MEDICAL MANAGEMENT OF RADIATION EMERGENCY

- Leonardo Oloan Agusta Sitanggang –

Follow-UpTraining Course on
Nuclear/Radiological Emergency Preparedness (NREP)
BRIN-JAEA
August 20, 2025

Hello Everyone

Leonardo Oloan Agusta Sitanggang

Dokter Ahli Madya

Kelompok Fungsi Layanan Kesehatan dan Kedaruratan Nuklir Serpong

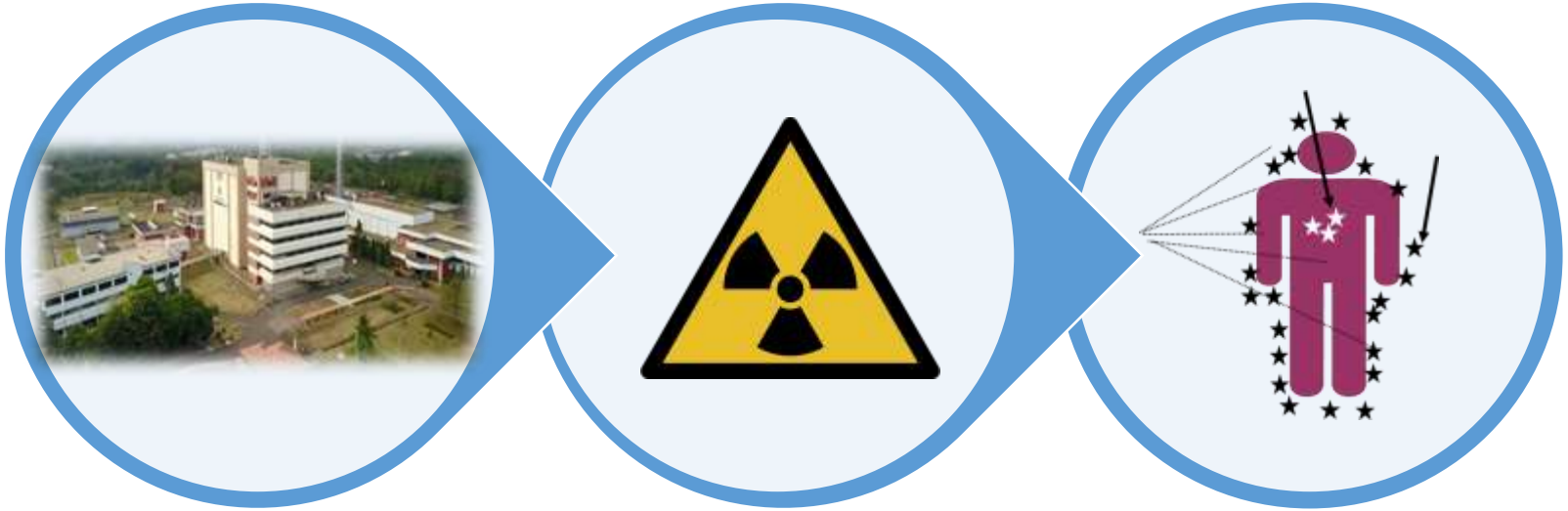
Direktorat Pengelolaan Laboratorium Fasilitas Riset, dan Kawasan Sains dan Teknologi, BRIN

leon003@brin.go.id


LETS
BREAK
THE ICE

Background

Nuclear or radiological emergencies, in general terms, may involve workers in facilities; other personnel; emergency workers;



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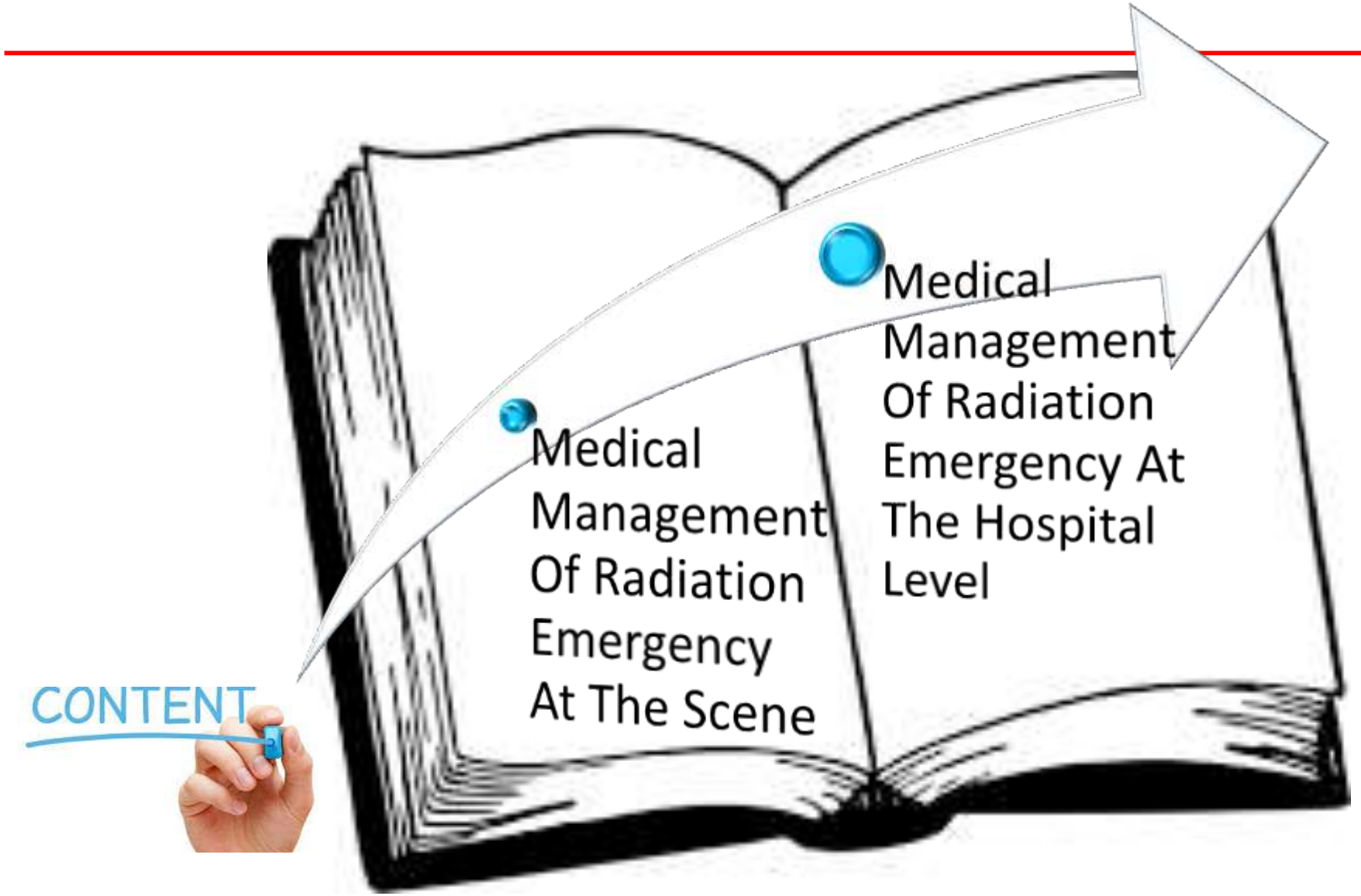
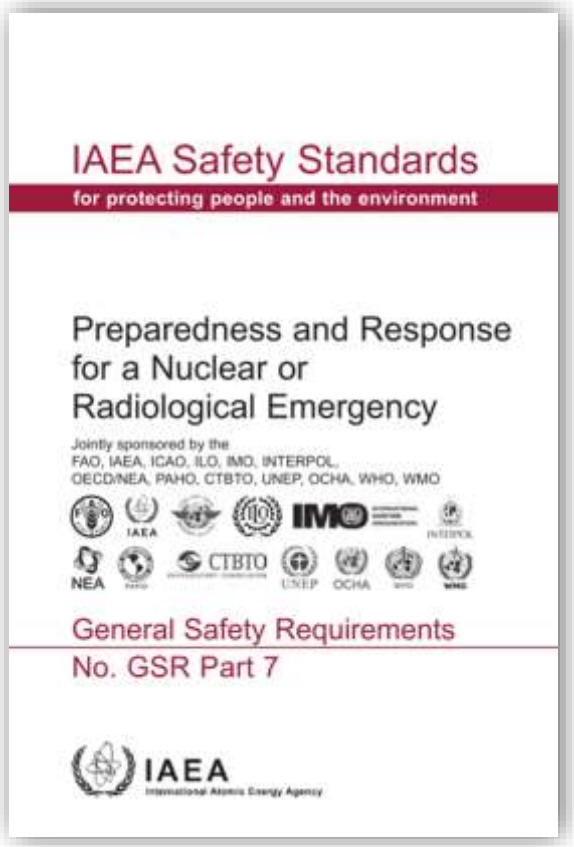
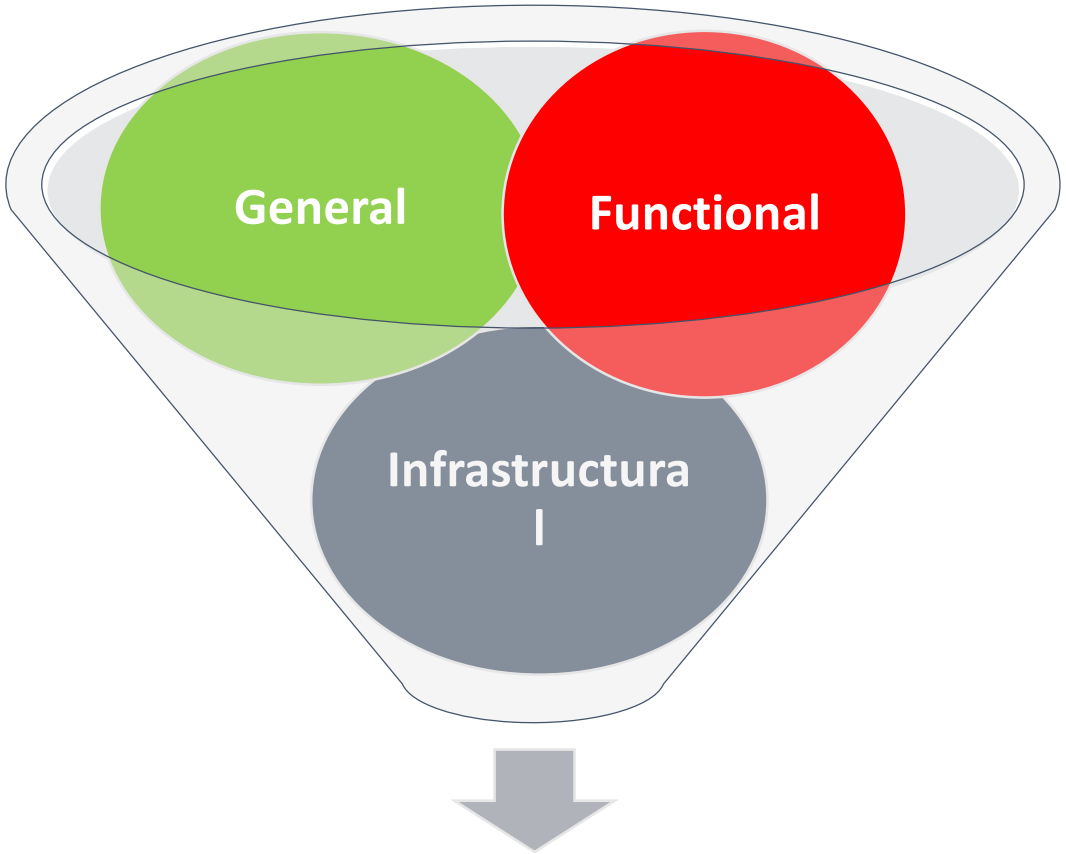

Medical Management Of Radiation Emergency At The Hospital Level
Medical Management Of Radiation Emergency At The Scene
CONTENT

I. Medical Management Of Radiation Emergency (1)





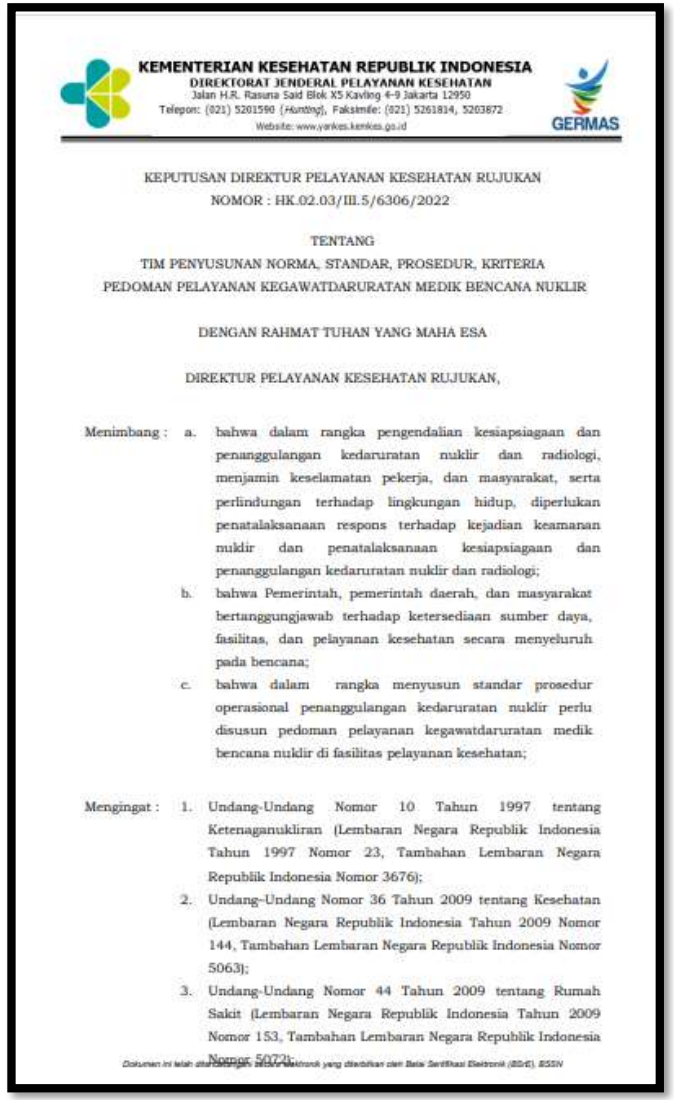
Goals of emergency preparedness and response

I. Medical Management Of Radiation Emergency (2)

Goal Of Emergency Medical Response :

1. To save lives and perform required emergency medical procedures
2. To treat radiation injuries and injuries resulting from an emergency situation
3. To perform required public health actions, including public advice and councelling, and long term medical follow-up

I. Medical Management Of Radiation Emergency (3)



KEMENTERIAN KESEHATAN REPUBLIK INDONESIA
DIREKTORAT JENDERAL PELAYANAN KESEHATAN
Jalan H.R. Rasuna Said Blok X5 Kavling 4-9 Jakarta 12950
Telepon: (021) 5201590 (Hunting), Faksimile: (021) 5261834, 5203872
Website: www.yankes.kemkes.go.id

GERMAS

KEPUTUSAN DIREKTUR PELAYANAN KESEHATAN RUJUKAN
NOMOR : HK.02.03/III.5/6306/2022

TENTANG
TIM PENYUSUNAN NORMA, STANDAR, PROSEDUR, KRITERIA
PEDOMAN PELAYANAN KEGAWATDARURATAN MEDIK BENCANA NUKLIR

DENGAN RAHMAT TUHAN YANG MAHA ESA

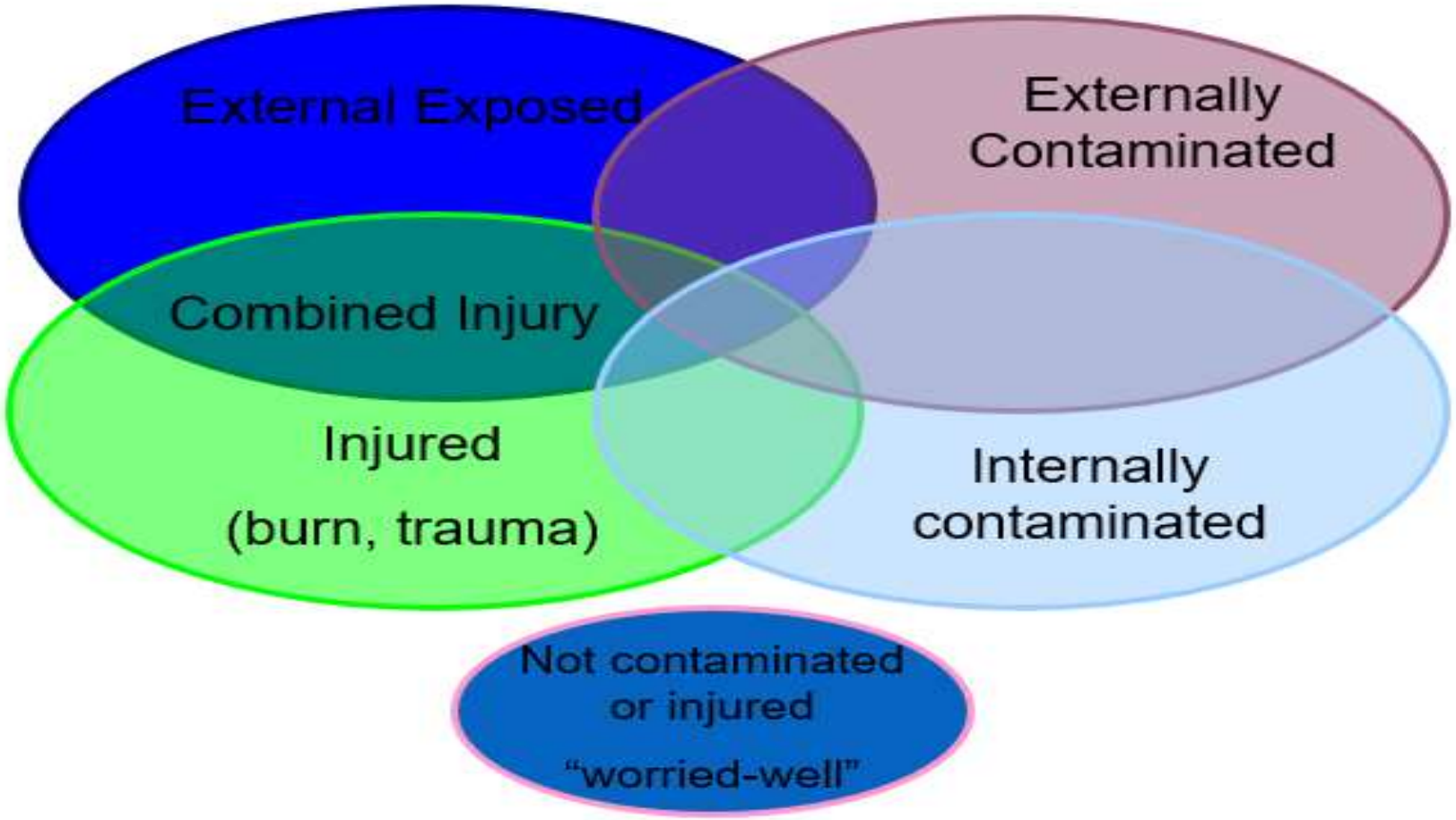
DIREKTUR PELAYANAN KESEHATAN RUJUKAN,

Menimbang :
a. bahwa dalam rangka pengendalian kesiapsiagaan dan penanggulangan kedaruratan nuklir dan radiologi, menjamin keselamatan pekerja, dan masyarakat, serta perlindungan terhadap lingkungan hidup, diperlukan penatalaksanaan respons terhadap kejadian keamanan nuklir dan penatalaksanaan kesiapsiagaan dan penanggulangan kedaruratan nuklir dan radiologi;
b. bahwa Pemerintah, pemerintah daerah, dan masyarakat bertanggungjawab terhadap ketersediaan sumber daya, fasilitas, dan pelayanan kesehatan secara menyeluruh pada bencana;
c. bahwa dalam rangka menyusun standar prosedur operasional penanggulangan kedaruratan nuklir perlu disusun pedoman pelayanan kegawatdaruratan medik bencana nuklir di fasilitas pelayanan kesehatan;

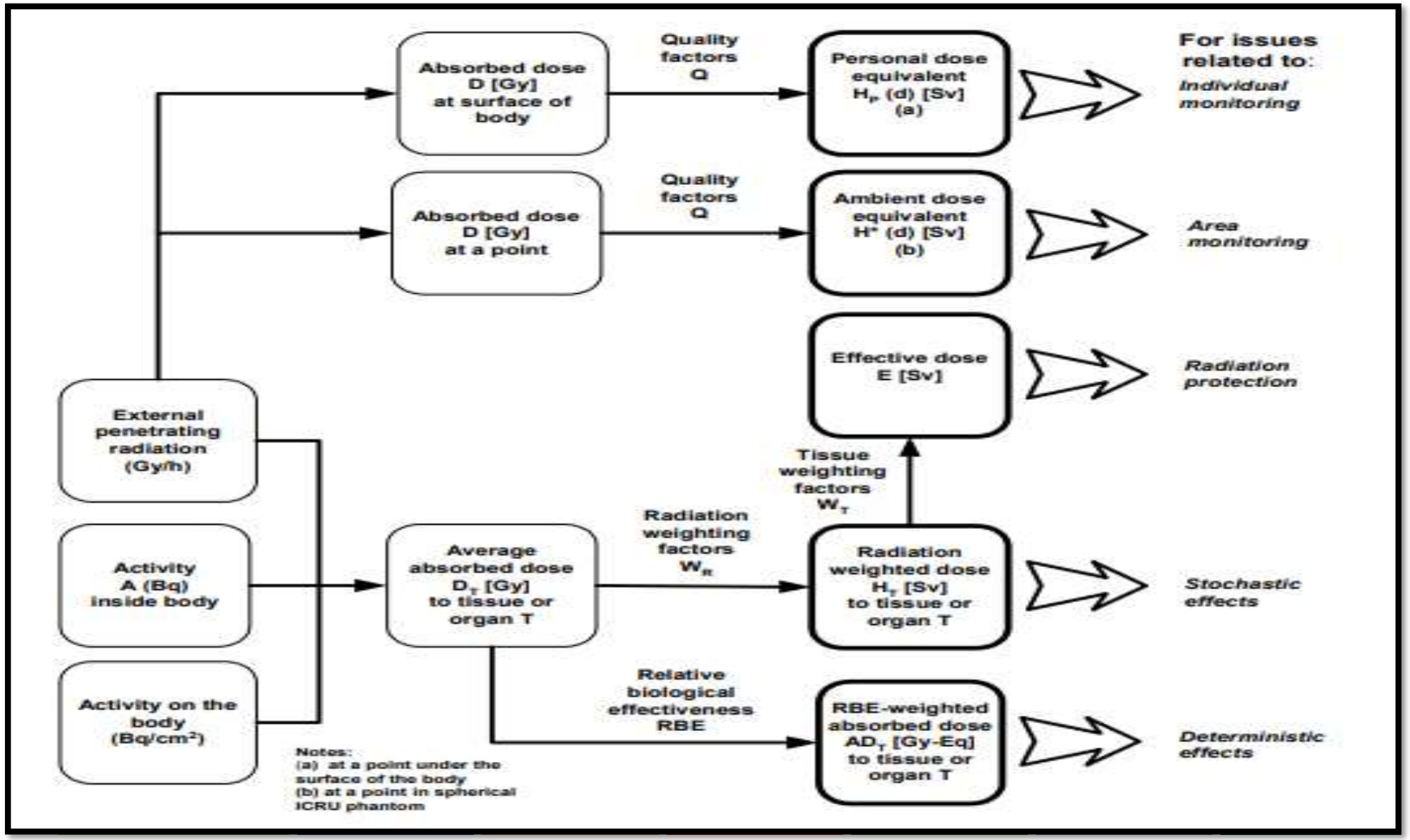
Mengingat :
1. Undang-Undang Nomor 10 Tahun 1997 tentang Ketenaganukliran (Lembaran Negara Republik Indonesia Tahun 1997 Nomor 23, Tambahan Lembaran Negara Republik Indonesia Nomor 3676);
2. Undang-Undang Nomor 36 Tahun 2009 tentang Kesehatan (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 144, Tambahan Lembaran Negara Republik Indonesia Nomor 5063);
3. Undang-Undang Nomor 44 Tahun 2009 tentang Rumah Sakit (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 153, Tambahan Lembaran Negara Republik Indonesia Nomor 5072);

Berorientasi Pelayanan | Akuntabel | Kompeten | Harmonis | Loyal | Adaptif | Kolaboratif

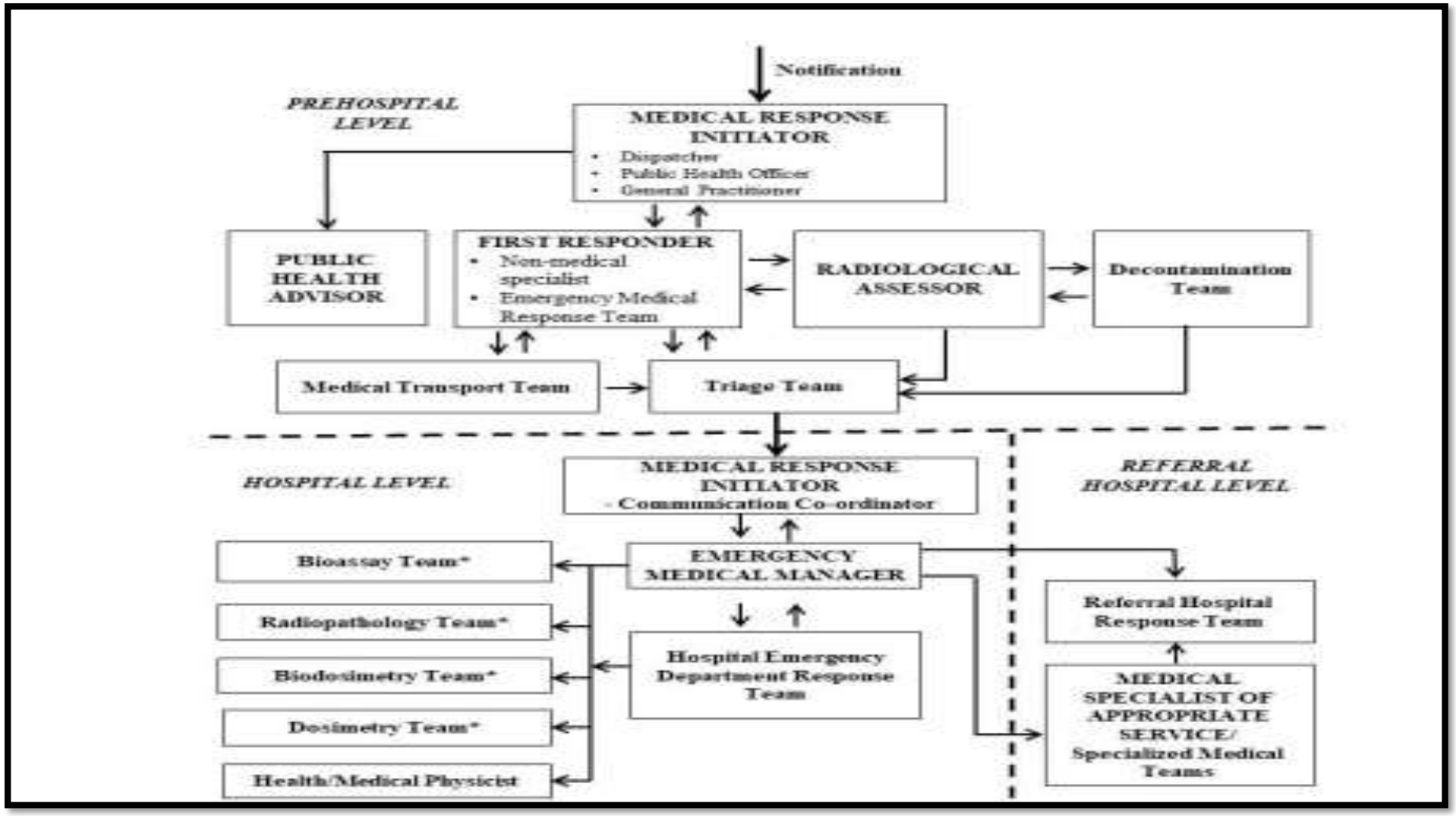
I. Medical Management Of Radiation Emergency (4)



I. Medical Management Of Radiation Emergency (5)



I. Medical Management Of Radiation Emergency (6)



I. Medical Management Of Radiation Emergency (7)

KEPUTUSAN MENTERI KESEHATAN REPUBLIK INDONESIA
NOMOR HK.01.07/MENKES/420/2018
TENTANG
RUMAH SAKIT RUJUKAN BENCANA NUKLIR NASIONAL

DENGAN RAHMAT TUHAN YANG MAHA ESA

MENTERI KESEHATAN REPUBLIK INDONESIA,

Menimbang : a. bahwa dalam rangka pengendalian kesiapsiagaan dan penanggulangan kedaruratan nuklir dan radiologi, menjamin keselamatan pekerja, dan masyarakat, serta perlindungan terhadap lingkungan hidup, diperlukan penatalaksanaan respons terhadap kejadian keamanan nuklir dan penatalaksanaan kesiapsiagaan dan penanggulangan kedaruratan nuklir dan radiologi;

b. bahwa Pemerintah, pemerintah daerah, dan masyarakat bertanggungjawab terhadap ketersediaan sumber daya, fasilitas, dan pelayanan kesehatan secara menyeluruh pada bencana;

c. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a dan huruf b, perlu menetapkan Keputusan Menteri Kesehatan tentang Rumah Sakit Rujukan Bencana Nuklir Nasional;

Mengingat : 1. Undang-Undang Nomor 10 Tahun 1997 tentang Ketenaganukliran (Lembaran Negara Republik Indonesia Tahun 1997 Nomor 23, Tambahan Lembaran Negara Republik Indonesia Nomor 3676);

RSUP FATMAWATI

DEPARTEMEN KESEHATAN RI
RS. DR. SARDJITO YOGYAKARTA

rshs

Berorientasi Pelayanan | Akuntabel | Kompeten | Harmonis | Loyal | Adaptif | Kolaboratif

II. Medical Management Of Radiation Emergency At The Scene (1)

First Responders

- *Facility Responder (First Aid)*
- Fire Service (Rescue)
- Police/Other Personnel

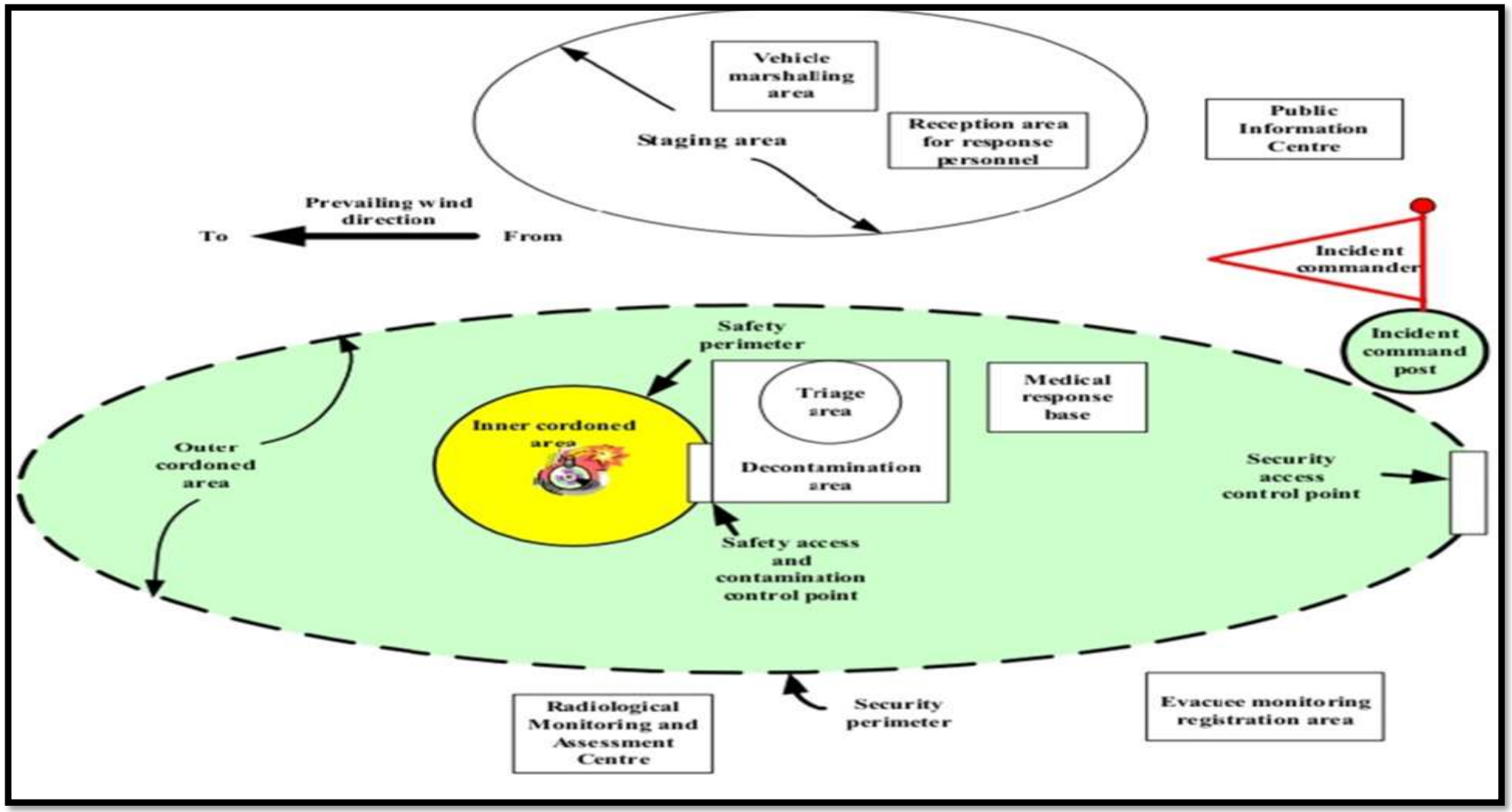
Emergency Medical Response Team

II. Medical Management Of Radiation Emergency At The Scene (2)

First Responders

- Note conventional hazards in the area (fire, smoke, steam, chemical, electrical hazards, etc.) Search for casualties
- Call for Emergency Medical Response Team and indicate situation and location
- If area is free of conventional hazards, check victims condition. If there is immediate life threatening hazards in the area, remove victim first
- Apply standard first aid procedures (life saving procedures)
- Stay with victims until help arrives
- Brief the Emergency Medical Response Team

II. Medical Management Of Radiation Emergency At The Scene (3)



II. Medical Management Of Radiation Emergency At The Scene (4)

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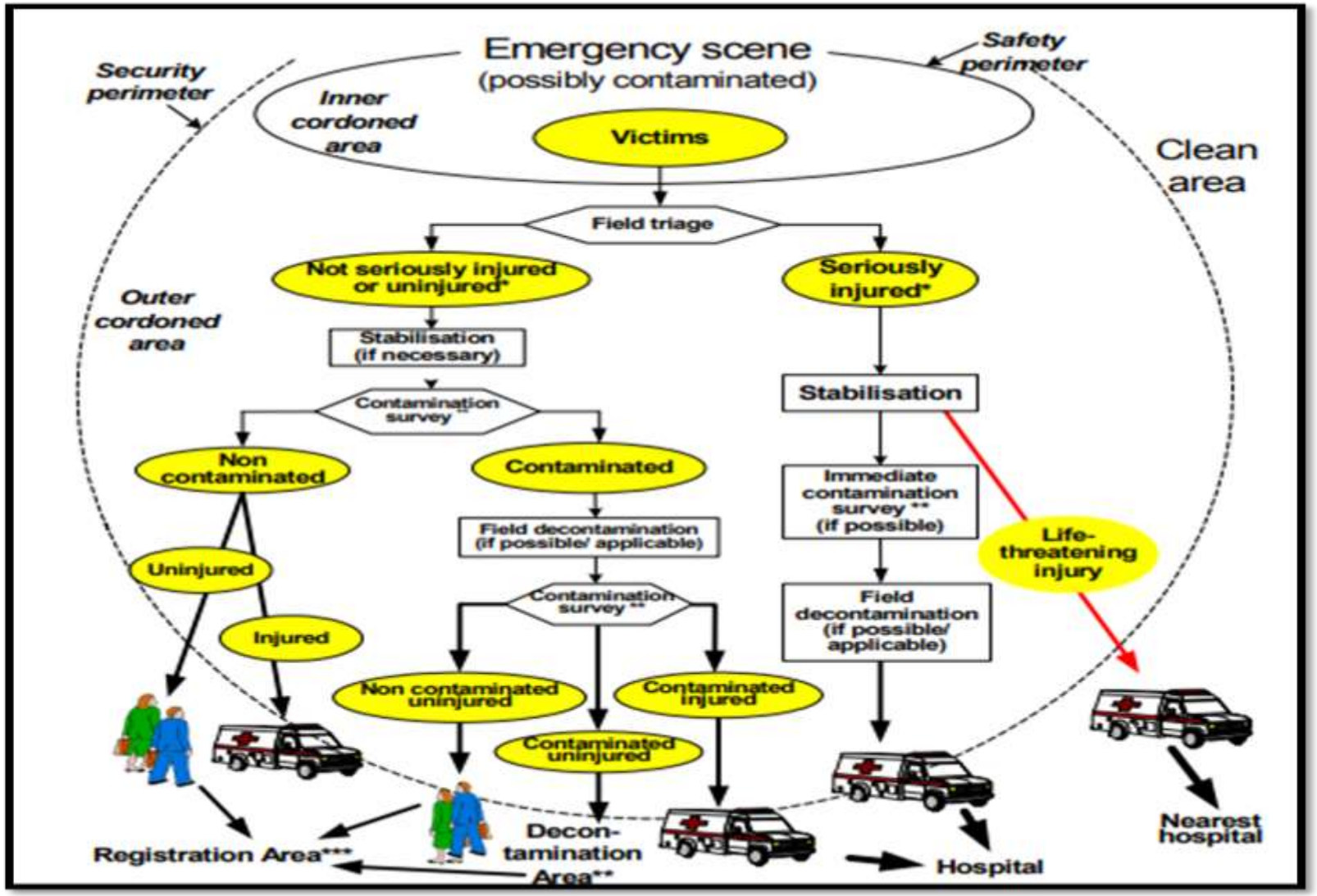

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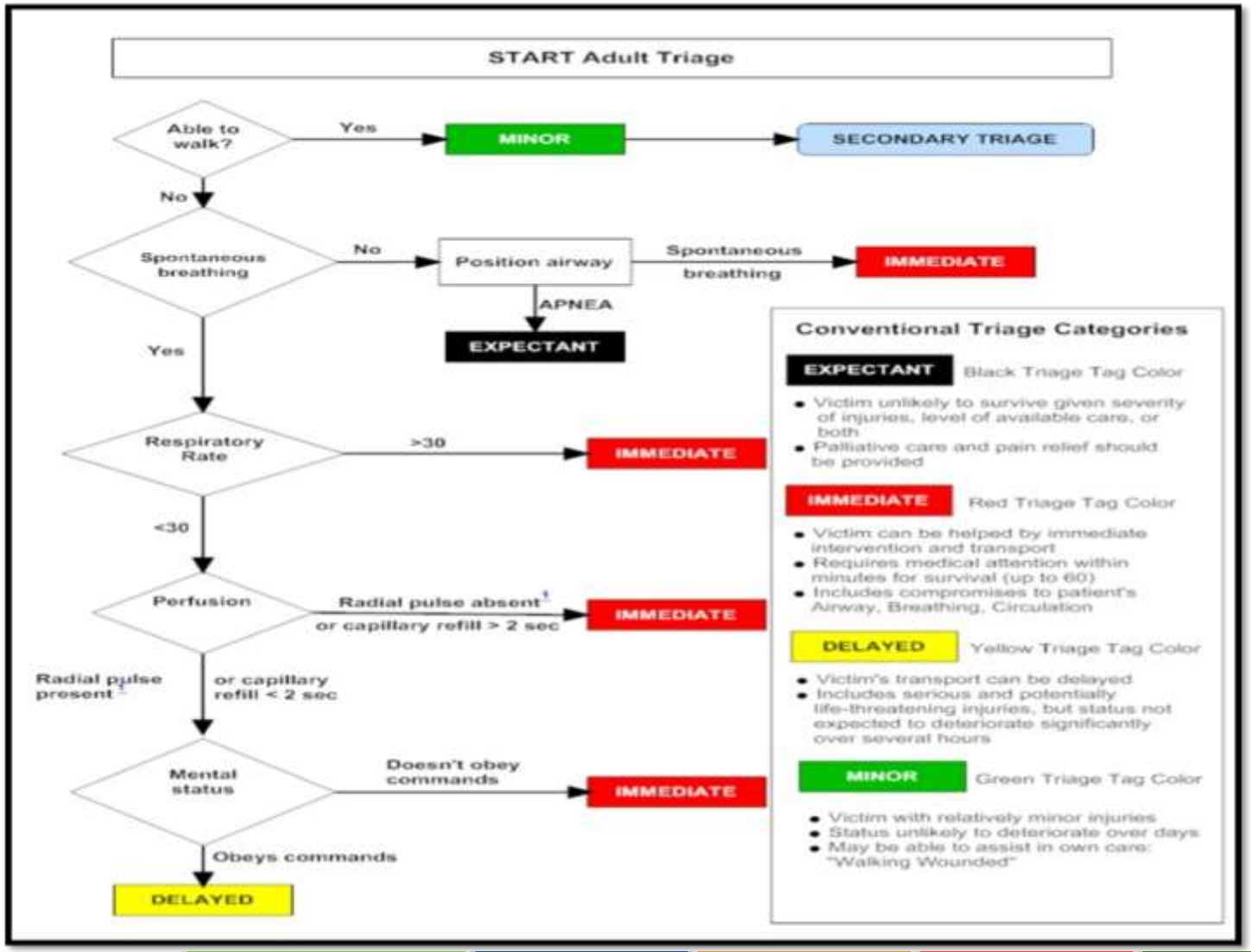


II. Medical Management Of Radiation Emergency At The Scene (7)






II. Medical Management Of Radiation Emergency At The Scene (8)

II. Medical Management Of Radiation Emergency At The Scene (9)

III. Medical Management Of Radiation Emergency At The Hospital Level (1)

What Should be Done at Hospital Level?

- Organization of the hospital radiation emergency response team
- Facility preparation and staff training
- Patient reception and triage
- Decontamination and decorporation procedures
- Radiological monitoring and contamination control
- Bioassay sampling (urine, faeces)
- Biodosimetry (blood sample for chromosome analysis)
- Post-emergency activities

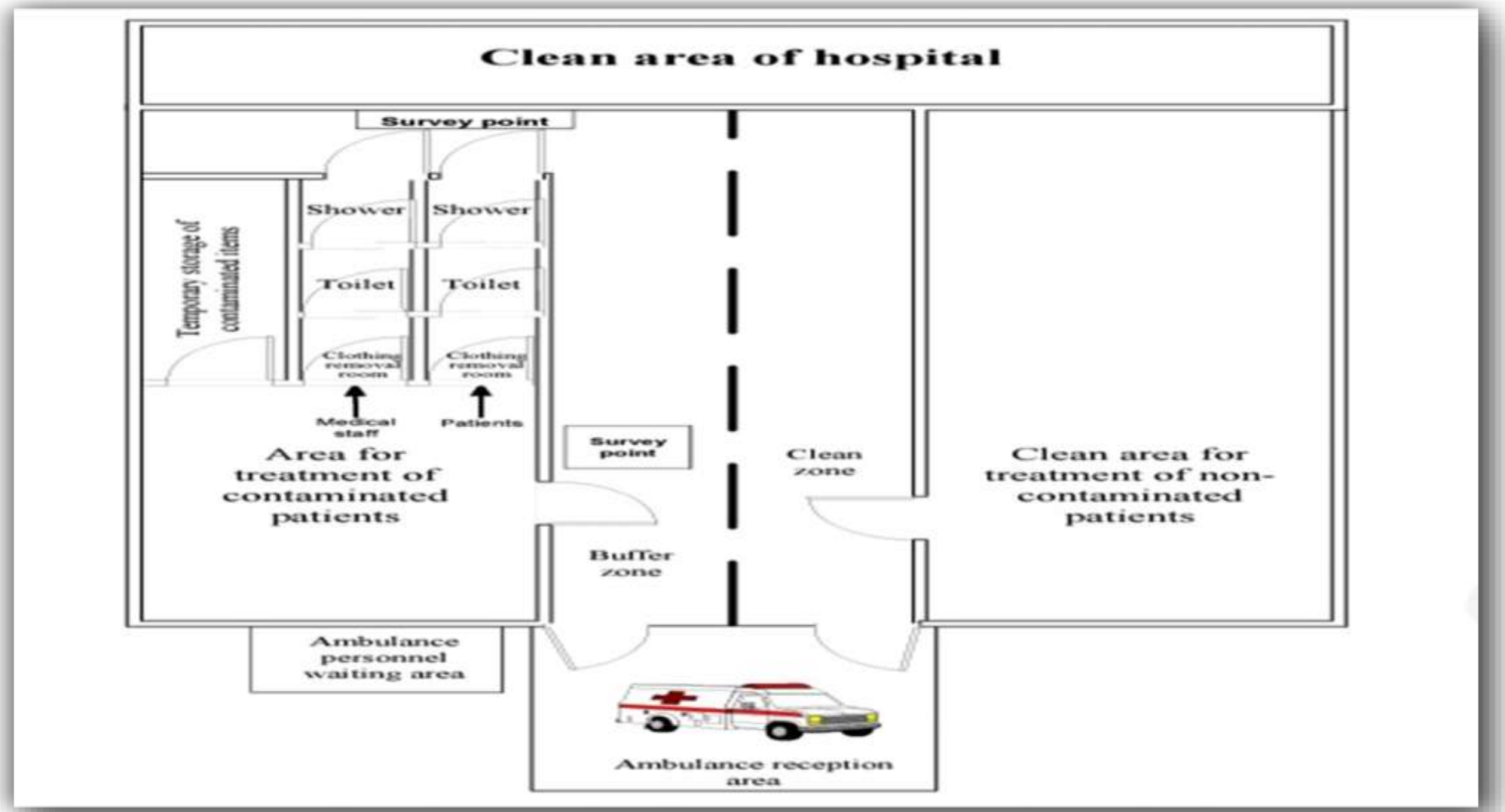
III. Medical Management Of Radiation Emergency At The Hospital Level (2)

Area Designation

Radiation Emergency Area (REA)

- The area must be suitable for appropriate life support and medical stabilization
- The area should be located close to an entrance or have an entrance directly into the treatment room from the outside
- The area should be easily accessible by ambulance

III. Medical Management Of Radiation Emergency At The Hospital Level (3)



III. Medical Management Of Radiation Emergency At The Hospital Level (4)

III. Medical Management Of Radiation Emergency At The Hospital Level (5)

Dose Assessment :

- **Initial (Primary Assessment)**
  - Prodromal symptoms; frequency, severity
  - Blood cell count focusing on lymphocyte count
  - Level of amylase (for exposure of head/neck)
  - Whole body counting (for neutrons)
  - Urine, stool
- **Intermediate Assessment**
  - Chromosome analysis
  - Count of blood cells (neutrophils, platelets)
- **Full Assessment**
  - Reconstruction of accident (mathematical)

III. Medical Management Of Radiation Emergency At The Hospital Level (6)

Radiological Triage Categories:

Score	Condition
0	Bystanders who, most probably, were not exposed to radiation
I	Patients that can be followed on an outpatient basis or by a day care hospital structure
II	Patients needing maximum medical effort to be rescued
III	Patients predicted to develop multiple organ failure (MOF), beyond any curative measures

III. Medical Management Of Radiation Emergency At The Hospital Level (7)

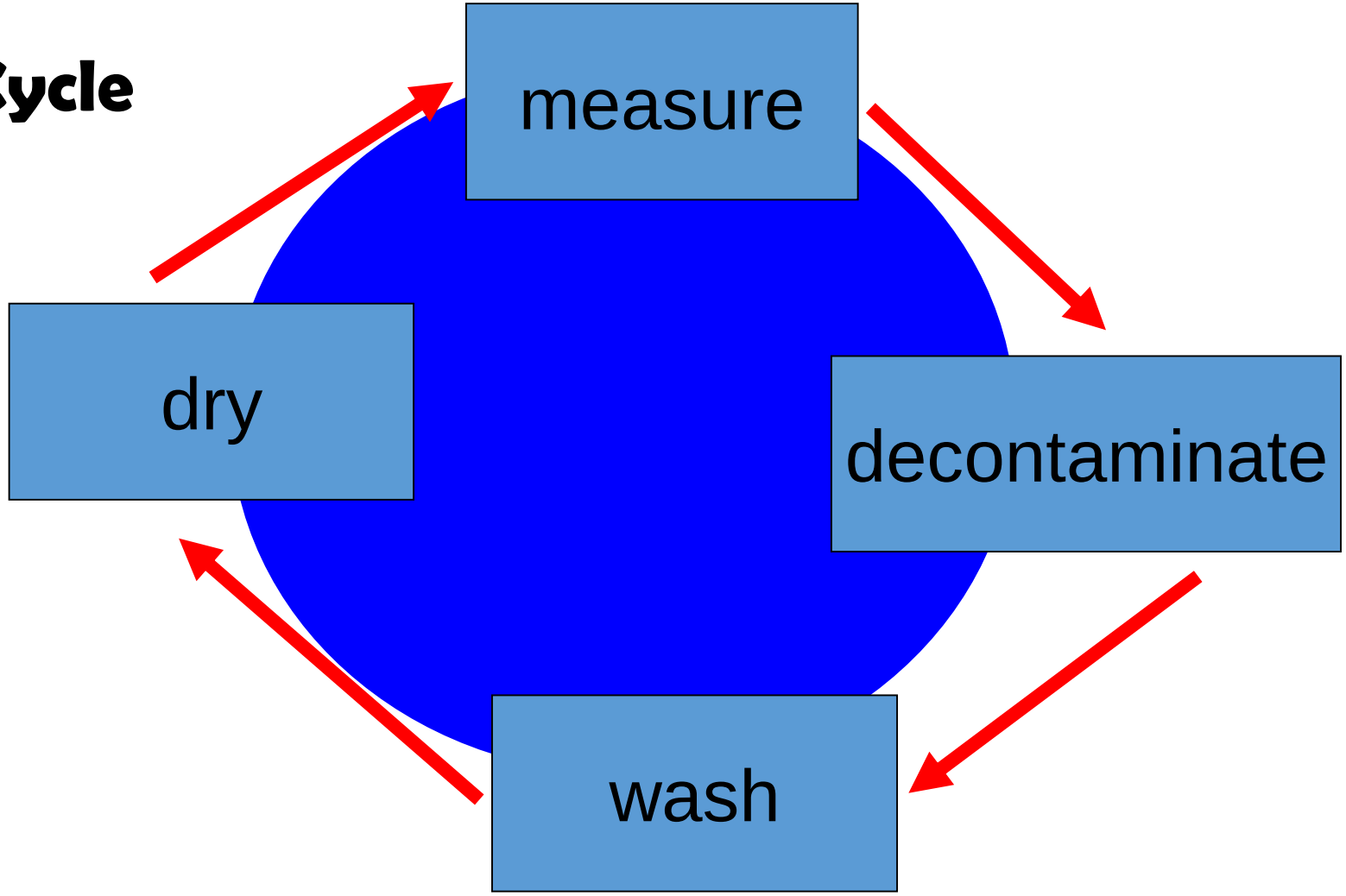
Table j3. Selection of the therapeutic strategy according to the clinical status of the patient, based on the scoring for the first 48 hours proposed in Table j2 (EBMT, 2007).

Score	Score I	Score II	Score III
Patient management	Outpatient clinical monitoring	Hospitalisation for curative treatment Depending on the scale of the event, some patients could be managed as outpatients (e.g. mass casualty event)	Hospitalisation. Prediction of Multi-Organ Failure (MOF)
Supportive care	At least daily blood cell counts for 6 days and weekly for 2 months	Supportive care, blood component therapy as necessary, symptomatic treatment of GI damage, reverse isolation	Palliative/symptomatic treatment. Blood component therapy if considered necessary
Cytokines/ growth factors	no	Early administration of G-CSF for 14-21 days.	Indicated until reassessment of the score. The re-evaluation during the first week will be based on laboratory findings and clinical symptoms
Stem Cell Transplantation	no	Criteria to transplant: severe bone marrow aplasia persisting 14-21 days under cytokines, no residual haematopoiesis, no irreversible organ damage. Type of graft: bone marrow, peripheral HSC, cord blood. Conditioning: fludarabine +/- antilymphocyte globulin. Don't use MTX for GVHD prevention	

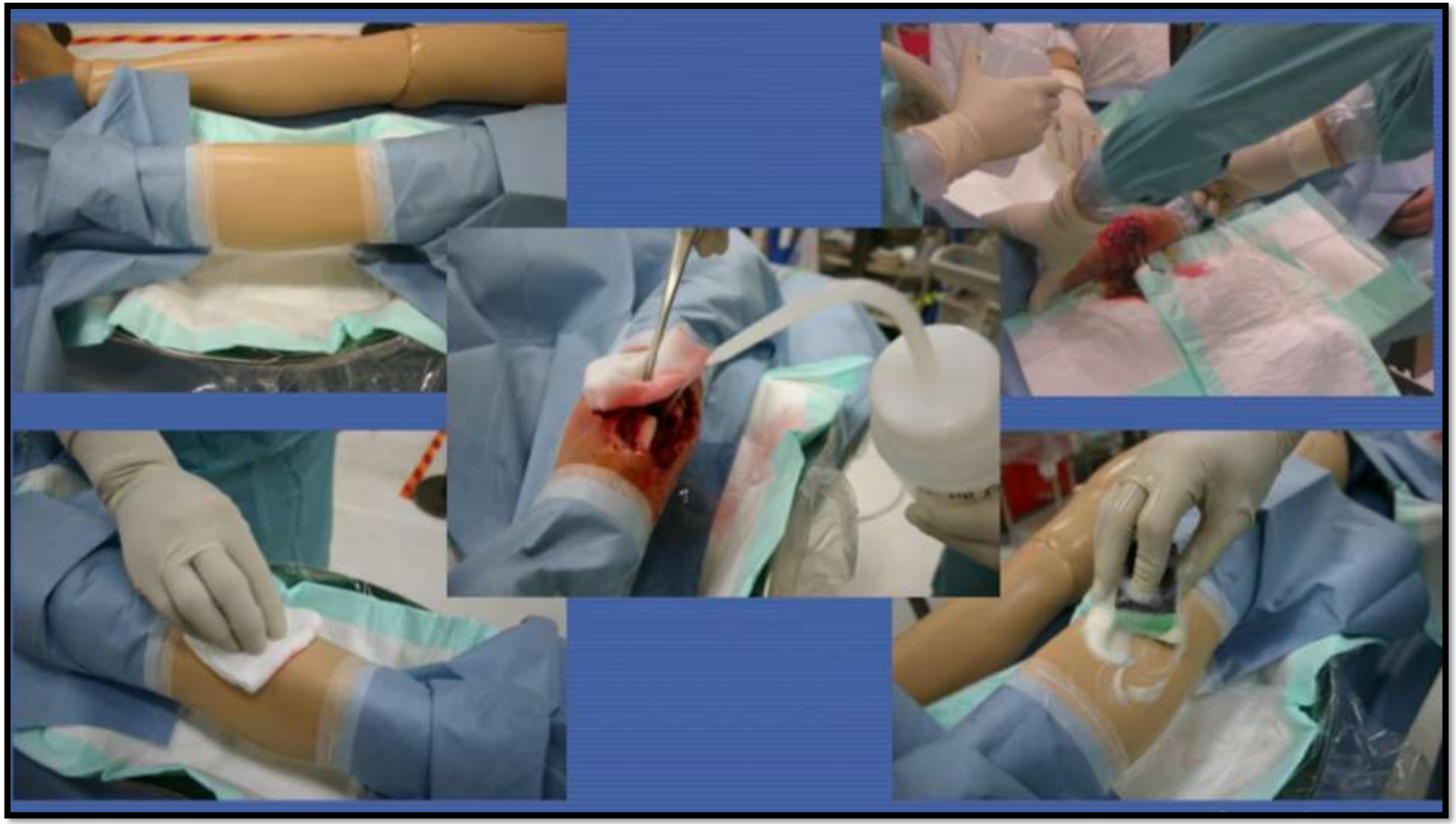
G-CSF: Granulocyte-colony stimulating factor
GI: Gastro-intestinal
MTX: Methotrexate
GVHD: Graft Vs. Host Disease
HSC: Haematopoietic Stem Cells

III. Medical Management Of Radiation Emergency At The Hospital Level (8)

The Decontamination Cycle

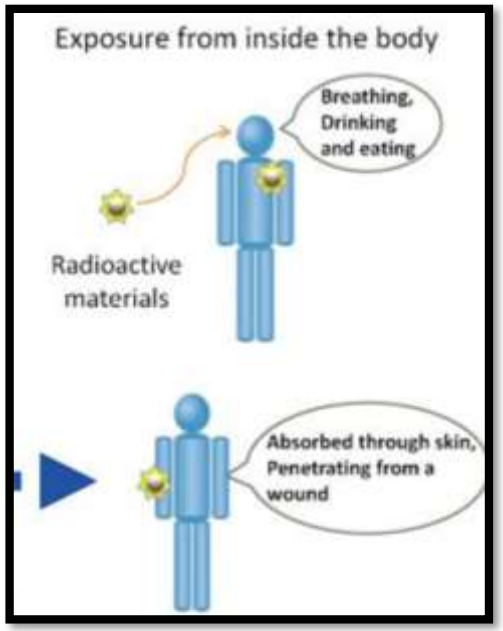


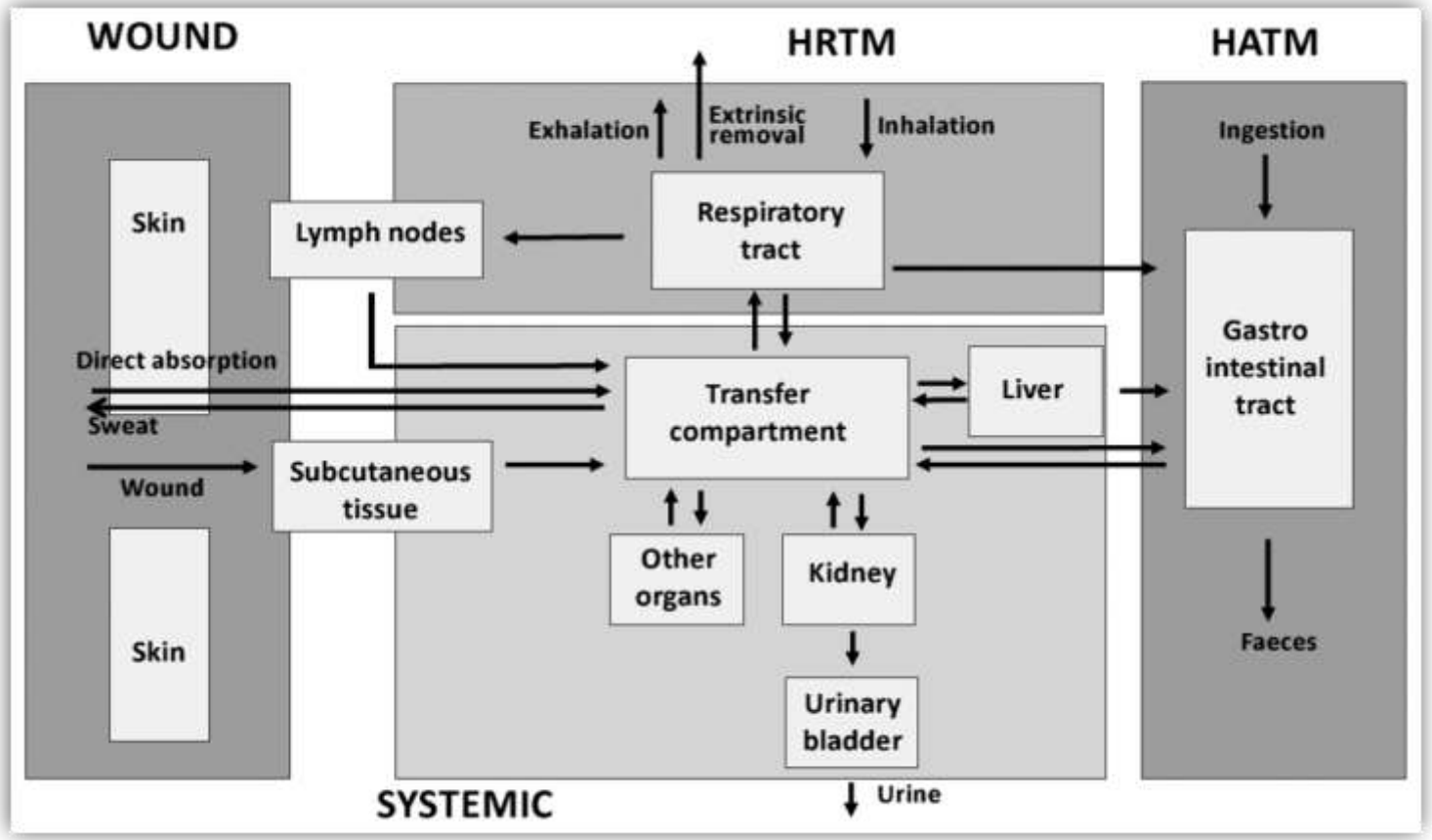
III. Medical Management Of Radiation Emergency At The Hospital Level (9)



III. Medical Management Of Radiation Emergency At The Hospital Level (10)

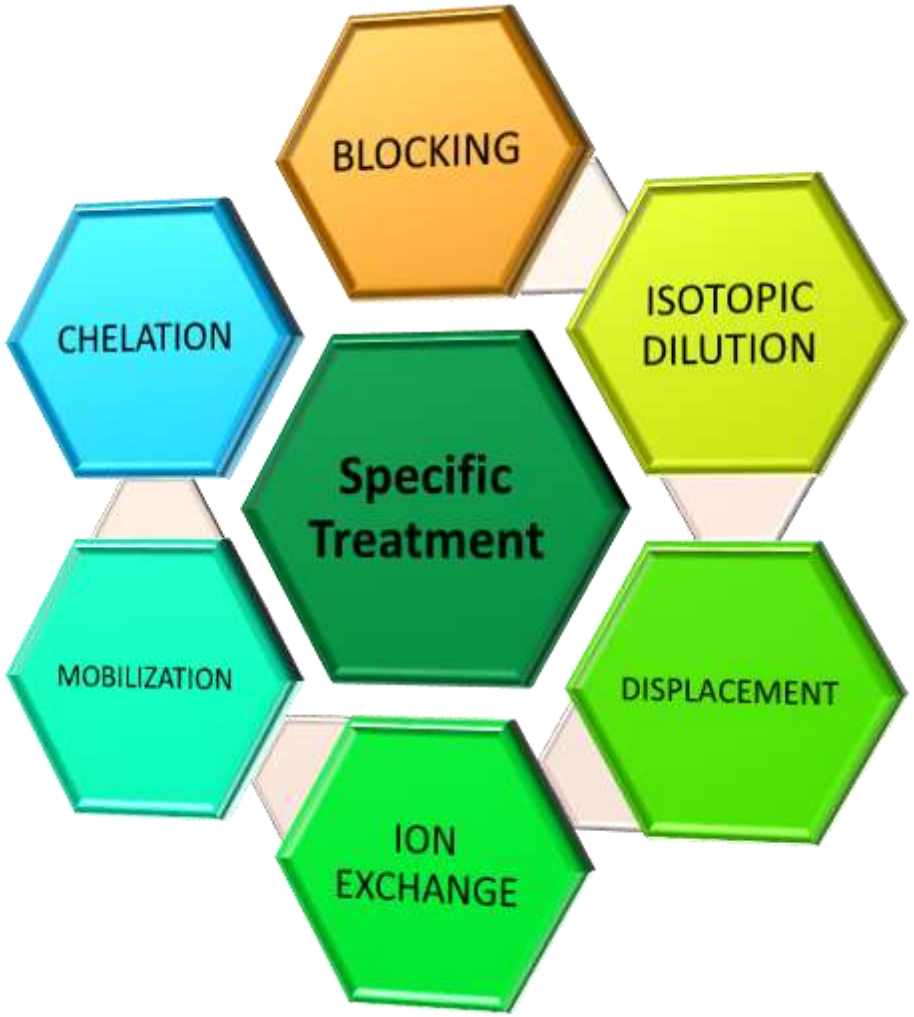
Internal Contamination





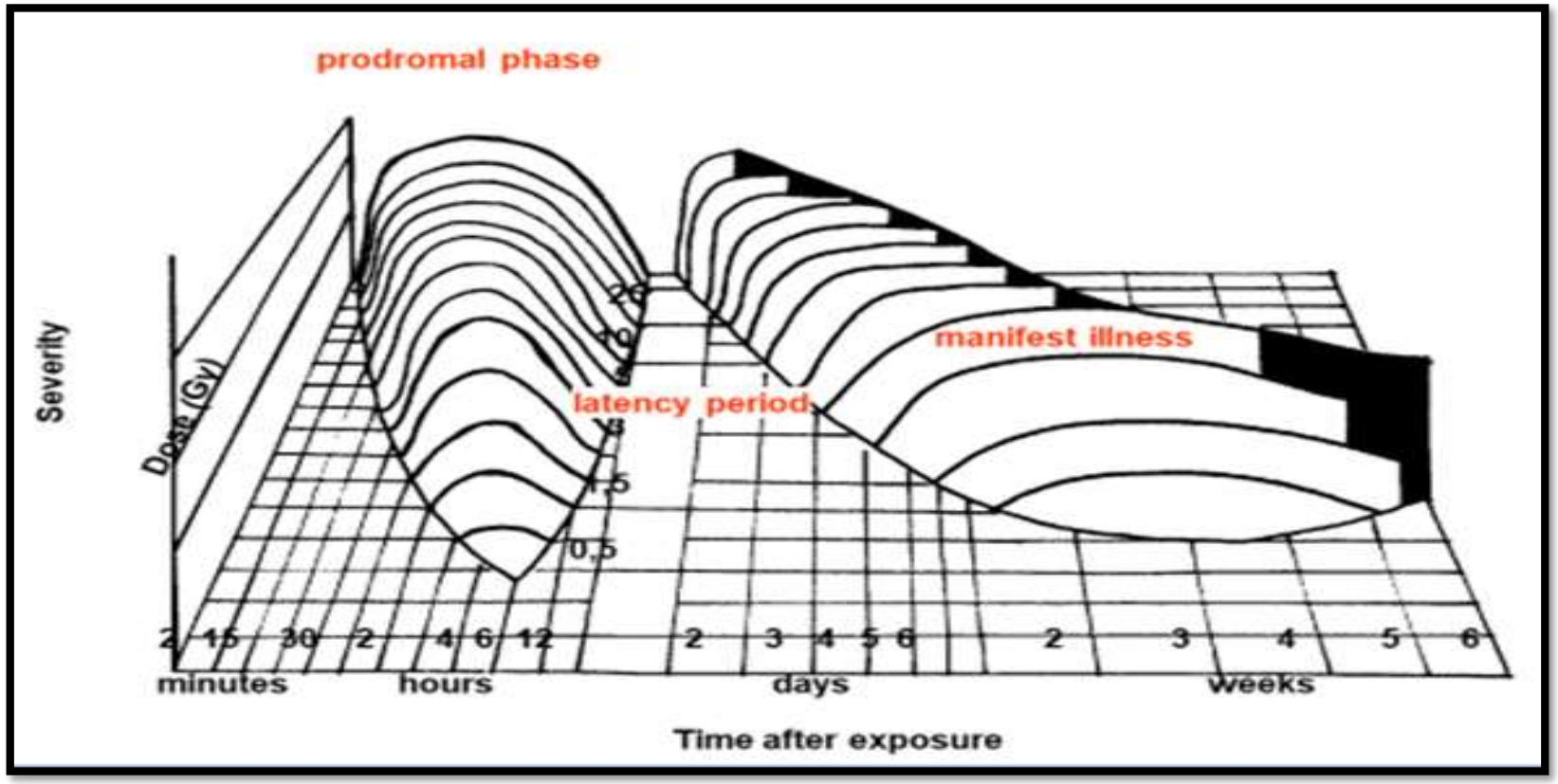
III. Medical Management Of Radiation Emergency At The Hospital Level (11)

Decorporation :

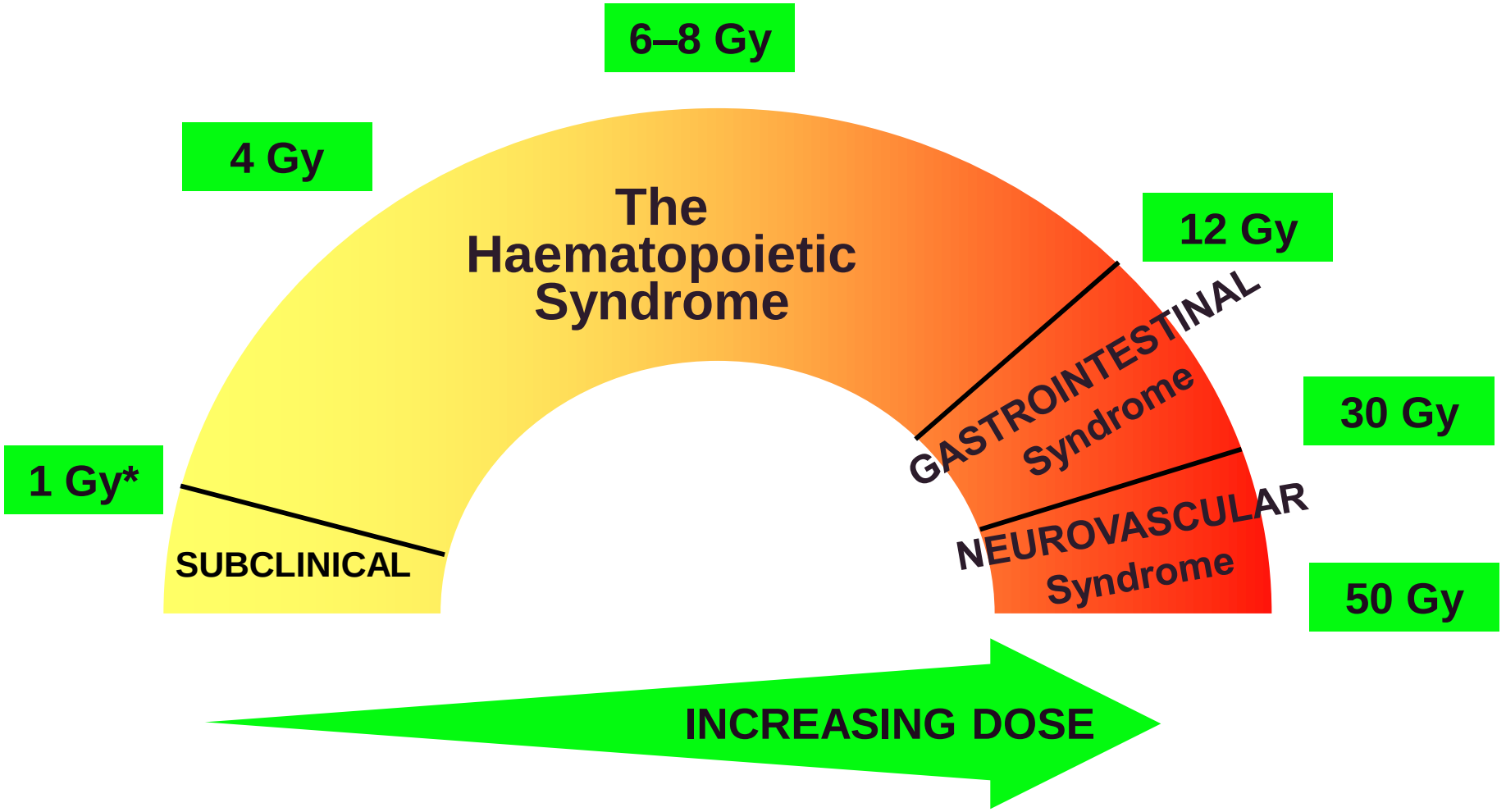


III. Medical Management Of Radiation Emergency At The Hospital Level (12)

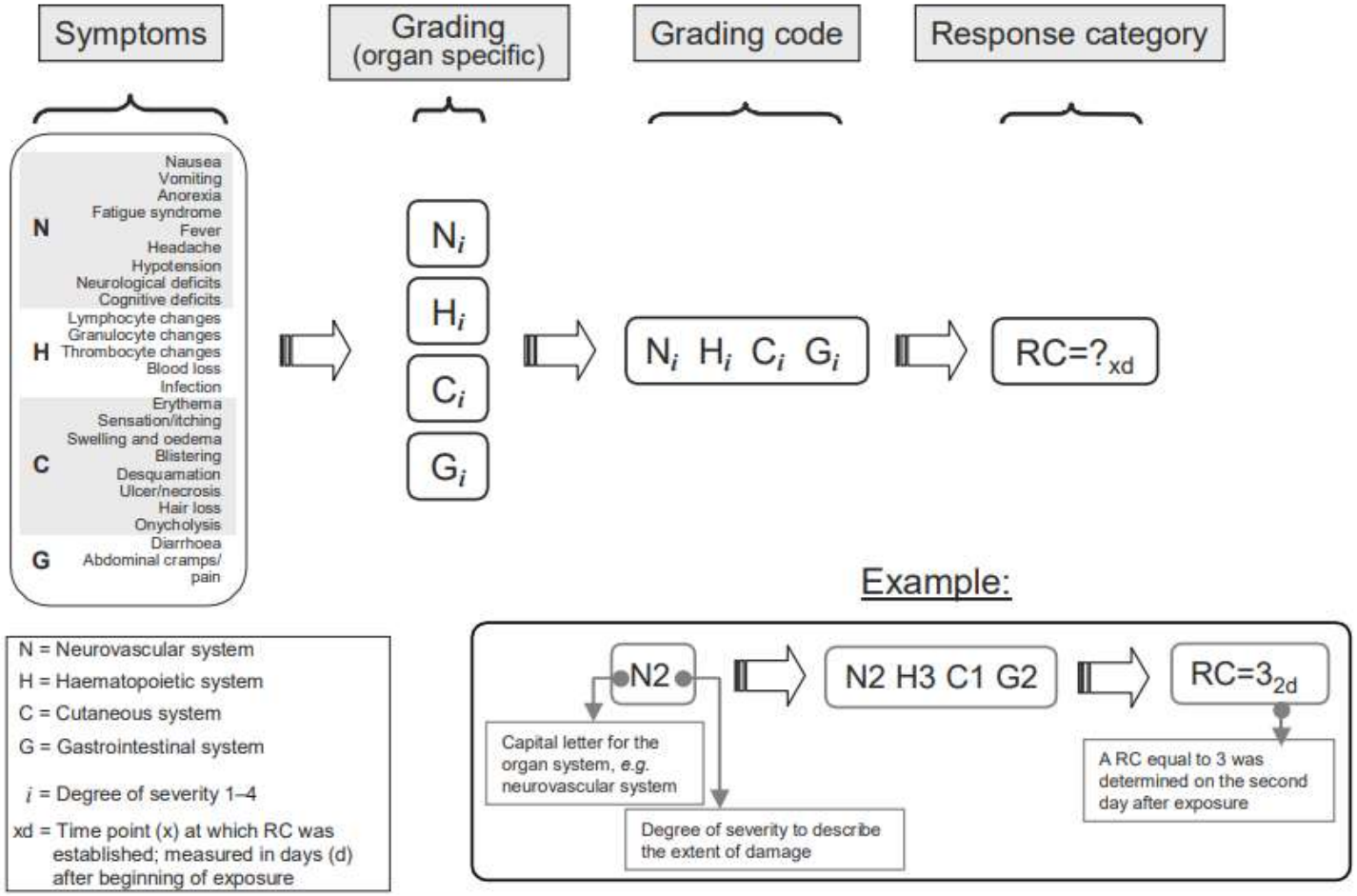
- *ARS (*SRA) is a deterministic effect of radiation exposure to the whole body or to a significant of the body above a dose threshold of about 1 Gy*

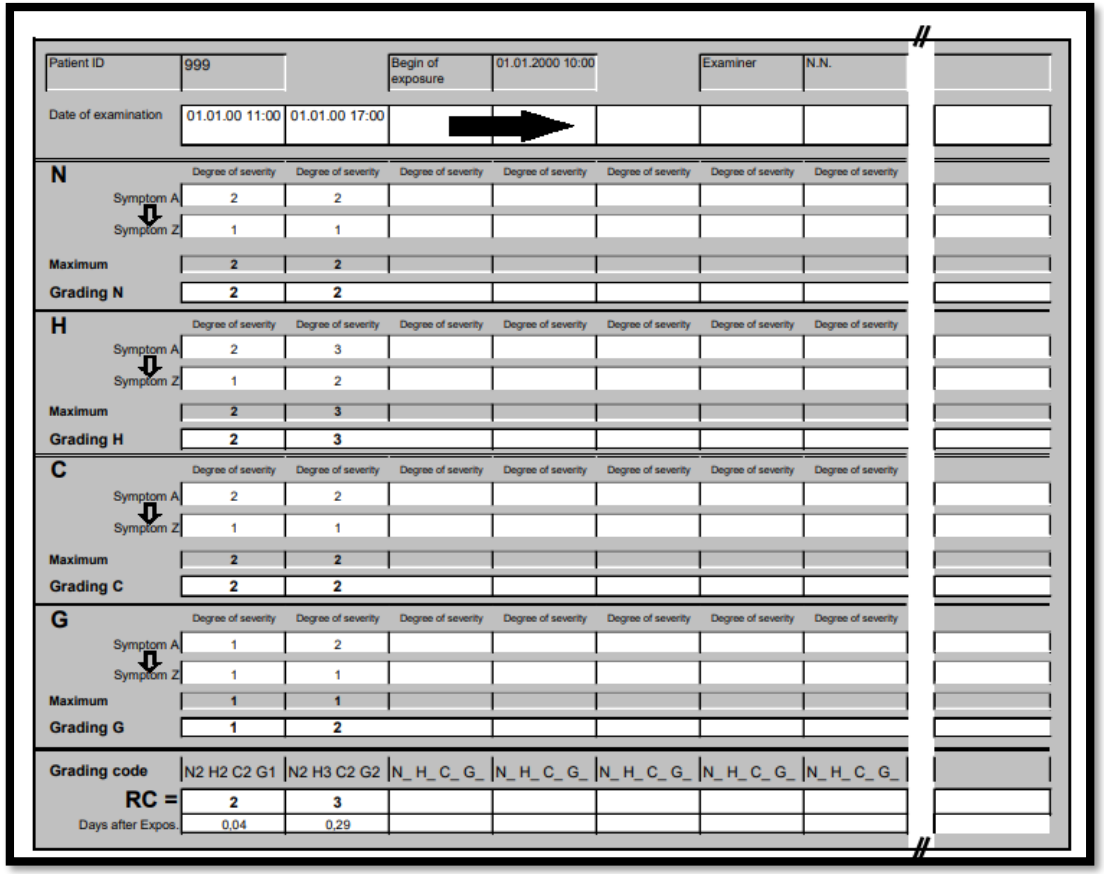


III. Medical Management Of Radiation Emergency At The Hospital Level (13)



III. Medical Management Of Radiation Emergency At The Hospital Level (14)

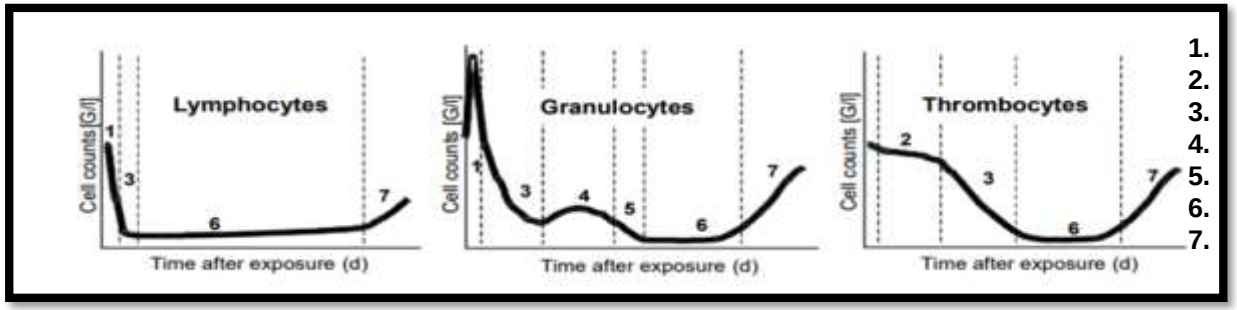




Patient ID	999		Begin of exposure	01.01.2000 10:00		Examiner	N.N.	
Date of examination	01.01.00 11:00	01.01.00 17:00						
N	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	
Symptom A	2	2						
Symptom Z	1	1						
Maximum	2	2						
Grading N	2	2						
H	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	
Symptom A	2	3						
Symptom Z	1	2						
Maximum	2	3						
Grading H	2	3						
C	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	
Symptom A	2	2						
Symptom Z	1	1						
Maximum	2	2						
Grading C	2	2						
G	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	
Symptom A	1	2						
Symptom Z	1	1						
Maximum	1	1						
Grading G	1	2						
Grading code	N2 H2 C2 G1	N2 H3 C2 G2	N_ H_ C_ G_	N_ H_ C_ G_	N_ H_ C_ G_	N_ H_ C_ G_	N_ H_ C_ G_	
RC =	2	3						
Days after Expos.	0,04	0,29						

III. Medical Management Of Radiation Emergency At The Hospital Level (15)

Time point of onset depending on severity of damage



1. Initial change (within 24-48 hr) (G,L)
2. Shoulder (T)
3. First phase of degeneration (G,L,T)
4. Abortive rise (G)
5. Second phase of degeneration (G)
6. Nadir phase (G,L,T)
7. Regeneration phase (G,L,T)

Decrease in lymphocyte count, initial granulocytosis

Persistent decreased lymphocyte count

Initial granulocytosis often followed by an abortive rise prior to granulocytopenia

Normal thrombocyte count prior to thrombocytopenia

Regeneration in each of the cell lineages (which can either be autologous or induced by SCT)

Development of secondary late effects

1st week

60 d

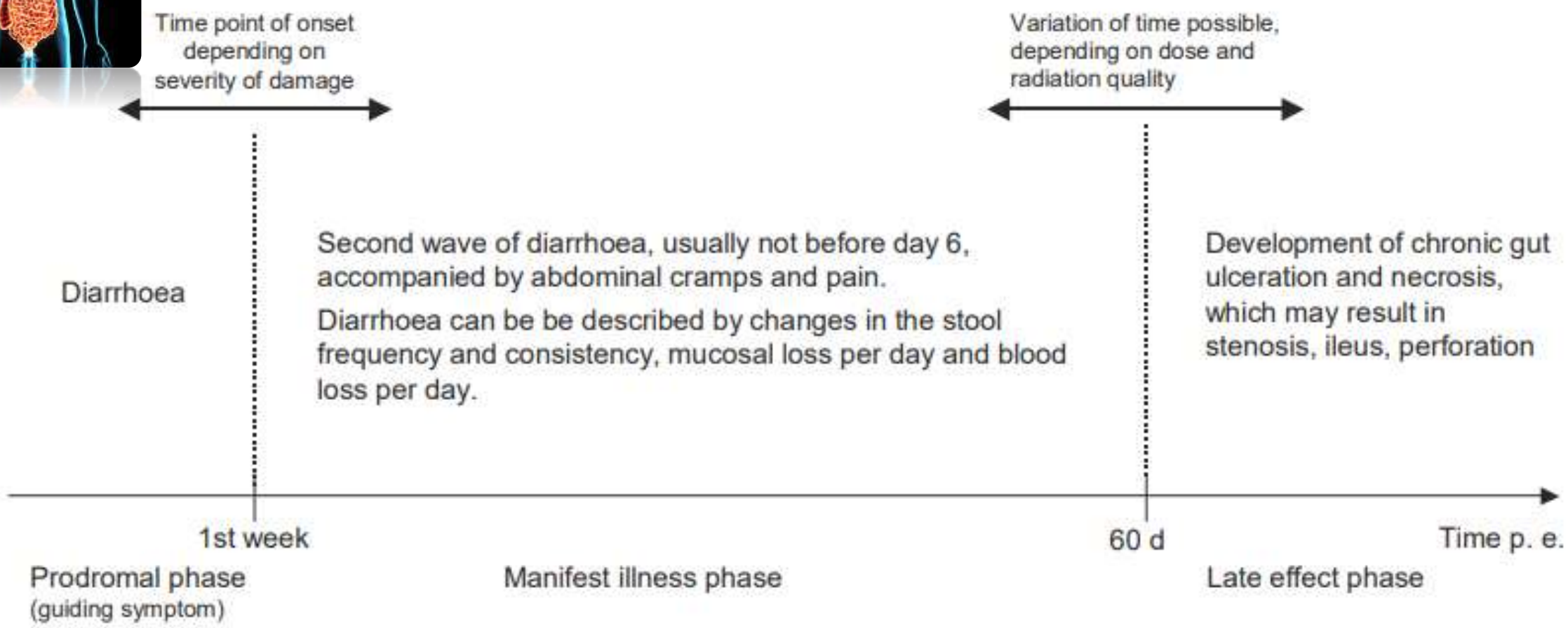
Time p. e.

Prodromal phase
(guiding symptoms)

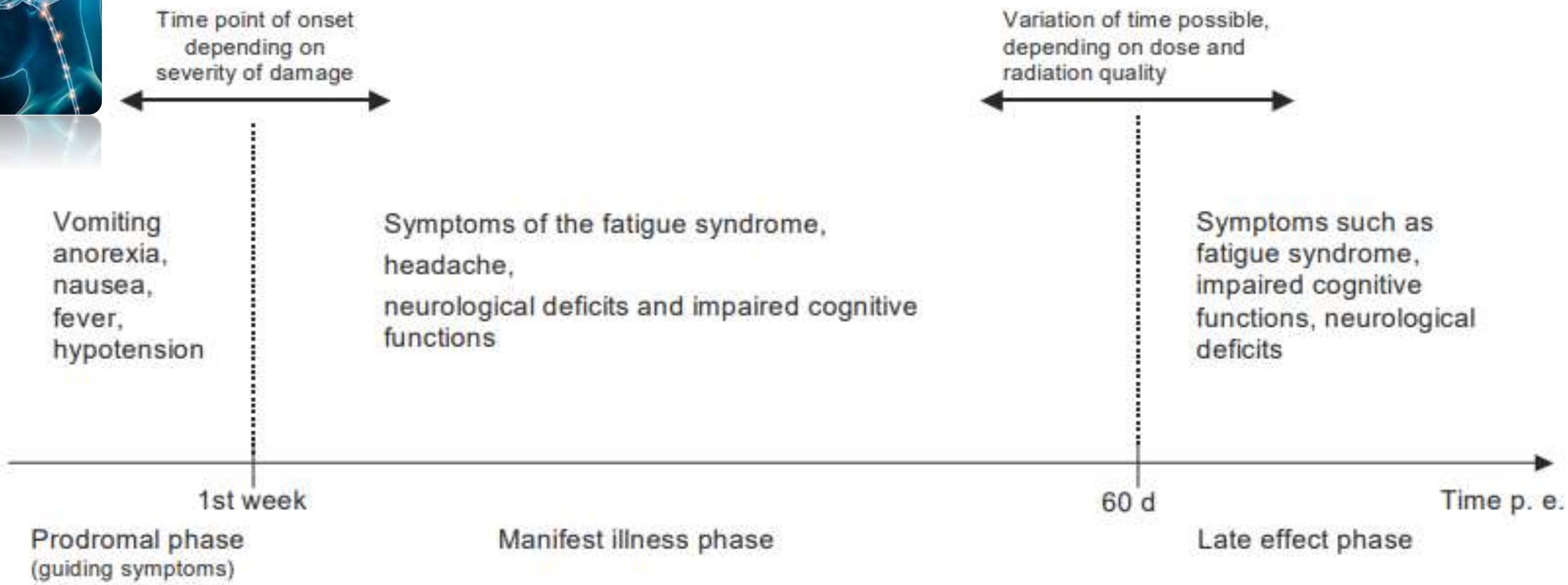
Manifest illness phase

Late effect phase

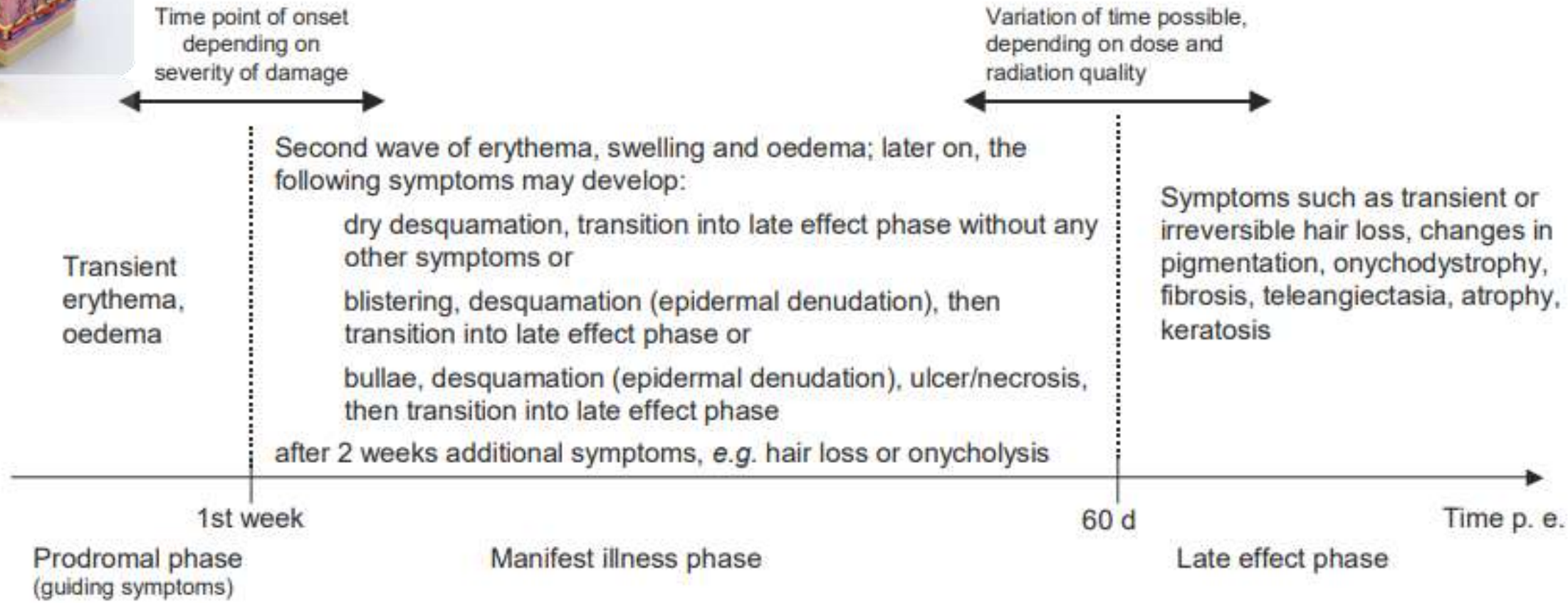
III. Medical Management Of Radiation Emergency At The Hospital Level (16)



III. Medical Management Of Radiation Emergency At The Hospital Level (17)



III. Medical Management Of Radiation Emergency At The Hospital Level (18)

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STOP


Medical Management Of Radiation Emergency At The Hospital Level
Medical Management Of Radiation Emergency At The Scene

thank you