



REPUBLIC OF LEBANON
MINISTRY OF PUBLIC HEALTH

Preventive Medicine Department

Mass Casualty Management and Triage Due to White Phosphorus

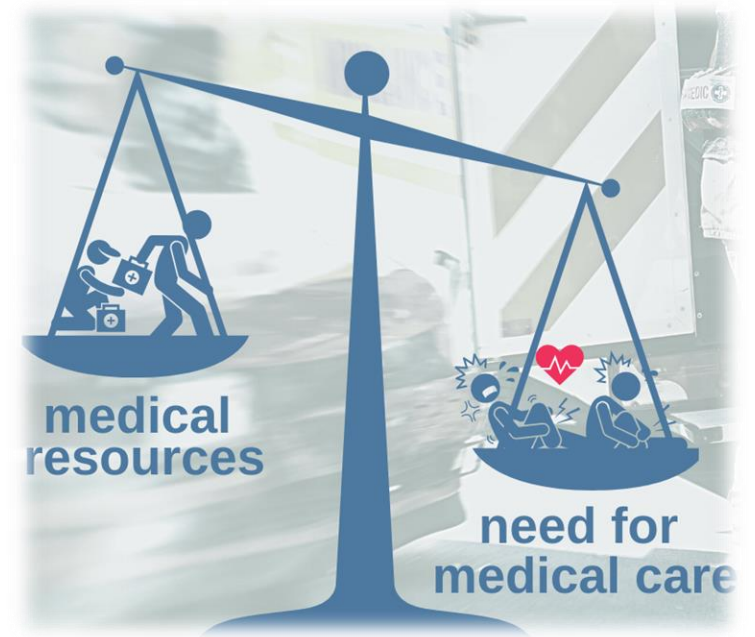
November 2023

A blurred, wide-angle photograph of a busy hospital ward. In the foreground, a person in a blue uniform is seen from behind, and another person in a blue uniform is partially visible on the right. The background is filled with medical staff in white coats and blue scrubs, some pushing gurneys. The ward has a clean, clinical appearance with light-colored walls and blue curtains. The overall scene conveys a sense of active medical care.

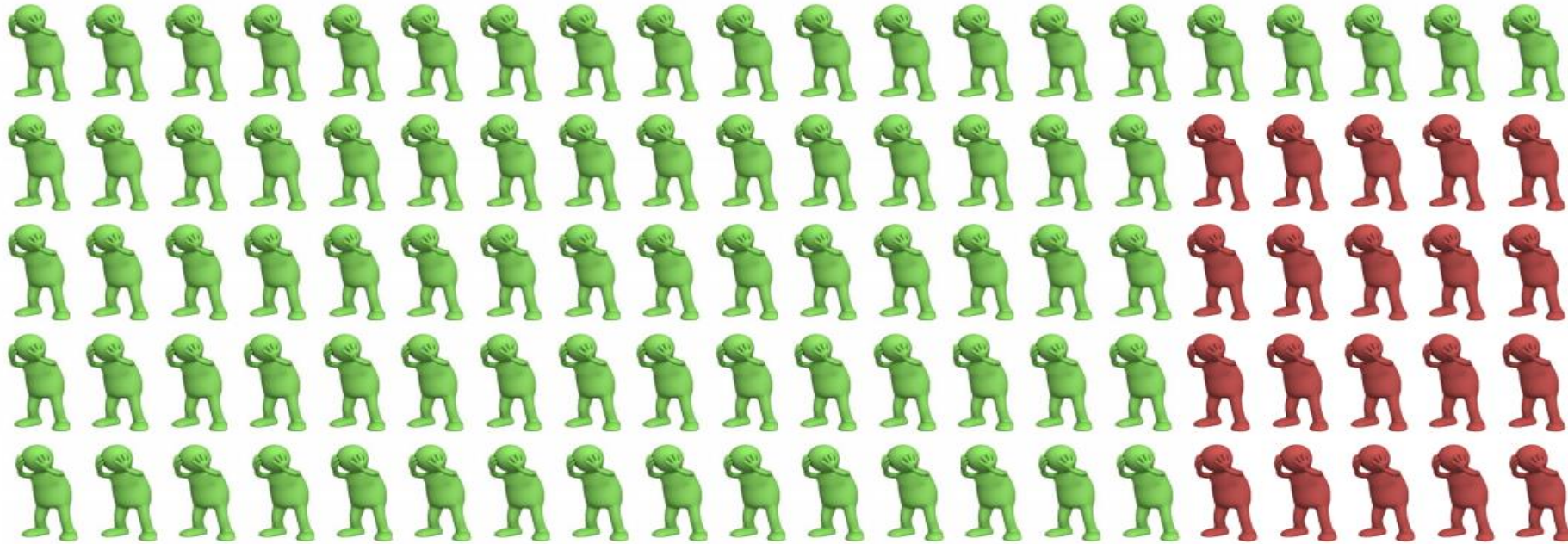
MCM

Mass Casualty Incident

Defined as a disasters and major incidents characterized by quantity, severity, and diversity of patients that can rapidly overwhelm the ability of local medical resources to deliver comprehensive and definitive medical care.



100 patients



80% with mild/
moderate injuries

20% severely
injured

Will drain 80%
of your
resources

Preparedness

- Previous Planning: Contingency planning +++
- Regular trainings
- Kits and medications...

MCI STEPS



1. MCI Declaration
2. Empty Emergency Room
3. MCM Kits

A blurred background of a hospital hallway. In the foreground, a wheelchair is partially visible on the left. The floor is light-colored with several colored lines: a yellow line with an arrow pointing left, a grey vertical line, a teal vertical line, and a red line forming a large 'V' shape. In the background, the lower legs and feet of several people are visible, suggesting a busy clinical setting.

MCI TRIAGE

MCI Triage (1)

What is Triage ?

Triage means “to sort”.

What is MCI Triage?

Offer the greatest good to the greatest amount of people.

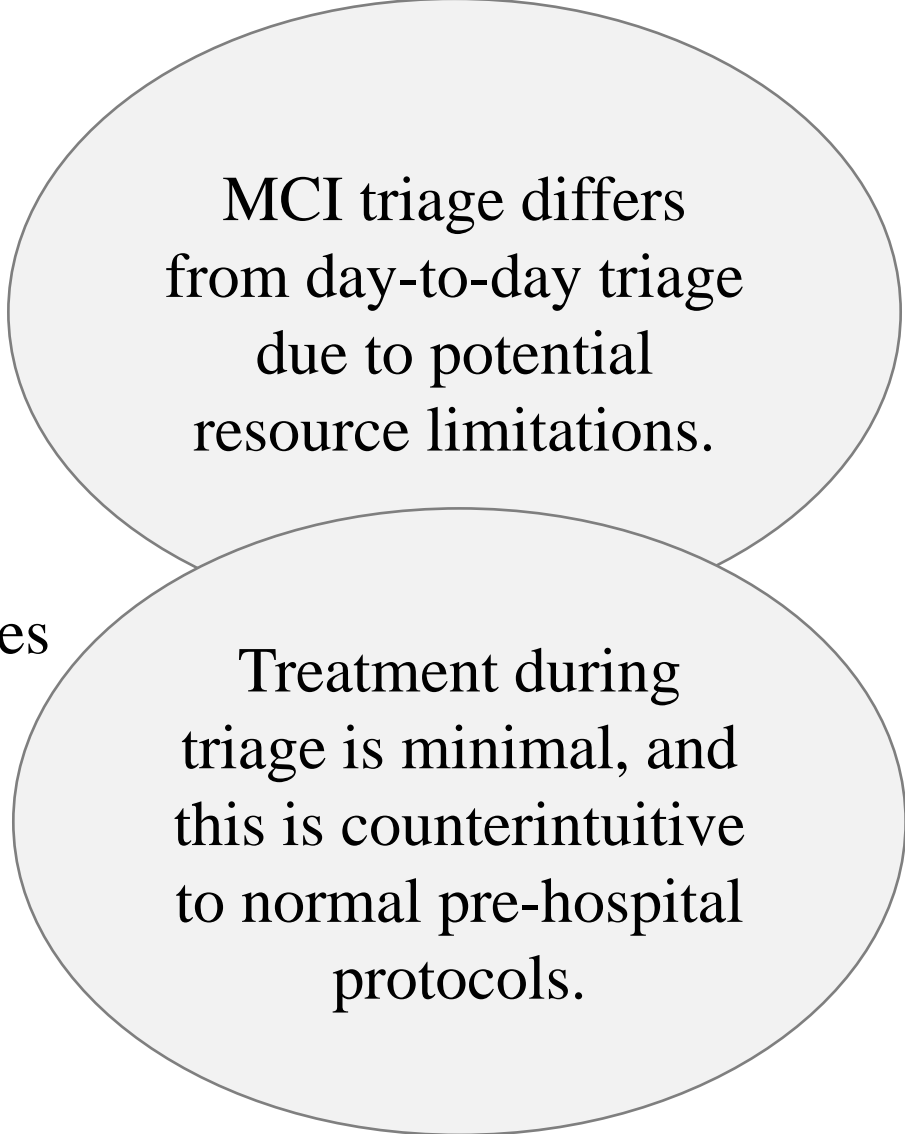
Goals of MCI Triage:

Move patients away from the incident and toward resources that offer more comprehensive care.

Phases:

Triage 1: upon the arrival to the hospital

Triage 2: in each area



MCI triage differs from day-to-day triage due to potential resource limitations.

Treatment during triage is minimal, and this is counterintuitive to normal pre-hospital protocols.

Triage Categories

EXPECTANT

Black Triage Tag Color

- Victim unlikely to survive given severity of injuries, level of available care, or both
- Palliative care and pain relief should be provided

DELAYED

Yellow Triage Tag Color

- Victim's transport can be delayed
- Includes serious and potentially life-threatening injuries, but status not expected to deteriorate significantly over several hours

IMMEDIATE

Red Triage Tag Color

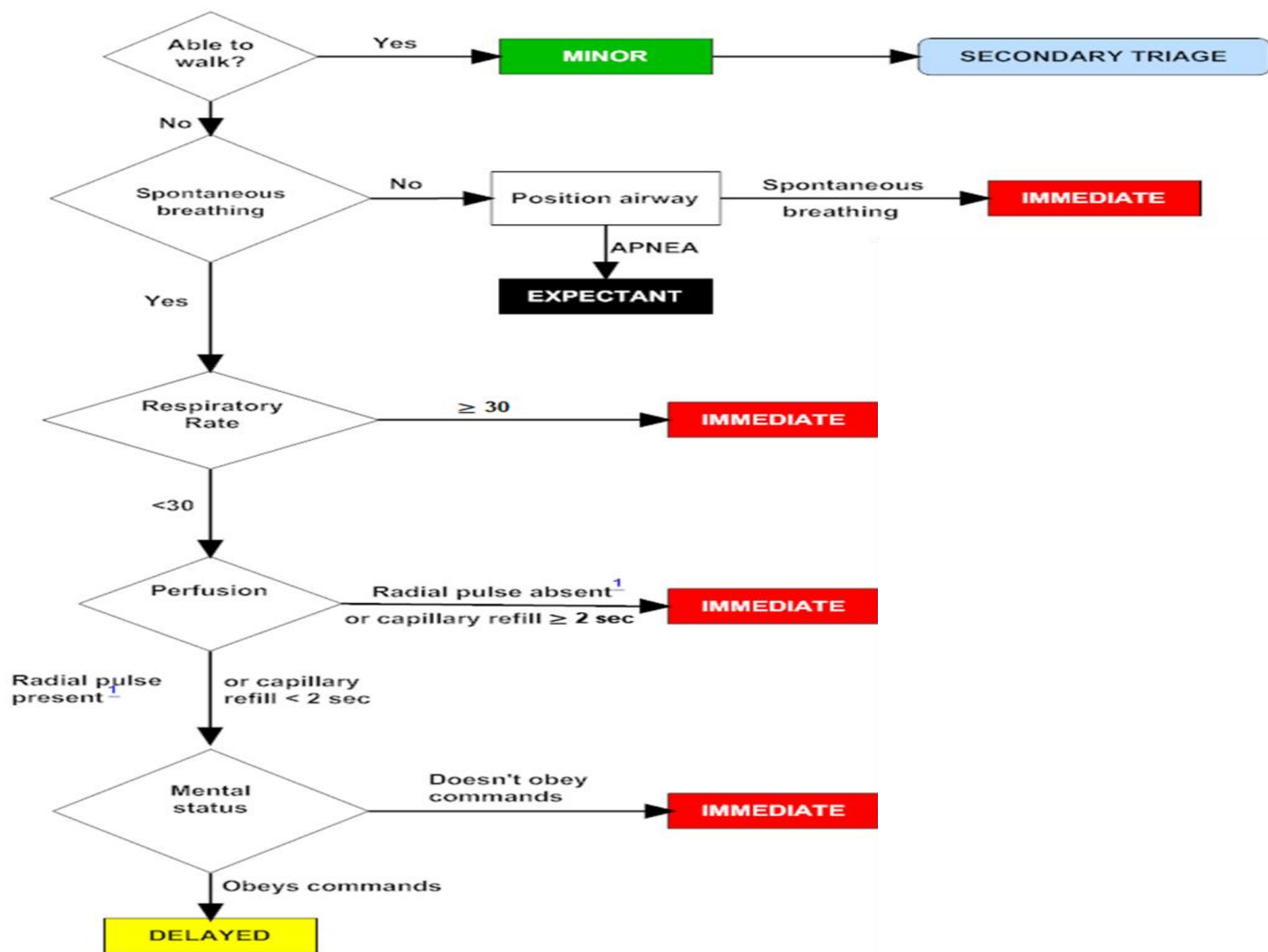
- Victim can be helped by immediate intervention and transport
- Requires medical attention within minutes for survival (up to 60)
- Includes compromises to patient's Airway, Breathing, Circulation

MINOR

Green Triage Tag Color

- Victim with relatively minor injuries
- Status unlikely to deteriorate over days
- May be able to assist in own care: "Walking Wounded"

START Adult Triage



RED Zone (1)

Who should be assessed in the Red Zone?

Patients who need direct life/limb-saving medical intervention.

This area should have enough space for equipment and provide a one-way flow of traffic.



RED Zone (2)

Personnel present and their performed function

Personnel	Function
Anesthesiologist/inhalation	Control airway
Senior surgeon	Make decision for OR
2 Emergency Physicians or critical nurses	Provide adequate care
Junior surgeon	Provide Vascular access
security	Control crowded (entry/exit)
Stretcher bears/porters	transfer non-walking patients outside the Zone
Admin staff	Patient tracking

Kits in the red zone should contain equipment and supplies for life saving interventions.

RED Zone key points

- Patient stabilization is priority
- All patients injured should receive Tetanus prophylaxis as requested
- **All patients should have pain assessment & receive analgesia if required**

Any diagnostic testing that requires significant staff time, advanced technicians or may create reporting delays should either wait or be transferred to referral facility (when feasible).

Green Zone (1)

Location:

- Fast options
 - **The outpatient clinic**
 - **Hospital lobby**
 - **Hospital Cafeteria**
 - **Shaded area not far from Emergency Unit**
- Time-consuming options
 - **A tented structure**
 - **A car park/parking lot**

Green Zone (2)

What happens in the Green Zone ?

Treatment stations...



Wound wash out and dressing

- Most patients will present with minor injuries requiring dressing



Orthopaedic examination

- Closed limb fractures should be reduced, stabilized and immobilized



ENT examination

- If the mechanism of injury included a blast...



Psychosocial support

- Some patients will require psychosocial support or follow-up

Re-assess, Re-assess, Re-assess...

Green Zone (3)

Personnel present and their performed functions

Personnel	Function
Doctors & Nurses	perform phase 2 Triage and treat patients
Psychologist/psychotherapist	Psychosocial support
security	Control crowded (entry/exit)
Stretcher bears/porters	Transfer patients outside the Zone
Admin staff	Ensures patient registration & tracking at control checkpoints (entry/exit)

Kits in the green zone should contain equipment and supplies for minor injuries

Green Zone (4)

How to operate the Green zone?

- Patients need to be quickly re-assessed – this is phase 2 Triage
- day-to-day triage tool can be used

Main goal of STEP 2 Triage in Green zone is not to prioritize patients for treatment but rather to **identify any patient that is beyond the Green zone treatment capacity** & refer them to the **Red zone**

More Areas to be Defined



Family Area



Media Area



Staff pooling Area

Security is Needed



Decontamination

Decontamination for walking and non-walking patients should be done before the phase 1 triage.



Decontamination Tent for patients



Decontamination Tent for personnel



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White Phosphorus

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Introduction

Used in the manufacture of rodenticides, incendiaries (grenades, shells, bombs), and as an igniter in fireworks

Used for 1st time as weapon in WWI

2004

US forces had used WP in Iraq

2006

Israel used WP in Southern Lebanon

2009

Israel used WP in Gaza

2023

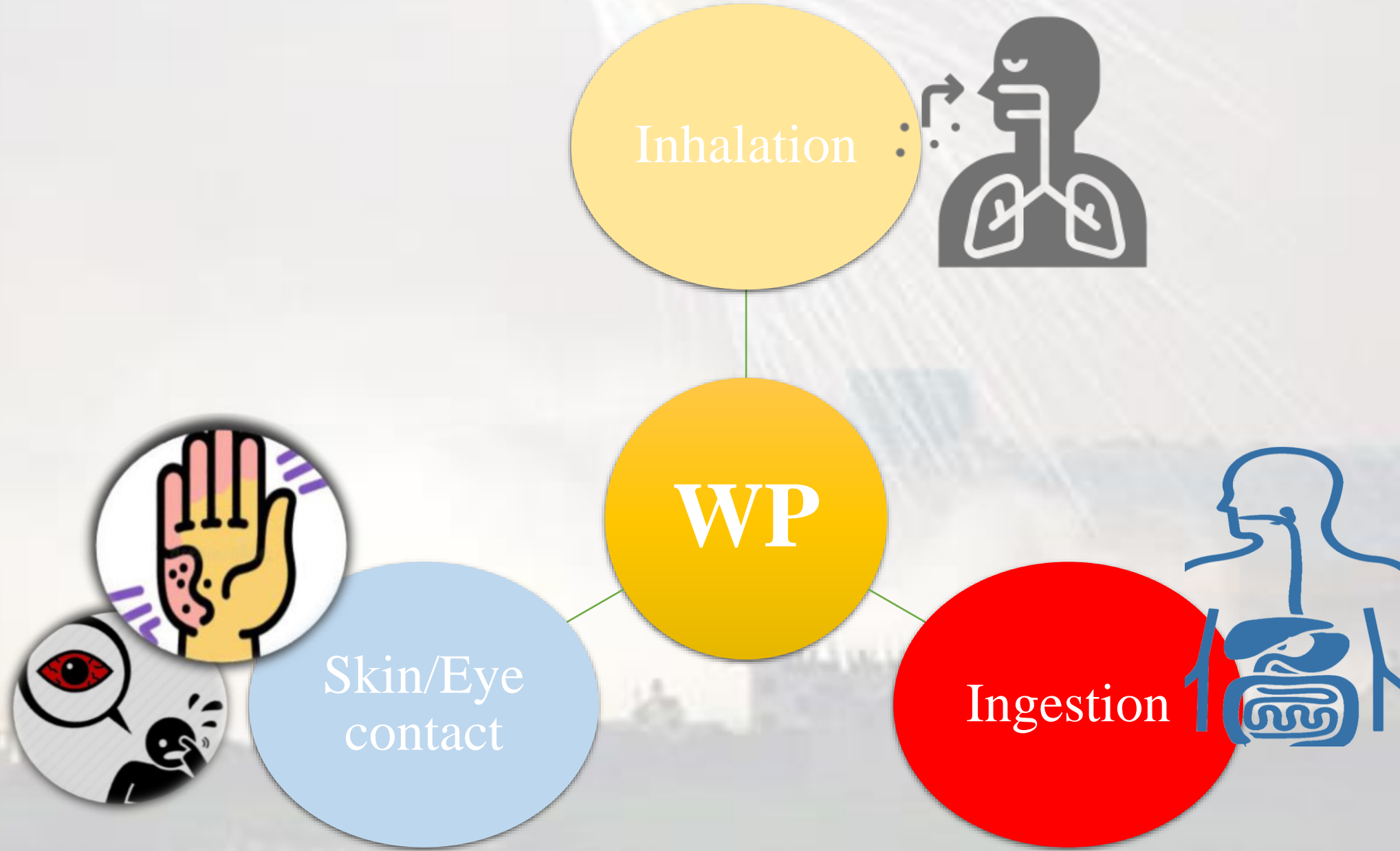
Israel is using WP in Gaza and Southern Lebanon

Specifications

- Poisonous waxy solid
- Causes chemical plus thermal burns
- Oxidizes in air → Phosphorus pentoxide + Water → Phosphoric acid
- Ignites spontaneously if temperature is greater than 30-34 Degrees Celsius producing thermal burns
- When exposed to air, light is emitted and white fumes with a garlic-like odor are released



Routes of Exposure

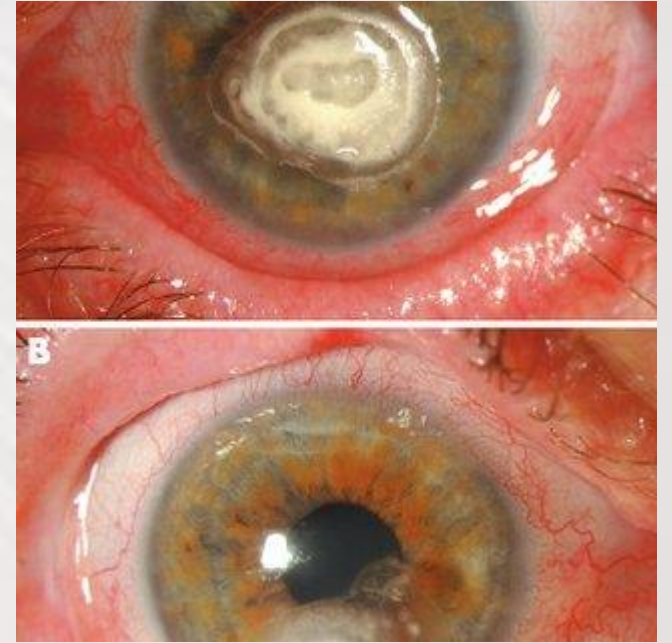




Exposure Effect

Eye Exposure

- Severe irritation with excessive lacrimation
- Sensation of a foreign body in the eye
- Photophobia
- Inflammation of the interior of the eyeball
(endophthalmitis)
- Perforation and damage of the cornea



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Skin Exposure (1)

- Thermal & chemical burn
- Severely painful, 2nd to 3rd degree burns
- 10%-20% burn of the total body area may lead to severe complications including death



Figure: White phosphorus burn

Many lesions, with severe underlying destruction and necrosis in the right shoulder (A) and left leg (B). After 16 months of follow-up (C, D).

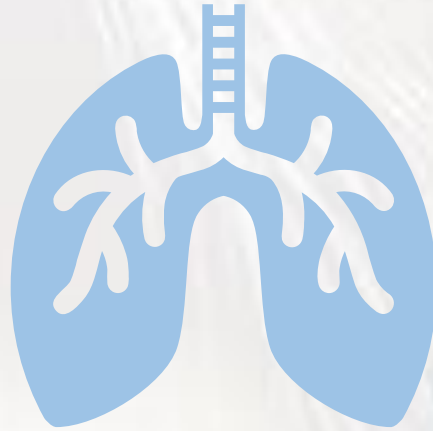
Skin Exposure (2)

- Consider the occurrence of electrolytes imbalance and hypovolemic shock
- WP is highly fat soluble, and easily absorbed through the skin, possibly causing whole-body/systemic effects and multi-organ failure.
- Smoke may release from the burn site from the continued burning of white phosphorus or the formation of phosphoric acid

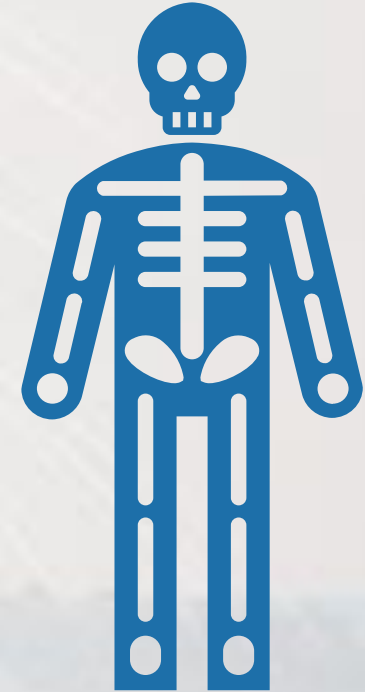
Inhalation Exposure



Eye and upper
respiratory tract
irritation



Chemical
Pneumonitis



Whole-
body/systemic effects
may also occur

Ingestion Exposure

- Burning pain in the throat and abdomen accompanied by feelings of intense thirst;
- Nausea, vomiting (emesis), diarrhea, and severe abdominal pain;
- Multi-organ failure
- Death may occur within 24 to 48 hours due to complete cardiovascular collapse.



Hospital Care



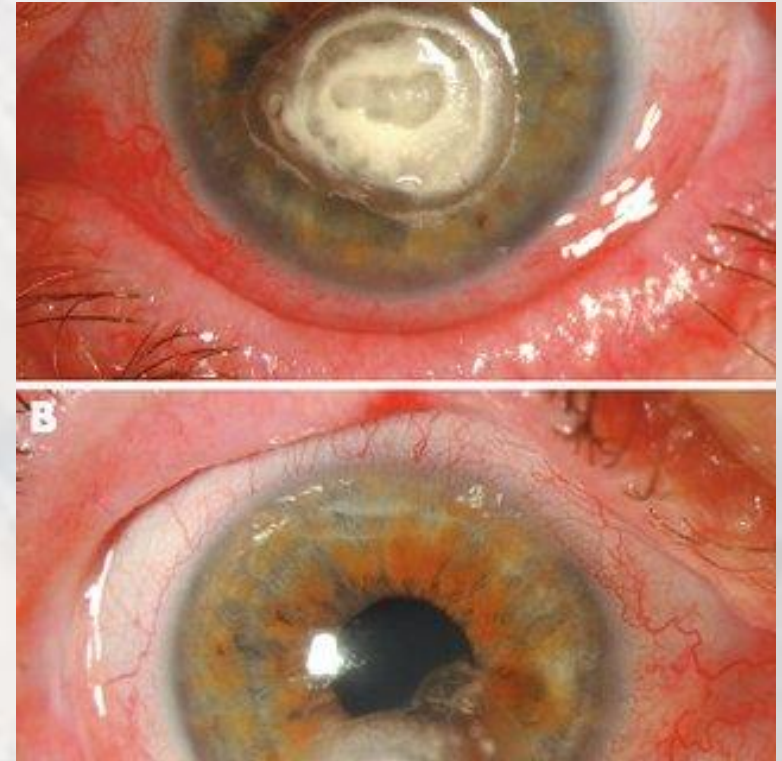
Decontamination & Case Management

- In case of casualties transferred directly to health facility without previous decontamination, consider the following:
 - establish a decontamination area outside the ER: proper level of PPEs with a showering system
- Triage & MCM
- Consider Tetanus prophylaxis



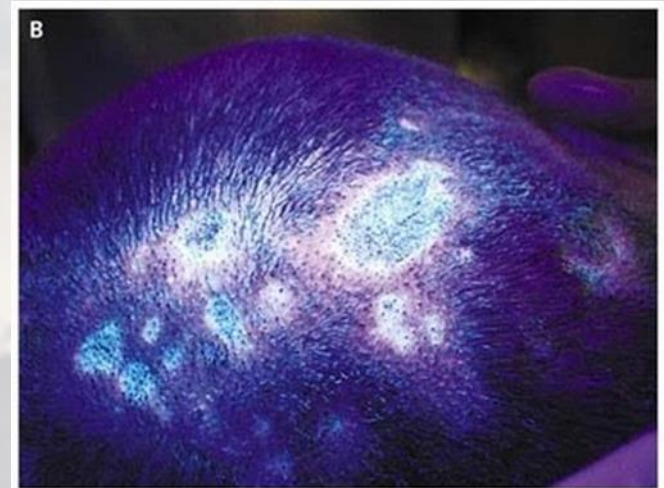
Eye Exposure

- If present, carefully remove contact lenses
- Irrigate exposed eyes with copious amounts of room temperature 0.9% saline or cold water for at least 15 minutes.
- Keep exposed eyes covered with wet compresses to prevent white phosphorus particles from re-igniting.
- Refer patient for evaluation and formal ophthalmologic examination



Dermal Exposure (1)

- Prompt removal of all clothing, including jewelry. Put contaminated clothes in double well-sealed bags. Clearly label these bags as dangerous.
- Immerse exposed areas in water while removing WP particles (forceps).
- Particles removed should be immediately immersed into a container of cold water to avoid ignition and reduce risk to HCW.
- **Visualization of phosphorus particles may fluoresce under an ultraviolet light source (black light, Wood's lamp).**



Dermal Exposure (2)

- Vigorous irrigation with cold water for 15 min.
- Monitor vital signs.
- Avoid application of any lipid or oil-based ointments as these may increase absorption of phosphorus through skin.
- Use Flamazine
- Monitor patient for development of systemic signs or symptoms of phosphorus poisoning (electrolytes, ABGs, Cr...)



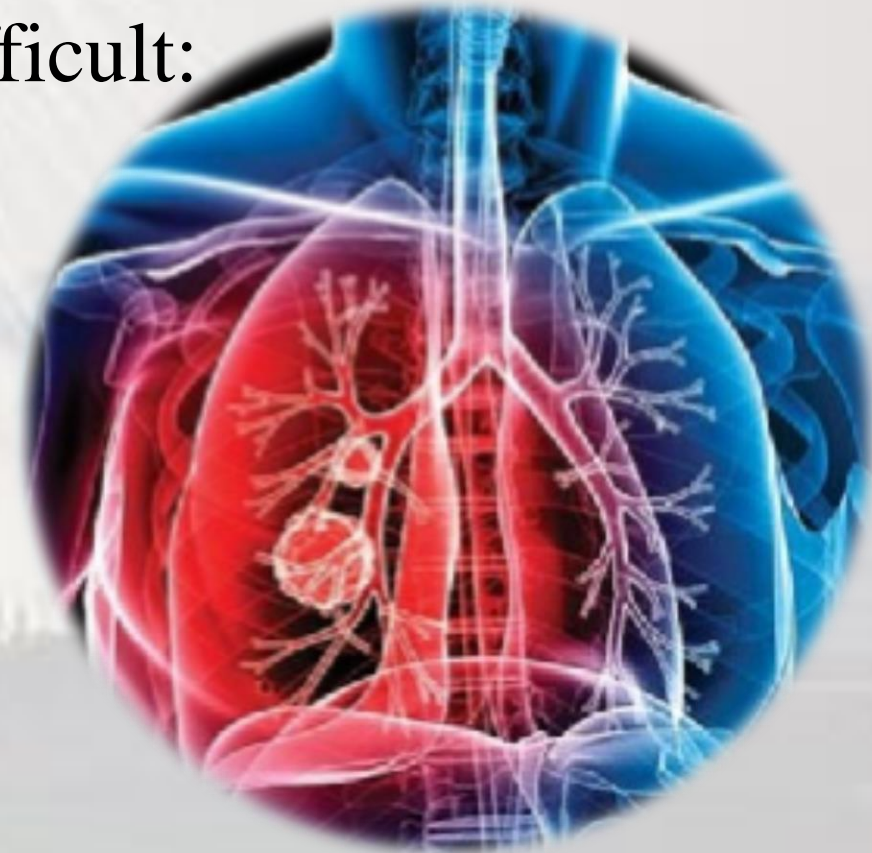
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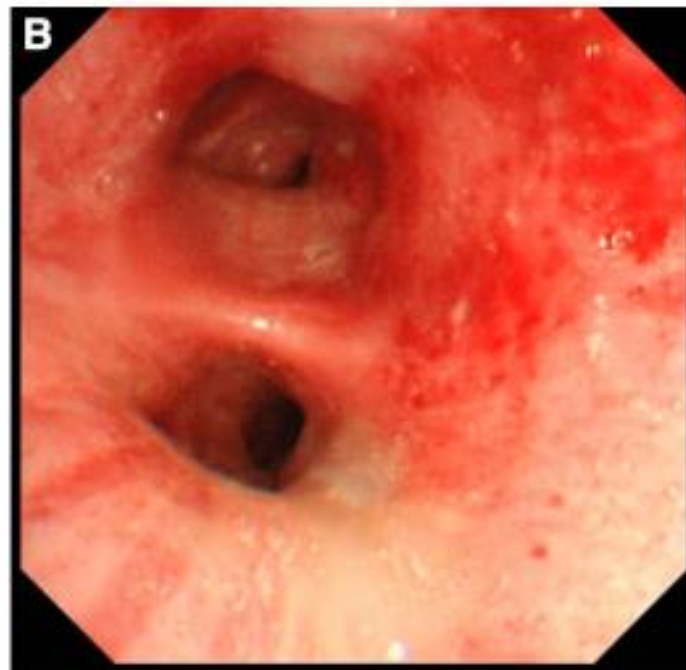
Inhalation Exposure

- Ensure that the casualty's airway is not obstructed.
- Evaluate vital signs.
- If shortness of breath occurs or breathing is difficult:
 - ✓ Administer 100% humidified supplemental oxygen,
 - ✓ Consider administering bronchodilators and corticosteroids if bronchospasm develops
 - ✓ provide assisted ventilation as required.



Inhalation Exposure

- Due to the intense pain of these burns, adequate pain control may lead to respiratory depression and precipitate intubation.
- Perform chest x-ray to R/O chemical pneumonitis. Repeat after 6-12 hours.



Oral Exposure

- **Emesis is not recommended** because of the corrosive potential of phosphorus.
- Caution should be used to prevent any healthcare providers from being injured by the lavage material. Gastric contents that are removed should be immersed in water.
- Monitor vital signs
- Perform ECG and CXR (on admission and after 6-12 hours)
- Perform blood tests (electrolytes, BS, ABGs, Cr, liver function...)



On-Site Morgue



- Wear PPE until confirming all remains are free of contamination.
- Establish a preliminary (holding) morgue if necessary



Different Levels of PPEs

Levels of PPEs

Level A



Level B



Level C



Level D





**“SAVE LIVES & ALLEVIATE SUFFERING,
BE HUMAN”**

Thank you



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