SCOPES

This policy applies to all sites titled South West Healthcare (SWH).

OBJECTIVES:

To ensure the health and safety of all employees, patients, visitors and contractors of SWH by completing a Risk Assessment Plan prior to any employee undertaking hazardous works or maintenance onsite.

This procedure describes how the risks involved with planned works and maintenance are assessed and how controls are selected. It addresses works and maintenance tasks undertaken rather than specific workplace hazards.

DEFINITIONS:

Risk Assessment Plan: The primary objectives of the Risk Assessment Plan are to:
- Identify hazards associated with contract tasks and activities;
- Determine the level of risk; and
- Establish appropriate risk control measures.

Employee: For the purpose of this policy, any employee refers to any staff member or contractor under the employ of SWH.

Hazard/Risk: A situation, task or activity with the potential to cause injury or damage.

Hazardous Works / Maintenance: Any work or maintenance with the actual likelihood of harm or damage.
- Working in confined spaces;
- Working at heights;
- Demolition work;
- Working with hazardous goods or materials e.g. asbestos; and
- Work involving significant danger to the public.
PROCEDURE: Risk Assessment Plan

The employee shall prepare a Risk Assessment Plan (attachment 1) prior to the commencement of hazardous works and maintenance, and implement it during the course of the undertaken works or maintenance (Refer to AS 4804, Clause 4.3.4). In summary, the process consists of the following steps:

- Identify hazards associated with the tasks or activities;
- Assess the level of risk for each hazard;
- Implement control measures for each hazard identified;
- Monitor adequacy of the plan during the works/maintenance and update it if necessary.

**Step 1 Identify hazards associated with the tasks to be undertaken**

This is should be undertaken by considering each major task/activity to be carried out during the works/maintenance. Other tools that may be used include inspections, consultation, reviewing records and seeking specialist advice.

**Step 2 Assess the level of risk for each hazard**

The level of risk associated with each hazard is often referred to as its ‘Risk Rating’. To determine the Risk Rating for each hazard, the likelihood of the event occurring and the consequences should it eventuate are assessed on a five level scale. The resultant Risk Rating is then read off the matrix.

<table>
<thead>
<tr>
<th>LIKELIHOOD</th>
<th>CONSEQUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Insignificant</td>
</tr>
<tr>
<td>Almost Certain</td>
<td>Moderate</td>
</tr>
<tr>
<td>Likely</td>
<td>Moderate</td>
</tr>
<tr>
<td>Possible</td>
<td>Low</td>
</tr>
<tr>
<td>Unlikely</td>
<td>Low</td>
</tr>
<tr>
<td>Rare</td>
<td>Low</td>
</tr>
</tbody>
</table>

* Should never occur.

Continued next page
Step 3 Implement control measures for each hazard identified

The employee will need to develop control measures to minimise or eliminate each hazard. This should be determined by a consideration of the Risk Rating, the “Hierarchy of Control” and any relevant legislation or regulations. The Hierarchy of Control, which lists control strategies in order of desirability, is illustrated below:

- **Eliminate the Hazard**
  - eg: off site cutting of panelwork.

- **Substitute the Hazard**
  - eg: replace ladder with scissor lift.

- **Engineering Controls**
  - eg: reverse alarms/lights fitted to plant, exhaust ventilation to remove fumes.

- **Administrative Controls**
  - eg: job rotation, work instructions, safety inspections.

- **Personal Protective Equipment**
  - eg: hearing protective devices, respirators, hard hats.

Step 4 Review of Risk Assessment Plan

Following the completion of Risk Assessment Plan, the plan is to be forwarded to the Facilities and Supply Manager for approval and then to the OH&S Manager for signoff. In the event that modifications to the plan are required it will be returned to the employee for further review. This will continue until approval and signoff is achieved.

Step 5 Monitor the adequacy of the plan during the tasks and update it if necessary

During the course of the works / maintenance, the compliance with the Risk Assessment Plan shall be monitored and the plan should be reviewed periodically to ensure that it remains relevant.

REFERENCE:

- Department Human Services – Managing Contractor Health & Safety Risks
- Occupational Health & Safety (General Safety) Regulations 1980
Attachment 1

Risk Assessment Plan For Hazardous Works / Maintenance

<table>
<thead>
<tr>
<th>OH&amp;S Assessment No.</th>
<th>(OH&amp;S Manager Use Only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of Activity:</td>
<td></td>
</tr>
<tr>
<td>Location(s) of Work:</td>
<td></td>
</tr>
</tbody>
</table>

Brief Description of Work:

**Hazard Identification:** Identify all the hazards; evaluate the risks (low / moderate / major); describe all existing control measures and identify any further measures required. Specific hazards should be assessed on a separate risk assessment form and cross-referenced with this document. Specific assessments are available for hazardous substances, biological agents, display screen equipment, manual handling operations and fieldwork.

<table>
<thead>
<tr>
<th>Hazard(s)</th>
<th>Risk Rating</th>
<th>Control Measures (i.e., alternative work methods / mechanical aids / engineering controls, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Continue on separate sheet if necessary*

**Engineering Controls:** *Tick relevant boxes*

- Guarding
- Extraction (LEV)
- Interlocks
- Enclosure
- Other relevant information (incl. testing frequency if appropriate):

**Personal Protective Equipment (PPE):** Identify all necessary PPE.

<table>
<thead>
<tr>
<th>Eye / Face</th>
<th>Hand / Arm</th>
<th>Feet / Legs</th>
<th>Respiratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body (clothing)</td>
<td>Hearing</td>
<td>Other (Specify)</td>
<td></td>
</tr>
</tbody>
</table>

Specify the grade(s) of PPE to be worn:

Specify when during the activity the item(s) of PPE must be worn:

Non-disposable items of PPE must be inspected regularly and records retained for inspection

---

*Continued next page*
Infection Control: Identify all necessary considerations.

<table>
<thead>
<tr>
<th>Air sampling</th>
<th>Biowaste</th>
<th>Sharps disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust control</td>
<td>Staff vaccinations*</td>
<td>Decontamination Facilities*</td>
</tr>
</tbody>
</table>

*Infection Control Co-ordinator to be notified.

Document specific Infection Control Issues:

Persons at Risk: Identify all those who may be at risk.

<table>
<thead>
<tr>
<th>Operators</th>
<th>Technical staff</th>
<th>Cleaning staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance staff</td>
<td>Office staff</td>
<td>Healthcare personnel</td>
</tr>
<tr>
<td>Patients</td>
<td>Visitors</td>
<td>Others</td>
</tr>
</tbody>
</table>

Additional Information: Identify any additional information relevant to the activity, including supervision, training requirements, special emergency procedures, requirement for health surveillance etc.

Assessment carried out by:

Name:  Date:  
Signature:  Review Date:

Approved by:

Name:  Date:  
Signature:  Review Date:  
Position:  Facilities Manager

Signed off by:

Name:  Date:  
Signature:  Review Date:  
Position:  Occupational Health & Safety Manager

Completed Works Inspected

Name:  Date:  
Signature:  Review Date:  
Position:  Facilities & Manager
1. SCOPE:

This policy applies to all sites titled South West Healthcare (SWH).

2. PURPOSE:

The purpose of this guideline is to outline the precautions and procedures to be adopted in the management of casualties involved in radiation accidents so as to ensure that radiation doses to staff treating the casualties are kept to a minimum. It has the following sections:

- Introduction
- Set-up of room for receiving contaminated casualties
- Personal protective equipment
- Triage and treatment algorithm
- Contamination monitoring procedure
- Decontamination procedures
- Waste management
- Radiation injury
- Responsibilities

3. INTRODUCTION:

3.1. MEDICAL TREATMENT:

The medical stabilisation of casualties has first priority and takes precedence over any radiological consideration.

3.2. RADIATION SAFETY PROGRAM:

The Radiation Safety Program (RSP) of the Department of Human Services is the control agency for radiation incidents within Victoria and should be notified in the event of an incident.

The RSP may be contacted (24/7) by contacting the Emergency Coordinator, Public Health (DHS) on pager 132 222, # 87457.
3.3 CONTAMINATED CASUALTIES:

Where radioactive materials are known to be involved in the incident, it is important to monitor casualties for contamination (after stabilising life-threatening medical conditions) to ensure that radiation doses to both casualties and medical staff are kept as low as reasonably achievable.

4. SET UP OF ROOM FOR RECEIVING CONTAMINATED PATIENTS:

- Set up a controlled area large enough to hold the anticipated number of victims;
- Establish control lines and prevent the spread of contamination;
- Temporary barriers should be erected to exclude others entering the designated corridor and treatment area;
- Arrange for the hospital entrances other than the emergency department entrance(s) to be secured;
- Floor of corridor to treatment area, and treatment area itself, should be covered with heavy-duty paper or plastic to minimise spread of radioactive material. The covering materials should be secured to the floor with tape;
- Large bins lined with disposable plastic bags are to be provided for the disposal of contaminated waste such as clothing, linens, dressings, etc. Bags to be sealed and tagged for subsequent monitoring by Radiation Safety Officer (RSO)/Occupational Health & Safety Manager (OHSM);
- Non-essential equipment should be covered or removed from the controlled area; and
- There is no need to control air ventilation of areas receiving contaminated casualties, as there is minimal aeroionisation of radioactive material.

Notes:

Special floor covering is not necessary for treatment of casualties contaminated with radioactive material. The sole purpose of placing floor covering down is to make cleanup of contamination easier afterwards. Medical treatment must not be delayed because there is no floor covering in place.

An assembly point external to the hospital for the purpose of monitoring of casualties for radiological contamination should also be established (Refer ATTACHMENT 3.)

5. PERSONAL PROTECTIVE EQUIPMENT (PPE):

- Normal clothing used in operating suites will provide sufficient protection for medical personnel treating patients contaminated with radioactive material:
  - A gown with a waterproof apron;
  - Cap;
  - Waterproof shoe covers;
  - Surgical Mask with two (2) pairs of surgical gloves; and
  - Eye Protection.
- The use of lead aprons is unnecessary, as they do not provide sufficient shielding.
- Personal radiation dosimeters are provided for use in the Emergency Department (ED). These are to be worn by key medical treatment personnel in closest proximity to casualties. If personal dosimeters alarm (set to alarm at 100
\(\mu\text{Sv/hour}\), rotate staff to keep doses to a minimum and seek urgent advice from the Radiation Safety Program (RSP) and the OHSM.

**Note:**

The average natural background radiation dose in metropolitan areas that a person receives is 2000 \(\mu\text{Sv}\) per year.

6. **REMOVAL OF PPE:**

Remove protective garments and gloves across control line using standard surgery procedures. Bag and tag.

7. **TRIAGE OF CASUALTIES INVOLVED IN A RADIATION INCIDENT:**

Refer to attached algorithm (Attachment 1).

Provide triage at the ED entrance and direct:

- Casualties with life threatening conditions to the prepared treatment area; and other casualties to the radiation monitoring point;
- Stabilise life-threatening medical conditions of casualties;
- Ambulatory casualties who have recently entered the hospital, and have been at the site of the incident, advised to assemble at the radiation monitoring point for radiation monitoring by the OHSM (see *Contamination Monitoring Procedure*);
- Contaminated individuals to be decontaminated as appropriate; and
- Definitive medical treatment.

8. **CASUALTY FOLLOW UP AND COUNSELLING:**

- Order **IMMEDIATE** full blood examination (FBE) and differential and follow with absolute lymphocyte counts every 6 hours for 48 hours when history indicates possibility of total-body irradiation. See section on acute radiation syndrome in *Radiation Injury* (Attachment 2) for further information;
- Casualties who have been involved in radiation incidents should be followed up for a week, with particular reference to the development of nausea and vomiting, areas of otherwise unexplained erythema, conjunctival redness, epilation, and changes in full blood and lymphocyte count; and
- Casualties who have been or think they have been exposed to radiation may need psychological support to help alleviate any anxiety.

9. **CONTAMINATION MONITORING PROCEDURE:**

9.1 **SKIN AND CLOTHING:**

- Cover the probe with a surgical glove, for example;
- Ensure that the instrument is used in fast response mode, where this is possible;
- Set the instrument selector switch to the most sensitive range of the instrument;
- Holding the probe approximately 1 to 2 cm from the person’s skin and systematically survey the entire body from head to toe on all sides;
- Move the probe slowly (a few cm per second);
- Do not let the probe touch anything;
- Try to maintain a constant distance;
• Pay particular attention to body orifices, skin folds, hands, face and feet;
• An increase in count rate or dose rate above background indicates the presence of radiation;
• Document areas of contamination on a body map together with monitor details, monitor readings for the various body areas that are contaminated, and details of the casualty; and
• When necessary, adjust the range of the instrument by moving the range selector switch.

Note that some instruments cannot detect alpha radiation and some low-energy beta radiation. Because alpha radiation is non-penetrating, it cannot be detected through even a thin film of water, blood, dirt, clothing, or through probe cover.

9.2 BODY ORIFICES AND WOUNDS

• Nasal and oral swabs should be collected using moist, clean cotton tipped applicators;
• Any sputum, vomitus, or tissues from nose blows should be collected;
• Any initial wound dressings should be collected; and
• Swabs, dressings, etc. should be placed in separate plastic bags and labelled with patient details, site, and time for later analysis. The Radiation Safety Program will arrange for the collection of these specimens.
10. DECONTAMINATION PROCEDURES

The medical stabilisation of casualties has first priority and takes precedence over any radiological consideration. Decontamination should be as thorough as practical. Reduction of background radiation levels is not always possible.

10.1 AMBULATORY PATIENTS

Careful removal of clothing will reduce contamination by about 90%. Small areas of superficial contamination can be decontaminated using a sink or basin. If extensive body areas are contaminated, the patient can be showered under the direction or with the assistance of the OHSM.

Caution the patient to avoid splashing water into the eyes, nose, mouth, or ears. Repeated showers might be necessary, and fresh towels provided for drying after each shower.

10.2 STRETCHER PATIENTS:

Careful removal of clothing will reduce contamination by about 90%.

10.3 DECONTAMINATE OPEN WOUNDS FIRST:

• Drape wound with waterproof material;
• Gently irrigate with saline or water;
• Remove contaminated drapes, dressings, etc;
• Monitor;
• Repeat until there is no further reduction in radiation level; and
• If radiation level cannot be reduced to near background levels, debride wound, if clinically appropriate, and bag and label debris.

10.4 DECONTAMINATE BODY ORFICES:

• Oral cavity - encourage brushing the teeth with toothpaste and frequent rinsing of the mouth;
• Pharyngeal region - gargling with a 3% hydrogen peroxide solution might be helpful;
• Radioactive material swallowed - gastric lavage may be used;
• Eyes - rinse by directing a stream of water from the inner canthus to the outer canthus of the eye while avoiding contamination of the nasolacrimal duct; and
• Ears - external rinsing; an ear syringe can be used to rinse the auditory canal, provided the tympanic membrane is intact. Detonation of an explosive device to disperse radioactive material carries the risk of barotrauma to the ears.

10.5 EXTERNAL DECONTAMINATION (INTACT SKIN):

• Wash under a stream of water, gently scrubbing at the same time with a soft disposable brush or surgical sponge. Special attention should be given to nails, skin folds and hair;
• Use gentle, neutral pH soap if required;
• Scrub for 3 – 4 minutes, rinse for 2 – 3 minutes and then dry;
• Monitor; and
• Repeat if necessary.
• Decontamination stops when no further significant reduction in radiation level can be achieved.

**Note:**

Avoid excessive scrubbing. Even minimal abrasions may result in a greater than ten-fold increase in incorporation of radioactive material.

10.6 **AFTER DECONTAMINATION:**

Move casualties from 'contaminated' stretcher to clean stretcher across control line for transport of casualty to definitive treatment area.

11. **WASTE MANAGEMENT:**

11.1 **BAGGED WASTE:**

- At the conclusion of the decontamination of the patient soiled linen, dressing materials, etc. should be surveyed by the hospital radiation safety officer for residual contamination;
- Contaminated linen and waste should be double-bagged and labelled ‘radioactive’; and
- Bagged contaminated waste should then be stored in a secure, isolated area, free from human interference, until decay has occurred naturally, rendering the waste no longer radioactive. The time for this to occur is dependent on the specific radioisotope. In the case of waste with a long half-life, the OHSM will make arrangements for the proper disposal of the waste.

11.2 **CONTAMINATED BUILDINGS:**

- Cleaning staff should wear the same PPE as the decontamination team;
- Disposable floor coverings and other coverings should be rolled up and placed in plastic bags;
- The entire area should then be thoroughly surveyed for residual contamination;
- In most cases, normal cleaning methods will remove the material;
- Vacuum cleaners that can handle wet material and have high efficiency filters are useful; and
- Some surfaces may require repeated scrubbing and vacuuming before they are free of contamination.

11.3 **DISPOSAL OF WASTE:**

- All waste materials should be disposed in accordance with prescribed procedures.
12. RESPONSIBILITIES:

IONISING SAFETY OFFICER – Mayne Health, Manager or on call radiographer

♦ Provide the initial response to, and investigation of accidents and emergencies.
♦ Provide practical advice to users of ionising radiation
♦ Formulate and review practical procedures for work with ionising radiation.

NON-IONISING SAFETY OFFICER – Ward 2 Unit Manager or Peri-Operative Manager

♦ Ensure training, information and advice on non-ionising radiation safety is available to staff
♦ Ensure there is an emergency procedure for incidents involving non-ionising radiation
♦ Ensure the work involving significant potential for adverse consequences is identified and assessed for risk.

13. REFERENCES

• Hospital Radiation Incident Management – Department of Human Services (2004).
• Medical Management of Radiation Accidents – CRC Press.
ATTACHMENT 1.

**Radiation Accident With Trauma Or Illness**

1. Life threatening problem:
   - Yes: Stabilise
   - No: Externally contaminated

2. Externally contaminated:
   - Yes: Admit to emergency dept and treat medical problem
   - No: Survey and document, collect wound dressings

3. Survey and document, collect wound dressings:
   - Stable:
     - Yes: Stabilise
     - No: Decomitate
   - Unstable:
     - Yes: Stabilise
     - No: Admit to controlled area

4. Decomitate:
   - Wounds 1st priority:
     - Drape, irrigate, blot, dry, resuscitate
   - Objects 2nd priority:
     - Flush repeatedly
   - Intact skin 3rd priority:
     - Wash, blot, dry, resuscitate

5. Contamination reduced to an acceptable level?
   - Yes: Waterproof dressing to wound(s)
   - No: Contamination reduced to an acceptable level?

6. Contamination reduced to an acceptable level?
   - Yes: Survey entire body
   - No: Contamination reduced to an acceptable level?

Acknowledgement to the diagram, upon which this is based, contained within Medical Management of Individuals Involved in Radiation Accidents, Technical Report Series No. 131 by Australian Radiation Protection and Nuclear Safety Agency.
ATTACHMENT 2.

RADIATION INJURY

Exposure to high levels of penetrating radiation can involve the whole body (uniformly or non-uniformly), a significant portion of the body, or a small, localised part. The exposure can be acute, protracted, or fractionated (in divided doses) over time.

Local Injury

Most radiation injuries are ‘local’ injuries, frequently involving the hands. These local injuries seldom exhibit the classical signs and symptoms of acute radiation syndrome.

Consider local radiation injury in the differential diagnosis if the patient presents with a skin lesion without a history of chemical or thermal burn, insect bite, or history of skin disease or allergy. If the patient gives a history of possible radiation exposure (such as from a radiography source, X-ray device, or accelerator) or a history of finding and handling an unknown metallic object, note the presence of any of the following: erythema, blistering, dry or wet desquamation, epilation, ulceration. Local injuries to the skin evolve very slowly over time and symptoms may not manifest for days to weeks after exposure.

Conventional wound management is usually ineffective in these cases. Consultation with experts regarding definitive diagnosis, assessment of tissue dose, treatment, and prognosis is recommended. This advice can be obtained from the Division of Radiation Oncology, Peter MacCallum Cancer Centre (contact Peter McCallum switchboard on 9656 1111).

Acute Radiation Syndrome

Acute radiation syndrome (ARS) is an acute illness caused by irradiation of the whole body (or a significant portion of it). It follows a somewhat predictable course and is characterised by signs and symptoms that are manifestations of cellular deficiencies and the reactions of various cells, tissues, and organ systems to ionising radiation.

Immediate, overt manifestations of the acute radiation syndrome require a large (i.e., at least a few grays (Gy), usually whole-body) dose of penetrating radiation delivered over a short period of time. Penetrating radiation comes from a radioactive source or machine that emits gamma rays, X-rays, or neutrons. The signs and symptoms of this syndrome are non-specific and may be indistinguishable from those of other injuries or illness.

The ARS is characterised by four distinct phases: a prodromal period, a latent period, a period of illness, and one of recovery or death. During the prodromal period patients might experience loss of appetite, nausea, vomiting, fatigue, and diarrhoea; after extremely high doses, additional symptoms such as fever, prostration, respiratory distress, and hyperexcitability can occur. However, all of these symptoms usually disappear in a day or two, and a symptom-free, latent period follows, varying in length depending upon the size of the radiation dose. A period of overt illness follows, and can be characterised by infection, electrolyte imbalance, diarrhoea, bleeding, cardiovascular collapse, and sometimes short periods of unconsciousness. Death or a period of recovery follows the period of overt illness.

In general, the higher the dose the greater the severity of early effects and the greater the possibility of late effects.
Depending on dose, the following syndromes can be manifest:

- **Haematopoietic syndrome** - characterised by deficiencies of leucocytes, especially lymphocytes, and platelets, with immunodeficiency, increased infectious complications, bleeding, anaemia, and impaired wound healing.
- **Gastrointestinal syndrome** - characterised by loss of cells lining intestinal crypts and loss of mucosal barrier, with alterations in intestinal motility, causing vomiting and diarrhoea, fluid and electrolyte loss. There is loss of normal intestinal bacteria, and damage to the intestinal microcirculation resulting in sepsis; in addition to the haematopoietic syndrome.
- **Cerebrovascular/Cardiovascular syndrome** - primarily associated with effects on the vasculature and resultant fluid shifts. Signs and symptoms include vomiting and diarrhoea within minutes of exposure, confusion, disorientation, cerebral oedema, hypotension, and hyperpyrexia. Fatal in a short time.
- **Skin syndrome** - can occur with other syndromes; characterised by loss of epidermis (and possibly dermis) with ‘radiation burns’.

**Initial Emergency Management:**

- If trauma is present, treat.
- If external contaminants are present, decontaminate.

**Diagnosis:**

History of exposure - consider acute radiation syndrome in the differential diagnosis if any of the following are present:

- History of a known or possible radiation exposure (for example, entering an irradiation chamber when the source is unshielded).
- History of proximity to an unknown (usually metallic) object with a history of nausea and vomiting, especially if n/v are unexplained by other causes.
- Tendency to bleed (epistaxis, gingival bleeding, petechiae) and/or respiratory infection with neutropenia, lymphopenia, and thrombocytopenia, with history of nausea and vomiting two to three weeks previously.
- Epilation, with a history of nausea and vomiting two to three weeks previously.

**Symptoms** - note type of symptom, time of onset, severity, and frequency.

**Clinical lab** – IMMEDIATE FBE with differential. Repeat in 4-6 hours, then every 6 to 8 hours for 24 to 48 hours. Look for a drop in the absolute lymphocyte count if the exposure was recent (see diagram). If the initial WBC and platelet counts are abnormally low, consider the possibility of exposure a few days to weeks earlier.

**Figure.** Curves 1-4 correspond roughly to the following whole-body doses: curve 1 - 3.1 Gy; curve 2 - 4.4 Gy; curve 3 - 5.6 Gy; curve 4 - 7.1 Gy. From Goans, Ronald E., Holloway, Elizabeth C., Berger, Mary Ellen, and Ricks, Robert C. ‘Early Dose Assessment Following Severe Radiation Accidents,’ *Health Physics* 72(4): 1997.
**Acute Radiation Syndrome: Dose Less than 2 Gray**

Nausea and vomiting due to radiation are seldom experienced unless the exposure has been at least 0.75 to 1 Gray of penetrating gamma or X-rays and it has occurred within a matter of a few hours or less. The prospective patient who has been asymptomatic within the past 24 hours will most certainly have had less than 0.75 Gray of whole-body exposure. Hospitalisation generally will be unnecessary if the dose has been less than 2 Gray.

**Management of ARS (dose <2 Gray):**

- Close observation and frequent FBE with differential.
- Outpatient management may be appropriate.
- Provide instructions regarding home care.

**Acute Radiation Syndrome: Dose Greater than 2 Gray**

Signs and symptoms become increasingly severe with dose.

**Haematopoietic Syndrome:**

- The prodromal phase - nausea, vomiting and anorexia within a few hours at the higher dose levels, or after 6 to 12 hours at the lower dose levels. Lasts 24 to 48 hours, after which time the patient is asymptomatic and may feel well. The absolute lymphocyte count will fall; a stress response of WBC may be present.
- The latent phase - lasts a few days to as long as 2 to 3 weeks at the lower dose levels. The patient is asymptomatic but FBEs will show characteristic changes in the blood elements, with lymphocyte depression and gradual decrease in neutrophil and platelet counts.
- A bone marrow depression phase requires sophisticated treatment. Infection and haemorrhage could occur when white cell and platelet counts become critically low.
- The recovery phase - stem cells in the bone marrow are never completely eradicated at 2 to 10 Gray; some may replicate and eventually produce sufficient blood elements. Supportive therapy is required.

**Gastrointestinal Syndrome:**

- Over 10 Gray - this syndrome is distinguishable from the haematopoietic syndrome by the prompt onset of nausea, vomiting and profuse diarrhoea, followed by a short latent period. GI symptoms recur and lead to marked dehydration, and vascular effects. The GI mucosa becomes increasingly atrophic, and massive amounts of plasma are lost to the intestine. Massive denuding of the GI tract and accompanying septicaemia and dehydration can occur. If the patient survives long enough, depression of the haematopoietic system occurs and complicates the clinical course.

**Cerebrovascular / Cardiovascular Syndrome:**

- Over 30 Gray, an extremely high dose, to the whole-body. Always fatal, there is very early nausea, vomiting, anorexia and prostration, and irreversible hypotension; blood pressure will be markedly unstable. Within hours after exposure, the victim will be listless, drowsy, tremulous, convulsive, and ataxic. Death most likely will occur within a matter of days.
Management of Acute Radiation Syndrome (Dose >2 Gray)

Initial management:

- Vomiting - use selective blocking of serotonin 5-HT$_3$ receptors or use 5-HT$_3$ receptor antagonists.
- Consider initiating viral prophylaxis.
- Consider tissue, blood typing.
- Treat trauma.
- Consider prompt consultation with haematologist and radiation experts, re: dosimetry and prognosis use of colony stimulating factors, stem cell transfusion, and other treatment options.
- Draw blood for chromosome analysis; use heparinised tube.
- Note areas of erythema and record on body chart. If possible, take photographs.

Begin, as indicated:

- SUPPORTIVE CARE in a CLEAN environment (reverse isolation).
- Prevention and treatment of infections.
- Stimulation of haematopoiesis (use of growth factors, i.e., GCSF, GMCSF, interleukin 11).
- Stem cell transfusions: cord blood, peripheral blood, or bone marrow. Platelet transfusions if bleeding occurs or if platelet count too low.
- Psychological support.
- Observe carefully for erythema (document locations), hair loss, skin injury, mucositis, parotitis, weight loss, and/or fever.
- Consultation with experts in radiation accident management is encouraged.
ATTACHMENT 3.

Detection of Radiological Contamination
Hospital Mass Casualty Incident Flow Diagram

Radiological Detection Control With 2 Area Monitors and 1 Cypher

Self-presenters, Medically stable

Critically Ill via Ambulance

Decon

Control Line

Triage

Area Monitor

Area Monitor

Control Line

Clean Area

X

Staff

Cleaning X

Resus

X

X

Waste

Operating Theatre

X

X

Staff

Cleaning X

X

Waste

Hospital Exterior

Emergency Department

X Initial placement of Cypher detector

X Later placement of Cypher detector

X Final tasks with Cypher detector