospitals will be able
to manage any crisis or
disaster situation

Problems...

- Threat of intentional attacks on civilian soft targets continues...
- Threat of intentional attacks on critical infrastructure continues...
- Naturally occurring environmental and biological events will continue...

All Emergencies...

- Will have more to impact...
- Will impact an older population...
- Will impact an increasingly unhealthy population...
- May cripple technology...

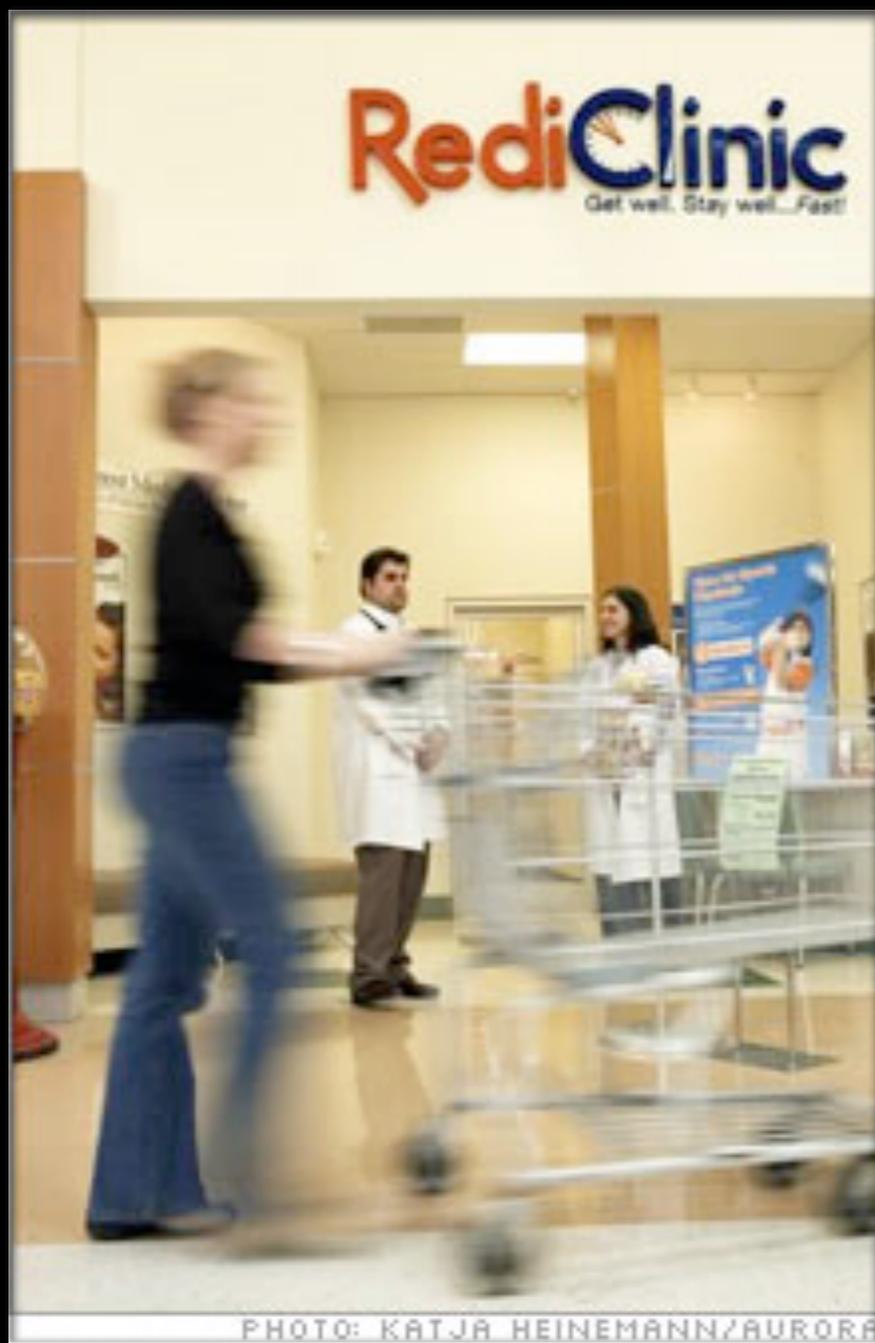


Urgent Care Centers



Emergency Departments of
the Future?





Retail Healthcare Clinics

Scenarios

Scenario One

- Call to hospital for person not breathing
- On arrival, crews begin treating man in cardiac arrest in laundry area

Scenario One

- After 10 minutes in the building
- Sodium Hydroxide leak is noticed
- responders are overcome

Scenario Two

- Man walks in to Urgent Care Center..
- 9-1-1 is called after people in waiting room become ill

Scenario Two

- Man inhaled selonomethionine
- Went home to change, then to clinic
- Two dozen people symptomatic

Scenario Three

- Local school for special needs kids
- Respond for respiratory distress...

Scenario Three

- Arrive to find 500 kids being evacuated
- Two 15 gallon drums of hydrochloric acid spilled
- Schools is attached to a hospital

St. Louis Case

- Two men working in chemical production light-industrial facility
- Drop a barrel of nitroaniline
- They self-refer to two different hospitals

St. Louis Case

- Total of eight people self-referred
- Closed two hospitals
- August 31, 2008

Mason City, IA

- Call for “routine” trouble breathing at Mercy Medical Center
- Found man in cardiac arrest
- Noticed chemical spill after treating person

Mason City, IA

- Four of five responders required eval
- Exposure to Sodium Hydroxide

Saratoga Springs, UT

- Man exposed to chemical at work
- Drives home then to Insta-Care Clinic
- Twenty-four people exposed at clinic

Critical Points

- Decon should be done on site...
- Contaminated self-referrals pose risk...
- FD must be involved in decon...
- Decon all victims prior to transport...

Unpopular Statements

- Hospitals cannot be “on their own” for decon...
- Incidents at walk-in/urgent care centers will rise...be prepared
- Traditional responders must continually train for mass casualty decon...

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