Emergency Planning for Radiological Incidents

UK Government guidance [1] defines a CBRN incident as one involving a "deliberate chemical, biological, radiological or nuclear incident" and a HazMat incident as one involving a release of major hazardous materials, e.g. from industrial processes or materials in transit. It states that, while these incidents are very unlikely, it is sensible to be ready to deal with contamination of this type.

This advice sheet is written primarily for Medical Physics or Radiology staff planning to advise or assist in the event of casualties arriving at hospital with suspected radioactive contamination. Further information, including on chemical and biological contamination and monitoring areas or large numbers of people, can be found in the References. Some hospitals will have specific considerations, e.g., if they are the centre likely to receive casualties from a nearby civil or military nuclear facility.

Priority of Actions and Key Aims

In a radiological or nuclear incident, the actions in order of priority are:

1. **Resuscitation/life-saving treatment/urgent medical or surgical care**
2. **Containment:** preventing spread of contamination on individual (e.g. from skin contamination to ingestion or absorption via wound), to other people or to the surroundings
3. **Decontamination:** removing as much contamination as possible
4. **Other clinical treatment and follow up**

Medical Physics/Radiology staff may need to assist with/advise on:

1. Identifying radioactive contamination by monitoring, and assess its levels
2. Minimising the spread to other people or areas
3. Handling radioactive waste generated by the decontamination process, using segregation, containment and safe disposal where possible
4. Communication with non-specialist staff, external bodies, the public and patients

Triage and Initial Assessment of Exposure

Emergency personnel may use the Step 123+ incident scene triggers to identify a CBRN scenario [2]. **Urgent medical or surgical care must not be delayed due to radioactive contamination.** P1 casualties (those in a life-threatening condition) should be given emergency treatment without decontamination, while P2/3 casualties may be decontaminated first [2]. Has the casualty been exposed to external radiation only, or are they potentially contaminated? Is contamination only on clothes, on skin/hair, or internal? Is it possible to ascertain what isotope, emission type or activity?

Planning and Business Continuity

Radiological incident plans must fit with wider Trust Major Incident Plans, which cover other scenarios and types of contamination. Liaison with key staff groups such as Emergency Department (ED) and Trust Emergency Planning Officers is vital, as is adequate regular training. Consider the effects of disruption and the need to maintain normal urgent clinical work as far as possible.

Who will provide which response, and how will they be contacted? E.g., for a potentially contaminated casualty arriving at an ED, the initial monitoring and decontamination may be undertaken by ED staff. Nuclear Medicine/Medical Physics staff including RPAs/RWAs may then provide further advice and support. Staff should not work outside their competence: e.g., Physics staff might not be trained in wearing full PPE required for some types of biological or chemical contamination.

Preventing Spread of Contamination to People and Areas

This is a key priority. In a large-scale incident, it may be necessary to set up "warm and cold zones" with barriers and a triage system to separate contaminated and uncontaminated people. Access to areas with potential contamination must be controlled. It is also important to prevent contamination of key clinical areas with long-lived radioactive contamination, as far as possible.

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PPE and Staff Protection

- A flowchart on appropriate PPE for different contamination types is provided in the UKHSA guidance [2], recommending more extensive PPE for suspected biological or chemical contamination than for radiological alone. Staff must be trained in the use of the relevant PPE.
- General radiation protection principles including time, distance and shielding apply. There should be no eating, drinking or smoking in areas with contamination, to prevent ingestion.
- The risk to health professionals is likely to be low. External doses received can be estimated using dose rate measurements, or electronic personal dosimeters (EPDs) worn if available.

Monitors and Monitoring

Staff must use monitors that they are trained in using. For example, ED staff may have access to and be trained in using combined dose rate/contamination meters such as ROTEM RAM GENE monitors. Medical Physics/Nuclear Medicine staff may be competent in using other monitors, appropriate to the contamination type. UKHSA guidance [2] suggests a contamination threshold of three times background level, or a locally agreed action level may be adopted. Guidance [5] gives action levels for monitoring of internal contamination for a range of hand-held monitors.

Decontamination

If there is a life-threatening injury, this takes priority. Otherwise, decontamination via removal of outer clothing may be sufficient; consider the casualty's dignity, be systematic, and store contaminated clothing safely. Guidance [2] and [4] describe dry and wet decontamination methods, with wet decontamination preferred for caustic substances or radioactivity. Use water plus a washing aid (e.g. sponge plus detergent) and a rinse-wipe-rinse system. Take care to avoid splashing contamination and use specialist decontamination facilities (e.g. tent) if necessary. Damp wipes may also be effective at removing contamination. Contain contaminated wastewater if possible; if not, do not delay decontamination but liaise with the Environment Agency (EA) and utility companies.

Communication

- **Internally:** Scientific responders may be required to advise on radiation protection, e.g. to ED staff and Incident Control Centre. Use understandable language and established communication routes.
- **Externally:** Relevant organisations who may be involved include the Police, Local Authorities, Fire and Rescue Service, HSE, UKHSA and EA. A full description of responsibilities of different organisations and agencies, including for devolved nations, is available in [1].
- **Media:** Use established Trust arrangements, avoiding confusing and contradictory messages.

Record Keeping and Follow Up

It is vital to keep records throughout the incident, e.g. a log of actions and advice given, contamination monitoring data or dose rates, and details of people involved. The area must be monitored before it can be returned to normal use. Any accumulated waste must be stored or disposed of safely, with advice from an RWA and the EA. Follow up with staff and patients involved will be needed, and radiation doses estimated where possible. Lower radiation doses are associated with stochastic effects and an elevated lifetime risk of cancer. At higher doses, deterministic effects may occur. A full discussion of these is beyond the scope of this document, but specialist advice should be obtained. Further guidance is provided in [2]. Finally, an incident investigation and report must be produced.

References

[1] "Strategic National Guidance: The decontamination of buildings, infrastructure and open environment exposed to chemical, biological, radiological substances or nuclear materials", UK GDS, March 2017
[2] "Chemical, biological, radiological and nuclear incidents: clinical management and health protection", 2nd ed., Public Health England, 2018
[3] National arrangements for incidents involving radioactivity (NAIR) - GOV.UK (www.gov.uk)
[4] NHS England » Hazardous Materials (HAZMAT) and Chemical, Biological, Radiological and Nuclear (CBRN)
[5] https://www.gov.uk/guidance/rapid-screening-for-internal-radioactive-contamination-training-resource
[6] HPA-CRCE-017 "Radiation Monitoring Units: Planning and Operational Guidance, HPA 2011