

Expect the unexpected: Chemical warfare in the ED.

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Conflict of interest

- None



Chemical incidents



Tokyo (1995) - Lessons learned

- No preparedness
 - No chemical incident plan
 - No hospital disaster plan
 - No multidisciplinary coordination and communication
- No decontamination
 - On site
 - In hospitals
- Difficult identification of toxin
 - After 2 hours "acetonitrile" (FD)
 - After 3 hours "Sarin" (Police) – no interagency sharing



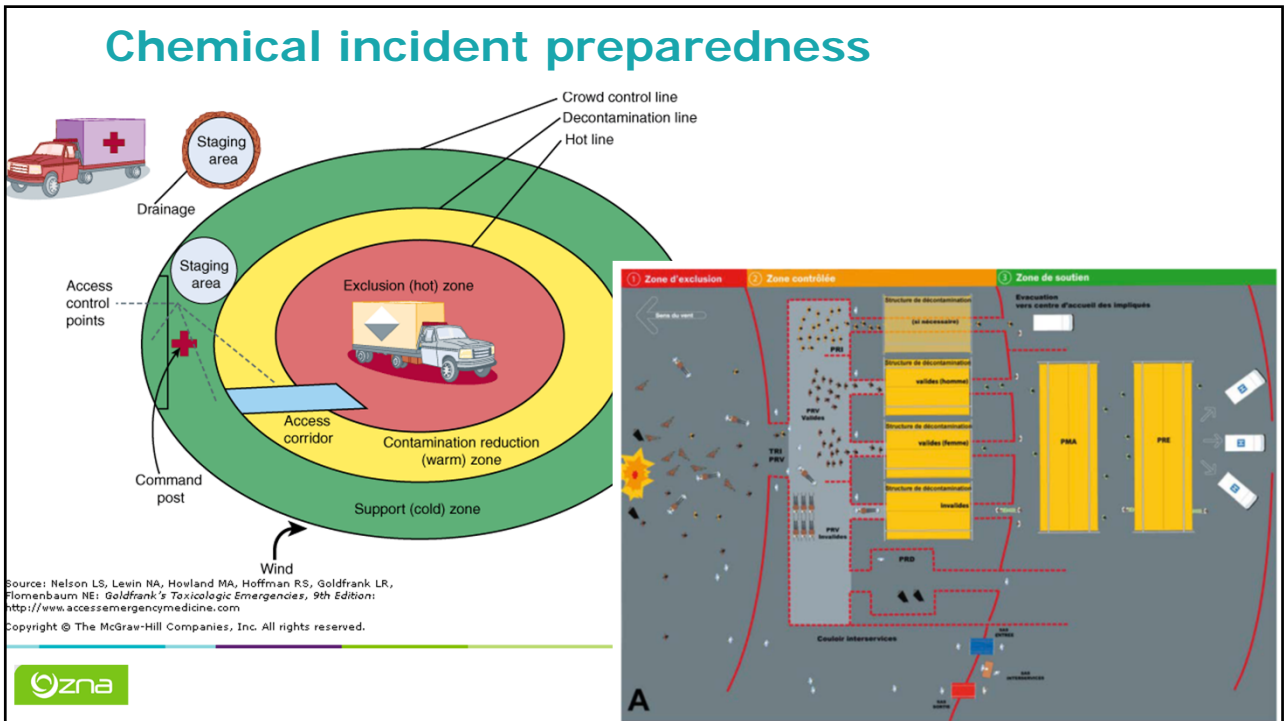
Acad Emerg Med 1998, 5(6): 613-7 Acad Emerg Med 1998, 5(6): 618-24 Crit Care 2005, 9:397-400
 Acad Emerg Med 1998, 5(6): 625-8 Resuscitation 2006, 68:193-202 Toxicol Appl Pharmacol 2005, 207(2):471-6

Tokyo (1995) - Lessons learned

- Majority self-presenters
 - 12 dead + 5500 wounded
 - 700 by EMS
- No PPE
 - Hospital
 - EMS
- Secondary contamination
 - Medical 20% staff
 - Police & Fire 10% staff
 - Extent of secondary exposure \approx duration and degree of physical contact



Acad Emerg Med 1998, 5(6): 613-7 Acad Emerg Med 1998, 5(6): 618-24 Crit Care 2005, 9:397-400
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Personal Protective Equipment

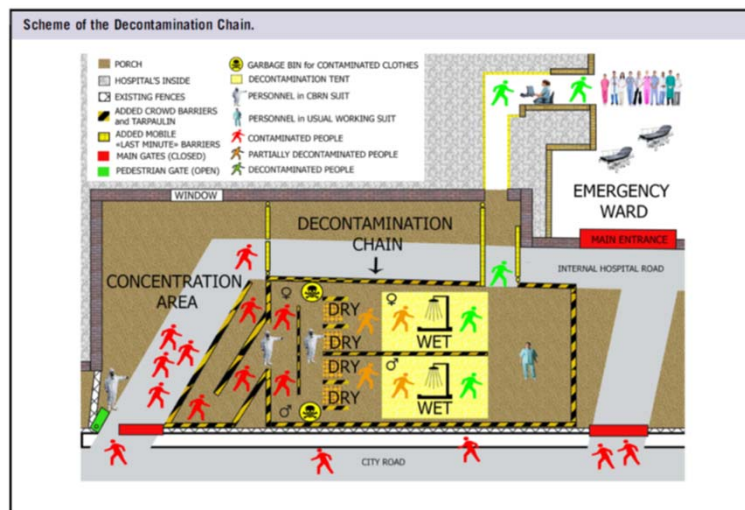
- ▣ Level A - D
 - ▣ More expensive
 - ▣ More troublesome
 - ▣ More training

- ▣ PPE
 - ▣ (Hot zone = level A)
 - ▣ Warm zone = level B or C



Emerg Med Clin N Am 2015, 33: 51-68
www.cdc.gov www.osha.gov

Hospital preparedness



Disaster Med Public Health Prep 2018, Epub ahead of print



ORIGINAL RESEARCH

Assessment of CBRNe preparedness among emergency department healthcare providers in an inner city emergency department
J Emerg Manag 2015, 13:431-46

Are Dutch Hospitals Prepared for Chemical, Biological, or Radionuclear Incidents? A Survey Study
 Luc J.M. Mortelmans, MD;^{1,2} Menno I. Gaakeer, MD;³ Greet Dieltiens, MD;¹ Kurt Anseeuw, MD;¹ Marc B. Sabbe, MD, PhD^{2,4}
Prehosp Disaster Med. 2017;32(5):1-9.

- 40% decontamination facility
- Mean capacity/hour
 - ambulatory
 - supine
- 50% PPE available
- 18% level A or B

Emergency care providers are inadequately prepared to manage CBRNE incidents.

Hospital disaster

Survey 2016

TABLE 2

Features of Disaster Plans in 2016

Type of Disaster	N=83 (%)	Activation of the Plan Within the Last 3 Years	N=80
Mass casualty incident	76 (92)	Hospitals with plan activated in the last 3 years	18 (23)
Hospital accident (fire, black-out, security or communication problem)	76 (92)	Plan Tested in Last 3 Years	N=80 (%)
Infectious problem (eg. Ebola, SARS)	65 (79)	HICS activation only	38 (48)
NRBC + B + T Risks	N=80 (%)	Simulated patients	33 (41)
Nuclear/radiological	14 (18)	Descriptive cards	27 (34)
Biological	25 (31)	Plan tested ≥ 1 time/year	42 (52)
Chemical	27 (34)	Plan tested ≥ 1 time/3 years	80 (100)
Burned	15 (19)	Presence of a HICS	N=80 (%)
Polytraumatized	46 (58)	HICS present	70 (88)
Plan Designed for Specific Populations of Patients	N=80 (%)	Leader of HICS	N=68 (%)
Children	19 (24)	Hospital's board member	38 (56)
Geriatric patients	12 (15)	ED medical officer	14 (21)
Migrants	10 (13)	Surgery medical officer	4 (6)
Reception of relatives	33 (41)	Anesthesia medical officer	1 (2)
Care Team for Victims' Relatives	N=80 (%)	Specialist according to the type of accident	3 (5)
Staff from emergency department	37 (46)	Other	8 (11)
Staff from psychiatry department	11 (14)	Time Needed for HICS to be Operational	N=68 (%)
Staff from other departments	31 (39)	< 20 minutes	7 (10)
Other	30 (38)	20-40 minutes	38 (56)
Patients' Flow Management	N=80 (%)	> 40 minutes	23 (34)
The flow of daily patients is separate from disaster's flow	Yes 41 (51)	Type of Risk Treated	N=78 (%)
Flow Management Tool in a Daily Situation	N=83 (%)	Chemical	47 (60)
Digital support	67 (81)	Biological	32 (41)
Paper	20 (24)	Nuclear/radiological	25 (32)
Other	3 (4)	No decontamination zone	30 (39)
None	4 (5)	Readiness of Decontamination Zone	N=48 (%)
Flow Management Tool in a Disaster Situation	N=78 (%)	Time necessary to be operational (min)	Average Median
Digital support	52 (67)		40.3 30.0
Paper	56 (72)	Decontamination Manager	N=48 (%)
Other	6 (8)	Hospital care staff	26 (54)
None	5 (6)	Hospital technical staff	23 (48)
Hospital Access Control Manager	N=80 (%)	Professional firefighters	19 (40)
Private security	29 (36)	Civil protection (FEMA in USA)	1 (2)
Police	24 (30)	Army	1 (2)
Other (technical staff)	34 (43)	Airnet	10 (21)
None	13 (16)	Personal Protective Equipment (PPE)	N=48 (%)
Recall of Additional Staff	N=80 (%)	Shields and disposable gowns	44 (92)
ED staff	74 (93)	Light chemical protective seal (PPE)	38 (79)
Staff from other departments	71 (89)	Other	7 (15)
		None	2 (4)



Disaster Med Public Health Prep 2018, 7:1-7

Case Study

Effectiveness of Hospital-Based Decontamination During a Simulated Mass Casualty Exposure

- 2 major metropolitan hospitals Texas
- 10 subjects visible and 10 invisible simulants
- *This study demonstrated that hospital preparedness for mass casualty decontamination is minimal at best, and highlighted the exposure vulnerability of hospital personnel should an actual event occur.*

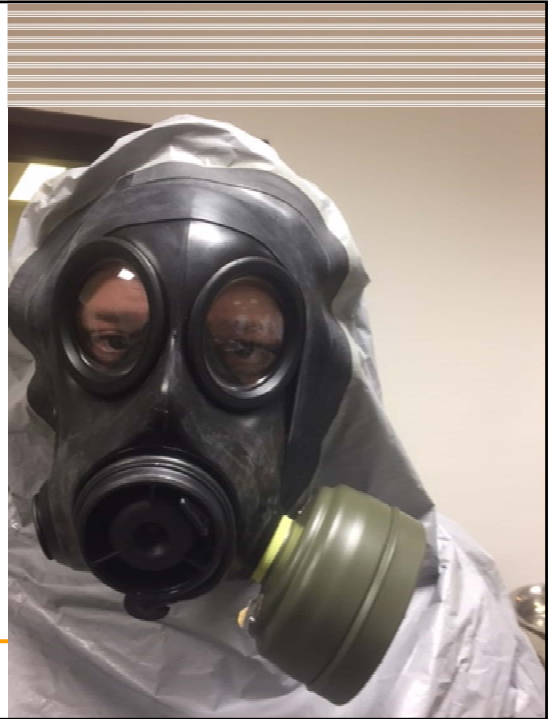


J Occup Environ Hyg 2011, 8(12):131-8



My pragmatic concepts

- Recognize it
- Know basics of toxicology
- Be prepared and practice
- Identify the toxin
- Treat the patient
 - Decontamination
 - Forward treatment
- Protect yourself (PPE)
 - Most appropriate not most protective



Toxicology basics

- Physicochemical properties of toxins
 - Toxicity
 - Latency
 - Persistency
 - Transmissibility
- Characteristics of exposure
- Concentration and duration of exposure
- Environmental conditions



Be prepared

- Have a chemical incident response plan
- Multidisciplinary coordination and communication
- Poison information management
 - System for collection, evaluation and dissemination
 - Information about
 - Toxin
 - Counteractions
 - Decontamination
 - Therapeutic information
 - Poison information center / Clinical toxicologist in CP
 - "Specialist lifeline"



Identify the toxin

- As soon as possible (sometimes difficult)
- Monitors
 - Technically limited
 - Time consuming
 - Qualitative or quantitative analyse
 - False positives and false negatives
 - Skilled personnel
- Working diagnosis
 - Common sense
 - Toxidromes



Treat the patient

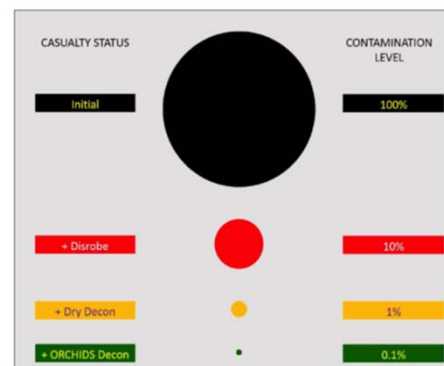
- Decontamination
 - Goal
 - Limit absorption of toxin
 - Prevent secondary contamination
 - Protect healthcare structures
 - Location
 - On site
 - Hospital
 - As soon as possible
 - The more toxic, the sooner
 - ↔ Specialist response
 - Within 10 – 15 minutes



PLoS One 2017, 12(6):e0179309 Ann Emerg Med 2018 (Epub ahead of print)
 Initial Operation Response to CBRN Incident, Home Office, UK Emergency Preparedness, Resilience and Response, NHS England, UK
 Plos Curr 2015 November 2,7:ecurrents Primary Response Incident Management Scene (PRISM)

Treat the patient

- Decontamination process
 - Evacuate
 - Disrobe
 - Improvised / interim decontamination
 - Dry decontamination (default)
 - Wet decontamination (caustic / B-R-N)
 - Technical / secondary decontamination
 - Rinse – wipe – rinse
 - Water & soap
 - Active drying
 - Duration 3-5 min



(Source: Public Health England, 2014)



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Treat the patient

Table 2. Number of participants who carried out the key steps of dry decontamination successfully in the guidance and no-guidance groups.

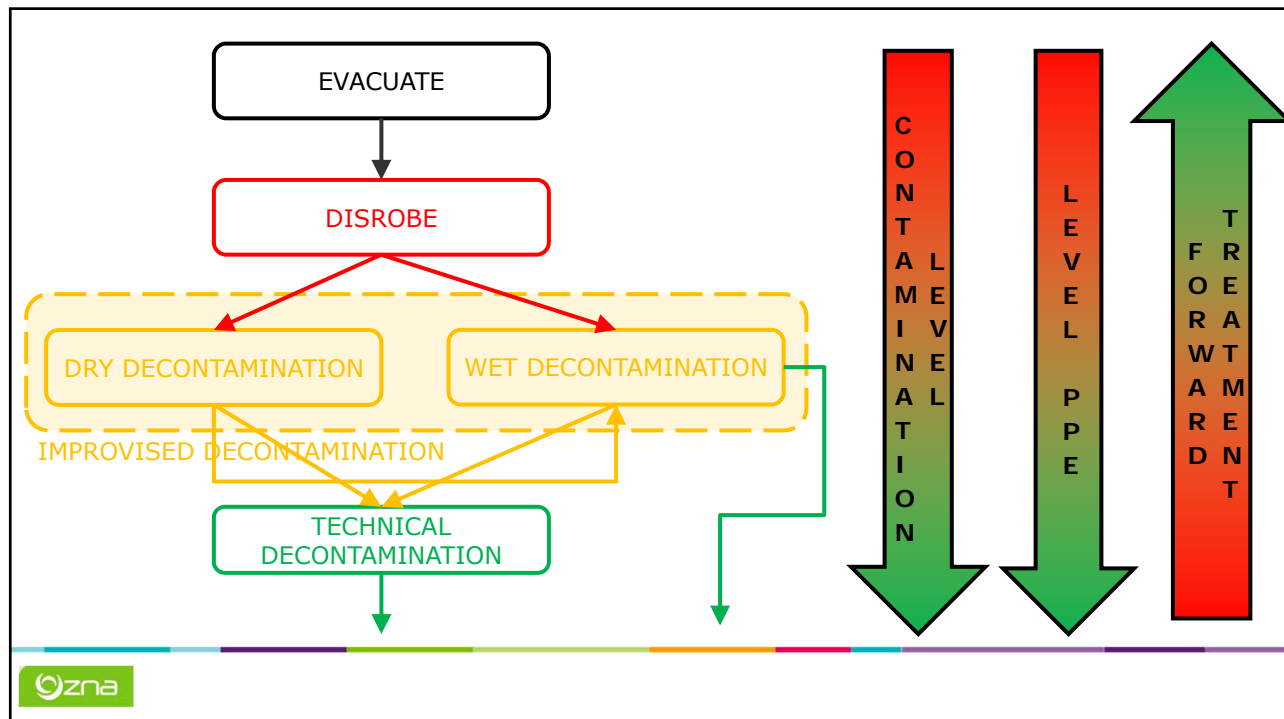
Group	Whole body decontaminated (n)	Top-down decontamination (n)	Sufficient blue roll used (n)
Guidance	10 (100%)	7 (70%)	10 (100%)
No guidance	2 (18%)	1 (8%)	0 (0%)

- ▣ Dry decontamination (default)
 - ▣ Dry absorbent material
 - ▣ Paper tissue, blue roll, incontinence pads, towels, ...
 - ▣ With guidance

- ▣ Wet decontamination (caustic / B-R-N)
 - ▣ Rinse – wipe – rinse
 - ▣ Water from any source
 - ▣ Active drying
 - ▣ Duration 90 sec (US: 15 sec)



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CONCLUSION

- ▣ Limited incident
 - ▣ Follow the plan
 - ▣ Consult your “lifeline” (if needed)

- ▣ Mass incident
 - ▣ Follow the plan
 - ▣ On-site adaptation and ingenuity
 - ▣ Consult your “lifeline”



Thank you for your attention

