ふくしまから
はじめよう。
Future From Fukushima.

25 – 27 February 2013
International Academic Conference on Radiation Health Risk Management in Fukushima
Adatara Hall, 3F West Wing, Fukushima View Hotel
Fukushima, Japan

Initial Medical Response to the Fukushima Nuclear Accident at Fukushima Medical University Hospital

Arifumi HASEGAWA, MD, PhD
Department of Emergency and Critical Care Medicine
Nuclear Disaster Medical Center
Fukushima Medical University

Contents

- Medical response in the early phase of the Nuclear Power Plant accident
- Current issues in the chronic phase

Fukushima Medical University Hospital (FMU)

Complex Disaster

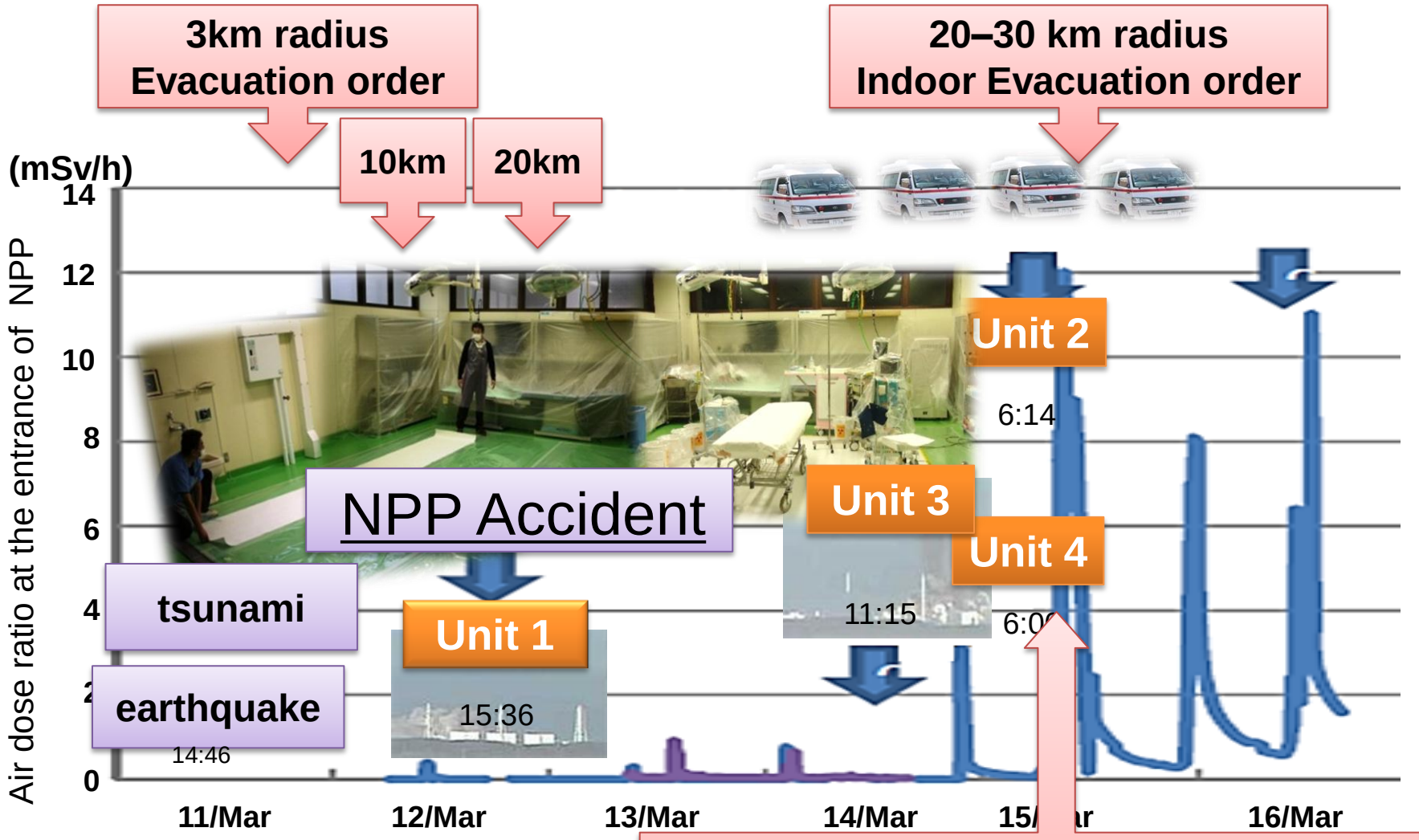
Earthquake
major trauma

Tsunami
aspiration pneumonia, hypothermia

Disaster station hospital (35 teams, 180 Medical staff)
Number of patients (12–14 Mar): 168 (Total)
(Green 93; Yellow 44, Red 30, Black 1)

Medical evacuation : off-site transport

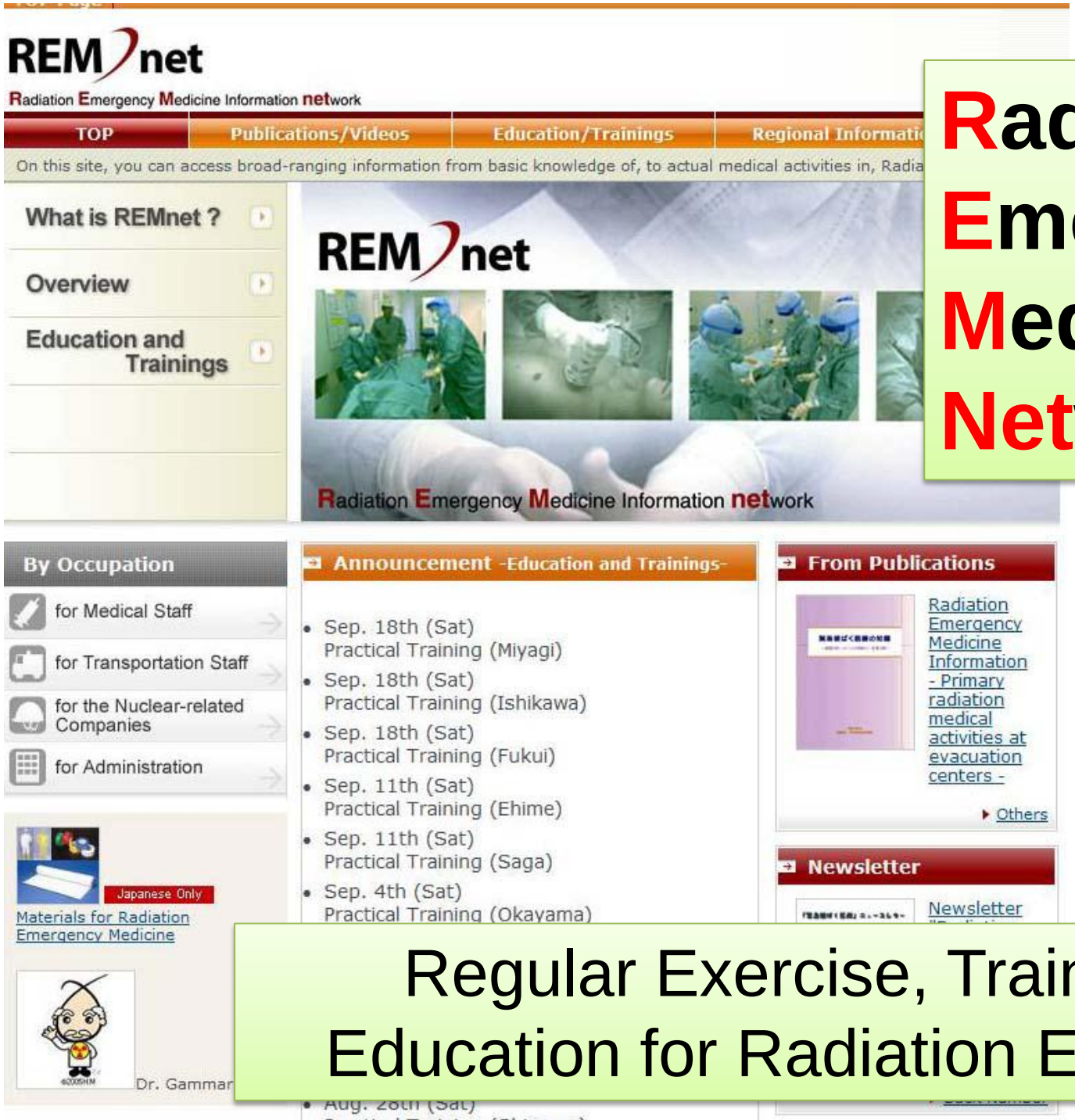
Nuclear Disaster among the Complex Disaster



- 30km radius flight ban
- Evacuation of helicopter company
- Flight restraint of force
- Evacuation of medical support team

What we wanted to know at that time

- What is happening at the NPP?
- What dose of radiation is dangerous?
  - ✓for patients?
  - ✓for medical staff?
- What level of contamination is dangerous?
  - ✓for patients?
  - ✓for medical staff ?
- What types of radionuclides
  - ✓are released?
  - ✓pose health risks?
- What is the appropriate decontamination level?



Radiation Emergency Medicine Network

Regular Exercise, Training and Education for Radiation Emergency

REMnet collapse in Fukushima Prefecture

Radiation Emergency Medicine Information network

Prefecture	Plant	Primary REM Hp	Secondary	Tertiary
FUKUSHIMA	1F 2F	*OHNO prefectural Hp* *FUTABA welfare Hp* *IMAMURA Hp* *South SOMA city Hp* Workers compensation Hp IWAKI city Hp	FMU (Level I Emergency Medical Center)	NIRS (National Institute of Radiological Sciences)

no entry zone, planned evacuation zone

hospitals in evacuation zone

15/Mar/2011: Arrival of external support

REMAT (Radiation Emergency Medical Assistance Team)

- Radiation Emergency Medical suppo
  - ✓ Notification
  - ✓ Education

National Self Defense Force

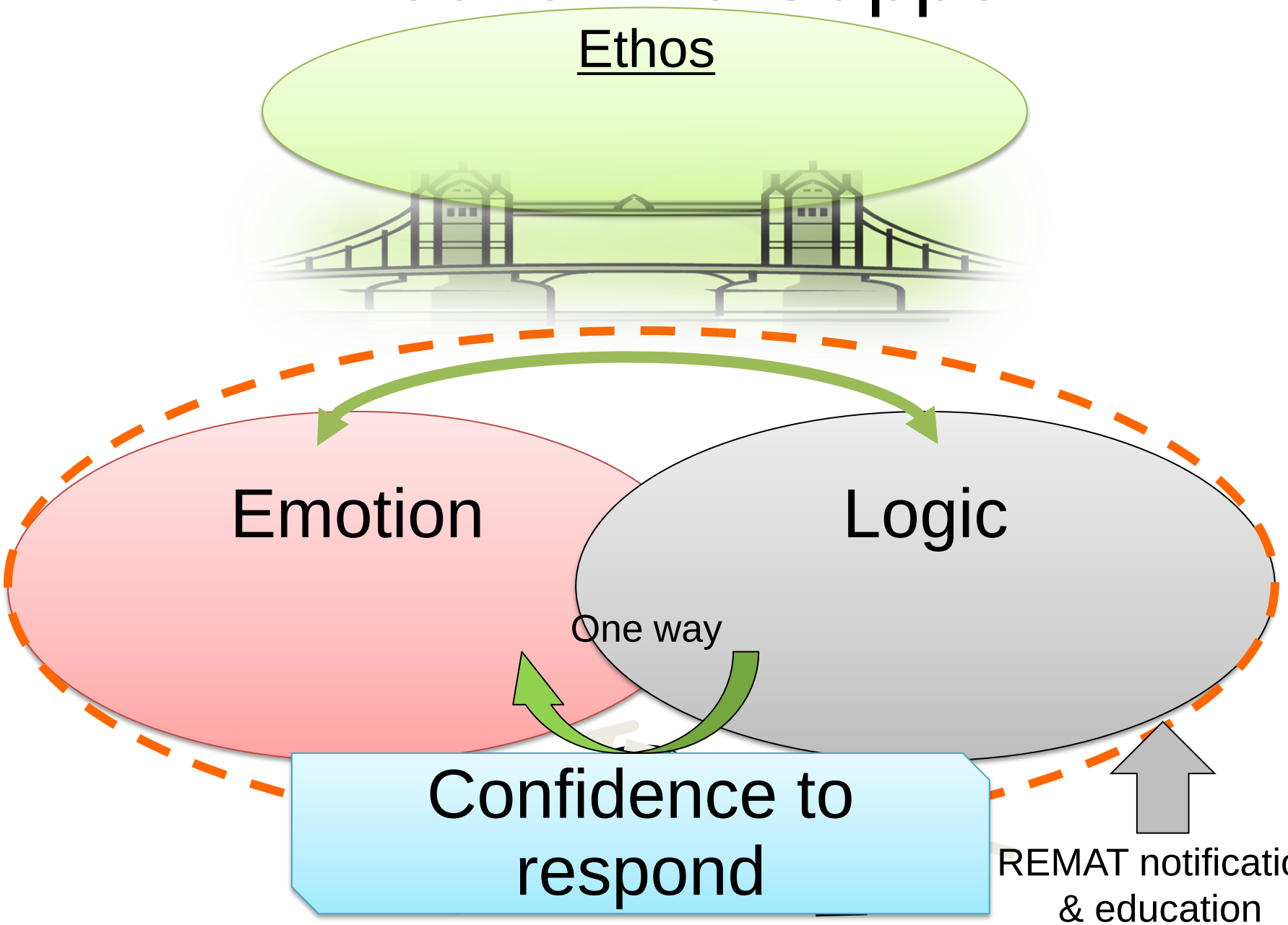
Japan Atomic Energy Agency (JAEA)

- Decontamination support
  - ✓ Whole body decon shower setting

"be close to explosion"
"mission as the front hospital in the battle field"
Prepare for mass casualty incident

Activity point in Fukushima Medical University

Effect of the Support



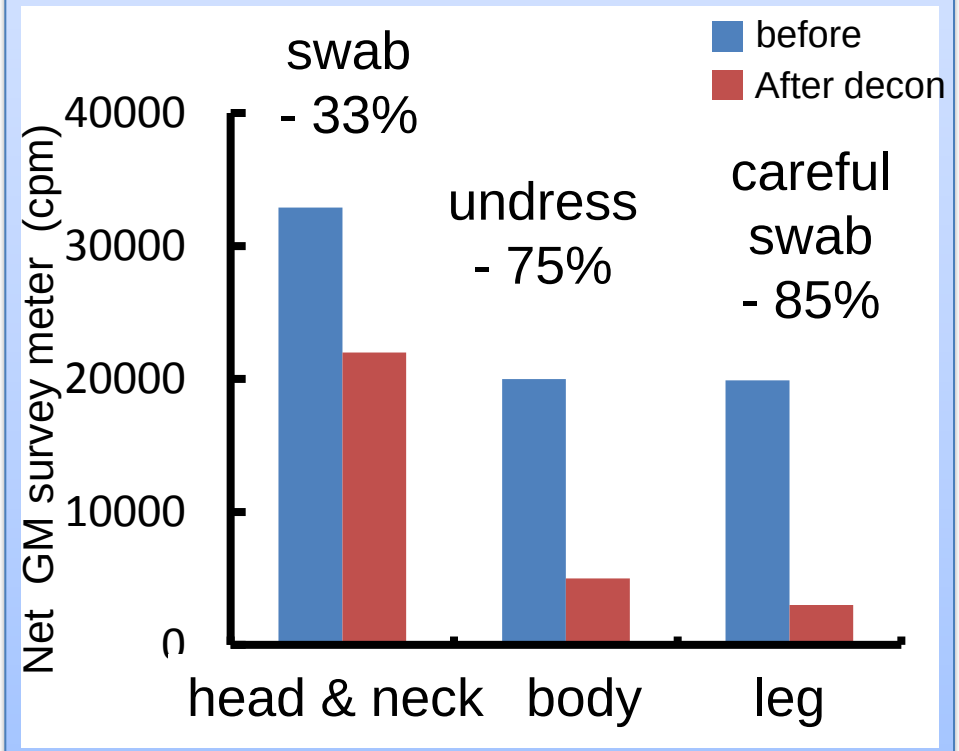
Patients transported from NPP to FMU

(11th–31st/Mar/2011)

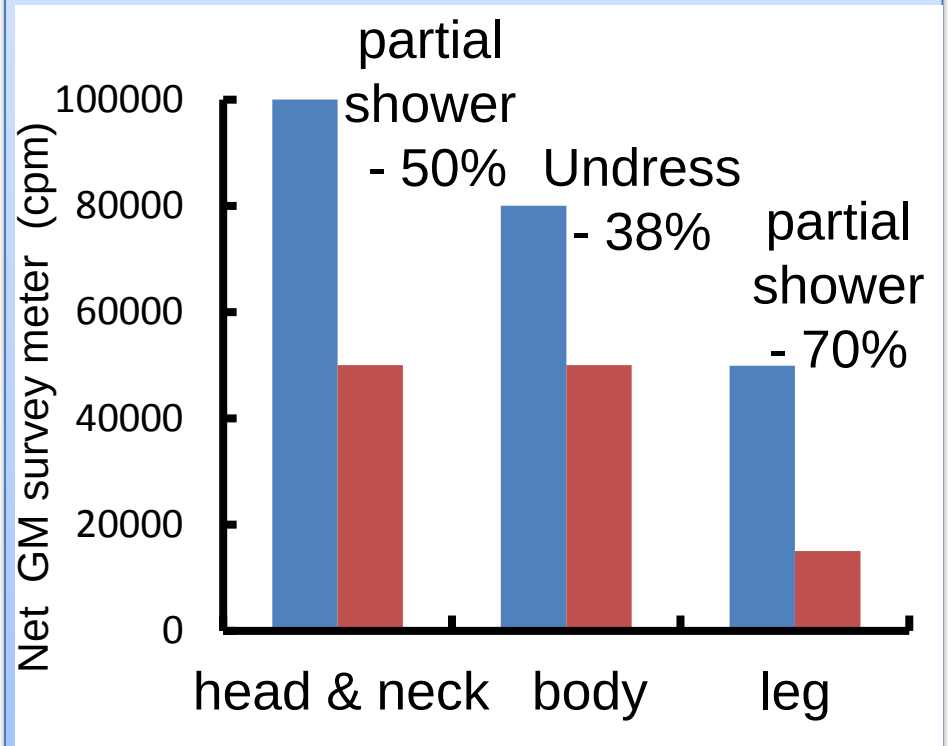
	Date	Patient diagnosis	Decon methods	Outcome
1	14/03/2011	Cervical wound, brachial plexus injury	Undress and wiping	Admission→ Discharge 16 Mar
2	15/03/2011	Right leg wound		No admission
3		Left leg wound		No admission
4		Right leg wound		No admission
5	16/03/2011	Abdominal wall injury	Whole body decon (shower)	No admission
6	25/03/2011	Cont. of feet skin		Admission→NIRS
7		Facial rash due to HZV		No admission
8	24/03/2011	Cont. of feet skin, s/o internal contamination.		Admission→NIRS
9		Cont. of feet skin, s/o internal contamination.		Admission→NIRS

The patients examined with undress and wiping decontamination

Case 3: Left leg wound (15 Mar 2011)



Case 4: Right leg wound (15 Mar 2011)



Decontamination Support

Whole body decontamination shower tent (Base-X) + water supply truck
(Self Defense Force)

Whole body shower bus
Japan Atomic Energy Agency
(JAEA)

Decontamination support by SDF and JAEA

JAEA shower bus

Shower tent 1

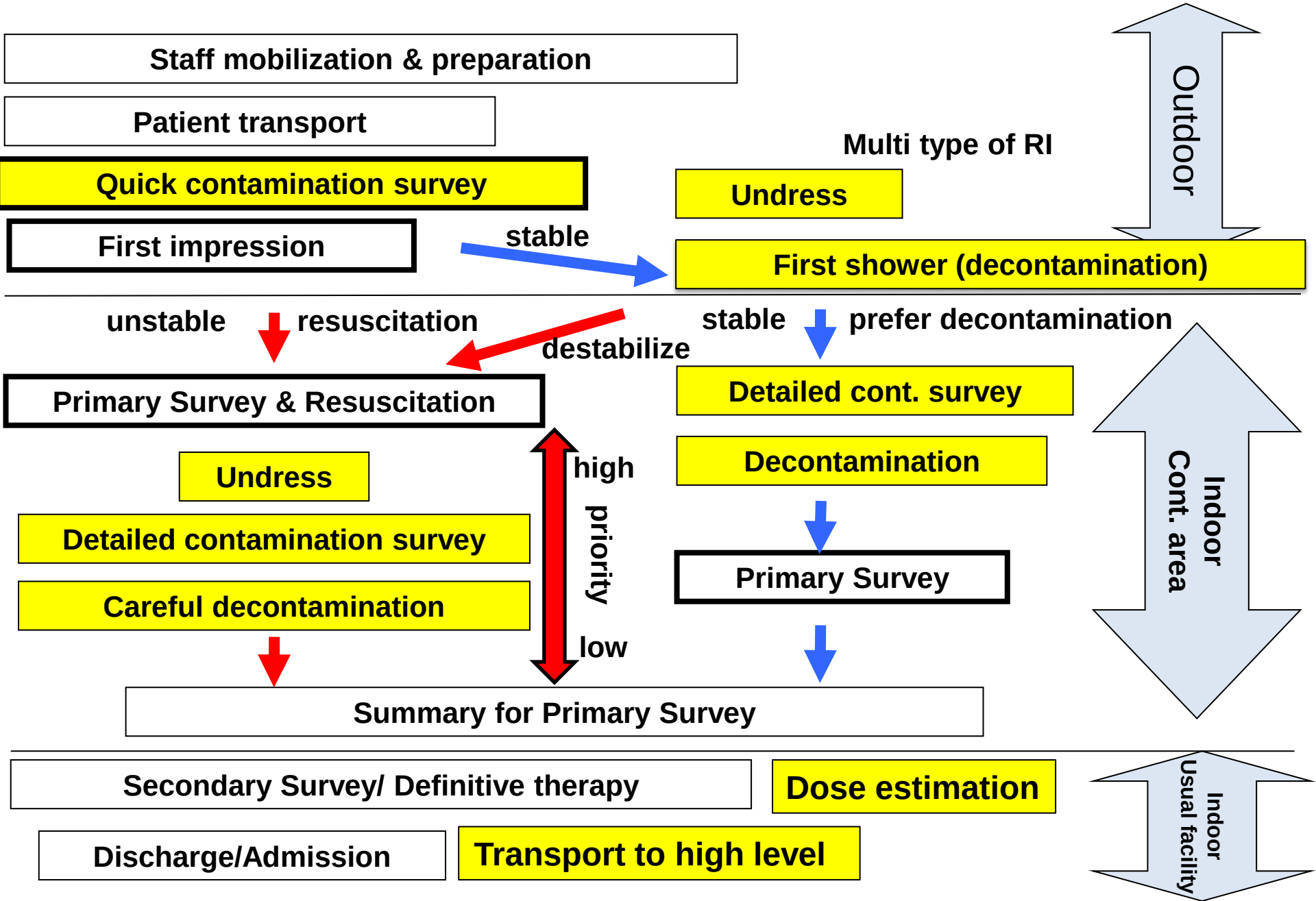
JAEA surface contamination detection bus

Shower tent 2

Patients transported from NPP to FMU
(11–31 Mar 2011)

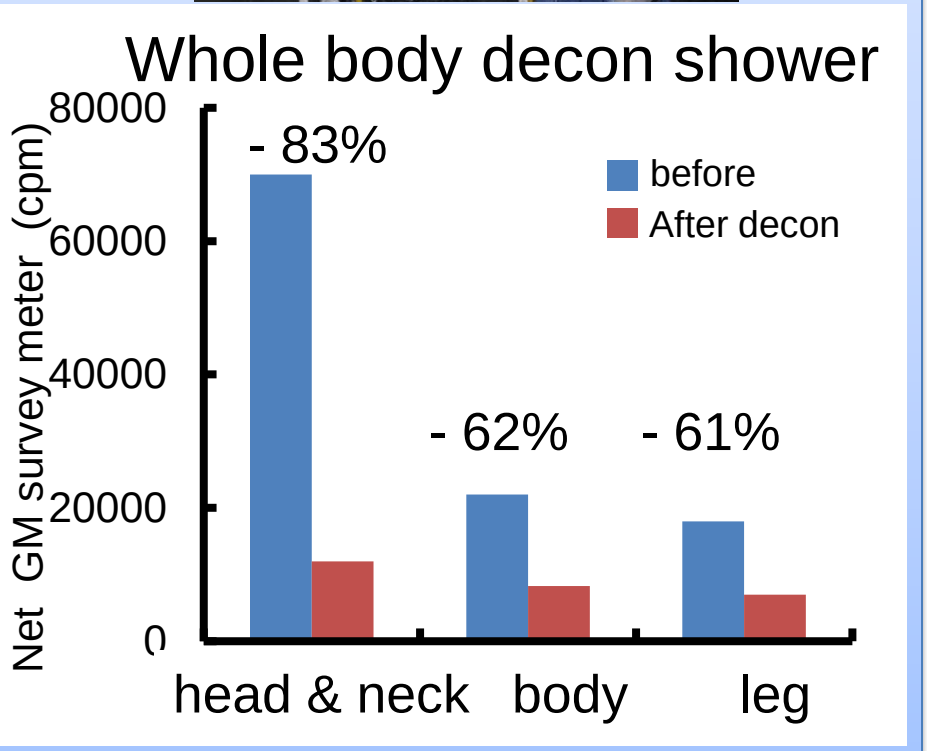
	Date	Patient diagnosis	Decon methods	Outcome
1	14/03/2011	Cervical wound, brachial plexus injury	Undress and wiping	Admission→ Discharge 16 Mar
2	15/03/2011	Right leg wound		No admission
3		Left leg wound		No admission
4		Right leg wound		No admission
5	16/03/2011	Abdominal wall injury	Whole body decon (shower)	No admission
6	25/03/2011	Cont. of feet skin		Admission→NIRS
7		Facial rash due to HZV		No admission
8	24/03/2011	Cont. of feet skin, s/o internal contamination.		Admission→NIRS
9		Cont. of feet skin, s/o internal contamination.		Admission→NIRS

REM Examination Procedure on Initial Phase

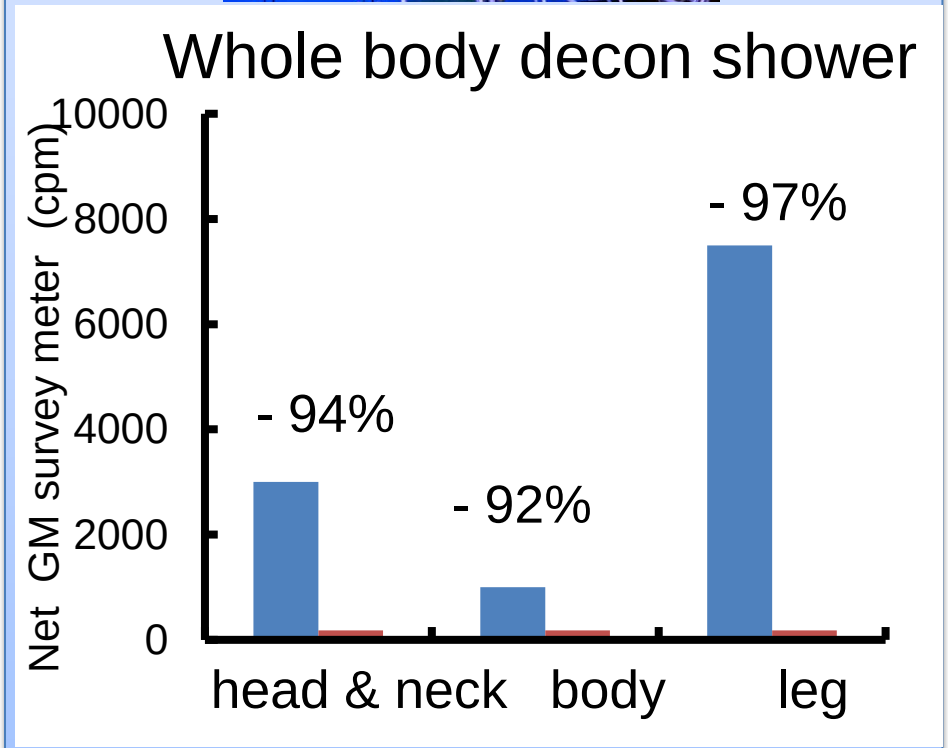


The patients examined with whole body shower decontamination

Case 5: Abdominal wall injury (16 Mar 2011)

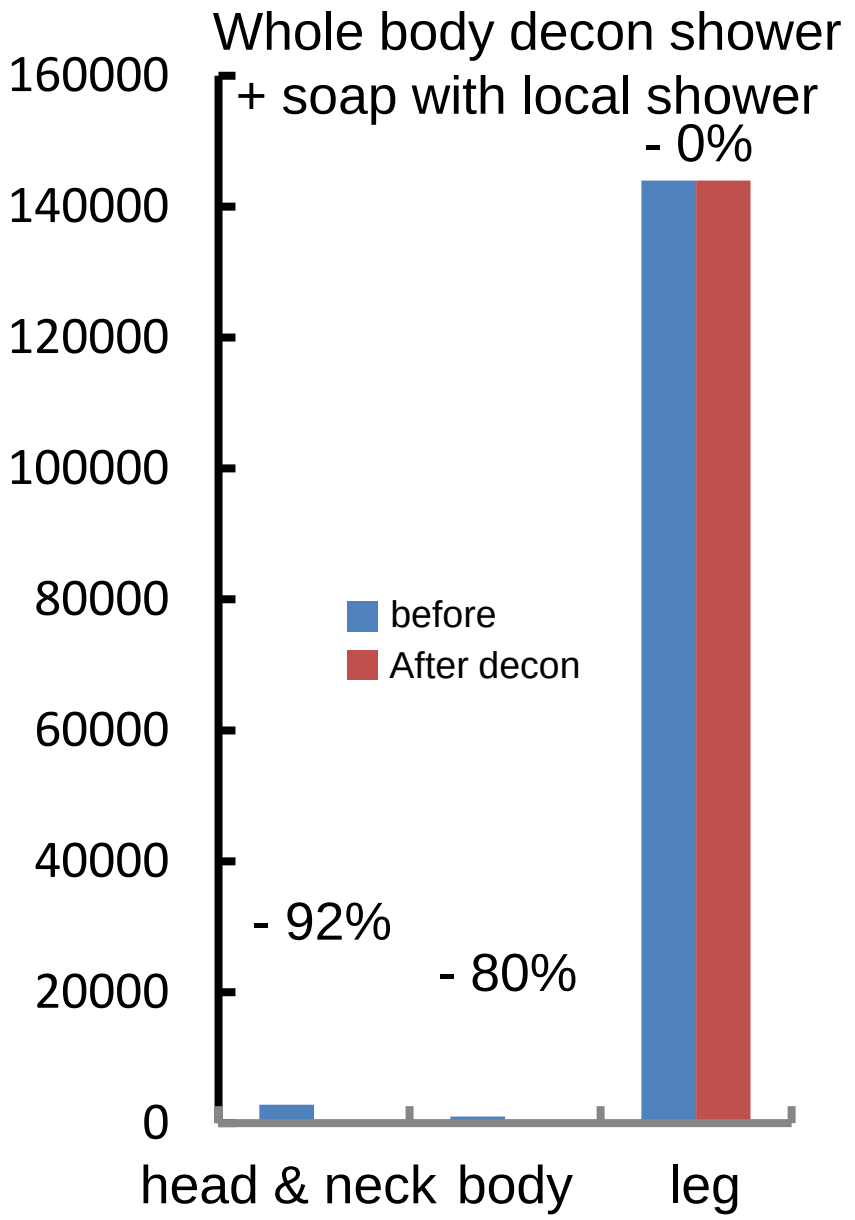


Case 7: Facial rash (HZV) (25 Mar2011)



The high level contaminated patients in their feet, examined with whole body and local shower decon

Case 8: Cont. of feet skin (24 Mar 2011)



Dose estimation for high level contaminated patients transported to NIRS

	Case 8	Case 9	Case 6
Reading of Personal Dosimeter *1	180	179	173
Skin equivalent dose *2	466	466	3
Committed effective dose *3	39	35	0
Thyroid equivalent dose *4	259	137	1.7

[mSv]

*1: Reading of Personal Dosimeter; External exposure dose
*2: Skin equivalent dose; Calculated from concentration of contaminated water and working time by NIRS
*3: Committed effective dose ; Estimated from the measurement of WBC and radionuclide intake scenario of each person by NIRS
*4: Thyroid equivalent dose ; Estimated by the measurement of thyroid monitor by I-131 intake scenario of each person by NIRS

Data from NIRS

Summary : injured and sick workers in NPP

I. <u>Contaminated patients; Unable to clear the screening level 12</u>
   - Trauma 12（dead 2）, including Force commander

31 Mar 2011

II. <u>Not Contaminated patients; Clear the screening level 309</u>
   - External cause 185
     - Trauma (mild) 86
     - Trauma (moderate) 43
     - Trauma (severe) 5
     - heat stroke 51
   - Internal cause 124
     - ACS 8 （dead 3）
     - Stroke 4
     - Others 112

（1F medical team：11/Mar/2011～31/Aug/2012)

Medical requirement in the NPP

Injured and sick workers in NPP

Physiological unstable

Future risk

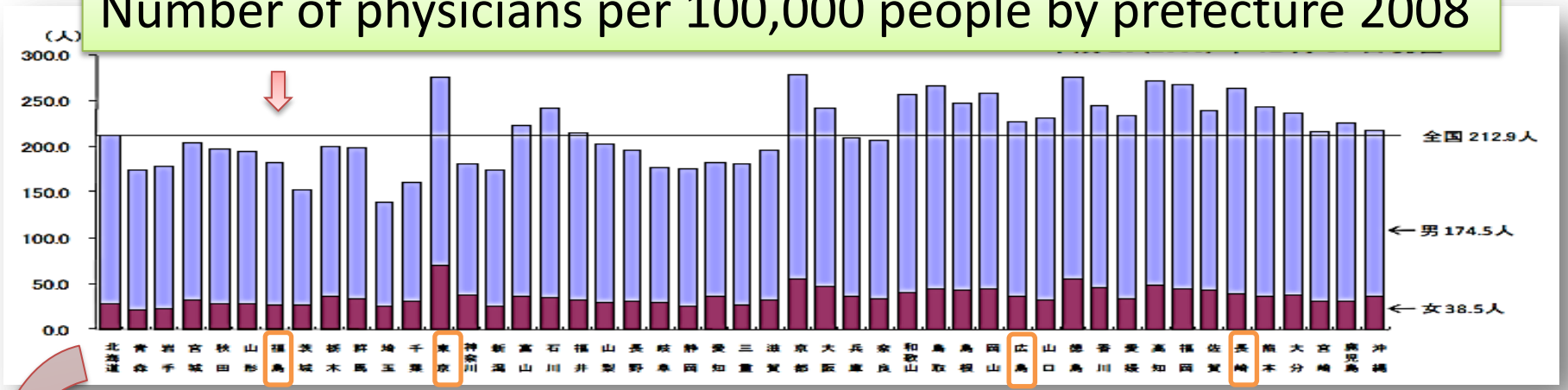
Highly exposed

Heavily contaminated

Before disaster: Number of physicians per 100,000 people

Survey of Physicians, Dentists and Pharmacists 2008 Ministry of Health, Labor and Welfare

Number of physicians per 100,000 people by prefecture 2008



Time trend

Survey year	Number of physician	Shift	Number of physicians per 100,000 people		
			Fukushima	Average in Japan	Ranking/ 47
2004	3601	-12	171.0	201.0	38
2006	3663	+62	176.0	206.3	38
2008	3760	+97	183.0	212.9	37
2010	3705	-55	182.6	219.0	41

Fukushima Prefecture H.P.

After disaster: decrease number of full-time physicians in Fukushima

3.11

Year	Number of physician	Shift
Mar, 2011	2024	
Dec, 2011	1953	-71
Aug, 2012	1945	-8

Sustaining the usual healthcare delivery system

Maintenance of the radiation disaster medical system

Current REMnet in Fukushima Prefecture

Radiation Emergency Medicine Information network

On-site first-aid station

Plant emergency physician

Transport car Ambulance

Emergency transport base

Japan association for Acute Medicine

No contamination <13,000cpm

Primary

City Hp

Workers compensation Hp

Ambulance Force heli

contamination severe trauma

Secondary

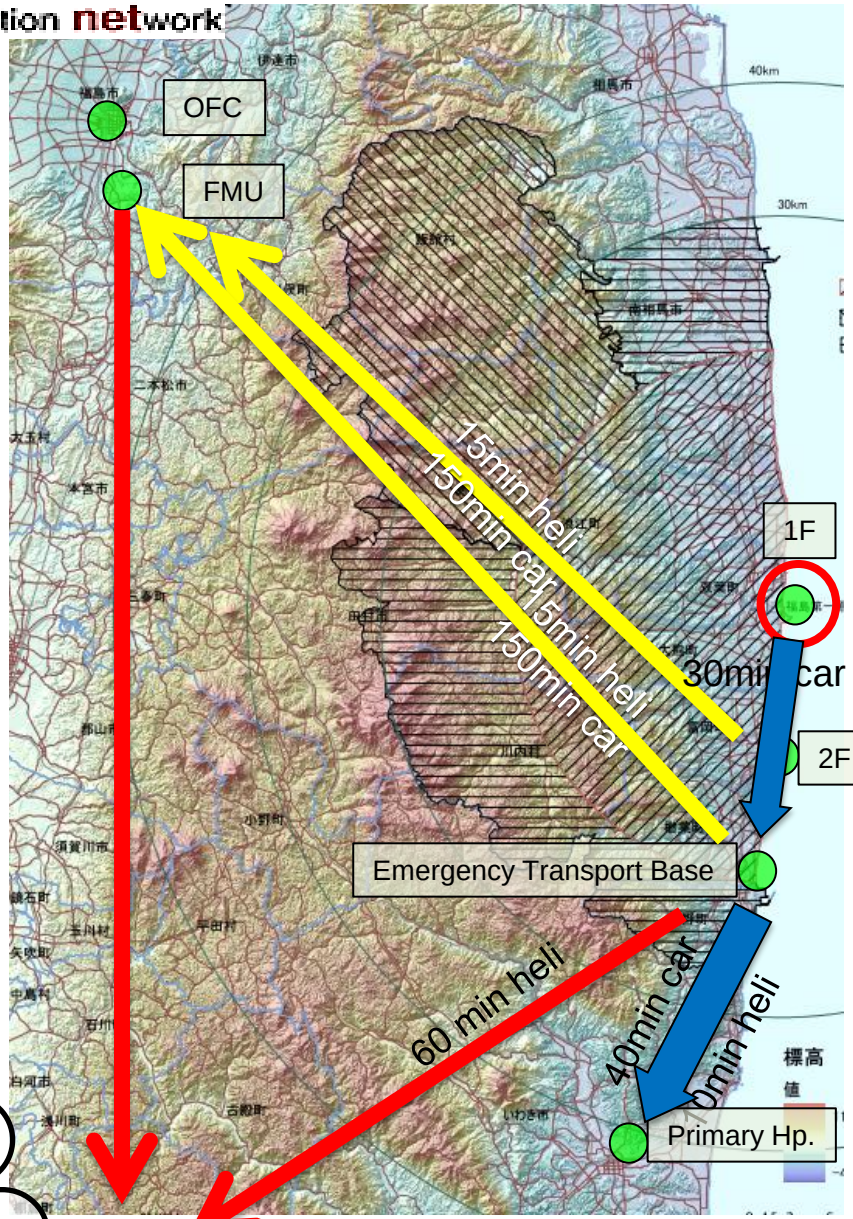
FMU

ARS severe contamination

Tertiary

NIRS

Hiroshima Uni. Hp



Geospatial Information Authority of Japan (GSI)

Shift from “Uncommon” to “Common”

Uncommon → **Common**

- Perceived as uncommon
- Poor medical support system
  - no CBRNE-DMAT
  - only one REMAT
- Education and Facility
  - radiation protection
  - contamination control
- Low priority
  - other medical problems

- Perceived as common by physicians
- Maintain the support system
- Useful Education and maintain Facility for common medical protection
  - estimate and real acceptance for minimized risk
  - preparation for CRBNE causality
- REM is one of the local community medical system

Chronic phase disaster medicine
= Local community healthcare service

Three targets of our work

Target	Situation	Method
Plant workers	High risk in radiation exposure & contamination, diseases & accidents	Radiation Emergency Medicine
Emergency responder	High risk in radiation exposure & contamination	Radiation clinic
Residents	Chronic low dose exposure, stress/fear	education/communication/coordination

Conclusion

- No patients with severe radiological problem such as ARS
- All contaminated patients were physiologically stable
- Decontamination supports from the Force and JAEA were essential in radiation emergency medicine
- Support from REMAT gave us confidence to respond the nuclear disaster
- Not well prepared Nuclear or CBRNE disaster medical support system
- Maintaining radiation emergency medical system to deal with the disaster
- Difficult, but have dream to consider the chronic phase radiation disaster medicine as part of the common local community medical system.