- **epidemiology** (when, where, who)
    - **time:** in particular, the timescale of case presentation e.g. have cases presented over minutes, hours, days or weeks?
    - **place:** is the geographical location of the cases confined to a small area (cluster) or are they more diffuse?
    - **person:** are all sections of the community affected or has the illness occurred in a subset of the population that may have shared common exposures?
- **clinical features**

Based on this information the outbreak or incident can be classified as **acute** or **delayed** for further management (see figure 1). Irrespective of whether the act of release was deliberate or not the prime aim at this stage of management is to reduce exposure. Health and safety issues are a priority in every incident and should be rapidly referred to the local health and safety department or OHS.

2.4 Detailed clinical assessment and appropriate investigations

A detailed clinical history is essential in establishing the cause of an unusual illness (see appendix 3). The more information gathered in the early stages, the easier the investigation, as common features emerge. The nature and time course (**when**) of the symptoms is very important but also consider any potential risk factors. The following information should be sought:

- **where** has the patient been recently?
    - where do they live?
    - where do they work?
    - have they travelled anywhere?
    - how did they travel?
    - have they attended any special events?
- **who** the patient is and what they have been doing recently?
    - what is their job?
    - what do they do as hobbies or for recreation?
    - have they had any particular exposures e.g. to foods/ drink/ drugs or unidentified substances?
    - have they done anything new or strange recently?
- who or what has the patient been mixing with recently?
    - have they had contact with animals or other ill people?
- ask the patient what they think has caused the illness - this may reveal unusual events or experiences which may give clues?
- are there any other people suffering from the same symptoms?

If alerted by the history or by examination to the possibility of an unusual illness always involve senior colleagues through your regular chain of command and wherever necessary request an expert clinical assessment. **Call your local HPU for advice**. Keep records of all advice received.

Take samples as necessary for routine and specific laboratory investigations:

- ensure these are accompanied by the necessary completed routine and special request forms (appendix 2)
- where deliberate release is suspected (or there are other forensic considerations) it is also very important to maintain a chain of evidence

Always remember that you may only see one case, but that case may have been part of an outbreak or larger incident.

2.5 Determining whether cases of illness occurred naturally/ accidentally or as a result of deliberate action

Whenever an outbreak or incident of unusual illness occurs, consideration should always be given to whether it is a natural or accidental phenomenon or whether it might be the result of deliberate action, or indeed a new or emerging condition. The setting and nature of the outbreak or incident may give some indication of a deliberate release and checklist 1 contains a list of pointers to the possibility of a deliberate or accidental release.

None of the features in checklist 1 are specific for outbreaks or incidents caused by deliberate or accidental release. However, with any of these features, the possibility of a deliberate or accidental release should be considered. Note that for infectious agents, the presentation of illness due to deliberate release may be more sudden, more severe and involve larger numbers than in natural outbreaks. The time course may show a more rapid rise than is characteristic in a natural outbreak. This might be particularly the case where there has been aerosol dispersion of the agent. Most infectious agents considered likely to be used in a deliberate release are not normally transmitted person-to-person, the main exceptions being smallpox and pneumonic plague.

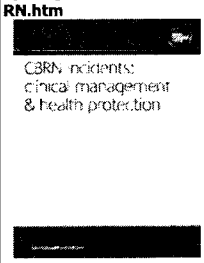
Figure 1: Emergency clinical situation algorithm

IF ANY OF THE FOLLOWING UNUSUAL CLINICAL PRESENTATIONS OCCUR – CONSIDER DELIBERATE RELEASE

- Unusually large numbers of patients present over a time period
- Cases linked by epidemiological features
  - ➢ Similar features/ similar geographical area
  - ➢ **STEP 1-2-3** (see Box)
- Signs/ symptoms unusual or unusually severe
- Known cause but unusual in UK or where acquired
- Known cause but not responding to standard therapy
- Unknown aetiology

CBRN INCIDENTS

hpa.org.uk/emergency/CBRN.htm



Consider the risk of transmission or contamination to staff and/ or other patients
***Isolate patient**
***Use standard personal protective equipment (PPE) - wear gloves, gown, and mask (add eye protection if patient coughing or vomiting)**

ACUTE

- over minutes to hours
- occur in circumscribed geographical area
- occur in people who may have shared a known common exposure

Most likely: CHEMICAL
Other possibilities: Biological toxins
Radiological

DELAYED

- over hours to days or days to weeks
- may or may not occur in geographical clusters
- may or may not occur in people who have shared a known common exposure
- detected by surveillance

Most likely: INFECTIOUS AGENT
Other possibilities: Radiological
Chemicals (latent period)
(Psychological)

STEP 1-2-3

The following precautions should be taken before continuing with the assessment.

First Actions
One Casualty
Treat as **normal**

Two Casualties
Have a **low index of suspicion** but otherwise treat as normal

Three Casualties or More
Initial assessment should be outside the department, use **PPE**, ask for **SPECIALIST HELP**

- **STAFF PROTECTION (PPE), HOSPITAL PROTECTION (air conditioning, isolation)**
- **INITIAL CLINICAL ASSESSMENT, HISTORY AND LIFE SAVING MANAGEMENT**

In a chemical incident prompt decontamination may be life saving. In a radiological incident triage and treat life threatening injury before decontamination; if the patients clinical condition permits, decontaminate first and then treat. Initiate local/ regional contingency plans.

1. SEEK EXPERT ADVICE locally*

2. Ensure safety of self, other staff and patients

DECONTAMINATION

Rinse-Wipe-Rinse

Step 1
Gently wash affected areas with soapy water (0.9% saline for open wounds and eyes): this dilutes the contaminant and removes particles and water based chemicals

Step 2
Wipe affected areas gently but thoroughly with sponge or soft brush or washcloth: this removes organic chemicals and petrochemicals

Step 3
Gently rinse affected areas

3. Detailed clinical assessment – use standard PPE

- **Nature and time course of symptoms**
- **Detailed clinical history**
- **Identify possible recent risk factors:**
  - **Where has the patient been?**
  - **What has the patient been doing?**
  - **With whom or what has the patient had contact?**

4. Management as per best available advice

- **Take samples for laboratory investigations**
- **Treatment or Prophylaxis as indicated**

5. Record information and communicate with

- **Senior clinician**
- **Hospital management**
- **Infection control**
- **Local medical microbiologist & chemical pathologist**
- **Laboratories**
- **Local HPU**
- **Chemical Hazards and Poisons Division/ National Poisons Information Service**
- **Local Radiation Protection Advisor**

***Inform local HPU IMMEDIATELY**
http://www.hpa.org.uk/lars_hpus.htm

SEEK EXPERT ADVICE For full list and contact details see Appendix 1

Checklist 1: Pointers that an outbreak or incident of unusual illness may have been caused by a deliberate or accidental release

Suspicious syndromes

- multiple cases of unexplained disease, syndrome or death
- single case of disease caused by uncommon agent e.g. inhalational anthrax, pneumonic plague or viral haemorrhagic fever
- unusual foci of infection e.g. mediastinitis
- unexpected degree or speed of onset
- higher morbidity and mortality than expected with a common disease or syndrome
- acute profound unexplained bone marrow depression
- unexplained skin lesions or hair loss with systemic symptoms
- odour: patient(s) reporting suspicious chemical smells associated with symptoms

Suspicious circumstances

- intelligence of a credible threat
- heightened alert level (severe, critical)
- suspected or known deliberate or accidental release in another country
- multiple cases with similar disease or syndrome presenting around the same time
- simultaneous outbreaks of similar illness in non-contiguous areas
- disease with an unusual geographic or seasonal distribution
- recognised illness occurring in an unusual setting within a community
- illness affecting a key sector of the community
- illness only among people in proximity to common ventilation systems
- death or illness among animals preceding or accompanying illness in humans

Suspicious supportive investigations

- recognition of atypical transmission routes e.g. by aerosol, food or water
- failure of a common disease to respond to usual therapy
- similar typing of agents isolated from temporally or spatially distinct sources
- multiple unusual or unexplained disease entities coexisting in the same patient without other explanation
- unusual, atypical, genetically engineered, or antiquated strain of agent

2.6 What to do if deliberate or accidental release is suspected?

The local HPU should be notified whenever health professionals are involved with cases of an unusual illness. **Where a deliberate explanation for the outbreak or incident is suspected, the CCDC or CHP should discuss this immediately with the police.** Although personal safety and clinical care takes priority, forensic issues such as preservation of evidence and chain of evidence must be taken into consideration where possible.

The DH guidance *Deliberate release of biological and chemical agents: Guidance to help plan the health service response* (2002) is at: http://www.dh.gov.uk/assetRoot/04/07/17/86/04071786.pdf

2.7 Personal safety and patient containment

If you suspect that a patient has an unusual illness - consider the safety of yourself, your staff and other people in the environment where you are seeing the patient. It is not possible to outline appropriate measures for all possible scenarios in this document. You should **call for expert advice immediately;** they will advise not only on personal safety but also on the further management of the patient(s) and of any exposed but not ill people (including yourself and your staff).

2.8 Clinical features

As always in medicine, a good history is vital in diagnosing the cause of an illness. Gather as much information as possible about the clinical features and clinical course of the illness, as well as about potential risks or exposures (see also section 2.4 and appendix 3). This is particularly important in the case of acute presentations of outbreaks where speed of diagnosis may be crucial to save the lives of cases, and for the protection of others. Many chemical, biological and radiological agents could potentially be used in a deliberate or accidental release, including agents that clinicians will often see in the course of routine work as well as more exotic agents. It is not possible to give a comprehensive guide to the presenting features of all the agents that might be used. **The key is to maintain a high index of suspicion.**

The presenting features of some biological (table 1) and chemical agents (table 2) that might be used are shown. Please note these tables are only a very brief guide and comprehensive guidance is available at: http://www.hpa.org.uk/infections/topics_az/deliberate_release/defaultDAR.htm
Table 3 shows the presenting features of radiation exposure. Further information can be obtained at the following link: http://remm.nlm.gov.

Epidemic hysteria (mass psychogenic illness) is characterised by widespread subjective symptoms thought to be associated with environmental exposure to a toxic substance in the absence of objective evidence of an environmental cause. Epidemic hysteria may present as an outbreak of unusual illness, alternatively such presentations may complicate a real chemical, biological or radiological incident of unusual illness. This is essentially a diagnosis of exclusion but prompt identification of the outbreak is important to limit cases. Such incidents are believed to occur more commonly in closed communities, such as schools or factories, and are more likely to involve females. Spread of symptoms is most often by line of sight.

Nutritional deficiencies have been described as possible causes of outbreaks of disease in countries with malnutrition however this is unlikely in this country. Although it should be considered if those affected are from a section of the community that may have experienced general food shortages or a particular dietary lack.

2.9 Personal protective equipment (PPE)
Personal safety considerations are essential for all personnel dealing with cases of unusual illness. All premises should have relevant plans on the management of HAZMAT or CBRN casualties, which will include arrangements for decontamination. Awareness of the risks of self-referral from an incident and methods of management should be included in these plans. Provision of PPE, with appropriate training, is important in protecting staff from contaminated casualties and material in the event of a possible or actual overt deliberate or accidental release of chemical, biological or radiological agent(s).

PPE is provided for all ambulance and acute Trusts including portable decontamination units. Many Trusts have protocols for decontamination of casualties and guidance for decontamination (2004) is available at: http://www.ukresilience.info/emergencies/cbrn/people.aspx

2.10 Decontamination
Decontamination of the injured or otherwise sick will be the responsibility of the ambulance services and EDs; fire services oversee the mass decontamination of exposed but uninjured persons. EDs must be prepared to decontaminate large numbers of self-presenting casualties.

The decontamination process aims to remove clothing and skin contamination without endangering personnel. The careful removal of contaminated clothing will reduce the level of contamination and should, therefore, be a priority. Special care must be taken to ensure there is no spread of contamination from any clothing to exposed skin. Clothing should then be stored away from other personnel and casualties in labelled clear plastic bags in a secure area for evidence retrieval, decontamination if possible or destruction as appropriate.

In a chemical incident prompt decontamination may be life saving. In a radiological incident life threatening injury should be triaged and treated before decontamination; if the patients' clinical condition permits, decontaminate first then treat. In persons exposed to radiation, external decontamination is essentially the same as for non-radioactive chemicals. Radiation monitors are used during decontamination to ensure that patients are clean before transportation to hospital.

2.11 Radiation sources
People cannot sense radiation and so exposure to a radioactive source may not be immediately apparent unless there happens to be a detecting instrument e.g. a Geiger counter, present to indicate that an accidental or malicious event has occurred. Radiation sources are used widely in medicine and industry and their use is subject to strict controls. However, loss of control can happen and worldwide there are many instances of sources being lost, mislaid or stolen. These are referred to as 'orphaned sources' and concerns regarding their malicious use have increased following heightened awareness of international terrorism.

Table 1: Presenting features of some biological agents which might be used in a deliberate release

Further information and agent specific guidelines available at: http://www.hpa.org.uk/infections/topics_az/deliberate_release/default.htm

Agent	Presenting features
Anthrax	Main forms are: a) inhalational: non-specific flu-like prodrome* followed 2-4 days later by rapidly progressive respiratory failure. Widened mediastinum and/or pleural effusions on chest X-ray b) cutaneous: raised itchy inflamed pimple which over 2-6 days progresses to a papule then a **painless** vesicle surrounded by extensive oedema, culminating classically in a black eschar c) gastrointestinal: severe abdominal pain, nausea, vomiting, watery/bloody diarrhoea Note: may also present as bacteraemia or meningitis * Influenza and seasonal respiratory disease differ from anthrax in having a prodrome associated with rhinorrhoea and sore throat *Differential diagnoses include leptospirosis (haemorrhagic mediastinitis, pleural effusion) or herpes simplex virus (haemorrhagic meningitis)*
Botulinum Toxin	Acute onset of bilateral cranial nerve involvement. Symmetrical descending weakness or paralysis that may extend to complete flaccid paralysis. The patient remains alert with no loss of sensation and no fever. May have double or blurred vision and speech. Nausea, vomiting and diarrhoea follow ingestion of toxin. *Differential diagnoses may include Guillain-Barré syndrome and myasthenia gravis*
Brucellosis	Variable presenting symptoms which may include persistent fever, fatigue and joint pain. Onset may be acute or insidious. Other clinical features include; weight loss, general malaise, muscle pain, dry cough. *If presentation includes hepatitis, differential diagnoses would include hepatitis viruses (HBV, HBC)*
Melioidosis (and Glanders)	Clinical features of both diseases are very variable, usually with fever. For each infection, one form of disease may progress to another and infections may present acutely with rapid progression and death, or run a chronic or relapsing course. The three main clinical syndromes are: a) Pneumonia b) Skin or soft tissue infection with multiple abscesses possible c) Sepsis syndrome
Plague	Pneumonic: Intense headache, malaise, fever, vomiting, prostration, cough and dyspnoea, rapidly progressive respiratory symptoms, watery blood stained sputum. Multilobar consolidation/bronchopneumonia on chest X-ray. Bubonic: Swollen, painful, tender lymph nodes with associated oedema and erythema. Note: may also present in septicaemic/ meningitic/ pneumonic/ pharyngeal forms *Differential diagnoses may include bacterial and viral pneumonia (e.g. Strep. pneumoniae, legionella, influenza, hantavirus, tuberculosis) or with sepsis syndromes infections including, streptococci, staphylococci, malaria, leptospirosis, yellow fever, rickettsioses, tuberculosis, HIV*
Q-fever	Presents as flu-like illness with fever and cough. The main clinical feature is pneumonia or a chronic malaise and fatigue that may last for months. Other features may include; hepatitis, neurological symptoms, thyroiditis, anaemia, gastroenteritis. *Differential diagnoses may include bacterial and viral pneumonia (e.g. Strep. pneumoniae, legionella, influenza, hantavirus, tuberculosis)*

Agent	Presenting features
Smallpox	Fever, prostration, severe headache, body pains. In a typical presentation, a maculopapular rash begins 2-3 days later mainly on the face or extremities. This progresses to classical vesicular and then pustular lesions that may go on to coalesce to form bullae covered by macerated skin. Haemorrhagic disease is rare: rash accompanied by haemorrhage into mucous membranes and skin. *In the presence of a vesicular skin rash the differential diagnosis would include varicella or if the rash is diffuse/haemorrhagic differential diagnoses may include, measles, rickettsioses, meningococcaemia or dengue*
Tularemia	Many different forms depending on mode of transmission, usually flu-like illness with systemic symptoms 3-5 days later. The three main forms are: a) pneumonic - acute flu-like symptoms +/- clinical pneumonitis/ pneumonia b) typhoidal - diarrhoea and vomiting c) septicaemic – acute Gram-negative sepsis Other features may include: ocular lesions, skin ulcers, oropharyngeal or glandular disease. *Differential diagnoses may include bacterial and viral pneumonia (e.g. Strep. pneumoniae, legionella, influenza, hantavirus, tuberculosis) or with sepsis syndromes infections including, streptococci, staphylococci, malaria, leptospirosis, yellow fever, rickettsioses, tuberculosis, HIV*
Viral Haemorrhagic Fever (VHF) viruses: a) Lassa b) Crimean-Congo c) Ebola and Marburg	Acute febrile illness with prostration and signs of increased vascular permeability and circulatory failure. Clinical symptoms and features vary with infecting agent and haemorrhage is often a late feature. a) insidious onset; fever, shivers, malaise, headache and general aches. Sore throat is common and may have tonsillar or pharyngeal exudate. In severe attacks, lethargy and prostration disproportionate to fever. May progress to oedema, encephalopathy, pleural effusion and ascites. b) abrupt onset fever, chills, malaise, irritability, headache, severe limb and loin pain. Followed by anorexia, nausea and vomiting. Face and neck flushed and oedematous, and conjunctival/ pharyngeal injection. Petechial rash begins on trunk and spreads to whole body; bleeding manifestations appear on day 4 or 5. c) acute fever, diarrhoea which may be bloody, and vomiting. Headache, nausea and abdominal pain are common. May progress to conjunctival injection, dysphagia, hiccups, and haemorrhagic symptoms such as epistaxis, haematemesis, melaena and purpura may develop. Some patients at 3-8 days have a maculopapular rash over the trunk which then desquamates. *If there is a diffuse/haemorrhagic rash differential diagnoses may include, measles, rickettsioses, meningococcaemia or dengue, with sepsis syndromes infections including, streptococci, staphylococci, malaria, leptospirosis, yellow fever, rickettsioses, tuberculosis, HIV, If presentation includes hepatitis, differential diagnoses would include hepatitis viruses (HBV, HBC, pharyngitis or epiglottitis common viral and streptococcal sore throat*

Table 2: Presenting features of some chemical agents which might be used in a deliberate release

Note: 1. Clinical presentation will depend on route of exposure and dose received; symptoms may evolve over time. Further information and specific guidelines at: http://www.hpa.org.uk/infections/topics_az/deliberate_release/chemicals/chemical_homepage.htm

2. The effects on eyes, respiratory rate, and skin colour have been listed in separate columns because these are the features that can be identified visually by staff who are wearing NHS-specified PPE

Agent	Eyes	Respiratory Rate	Skin	Other Features
Nerve Agents	Small pupils	↓	Normal, pale, or cyanosed	Drooling , choking and collapsing close to release point are key features *Muscarinic effects*: profuse secretions, bronchospasm, bradycardia, abdominal cramps, diarrhoea *Nicotinic effects*: muscle fasciculation, weakness, respiratory paralysis, tachycardia, hypertension *Central nervous system effects*: confusion, ataxia, emotional lability, convulsions, coma, central respiratory depression, leading to death
Mustard	Normal pupils Eye irritation	Normal or ↑	Erythema, blisters, pigmentation	Nausea, vomiting, headache, rhinorrhoea, tachycardia Hoarse voice, sore throat, cough Skin features worse where clothes are tight fitting (armpits and groin) REMEMBER, the onset of effects may be delayed for up to 6 hours
Chlorine	Normal pupils Eye irritation	↑	Normal, pale or cyanosed	Eye, nose and throat irritation, cough wheeze and dyspnoea, sputum, bronchospasm and chest pain, chemical pneumonitis and/ or pulmonary oedema, nausea and vomiting, metabolic abnormalities leading to death
Hydrogen Cyanide	Normal pupils May be fixed and dilated in severe poisoning	↑ ↓ pre-terminal	Normal colour in spite of tissue hypoxia	Low concentrations: headache, dizziness, anxiety, tachycardia, nausea, drowsiness, metallic taste High concentrations: loss of consciousness, convulsions, death from respiratory/ cardiac arrest in minutes
Phosgene	Eye irritation No effect on pupils	↑	Normal, pale or cyanosed	Three different phases: 1. *Early (<1 hour)*: irritation to eyes, lacrimation, blepharospasm, nausea and vomiting, tight chest, retrosternal discomfort and bronchoconstriction, hypotension, bradycardia/ tachycardia, in severe exposure - haemolysis and rapid death 2. *Latent (1-24 hours):* may appear well, symptoms precipitated by exercise 3. Oedematous phase: (non cardiogenic) pulmonary oedema leading to death
Ricin	May be conjunctivitis No effect on pupils	Normal or ↑	Normal	Fever is common, ingestion causes irritation of oropharynx and oesophagus, and gastroenteritis Other symptoms include bloody diarrhoea, vomiting and abdominal pain, pulmonary oedema, pneumonia and ARDS, seizures and CNS depression Death may follow multi-organ failure

Table 3: Presenting features of radiation exposure

Further information is available at: http://www.hpa.org.uk/infections/topics_az/deliberate_release/radiological/radiological_homepage.htm and http://remm.nlm.gov

Types of radiation exposure that might arise from a deliberate or accidental release	• Source external to body; involving part or whole of the body • Internal radioactive materials ingested, inhaled or deposited in wounds
Recognising radiation injuries by their clinical manifestations	Following a high level exposure, injuries evolve over time in distinct phases. The length and timing of these phases depends on the dose received. Low doses, <1.0 gray, generally do not produce observable effects.
Whole body exposure	• Initial prodromal phase with nausea, vomiting, fatigue and possibly fever and diarrhoea • Latent period of varying lengths from a few days to a month depending on dose • Period of illness characterised by infection, bleeding and gastrointestinal symptoms caused by deficiencies of cells of the haematopoietic system and, at higher doses by loss of cells lining the gastrointestinal tract
Local exposure	• Depending on dose can produce in the exposed area: erythema, oedema, dry and wet desquamation, blistering, pain, necrosis, gangrene or epilation • Local skin injuries evolve **slowly over time**, usually weeks to months • Local skin lesions may be **very painful** and **difficult to treat by usual methods**
Partial body exposure	• A combination of varying symptoms as above • Type and severity of symptoms depends on dose to and volume of the exposed part of the body
Internal contamination	• Usually no symptoms unless the intake has been very high, which is extremely rare
Differential diagnosis of radiation injury	Consider radiation injury in a differential diagnosis if the patient presents with: • A description of circumstances that might have led to a radiation exposure (e.g. work with scrap metal) • Nausea and vomiting, especially if accompanied by erythema, fatigue, diarrhoea or other symptoms and gastrointestinal infections and/ or allergy excluded • Skin lesions without knowledge of a chemical or thermal burn, or insect bite, or history of skin disease or allergy, but with desquamation and epilation in the exposed area further to erythema having occurred 2 to 4 weeks earlier • Epilation or bleeding problems (such as petechiae, gingival or nose bleeds) with a history of nausea and vomiting 2 to 4 weeks previously • Differential white blood cell counts show initial neutrophilia then rapid falls during the first week and prolonged leukopaenia thereafter

There are various types of radiation that could be encountered in an emergency. The most common are gamma rays and these are the most easy to detect with instruments because the radiation will travel long distances through air and also pass through substantial thicknesses of many solid materials. Gamma ray monitors are therefore routinely deployed on front line responding fire and ambulance service vehicles, and are also available in hospital EDs. Likewise, gamma ray monitoring is widely used for routine surveillance of persons and vehicles at all entry points to the UK. Provided the instruments are operated by trained personnel it should be relatively easy to determine the presence of a gamma emitting source and also whether patients are externally or internally contaminated.

Other types of radiation are alpha and beta particles. These are more difficult to detect, moreover appropriate instruments are generally only to be found in specialised scientific establishments. In the hospital setting the medical physics service is crucial for monitoring such radiation. Alpha and beta particles travel far shorter distances in air, millimetres to centimetres at most, and are easily stopped by small amounts of shielding material. A sheet of paper is sufficient to block alpha particles from, e.g. plutonium-239 or polonium-210. Detecting instruments will therefore only respond to these radiations when placed up-close to, say, a contaminated surface. Alpha and beta emitting sources therefore only pose a threat to health when the material contaminates the skin or actually enters the body by ingestion, inhalation or wounds. Placing a detector against the skin will only detect external contamination if present; it will not generally register internally incorporated radioactivity. This has to be determined by appropriate sampling of, e.g. blood, urine, faeces, saliva or nose blows.

Radiation sources may be of two types: sealed or unsealed. A **sealed source** is usually a small metal capsule with a powdered or granular radioactive chemical inside. The capsule will give off radiation, usually gamma rays, but provided the casing is intact there is no risk of the radioactive chemical leaking and spreading. Such a source is normally kept safely in a shielded container such as a lead pot. Unshielded sealed sources have accidentally come into the public domain and then there is potential for them to irradiate people. There have also been cases of sources being deliberately placed covertly at locations where they have irradiated people. People who have been irradiated by such a source do not themselves become radioactive and they pose no hazard to others. An emplaced device may not be detected for some time, during which the potential exists for large numbers of people to be exposed. The possibility of more immediate health problems could occur with this mode of attack. **Unsealed sources** are radioactive chemicals held in containers that are designed to be opened. They can range from small ampoules of diagnostic or therapeutic radionuclides used in nuclear medicine departments, through to large volumes of waste generated by the nuclear industry. Just like other chemicals, unsealed sources have been accidentally and deliberately released. They then have the potential to contaminate people externally and internally, the latter by ingestion, inhalation or through wounds. The material can spread from person-to-person and can contaminate the nearby environment, vehicles etc. Contaminated patients therefore *do* pose a hazard to emergency and health care personnel who have contact, particularly before it is recognised that a radioactive release may have occurred.

External decontamination procedures are essentially the same as for non-radioactive chemicals. Once a patient has been externally cleaned most of the risk to other persons has been removed. It is highly unlikely that the residual radiation dose rate from material inside the patient, or that in excreta, body fluids or clinical samples poses a serious hazard to others. However, this must be assured by using instruments to monitor for radiation in the immediate vicinity of the patient. **In any radiological incident expert advice and monitoring for health care staff is provided by the local medical physics service. A national point of expert advice is the RPD** (see appendix 1).

Deliberate release of unsealed sources may be covert e.g. radioactive material distributed in a public place or overt e.g. an Improvised Radiological Device (IRD) or dirty bomb in which an explosion is used to spread contamination in a public place. The former is more likely to result in delayed detection whilst the latter will elicit a rapid response from the emergency services. Late recognition that an explosion also included a radiation component could result in early responders and their equipment/ vehicles becoming contaminated. It should also be considered that as well as radionuclide(s) being involved, an IRD might also include hazardous chemical or biological agents.

Radionuclides used in the construction of a terrorist IRD would quite possibly be obtained by theft from legitimate users. Such radionuclides include gamma-ray emitters such as cobalt-60, iridium-192 or caesium-137 used in industrial radiography, beta radiation emitters such as strontium-90 used in

industrial gauges, or alpha emitters like plutonium, americium, curium and polonium mainly used with the nuclear power industry. Hospital nuclear medicine departments also carry a range of radioisotopes but these are mostly short-lived and so potentially less attractive to terrorists.

The scale of an IRD incident is difficult to foretell. As a general rule the smaller the explosion the smaller is the resultant area of spread of contamination and so the higher the local radiation dose-rate. In such a situation fewer people would be irradiated but it is unlikely that radiation doses would be sufficient to cause many patients to develop early health effects. The main concern would be to deal with injuries in general, including the likelihood of radioactively contaminated wounds. Life threatening wounds and burns should be treated first before dealing with any contamination. Conversely lower dose rates associated with more widespread dispersal would contaminate more people but with even less likelihood of causing them immediate health problems due to irradiation. Then an increasingly important task would fall upon public health professionals to deal with the inevitable public anxiety, which is likely to include fears of late arising health effects (induced cancer and genetic disorders).

2.12 Important notes for laboratory investigations

- **SEEK EXPERT GUIDANCE** (appendix 1)
- **Samples for laboratory investigations should be taken in a hospital setting where possible**
- Handle and label all samples as **high risk** until further information is available
- Maintain chain of evidence documentation (appendix 2) but do not delay urgent clinical investigations

The guidance primarily covers the toxicological, microbiological and radiological, investigation of symptomatic individuals. It does not attempt to cover the investigation of exposed but asymptomatic people. The investigation of such people will depend on the nature of the incident and results of investigations on symptomatic individuals.

The guidance addresses blind screening for possible agents. The clinical picture will guide the investigations undertaken. Furthermore, by the time cases have been recognised as unusual some investigations may already have been performed. If at any time a particular agent is suspected it may be appropriate to change to specific guidance or other appropriate investigation protocols. However, it should be remembered that information received before or during an overt deliberate release may be misleading and that substances released may be mixtures of different agents. It may still therefore be appropriate to conduct a blind screen. Further information in laboratories guide (section 8), see also *Protocol for the investigation of microbiologically unexplained serious illness and death* http://www.hpa.org.uk/infections/topics_az/deliberate_release/Unknown/Unknown_Agent_Protocols.pdf

2.13 Coordination and communication issues

- Experience and recent incidents suggest it is good practice to convene an **urgent case conference** which should include appropriate representatives of: clinicians, laboratories, public health professionals and expert advice centres to facilitate effective investigation and management.

- Overall management may be taken by local, regional or national public health professionals depending on the nature of the incident. The relevant outbreak control or other emergency plan will be used and an incident control team (ICT) convened. Individuals within the ICT will be assigned specific roles, including communication. **Any press enquiries should be directed to those responsible for overall management of the incident who will have a delegated press officer. On no account should press enquiries be fielded by anyone else.**

- Where there are large numbers of similar cases in multiple sites, unique identifiers will be needed. In emergency circumstances the use of patient name and date of birth as identifiers would avoid possible confusion and would be compatible with Caldicott principles and the Data Protection Act 1998.

All staff involved in investigating and managing incidents of unusual illness should be sure to maintain comprehensive records of information they have received and actions they have taken. These should always be signed, timed and dated.

GUIDANCE FOR THE AMBULANCE SERVICE

3. Guidance for the ambulance service

An ambulance service professional may become involved with incidents of unusual illness in several ways:

- you may be the first responder in acute incidents (see 3.1 below) where there may be a large number of casualties involved simultaneously
- you may be called to an individual or to small groups of cases involved in delayed incidents, either by the patients themselves or by other health professionals

Much of the advice that follows reiterates what will usually be standard practice (e.g. local ambulance service major incident and infection control procedures, and the NHS major incident guidance).
Health and safety issues should be considered as a priority in every incident, and should be referred to the relevant health and safety or OHS with appropriate speed.

3.1 Acute incidents

These are most likely to be chemical incidents, for which the ambulance service already has established procedures. However, where the cause is not yet shown to be chemical, it is important to remember that biological agents or radiation may be involved. This is particularly the case where deliberate release is suspected since mixed agents could potentially be used. Clinical responsibility for all victims/ casualties at the scene lies with the ambulance service who will coordinate all health service activities on site.

In the case of radiation follow the agreed procedures laid down in the policy on the wearing and use of electronic personal dosimeters.

Refer to the *STEP 123* procedure (figure 2) for a simple but effective risk assessment tool to use if you are first on the scene (and which is used by all the emergency services).

The key issues in response are summarised in checklist 2. The crucial points are:

- ensure personal safety
- tell, and seek advice from, the HPA CHaPD (see appendix 1)
- triage casualties and contaminated persons
- decontaminate cases
- communicate with other emergency services and with other health professionals
- keep comprehensive records, in line with ambulance service usual practice

3.2 Delayed incidents

While delayed incidents are more likely to have an infectious cause, they could also be due to chemical or radiation exposure.

That a patient might have an unusual illness may be recognised by ambulance control at the initial call or by you during your initial assessment of the patient. Where a patient presents with a clinical history and/ or symptoms suggestive of an infectious disease, the ambulance crew should follow established procedures for management of such patients. Ambulance control will take such action to assist the crew as may be necessary.

It is the responsibility of ambulance control to alert the hospital(s) to which patient(s) with suspected unusual illness are being taken and also to notify the local HEPA or HPU (which ever is appropriate for your ambulance service). Expert advice for the HPU will be provided from the HPA as necessary.

Where asked to transfer a patient with suspected or recognised unusual illness, standard procedures apply for the transfer of patients according to risk category. If in doubt, ask ambulance control to seek expert advice (appendix 1).

Ambulance professionals may be called out to assess a patient at an early stage, and the unusual nature of the illness may not be recognised until later. In this situation, the local HPU or someone from the incident control team may contact individuals, probably via ambulance control, to provide them with information about any likely exposure and what, if any, prophylactic treatment will be offered.

3.3 Equipment decontamination

Standard operating procedures exist for decontamination of vehicles and equipment after an incident. Contact HPA for advice if necessary and to determine whether any further measures are necessary for ambulance personnel protection.

Figure 2: STEP123 procedures, as used by all emergency services

STEP 123 - SAFETY TRIGGERS for EMERGENCY PERSONNEL
To be used when the cause is unknown

STEP 1	**ONE** casualty	Approach using normal procedures
STEP 2	**TWO** casualties	Approach with caution, consider all options, **report on arrival and update control.**
STEP 3	**THREE** casualties **OR more**	Do NOT approach the scene Withdraw Contain Report Isolate yourself **SEND FOR SPECIALIST HELP**

CHALETS or METHANE assessment to be provided as soon as practicable

DO NOT COMPROMISE YOUR SAFETY, OR THAT OF YOUR COLLEAGUES OR THE PUBLIC

Remember the emergency services have staff that are both trained and equipped to deal with a CBRN incident

CHALETS assessment	**METHANE assessment**
or	
C; casualties, number and severity	M; my call sign/ major Incident
H; hazards, present and potential	E; exact location
A; access, safe access and egress	T; type of incident
L; location, exact	H; hazards at the scene
E; emergency services, present and required	A; access
T; type of incident	N; number of casualties and severity
S; safety	E; emergency services present or required

Checklist 2: Actions to be taken by ambulance professionals responding to an acute incident

Full PPE should be used by all appropriately trained personnel entering the warm and hot zone to deal with casualties. Under no circumstances should unprotected personnel cross the inner cordon. If you come into unprotected contact with contaminated patients you must consider yourself to be a casualty.

Brief assessment of presenting features of casualties and history of incident

Seek expert advice (appendix 1) for further advice concerning personal safety and decontamination of casualties

Triage contaminated casualties (use JRCALC guidelines http://jrcalc.org.uk/) prior to treatment and decontamination

Decontaminate casualties according to advice received and agreed protocols for clinical, emergency or mass decontamination.

Feedback to ambulance control relevant information:

- Nature of the incident: where, when, what
- Number of casualties
- Clinical state
- Containment and decontamination activities in place
- Anyone else at risk? Make a list, including contact details, in case follow up is required
- Any conditions which might increase the risk to others?
- Other agencies involved
- Is deliberate release suspected?
- Where cases are being managed
- Readings from Electronic Personal Dosimeter

Keep comprehensive records of all information received and action taken

GUIDANCE FOR HOSPITAL CLINICIANS, INCLUDING EMERGENCY DEPARTMENTS

4. Guidance for hospital clinicians, including emergency departments

This guidance starts from the premise that patients have presented to hospital with an unusual illness and takes you through the acute process of their management. Personal safety and patient containment are vital. Health and safety issues should be considered as a priority in every incident, and should be referred to the local Health and Safety or OH service with appropriate speed.

It is reasonable to consider developing contingency plans in advance of any such incident in order to safe guard staff. Information such as age, address, GP details and contact details, could be gathered in advance as part of contingency plans providing it is regularly updated and securely held. Hospital emergency plans may also be relevant.

4.1 Personal safety and patient containment

Personal safety considerations are essential for health professionals dealing with cases of unusual illness, see algorithm (figure 1). Wherever cases of unusual illness present, assess whether the patient and contacts need decontamination if so follow the advice in your local hospital emergency plans. If necessary seek early expert advice on the appropriate level of PPE.

For all cases of unusual illness (either acute or delayed presentation), assess the patient and:

- always **SEEK ADVICE EARLY** from the usual hospital sources e.g. ID physician, medical microbiologist, hospital physicist, and call national experts, through the HPA or NPIS, as required
- where appropriate inform the local HPU and for suspected diseases inform the hospital lead for infection control
- assess again after advice, and take clinical samples using universal precautions (standard PPE includes, gloves, gown and mask, eye protection should also be worn if the patient is coughing or vomiting), take utmost care to avoid inoculation injuries
- inform local laboratory of sample status
- admit the patient to a single room or isolation ward if necessary

4.2 Overview of actions to be taken by hospital clinicians

Actions are summarised in the algorithm (figure 1).

4.2.1 Priority of action

- **Isolation** – appropriate isolation of those affected from other patients, health care staff and members of the public until an assessment can be made about the risk of transmission of the causative agents to others
- **Initial clinical assessment and life saving management** – appropriate PPE should be worn by those treating patients
- **Decontamination** – if necessary and following expert advice
- **Detailed clinical assessment** – use universal precautions
- **Clinical samples and definitive treatment or prophylaxis**

4.2.2 Record keeping

Information recorded about case(s) of unusual illness should cover:

- others who might be exposed or at risk (including staff)
- what is being done to prevent the development of further cases (e.g. patient containment, decontamination, controlled access, turning off air-conditioning, environmental sampling)
- all staff in contact with patient(s) including their personal contact details
- use of the chain-of-evidence form (appendix 2) if necessary

The importance of comprehensive record keeping cannot be over emphasised – ensure all entries are dated, timed and signed. Record not only the usual clinical details (appendix 3) but also:

- details of the advice received, source of advice and contact number
- actions taken to protect self and others
- who else has been informed

4.2.3 Lines of communication

a) HPU

Unusual illness may only be identified when the results of investigations are available. The fundamental elements of management as described here will apply to this situation; however, there

will inevitably be issues about potential risks to others, including health care staff, before the illness was recognised. In this circumstance, contact tracing and a public health risk analysis must be undertaken. In all circumstances of unusual illness the local CCDC or CHP must be informed.

b) Sources of expert advice
Infectious diseases: the local infectious diseases doctor or medical microbiologist
Radiological incidents: the local radiation protection advisor
Chemical Incidents: NPIS (for advice about the clinical management of individual patients) or CHaPD (for advice on PPE, incident and population management)
For national expert advice see appendix 1.

c) OHS
There may be staff who have had unprotected contact with a patient prior to realisation that special precautions should be taken. They are considered to be exposed until otherwise proven and expert advice (appendix 1) sought as to further management. Depending upon the nature of the incident full decontamination, prophylaxis, or some other measure(s) may be required.

A full written record should be maintained by the OHS of all staff who have been directly involved with the care of the case(s). This should include their name, age, address, GP details, 24-hour contact details, their level of contact with the case, and any adverse health effects reported.

4.3 Acute incidents or suspected overt deliberate release
This guidance does not provide definitive advice on chemical, microbiological or radiological hazard containment issues. **ALWAYS SEEK EXPERT ADVICE** and discuss case(s) with the appropriate expert. Expert advice will consider a range of issues including:

- use of a single room (isolation of patient)
- appropriateness of cohort nursing
- transfer of patients
- PPE
- cleaning, disinfection, waste disposal
- visitors
- contact tracing

a) Containment
It is important to contain the situation by separating those who are affected from those not exposed. In chemical, certain biological (white powder), or radiological incidents, patients should be removed from the facility until they have been decontaminated. When infectious agents are suspected, patients should be admitted to single rooms or isolation rooms.

Controlled access should be instituted in the ED and possibly the whole hospital, while staff prepare to receive potentially contaminated casualties. This should be as short as possible whilst clean and dirty areas are identified, uncontaminated casualties are cleared from these areas and staff put on PPE and the ED prepares to go into response mode. Air-conditioning systems should be switched off in relevant areas to reduce the risk of spread of contamination to other areas of the hospital.

Staff attending to patients before they have been decontaminated should wear appropriate PPE, as per expert advice. As a minimum this should entail following universal precautions (face mask, gloves, gown and eye protection), but may require specialised equipment. See local emergency plan.

b) Decontamination
In an acute incident (where a chemical/ toxic cause is most likely) **decontamination is crucial** in preventing secondary contamination. This will also be important in suspected overt deliberate or accidental release of a biological agent or radionuclide and where cases may have been exposed to, e.g. unidentified powders or gases. Anyone entering the exposed zone should wear full PPE.

There is likely to (but may not always) be some prior warning that casualties will arrive in an ED, and cases should have been decontaminated prior to transfer to hospital. However, patients may also self-present - if they have not been decontaminated then it should be done immediately on arrival. Guidance has been produced on appropriate decontamination methods for Trusts which do not have their own policies. **Personnel involved in the management of casualties prior to their decontamination must wear full PPE.** Dexterity is reduced in full PPE therefore pre-decontamination treatment is restricted to life-saving resuscitation techniques and intramuscular administration of

antidotes. **Personnel, who have already been involved with patient care while not wearing PPE, must be decontaminated.**

Where the aetiological agent is chemical or radionuclide and the patient has been appropriately decontaminated, it is possible, but unlikely that human body fluids will constitute a significant risk to staff during either assessment or the taking of samples. However, it must be remembered that in a potential deliberate release scenario, mixed exposure may have occurred to multiple agents, therefore even after decontamination, universal precautions should be taken and regular rotation of staff undertaken in chemical incidents i.e. if you don't know, protect your staff.

Where illness is due to unknown aetiological agent(s), patients should, wherever possible, be nursed in a single isolation room. Cohort nursing may be necessary depending on the numbers involved. Where there are grounds for believing that the illness may have a chemical or radiological cause, patients should be decontaminated before transfer to a ward. Universal precautions should be implemented as for all infectious hospital patients, as a minimum this should entail face mask, gloves, gown and eye protection, but aerosol precautions and specialised equipment may also be required until further information is available. It may also be advisable to limit the transport of patients to essential medical investigations only. See local emergency plan. Cleaning, disinfection and waste disposal should be as for standard isolation procedures.

4.4 Delayed incidents

ALWAYS SEEK EXPERT ADVICE. For a delayed incident the situation is more complicated because of the manner in which patients may present. Although health care staff may be pre-warned of the arrival of cases of unusual illness, it is also possible that they will be the ones recognising the unusual nature of the presentation.

4.5 Investigation of patient(s): samples to be taken

This guidance tells you what samples to take for a blind screen however you should always discuss investigations with the relevant expert. For an unusual illness where the cause is strongly suspected it may be more appropriate to switch to specific guidance. **Always collect samples as early as possible, preferably before specific treatments are given. However, provision of potentially life saving treatment should not be delayed by sampling procedures.**

For an unusual illness where the aetiology is not certain, it is preferable to take samples for a blind screen for toxicological, microbiological and radiological investigations, as well as for routine haematology and biochemistry. Some chemicals cannot be directly assayed but their presence can be inferred and their effect measured from the results of routine tests. If there is any suspicion that a case is unusual, all the samples must be kept pending further notice so that they are available for further diagnostic tests as necessary.

For toxicology it may not be necessary to analyse all samples taken once the clinical picture becomes clear, but without appropriate early specimens taken at the appropriate time identification of an agent retrospectively may not be possible. Special kits called Toxi-Boxes and ChEAKs (Chemical Exposure Assessment Kits) have been produced for use in such circumstances and are available in hospital EDs. **Toxi-Boxes or ChEAKs should always be used where available because the special bottles avoid chemical contamination of the specimens.**

With respect to microbiological investigation it is very important that appropriate good quality samples are obtained and referred to National reference laboratories for a number of investigations, including prolonged enrichment culture and molecular detection techniques. For virological investigations, this also includes electron microscopy, PCR and viral culture. Normally sterile site samples (with no commensal flora to complicate interpretation) in sterile containers are preferred wherever possible, provided they are clinically relevant.

With respect to radiation exposure, a specialised cytogenetic test, used to establish the radiation dose to the patient, using blood lymphocytes is available from HPA. Blood samples should be placed in lithium heparin tubes available in the Toxi-Boxes/ ChEAKs or from the phlebotomy service http://www.hpa.org.uk/radiation/services/chromosome_dosimetry/index.htm If internal or external contamination with radionuclide(s) is suspected the local medical physics service or radiation protection advisor should promptly monitor the patient, their clothing and surroundings with

appropriate radiation detectors. They and/or HPA will also advise on suitable sampling for radionuclide analysis at a specialised centre. Until advice is obtained a default list should include: blood, urine, faeces, vomit, skin swabs, sputum and nose blows. These should be frozen until transfer is arranged.

4.5.1 Specimen guidelines

- Patients may require decontamination before samples are taken
- All samples should be taken ideally before antidotes are given using **universal precautions** in appropriate **PPE**
- Samples should be **collected and transported safely and rapidly to the laboratories**
- The receiving **laboratory should be contacted by telephone** to expect the samples
- **Samples and request forms should be clearly labelled and note that special investigations may be required**
- Samples should be identified as **high risk** according to local protocols
- In the event of a suspected deliberate release, or where there are other forensic considerations, **chain of evidence documentation** should accompany specimens (appendix 2)

4.5.2 Toxicological blind screen

In order of importance, the samples for a **blind toxicological screen** should consist of:	
Adults	▪ 10ml blood in plastic (PP) lithium heparin tube ▪ 5ml blood in glass* lithium heparin tube ▪ 10ml blood in plastic (PP) EDTA tube ▪ 30ml urine without preservative
Children	▪ 5ml blood in glass* lithium heparin tube ▪ 5ml blood in EDTA tube ▪ 30ml urine without preservative

*If glass tubes are unavailable then substitute for plastic (PP)

Sample handling procedures for toxicological samples:

- **Do not use proprietary wipes** or swabs (e.g. Medi-swabs) to pre-clean venepuncture site since these contain solvents and trace elements which could interfere with assays. **Sterile water** (or **dry cotton wool** if skin is reasonably clean) should be used for this purpose. The ChEAKs contain a sterile water base swab.
- **Use only blood bottles with plastic or lined metal tops** as chemicals can leach from blood tubes with gel separators, or those containing mucous heparin solutions. Vacutainers, soft plastic bottles, reusable containers and rubber bungs can contaminate specimens. **Use the Toxi-Box or ChEAKs toxicological analytical sampling kit wherever possible.**
- Make every effort to avoid external contamination of specimen containers during collection.
- Each tube should be filled. The 5ml glass heparinised blood tube should be filled so that there is minimum air space in the tube. All tubes should be screwed tight. Do not centrifuge.
- Label the samples **high risk** and place in the sealable section of the plastic bag.
- Complete a chemical incident analysis form (appendix 2), mark **high risk** and place in the other section of the plastic bag.
- Wrap the plastic bag tightly in the corrugated cardboard to avoid damage in transit and place in the cardboard container. Tape the cardboard container shut.
- Transport to the hospital chemical pathology laboratory as soon as possible according to local protocols for high-risk samples.

If Toxi-Boxes or ChEAKs are not available then use routine specimen bottles but send an empty specimen bottle of the same type and from the same batch for *every* specimen to act as a control for background chemical contamination associated with the container used. Toxi-Boxes consist of:

1 x 10ml plastic lithium heparin tube	1 x 5ml glass* lithium heparin tube	1 x 4ml EDTA tube
1 x cardboard container plus corrugated cardboard for wrapping samples		
1x request form (this must be filled in for each patient: see appendix 2) plus plastic bag for form and samples		
1 x 60ml universal container for urine (the top is wide enough for males and females to urinate into directly, thereby minimising risk of cross contamination)		

*If glass tubes are unavailable then substitute for plastic (PP)

The ChEAKs consist of:

1 x 10ml plastic lithium heparin tube	1 x 5ml glass* lithium heparin tube	1 x 10ml plastic EDTA tube
An instruction leaflet	One pair of medium nitrile gloves	One sterile water based swab
All packaging for UN3373 regulations plus request form (this must be filled in for each patient: see appendix 2)		
1 x 50ml universal container for urine (the top is wide enough for males and females to urinate into directly)		
1 x 30ml syringe, 1 x 5ml syringe, 1 x 21g 1.5" needle		

4.5.3 Microbiological blind screen

The following samples are appropriate for a blind microbiological screen. The volumes quoted below relate to adult samples; smaller volumes are appropriate from children.

Sample	For	Requirements
Blood cultures	Extended aerobic and anaerobic culture	2 sets of blood cultures immediately (from one bleed) with another 2 if possible within the first hour (also from one bleed) Please inform if antibiotics have been given prior to sampling
Sera	Serology Biological toxin assays	2x10ml clotted blood, for both acute (admission) and convalescent phases Acute sample may be used for toxin assays, freeze and save any excess
Whole blood (EDTA)	Molecular investigations e.g. PCR	2x 0ml or 4x5ml whole blood acute phase
Urine	Standard testing and storage	Clean catch into sterile container – optimal volume >20ml

Other samples may also be appropriate depending on specific clinical features/ available information:

- **respiratory tract samples** e.g. sputum, bronchoalveolar lavage.
- **nose and throat swabs**
- **pus and vesicle fluid or swab of local lesions if present**
  pus - as large a volume as feasible, in sterile containers for microscopy, aerobic and anaerobic culture, and susceptibility testing
  local lesion (no pus) - swab put immediately into transport medium for aerobic/ anaerobic culture
  vesicular fluid - swab and place into viral transport medium and/ or dried onto a microscope slide (NB: refer to specific guidance if smallpox is suspected)
- **biopsy tissues** collect aseptically from local inflammatory lesion, necrosis or abscess, or if surgical debridement is performed
  - as many samples as possible from multiple areas; quantity is important
  - tissue - in sterile containers for direct culture (aerobic / anaerobic) and freezing
  - formalin-fixed (10% buffered formalin) or paraffin embedded
- **faeces/ stools**
- **other body fluids:** e.g. cerebrospinal fluid, pleural fluid, pericardial fluid

Sample handling procedures for microbiological samples:

- The primary container should be screwed tight, labelled and placed in an intact plastic bag
- Make every effort to avoid external contamination of containers during specimen collection
- A **high risk** label must be affixed to the specimen
- Each specimen must be packed individually, i.e. three specimens, three separate packages
- The bags should be sealed - pins, staples and metal clips should not be used
- The request form should include any other relevant information and include adequate clinical details - it must be labelled **high risk** and be placed in a different bag to the specimen
- Specimen bags and request form bags should be attached to each other using tape
- Specimens should be transported to the hospital laboratory as rapidly as possible according to local protocols for **high risk** specimens
- Disinfect secondary containers by wiping with hypochlorite (1,000ppm) solution or alcohol wipes

4.5.4 Other routine investigations

- Routine samples for biochemistry and haematology should be sent as usual to the local laboratory for analysis - Where blood is required for transfusion, consider the use of O-negative blood since cross-matching poses an infectious hazard in the laboratory
- Please **telephone the laboratory to expect the samples**
- **Routine specimens should be handled, labelled and transported as high risk**
- Standard blood gas analysers should **not** be used since they pose an infection hazard - Only machines using a cassette system which minimises the infectious hazard should be used

GUIDANCE FOR GENERAL PRACTITIONERS