

# The Tokyo Subway Sarin Attack at a Front Line Hospital Lessons Learnt

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# The scene of crime

This Policeman did not use protective equipment, even while he was standing in front of the sarin bag.



Soon after suffering chemical exposure, he collapsed!



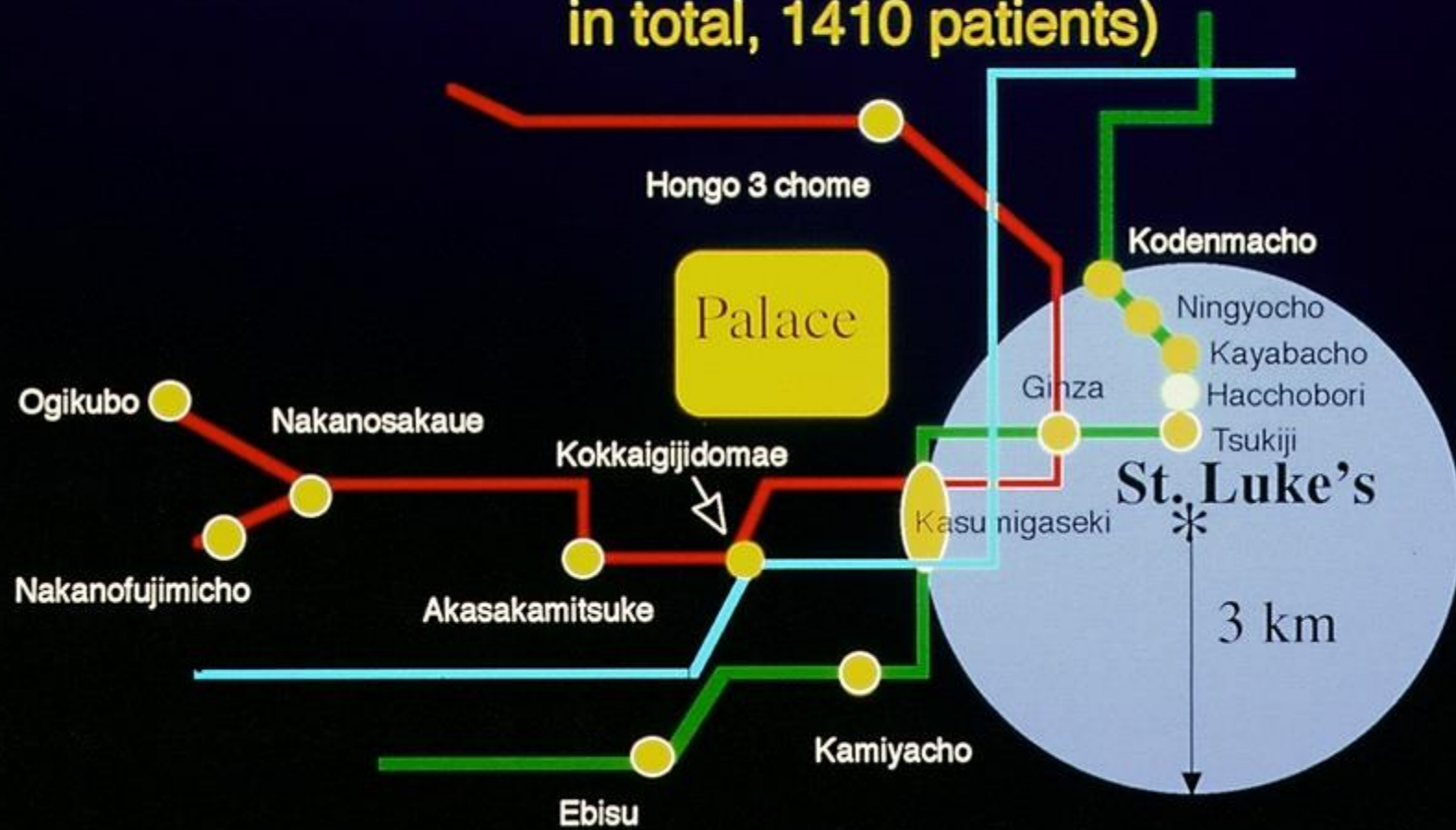








St. Luke's International Hospital received  
the greatest number of victims.  
(640 patients on the day of the attack,  
in total, 1410 patients)







**8:16 A.M.** First Call from the Fire Department  
"There has been a gas explosion! "

**8:28 A.M.** The first patient came on foot.

**8:43 A.M.** The first ambulance arrived.

**A FLOOD OF MORE THAN 500 PATIENTS**

**9:20 A.M.** Declaration of a disaster-oriented system.





# 救え命を

## 医師、看護婦500人 総力聖路加



### 地下鉄サリン殺傷事件

300人以上の犠牲者が出た地下鉄サリン殺傷事件。救急車で運ばれた患者は、〇〇人以上が手当てを受けた中央区の聖路加の救急科で治療された。医師や看護婦が終日大勢の中、懸命の努力に当たった。高校生や大学生のボランティアも加わったが、情報が入り乱れ、大勢が降りる新幹線の様相となった。同病院では女性1人が死亡し、症状の重い2人が入院した。

### 学生ボランティアも応援

聖路加病院は、救急科で治療を受けた患者は、300人以上が手当てを受けた中央区の聖路加の救急科で治療された。医師や看護婦が終日大勢の中、懸命の努力に当たった。高校生や大学生のボランティアも加わったが、情報が入り乱れ、大勢が降りる新幹線の様相となった。同病院では女性1人が死亡し、症状の重い2人が入院した。

### 心肺停止の二人蘇生

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### 救急車62台

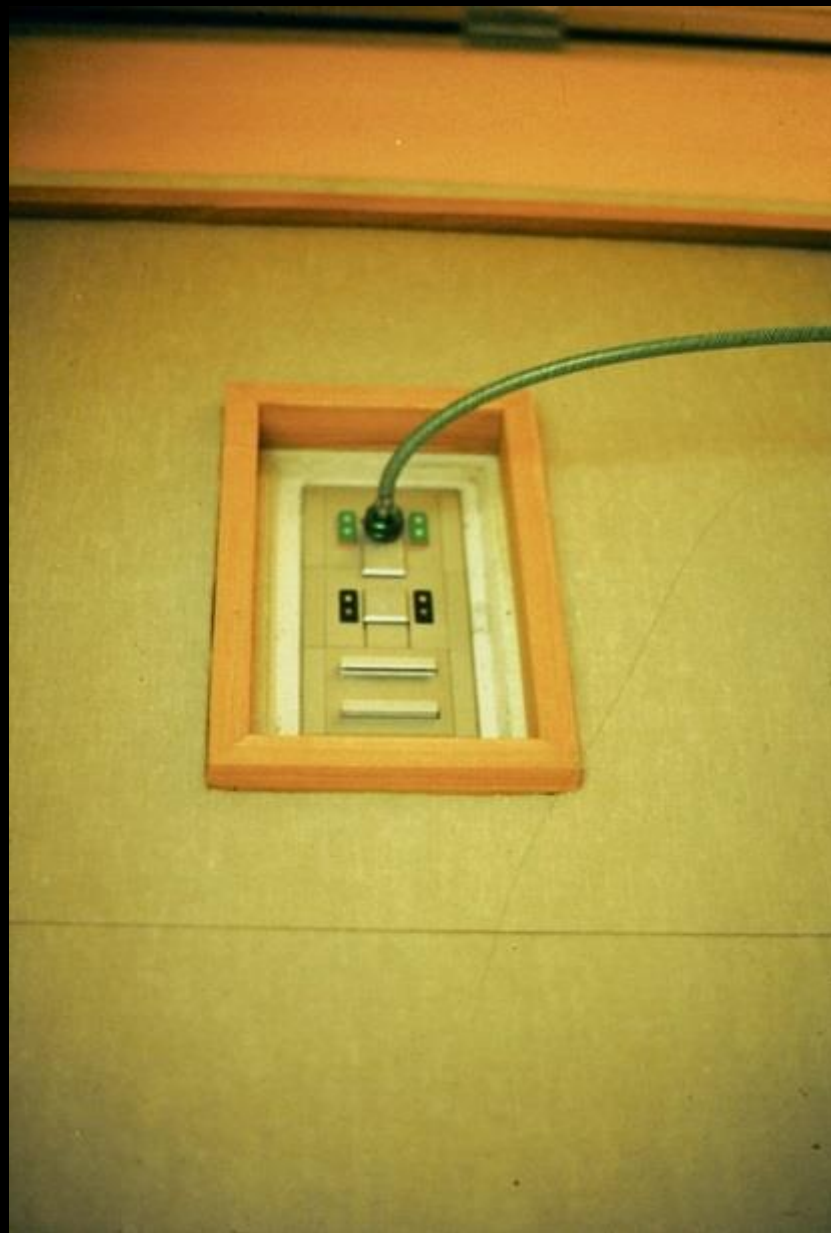
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### 関係が

聖路加病院は、救急科で治療を受けた患者は、300人以上が手当てを受けた中央区の聖路加の救急科で治療された。医師や看護婦が終日大勢の中、懸命の努力に当たった。高校生や大学生のボランティアも加わったが、情報が入り乱れ、大勢が降りる新幹線の様相となった。同病院では女性1人が死亡し、症状の重い2人が入院した。







## **Secondary Exposure Percentages for Various Medical Staff and Locations**

<b>Locations</b>	<b>Chapel</b>	<b>45.8%</b>	<b>( 38 / 83 )</b>
	<b>ICU</b>	<b>38.7%</b>	<b>( 12 / 31 )</b>
	<b>OPD</b>	<b>32.4%</b>	<b>( 34 / 105 )</b>
	<b>Ward</b>	<b>17.7%</b>	<b>( 14 / 79 )</b>
	<b>ER</b>	<b>16.7%</b>	<b>( 8 / 48 )</b>
<b>Occupational category</b>	<b>Nurse assistants</b>	<b>39.3%</b>	<b>( 11 / 28 )</b>
	<b>Nurses</b>	<b>26.7%</b>	<b>( 45 / 170 )</b>
	<b>Volunteers</b>	<b>25.5%</b>	<b>( 14 / 55 )</b>
	<b>Doctors</b>	<b>21.8%</b>	<b>( 12 / 55 )</b>
	<b>Clerks</b>	<b>18.2%</b>	<b>( 12 / 66 )</b>



## **Methods of Transportation to Our Hospital**

<b>On foot:</b>	<b>174 cases</b>
<b>Taxies:</b>	<b>120 cases</b>
<b>Cars of passing good samaritans:</b>	<b>67 cases</b>
<b>Cars of the Fire Defence Agency</b>	<b>64 cases</b>
<b>Ambulances:</b>	<b>35 cases</b>
<b>Police Patrol cars:</b>	<b>7 cases</b>

## **640 Patients on the Day of Attack**

**Age: 8 ~ 65 y.o.**

**(Average  $\pm$  SD = 35.00  $\pm$  12.27 )**

**Male : Female = 395 : 245**

**5 Pregnant Women**

**13 Children**

## **Severity of 640 Patients on the Day of Attack**

**Mild 528 Cases : Half Day Observation**

**Moderate 107 Cases: Admission**

**Severe 5 Cases :**

**1: Died in the Emergency Dept.**

**4: Intubated and Admitted**



## Summary of Si / Sx on Arrival      n=627

1. Miosis:	568 (90.5%)
2. Headache:	316 (50.4%)
3. Visual Darkness :	236 (37.6%)
4. Eye Pain :	235 (37.5%)
5. Dyspnea :	183 (29.2%)
6. Nausea :	168 (26.8%)
7. Cough :	118 (18.8%)
8. Throat Pain :	115 (18.3%)
9. Blurred Vision :	112 (36.9%)

## Laboratory Data during Admission

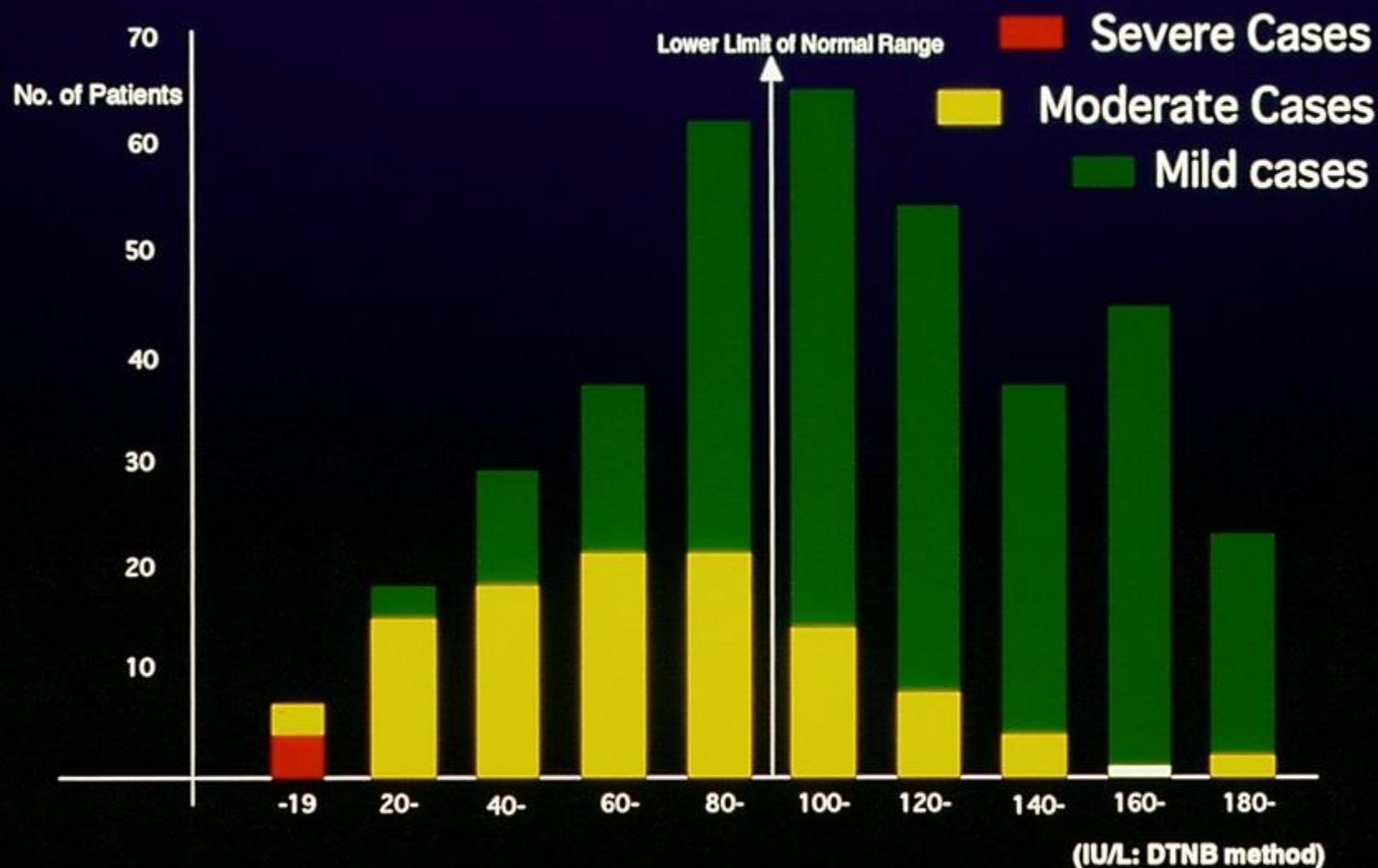
Chemical Data: Low Plasma ChE Value (74%)  
High CPK Value (11%)

Blood Cell Count: Leukocytosis ( 60% )

Assay of Arterial Blood Gas:  
Respiratory Alkalosis (67%)

ECG Findings: Taken in 57 Cases  
Normal (63%)  
QT Elongation (7%)  
Bradycardia (7%)

# Distribution of Plasma Cholinesterase Levels





# **Diagnosis**

**Miosis & Low ChE Values**

**Organic Phosphorus Intoxication ?**

**Information from**

**Doctors Concerned in  
the Matsumoto Sarin Affair  
and the Ground Self Defence Forces  
Hospital**

# Outcome of the Patients

640 patients on the day of the attack

528 patients  
went home.

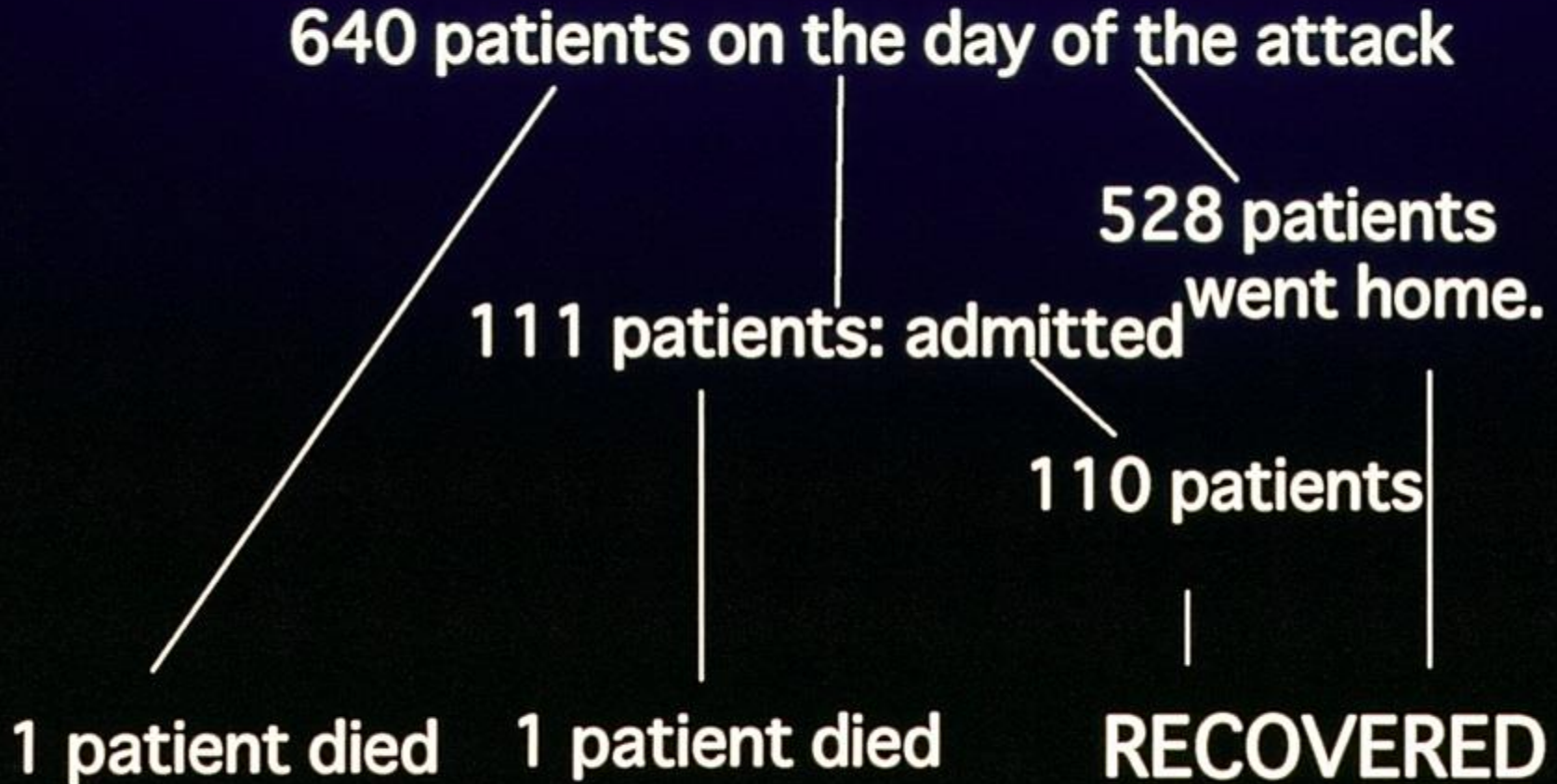
111 patients: admitted

110 patients

1 patient died

1 patient died

RECOVERED



# St. Luke's on the day of the attack





# Viewpoints

- Initial Treatment: Primary care
- Mass Decontamination System
- Personal Protective Equipments: PPEs
- Detection and Analysis
- Information system and coordination

# Initial Treatment

## Before and after the Sarin Attack

- Under Japanese law EMTs are not allowed to maintain a patient's airway using an endotracheal tube or to administer drugs to the victims of a chemical attack at the site of the incident. This law has changed after the sarin attacks, but EMTs can intubate and give epinephrine only for cardio-pulmonary arrest patients.
- Doctors should become more actively involved in the treatment of victims before they reach the hospital environment. However, even now, doctors are still not actively involved in the treatment of chemical disaster victims outside the hospital setting.

Until now in Japan warm zone medical procedures (autoinjector, tracheal intubation,,,,) are not introduced.



# Mass Decontamination System

## Before the Sarin Attack

- Decontamination facilities only existed for firefighters.

## After the Sarin Attack

- The Japanese Ministry of Welfare distribute mass decontamination facilities in 130 hospitals throughout Japan this year.
- The Fire authorities have begun to set up on-site decontamination facilities for victims, they have been distributed to large cities.

# Mobile Mass Decon-system made in Japan



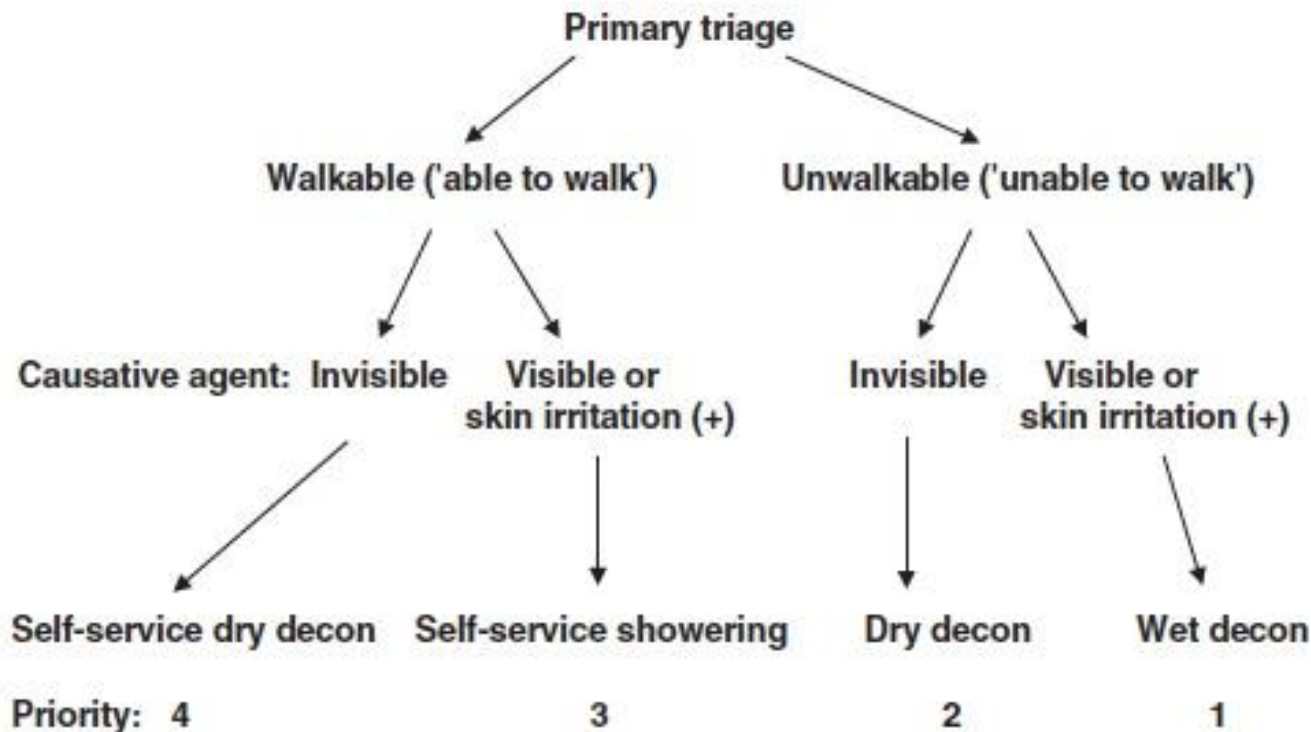
This system consists of inflatable tents, two decontamination lines , a warm water supply, air-conditioning and lighting.



# Official Decontamination Guide-line (2004)

- In March 2004, the Fire and Disaster Management Agency assembled leaders in this field to form the Study Group on Decontamination in NBC Emergencies, which proposed a more practical model for decontamination following terrorist attacks involving chemicals.
- The model provides criteria for decontamination depending on whether the causative agent is visible and whether the victims are ambulatory.

# The Japanese standard of Decontamination



Practical decontamination strategy. Adapted from the *Decontamination Manual* (the official report of the Task Force on the advanced procedures of fire righters by the Japanese National Fire Defense Agency, 2004).

# Wet (Water) Decontamination

- require time, labor, feed-water and drainage equipment, space, clothes, and protection of privacy
- Low efficiency





# Wind Decontamination



# Wind Decontamination for non persisting agents (blood agents, choking agents, psychochemical agents and nerve agents)

- Decontamination is a rate-controlling and time-consuming step. Even dry decontamination, which is basically changing the clothes of the victim, takes significant time.
- Therefore, in order to expedite the decontamination process, Japanese researchers created an original and unique wind decontamination system (Wind-Decon). Using Wind-Decon, ambulatory victims enter a wind tunnel and are exposed to wind speeds of over 25 m/sec, which is fast enough to expel any noxious gases that may be trapped beneath the clothes.
- This system can decontaminate hundreds of victims per hour. This Wind-Decon system has already been put into practical use by thermal power plants in Japan for removing dioxin particles from the clothing of utility workers.

# Indication of Wind Decon

- Nonpersistent agents (blood agents, choking agents, psychochemical agents and nerve agents)
- Mild victims who can walk and obey instructions
- No use for Persistent agents and severe patients



# Wind Decontamination

- This system can decontaminate hundreds of victims per hour. This Wind-Decontamination system has already been put into practical use by thermal power plants in Japan for removing dioxin particles from the clothing of utility workers. Some are commercially available.

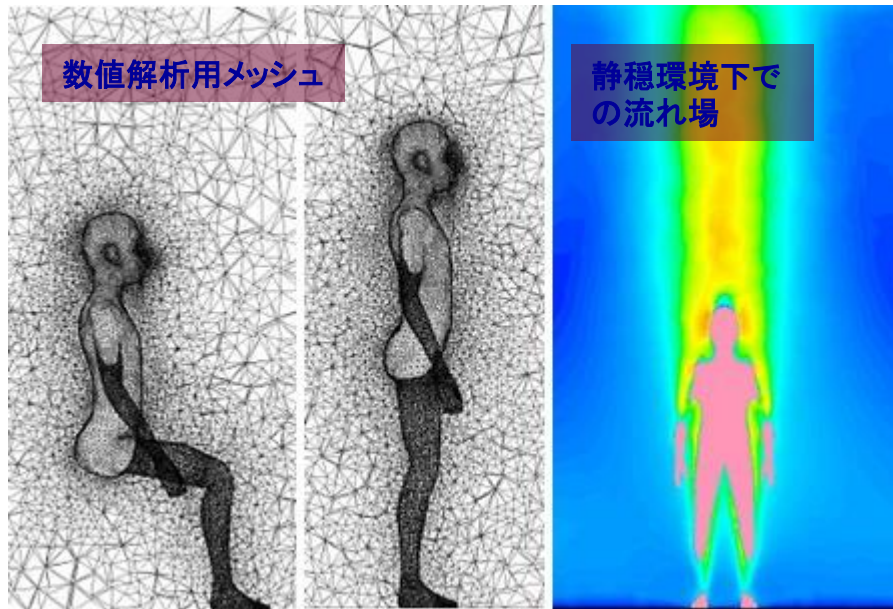


# **Benefits of the Wind Decon. System**

- **Easy to protect privacy**
- **Light-weight, ready to use (rapid deployment)**
- **Short period (30 sec.) for decontamination**
- **Effective to remove aerosols, powder and particulate materials (solid matter, such as asbestos, dioxin, dirty bomb, anthrax powder, etc)**
- **Applicable to daily activities of the Fire Department as well as to terrorism events**

# Comparative discussion between Virtual Manikin and Real Manikin

## Virtual Manikin



## Real Manikin





# Dr. Ito's Literature

1. Li C and Ito K: Performance evaluation of industrial air-shower in removal of gas- and liquid-phase contaminants from human body. Joint J of Novel Carbon Resource Sciences & Green Asia Strategy 1(1):40-47, 2014
2. Li C and Ito K: Performance evaluation of wind decontamination system by Computational Fluid Dynamics. *ibid* 1(2):12-17, 2014

# Personal Protective Equipments: PPEs

## Before the Sarin Attack

- Insufficient PPE was provided both on-site at chemical incidents and within the hospital environment.

## After the Sarin Attack

- The Japanese Ministry of Welfare distributed PPEs for hospitals throughout Japan, but only 4 sets were provided in each hospital.
- In contrast, the fire and police authorities, and the Japanese Self Defence Force do have sufficient PPE.

# Detection and Analysis

## Before the Sarin Attack

- The chemical disaster task force team of the Tokyo Metropolitan Fire Defence Agency included on-site analysis personnel even before the first sarin attack. However, during the sarin incident, they were unable to identify sarin since this chemical was not included in their library of possible substances.
- On the other hand, the Metropolitan Police Agency was able to identify the agent involved as sarin within 3 hours, due to the benefit of information collected during the Matsumoto Sarin Incident

## After the Sarin Attack

- Analysis equipments (GC/MS, HPLC, ICPM) was distributed to Emergency Centers throughout Japan.
- A total of 8 major cities have developed Anti-NBC Task Force within their local police department, they have on-site Analysis equipments.
- Japanese Self Defense Forces has also introduced many on-site Analysis equipments.



In the year 2000, the Japanese Government distributed chemical analysis equipment to 73 Emergency Centers throughout Japan.



### Numbers of Distributed Equipments

HPLC with library	58
HPLC	15
Fluorescent X ray	72
GC	1
GC/MS	9
LC/MS	10



# Information system and coordination

## Before the Sarin Attack

- There were two Poison Information Centers in Japan.
- There was no information system against Chemical Disaster.

## After the Sarin Attack

- The Japanese Government compiled a list of key personnel with expertise in the management of chemical disaster incidents; regular meetings have been convened, and a mailing list has been set up.
- Non-governmental mailing lists for clinical toxicologists have also been established and are now well known routes for the exchange of information concerning chemical poisoning.
- The Japanese Government has thus created a chemical terrorism management model. In this model, the Japanese Poison Information Centre has become the national coordinator of information on chemical disaster management.

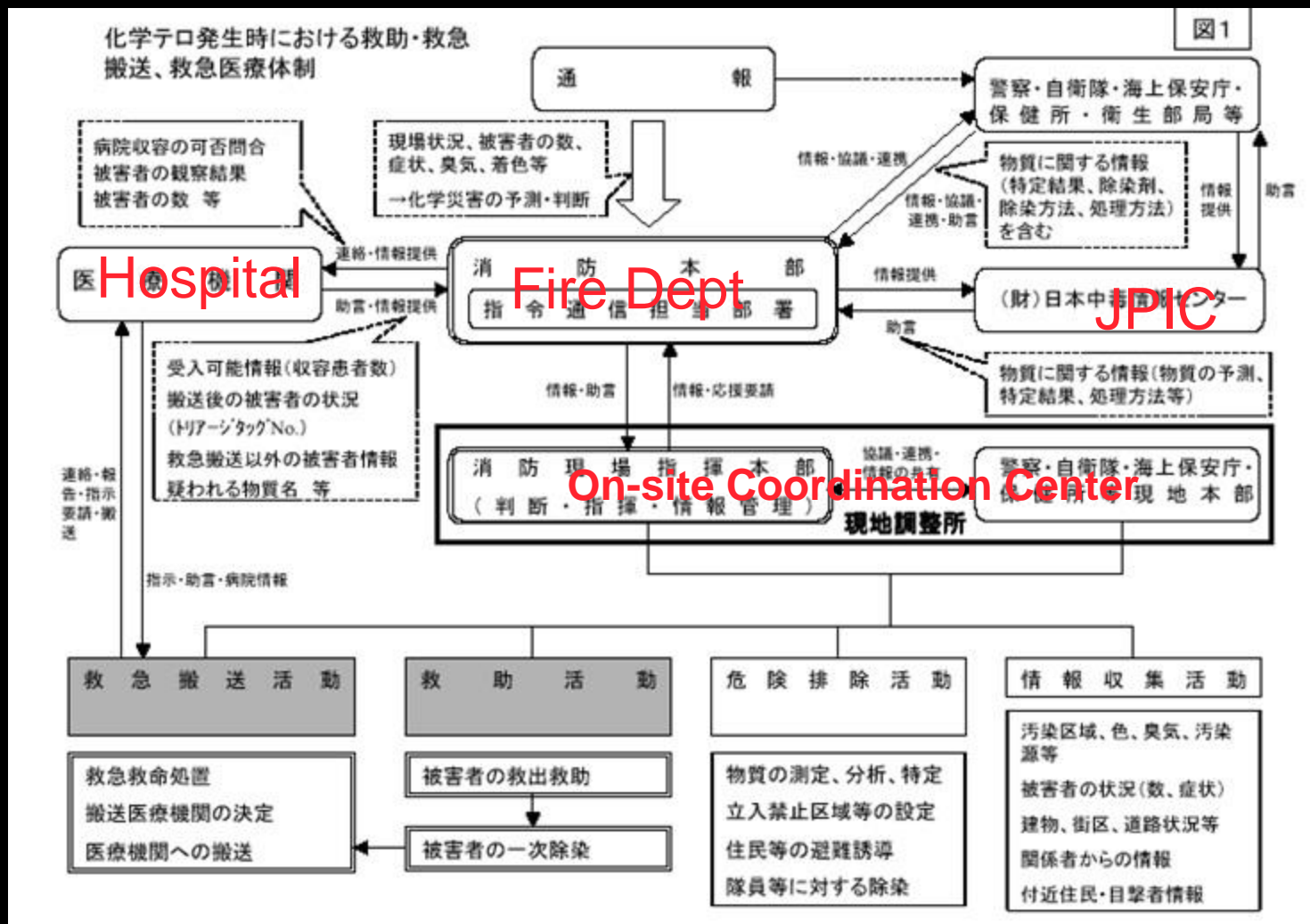
# The Japanese Government's NBC terrorism management model 2001

N B C テロ対処現地関係機関連携モデル

平成 13 年 11 月 22 日  
N B C テロ対策会議幹事会



# The Japanese Government's Chemical Terrorism management model



# The necessity of International Communication in case of chemical terrorism

- 1) When spreading of damage across the border is thought.
- 2) When response in the country in charge is very difficult and complicated, the independent country cannot resolve the problem autonomously and demands relief from each country.
- 3) when it is thought that there might be simultaneously attack to various countries to rouse attention.