Exposure and Symptom Triage (EAST) Tool to Assess Radiation Exposure after a Nuclear Detonation

Nuclear Detonation Survivor Prioritization for Evacuation / Bone Marrow Cytokines

Assess symptoms/data – major predictors listed first (e.g. ALC is best predictor, skin changes unlikely) - base cytokine and evacuation priority on column with *majority or strongest predictive variables* (2)

<table>
<thead>
<tr>
<th>ARS Severity Prediction</th>
<th>Severe ARS Predicted (&gt;6 Gy)</th>
<th>Moderate ARS Predicted</th>
<th>Mild ARS Predicted (&lt;2 Gy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALC/lymphocyte single value estimate (x10^9) (3)</td>
<td>&lt; 0.7 at 24h</td>
<td>0.7 – 1.1 at 24h</td>
<td>&gt; 1.1 at 24h</td>
</tr>
<tr>
<td>Vomiting onset (4)</td>
<td>Rapid (within 1h) after exposure</td>
<td>Intermediate (1-4h)</td>
<td>Delayed &gt; 4h</td>
</tr>
<tr>
<td>Vomiting (per day) (5)</td>
<td>&gt;6 or worsening with time</td>
<td>Moderate 3-6</td>
<td>1-2 or resolved</td>
</tr>
<tr>
<td>IMAAC /official 12-24h estimated dose map (6)</td>
<td>&gt;6 Gy (modify to 2-6 Gy if good shelter for 24h)</td>
<td>2-6 Gy (modify to &lt; 2 Gy if good shelter for 24h)</td>
<td>&lt;2 Gy</td>
</tr>
<tr>
<td>Location in damage or fallout zone (non-IMAAC map) first 12-24h</td>
<td>In damage or fallout zone with minimal / no sheltering</td>
<td>In damage/fallout zone with good sheltering (e.g. concrete)</td>
<td>Not in damage/fallout zone according to map</td>
</tr>
<tr>
<td>Diarrhea (stools / day)</td>
<td>Severe (&gt;6)</td>
<td>Mild / moderate (&lt;6)</td>
<td>None</td>
</tr>
<tr>
<td>Headache (7)</td>
<td>Severe, interferes with activities</td>
<td>Mild/moderate</td>
<td>None/minimal</td>
</tr>
<tr>
<td>Fever (unexplained)</td>
<td>High/sustained</td>
<td>Low (&lt; 101F) or resolved</td>
<td>None</td>
</tr>
<tr>
<td>Skin (beta) burns (8)</td>
<td>Burns / blisters &gt; 3% BSA</td>
<td>Burns/blisters &lt; 3% BSA</td>
<td>None</td>
</tr>
</tbody>
</table>

Match dominant signs/symptoms in column above to suggested triage category in same column below

<table>
<thead>
<tr>
<th>GCSF/myeloid cytokine priority (9)</th>
<th>2 – Possible benefit</th>
<th>1 – Most benefit</th>
<th>3 – Unlikely benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evacuation group (10)</td>
<td>2 – Second evacuated</td>
<td>1 – First evacuated</td>
<td>3 - Third evacuated</td>
</tr>
</tbody>
</table>

Complicating Medical Conditions / Vulnerability  
(see note 10)
Adjust evacuation priority to a higher color (e.g. yellow up to red) if patient has a condition for which local care is not available and that could deteriorate within 48h putting the patient at risk including but not limited to:
- Diabetes
- Dialysis / End Stage Renal Disease
- CHF (Congestive Heart Failure)
- Pregnancy
- Immunosuppression (e.g. AIDS, taking steroids/transplant meds, recent chemo)
- Severe Respiratory Disease (e.g. Asthma, COPD with disability, requiring oxygen, or daily symptoms)
- Vulnerable / at risk in current environment (e.g. pediatric, disability)

Myeloid cytokine (GCSF/other) administration (record dose/time) according to priority/availability (11)

Support – referral to resources for evacuation and basic needs coordination (12)


End notes – turn over
Goal: Initial rapid triage of persons with radiation exposure (no/limited injury) to prioritize them for evacuation/myeloid cytokine administration as not enough capacity in system to provide for all survivors

Setting: Assembly center or screening location in resource-poor environment after a nuclear detonation.

Process: Screen patients from highest to lowest precision predictors of ARS and assign priority. This tool is an imprecise guide and should not substitute for expert clinical and radiologic opinion when available. Use of serial ALC values for screening is optimal and should be instituted as soon as blood counts can be performed.

Outcome: One or combination of:
- Triage to acute medical care (depending on situation/severity of condition may have on-site resources to provide care or have to refer to another facility/location)
- Refer to myeloid cytokine administration/other medical support (may be co-located or separate)
- Assign priority for evacuation to area with adequate medical resources
- Refer to shelter/basic needs support

Endnotes:
1. Medical/trauma symptoms that preclude completion of assessment process. Consider oral anti-nausea/anti-diarrhea medications as needed without medical care (MC) referral during and post-assessment. Persons referred to MC may be treated and referred back for assessment or assessed in medical care area/hospital. Combined trauma/radiation injuries should be assessed by physician as worse prognosis when significant combined injury.
2. This tool is ONLY for use in severely resource-constrained environments. In areas with appropriate resources standard assessment tools (BAT, etc.) should be used. (see https://www.remm.nlm.gov/newptinteract.htm#skip)
3. Single values of ALC to predict dose are not precise. Obtain serial values as soon as possible. Use formulas and nomograms even for single values as accuracy is best when the time is precise (see link). Time is start of exposure began (e.g. fallout) NOT detonation (https://www.remm.nlm.gov/ars_wbd.htm#ldk_section)
4. Vomiting may be due to psychogenic or traumatic effects and time to onset may depend on fallout variables and NOT detonation time. Thus, caution is required when interpreting time to onset.
5. Vomiting can cause irritation of the stomach and other factors that can make the vomiting continue despite a relatively low radiation exposure. Thus, vomiting should be assessed in light of other signs and response to any medical treatment already provided.
6. In damage or dangerous fallout zone during first 12-24 h per IMAAC or other official mapping. Exposure likely significantly less than IMAAC predicted values if good quality (concrete / steel) sheltering for 24h
7. Headaches (HA) can be due to many things including lack of sleep, stress, trauma, and other factors. However, a severe HA in conjunction with other symptoms is likely radiation-related.
8. Radiation related burns occur from direct contact with highly radioactive fallout particles or flash burns from the initial explosion. Absence of skin changes does not have predictive value but the presence of skin burns, sloughing, or blistering that is not due to thermal burns is a poor prognostic indicator. Estimate 1% body area as the size of the patient’s palm.
9. Myeloid cytokines (e.g. GCSF) may not be available in a quantity sufficient for treating all candidates. Priority reflects degree of benefit based on prognosis. Refer to scarce resource triage tool for further information (see http://www.remm.nlm.gov/triagetool_intro.htm)
10. Evacuation priority is based on prognosis as well as resource demands and assumes that medical care in the area is inadequate. Higher priority for evacuation (e.g. yellow patient moves up to red group) may be assigned if underlying medical conditions could be potentially life-threatening if untreated for > 2d. Vulnerable adults, pregnant women, or children at risk in current environment may also receive higher priority for evacuation. In some cases, experienced providers may lower the evacuation priority based on low chance of survival in which case palliative care and scheduled re-evaluation and re-triage should be provided
11. Myeloid cytokine administration may be co-located with other assembly center functions or located at another site. Administration should be tracked – both on a card that remains with the victim and in a retainable/sharable database.
12. Support functions should include re-unification/communication support, shelter and basic needs facilitation, facilitation of evacuation, and provision/referral for mental health and medical services. Some of these may be co-located at the assembly center and others at separate sites.