INITIAL INVESTIGATION AND MANAGEMENT OF OUTBREAKS AND INCIDENTS OF UNUSUAL ILLNESSES

A Guide for Health Professionals

with particular reference to events that may be due to chemical, biological or radiological causes, including deliberate and accidental releases

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These guidelines will be revised regularly

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Contents **Page**

Checklists, Figures and Tables

Abbreviations

AC	Ambulance Control
APT	Anatomical Pathology Technologists
ARDS	Acute Respiratory Distress Syndrome
BAL	Bronchoalveolar lavage
CBRN	Chemical, Biological, Radiological, Nuclear
CCDC	Consultant in Communicable Disease Control (also known as CPH)
CEPR	Centre for Emergency Preparedness and Response
CfI	Centre for Infections
CHaPD	Chemical Hazards and Poisons Division (now part of CRCE)
ChEAKs	Chemical Exposure Assessment Kits
CHP	Consultant in Health Protection
CL	Containment Level
CNS	Central Nervous System
CRCE	Centre for Radiation, Chemical and Environmental hazards
DH	Department of Health
DSTL	Defence Science and Technology Laboratories
DWI	Drinking Water Inspectorate
EA	Environment Agency
ED	Emergency Department
EIZ	Emerging Infections and Zoonoses
EM	Electron Microscopy
EPU	Emergency Planning Unit (DH)
ERD	Emergency Response Division
FSA	Food Standards Agency
GP	General Practitioner
HAZMAT	Hazardous Materials
HEPA	Health Emergency Planning Advisor
HG	Hazard Group
HSE	Health and Safety Executive
HPA	Health Protection Agency
HPU	Health Protection Unit
ICT	Incident Control Team
ID	Infectious Disease
IRD	Improvised Radiological Device
JRCALC	Joint Royal Colleges Ambulance Liaison Committee
LaRS	Local and Regional Services
LAS	London Ambulance Service
LRF	Local Resilience Forum
NHS	National Health Service
NPHS	National Public Health Service
NPIS	National Poisons Information Service
OH	Occupational Health
OHS	Occupational Health Service
PCR	Polymerase Chain Reaction
PCT	Primary Care Trust
PI	Packaging Instructions
PP	Polypropylene
PPE	Personal Protective Equipment
RD	Regional Director
RPD	Radiation Protection Division (now part of CRCE)
SHA	Strategic Health Authority
STAC	Scientific and Technical Advice Cell
VHF	Viral Haemorrhagic Fever

1. Introduction

1.1 Purpose and scope

Outbreaks and incidents of unusual illnesses might have any one of a number of causes: infectious, chemical, radiological or even psychological distress. In a few instances, the release of chemical, biological or radiological agents has been intentional (see footnote[1]). The aetiological agent may remain undetermined, and there is also the possibility of new and emerging conditions.

Unusual illness incidents may present as single or multiple cases of unexplained disease or syndrome with atypical signs or symptoms especially if accompanied by high morbidity or mortality (see checklist 1).

This document is intended as an aid to decision making for health professionals and other health protection personnel who may be involved in the initial investigation, management and response to cases of unusual illness. It also aims to assist in making a judgement about whether an outbreak or incident is due to natural or accidental cause or deliberate release.

The document cannot cover all possible eventualities, nor is it intended to be a comprehensive guide. However, prompt appropriate actions are likely to be crucial and this guidance aims to ensure that all health professionals and other health protection personnel involved are confident about initial decisions and actions.

1.2 Intended audience

This document is aimed at clinicians who might be the first to detect cases of unusual illness, as well as laboratory personnel and other staff responsible for health protection:

- ambulance services
- hospital clinicians
- emergency departments
- general practitioners
- occupational health services
- histopathologists
- anatomical pathology technologists
- local laboratories
- public health professionals
- community pharmacists

It is set out so that users from different fields can readily identify the guidance that specifically applies to them, but can also appreciate the larger context within which that specific guidance operates.

1.3 How to use this document

All users are recommended to read the general guidance (section 2) first. This section deals with information which is pertinent to all health protection personnel, but which is not duplicated in the specific guidance for different groups of professionals. Readers from different specialities will then find specific guidance for their role in the relevant dedicated section. For ease of use this document is also available as a separate sub-document for each profession.

[1]This document will focus on chemical, biological and radiological incidents. Nuclear incidents have been excluded because a deliberate release of this type would be immediately apparent with no doubt as to aetiology. Radiological includes all other events involving radiation, including ‘dirty bombs’, all these are covered by this document.

GENERAL GUIDANCE FOR ALL USERS

2. General guidance for all users

2.1 Definitions

Unusual illness may be in/ of:

(a) patients presenting with signs or symptoms which do not fit any recognisable clinical picture, or
(b) known cause but not usually expected to occur in the UK or in the setting where it has been observed, or
(c) known cause that does not behave as expected e.g. failure to respond to standard therapy, or
(d) unknown cause or undiagnosed illness (see also *Protocol for the investigation of microbiologically unexplained serious illness and death* available at: http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1215675142361)

An **outbreak** is said to occur where:

- the number of cases observed is greater than the number expected over a given time period, or
- two or more cases are linked by epidemiological, toxicological, microbiological, or radiological features

Clearly one case of a serious unusual illness (e.g. inhalational anthrax) is of concern for public health but since this cannot be technically termed an outbreak it is instead referred to as an **incident.**

Although an outbreak or incident of unusual illness may be the result of natural or accidental processes, the possibility that it may be due to a **deliberate release** of a harmful agent must always be remembered; this may or may not have had malign intent. A deliberate or accidental release may be **overt**, where it is immediately apparent that a release has occurred, although the precise content of the release may not be clear. However, a release may also be **covert**, with the first indication being the presentation of people with unusual illness. Health professionals have a crucial role to play in the identification of such covert releases. Unrecognised syndromes may also be due to new or emerging conditions. If you are considering deliberate release remember the need for forensic chain-of-evidence.

Acute incidents - recognition occurs rapidly after the event, often within minutes to hours.
Delayed incidents - presentation of affected persons is delayed by hours, days or even weeks.

2.2 Critical factors in the initial response

Before any response can be mounted, the event has to be detected, recognised and then identified as requiring special action. Detection requires clinical awareness, timely surveillance and intelligence.
The critical factors in responding to outbreaks or incidents of unusual illness are:

- recognising that support may be needed to declare both the need for an initial response, and whether this is in fact an incident
- a high level of awareness of the possible occurrence of such outbreaks/ incidents, including those due to deliberate or accidental release
- immediate consideration of issues of patient decontamination and containment and staff safety when cases occur
- early expert clinical assessment of patients - to consider the most likely cause before epidemiological and test results become available and to institute rapid relevant investigations and management
- **SEEK ADVICE EARLY -** the HPA will help you find the relevant expert
- effective communication between different sectors of the health service and other relevant agencies
- effective co-ordination of the response by an overall incident management lead

2.3 Emergency clinical situation algorithm - Initial analysis of outbreaks and incidents

Although definitive diagnosis of an unusual illness will usually require laboratory confirmation, clinical management should be based on the steps in the emergency clinical situation algorithm (Figure 1). The roles of the health professionals are further clarified in the relevant sections of this document. **Contact details for health professionals to seek expert advice are given in appendix 1.**

Initial clues to the cause of an unusual illness come from three main pieces of information:

- **case detection** or the way in which cases came to light - an outbreak or incident of unusual illness may be detected in several different ways and the means of detection may itself give clues as to likely cause
- **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/Topics/EmergencyResponse/CBRNAndDeliberateRelease/CBRNIncidentsAGuideToClinicalManagementAndHealthProtec/

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

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: CHEMICAL
Other possibilities: Biological toxins
Radiological
(Psychological)

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/ProductsServices/LocalServices/

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 or medical conditions

- 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/deliberate_accidental_releases
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 chemical, biological or radiological incident. This is mainly a diagnosis of exclusion but these episodes are more common than previously thought and prompt identification of the outbreak is important to limit cases. Such incidents occur more commonly in schools and healthcare facilities and are usually associated with an odour report. Symptoms are varied and usually non-specific for example dizziness, headache and nausea are common. Motor symptoms are rarer but often indicate an incident that is more difficult to manage. Spread is most often by line of sight and between individuals with a pre-existing social connection (e.g.work colleagues). In all incidents of this kind the affected individuals will believe (often understandably) that they have been exposed to some noxious substance, but investigation reveals that this has not occurred or at least not to the level that could have caused the presenting symptoms. Incidents of this sort vary in size, but often result in a large emergency response and can be exceedingly difficult to manage. Optimum management depends on including epidemic hysteria as a possible cause from an early stage in the incident, separating symptomatic from non-symptomatic, providing reassurance and a credible explanation and minimising invasive medical procedures.

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. DH letter on mobile decontamination facilities and personal protective equipment (PPE) for chemical incidents at:
http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4010426

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.

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/deliberate_accidental_releases/biological

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 indistinct speech. Nausea, vomiting and diarrhoea follow ingestion of toxin. *Differential diagnoses may include Guillain-Barré syndrome and myasthenia gravis (although this is unlikely if more than one casualty)*
Brucellosis	Variable presenting symptoms which may include persistent fever, fatigue and joint pain or arthritis. 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 and/ or endocarditis, also 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/deliberate_accidental_releases/chemical
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/deliberate_accidental_releases/radiological 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

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.

2.11.1 Radiation types
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.

2.11.2 Sealed Sources
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.

2.11.3 Unsealed sources
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 CRCE (formerly 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).

The TMT Handbook (www.tmthandbook.org) offers detailed guidance on triage, monitoring and treatment of people exposed to ionising radiation following a malevolent act. Furthermore, a recent report of the Advisory Group on Ionising Radiation on High Dose Radiation Effects and Tissue Injury (www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1237362785060) summarises health effects, symptoms and available treatment options for radiation casualties.

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/web/HPAwebFile/HPAweb_C/1215675142361

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). Working alongside other emergency services and other specialist agencies, Ambulance Services Hazardous Area Response Team (HART) Incident Response Units (IRU) personnel provide an enhanced ambulance response to the following types of incidents:

- Chemical, Biological, Radiological or Nuclear (CBRN) incidents or those involving hazardous materials (HAZMAT) which have happened accidentally or have been initiated deliberately. These could include events such as a chemical explosion at a factory, large fires, explosions or a suspected terrorist attack.
- In support of the military (within England), firearms incidents, covert operations support, and certain public order incidents (http://www.ambulancehart.org.uk/about_hart/)

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

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

SAD CHALETS assessment	**METHANE assessment**
or	
S; survey	
A; assess	
D; disseminate	
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; start log	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

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 (whichever 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.

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 safeguard 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 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:

- Treatments given, samples taken, laboratory sent to, date and time diagnosis reached
- 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 <u>all</u> 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 is used to establish the radiation dose to the patient. The test is based on chromosomal aberration analysis in blood lymphocytes and is available from the HPA. It cannot be performed by the local clinical genetics units. 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/HPA/ProductsServices/Radiation/ChromosomeDosimetry/. 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 the Toxi-Box or ChEAKs toxicological analytical sampling kit wherever possible. If not available 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, however if vacutainers cannot be avoided a blank control should be sent with the specimen.
- 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	2x10ml 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

5. Guidance for General Practitioners

5.1 Action to take on recognising cases of unusual illness

Prepare in advance by taking a look at your surgery and consider how you would control access and segregate patients. At the initial clinical assessment a case may appear to be of unusual illness by virtue of its type, severity and/or symptoms. Summary of actions on recognising such a case:

- Think about it – see algorithm Figure 1
- Refer for advice to usual local sources raising concerns about unusual presentations as necessary
- Discuss with local HPU

The GPs direct involvement with cases will differ according to the category of incident. In an acute incident (most likely to be due to a chemical agent) the most seriously affected casualties will be taken to hospital. However, there may be some people with more minor symptoms who leave the scene and see their GPs. It is possible that some of these may be unaware that they have been exposed to any risk. In a delayed incident (more likely to be due to an infectious agent) GPs may well be pivotal in first recognising the unusual nature of the illness. Once again the patient may be unaware that they have been exposed to any risk. **A high index of suspicion is vital**, and the importance of a thorough history cannot be overstated in determining the cause.

Where an incident of unusual illness has been recognised in another setting but might affect other patients, the local HPU or incident control team should ensure that GPs are given all the information they require in order to safely manage patients and protect themselves and their staff. Very early on in an incident however there may not have been enough time for this to occur. This guidance is intended to help GPs through the early stages of decision-making under these circumstances. The HPA-RCGP clinical action cards entitled *New diseases, New threats* may also provide helpful information.

5.2 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).

5.3 Further management of case(s)

The local HPU will advise on the further management of the case(s). Patients may be sent home with advice or perhaps prophylaxis depending on the likely agent involved. In many cases however the likely further management will be transfer to a hospital for further investigation and care. Always ask at what level of risk patients should be transported, so that this information can be passed on to the ambulance service. Sometimes decontamination of the patient may be required prior to transfer to hospital; this will usually be done by ambulance professionals at the scene.

Do not perform any investigations on the patient - these should only be done in the hospital environment or other appropriate facility.

Where a decision to transfer to hospital has been made the GP should:

- call the hospital to which the patient is to be taken; local HPU may advise on which hospital to use
- speak to the relevant clinician at the receiving hospital, if possible, to ensure that any special requirements of the case are known before the patient arrives there
- arrange for an ambulance - tell ambulance control if the patient is infected or potentially contaminated and whether decontamination has been recommended

5.4 Further health protection for other exposed people

The local HPU will advise you if any decontamination, prophylaxis or other follow-up is required for other exposed people. The GP should make a list of all those believed to have been exposed. This should contain the name, address, age, GP details, contact details and likely level of exposure. Advice about environmental decontamination, which may be necessary, and how this should be arranged, will be provided from the appropriate expert advice provider (appendix 1).

5.5 Record keeping

The importance of comprehensive record keeping cannot be over emphasised. In addition to the usual clinical records, include details of the advice received, actions taken to protect self and others, and who else has been informed.

GUIDANCE FOR OCCUPATIONAL HEALTH SERVICES

6. Guidance for Occupational Health services

6.1 Action to take on recognising cases of unusual illness

An employee/ client of an organisation may turn to their OHS for advice if they are suffering with unusual symptoms or they feel they have been exposed to someone who has an unusual illness. These clients may have been exposed through the course of their work, if NHS or emergency service employees, or they may have been exposed during an acute incident. If a client presents to the OHS with an unusual illness it is crucial that they are identified as early as possible (see checklist 1).

A detailed clinical history is essential and full and concise written records should be maintained. 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. Refer to section 2.4 and appendix 3 for detailed information which should be sought.

6.2 Personal safety and patient containment

If it is suspected that a client has an unusual illness - consider the safety of yourself, your staff and other people in the environment where you are seeing the client. It is not possible to outline appropriate measures for all possible scenarios in this document. You should **call for expert advice immediately** (see appendix 1); they will advise not only on personal safety but also on the further management of the client(s) and of any exposed but not ill people (including yourself and your staff).

6.3 Further management of case(s)

The local HPU will advise on further management of the case. The client may be sent home with advice or perhaps prophylaxis depending on the likely agent involved. In many cases the likely further management of the case will be transfer to hospital for further investigation/ care. Ensure you inform the ambulance service and the hospital as to the level of risk which has been advised by the HPU.

All tests and investigations will be performed by the treating hospital. However, OHS in the NHS may be asked to take samples from clients/ employees of their own organisation for investigation, dependant on resources available to them. Early decontamination may be vital to minimise harm and OHS may be asked to assist if the resources are available to them, e.g. shower/ washing facilities.

OHS should ensure they inform the line manager if the employee is not returning to the workplace, in line with organisational absence policies. Return to work programmes for employees exposed to an unusual illness should incorporate the relevant advice from the local HPU and in liaison with relevant specialists and GP.

6.4 Further health protection for other exposed people

There may be staff who have had unprotected contact with a patient or colleague 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.

6.5 Record keeping

The importance of comprehensive record keeping cannot be over emphasised. In addition to the usual clinical records, include details of the advice received, actions taken to protect self and others, and who else has been informed.

6.6. Participation in occupational health registers

The HPA will establish a register of all those people who are exposed to the effects of an incident where unusual symptoms occur and the emergency response which follows. The OHS will be asked to assist with these registers. The register will have a number of functions, including to:

- ensure that anyone who was exposed has full information about the support services available
- monitor people's health for longer-term effects

The management of the register will be overseen by a steering committee, which could include representatives from DH, NHS, HPA, emergency services and Transport.

This multi-agency approach to OH follow-up is important because in many disasters, the number of individuals occupationally deployed from any single agency is typically small and subtle health problems related to the deployment may not be detected.

GUIDANCE FOR HISTOPATHOLOGISTS AND ANATOMICAL PATHOLOGY TECHNOLOGISTS

7. Guidance for histopathologist and Anatomical Pathology Technologists

As a histopathologist or an Anatomical Pathology Technologist (APT) you may become involved with investigating cases of unusual illness in several ways, you may:

- recognise similar unusual pathology at post-mortem examination of patients who may have died in different settings and with no connections having been previously made between them
- receive laboratory results from a previously performed post-mortem examination, which indicate an unusual illness
- be informed about an unusual illness which has already been recognised as such and asked to perform a post-mortem examination
- the case may arise either from a death in hospital, the community or in a deceased that has been repatriated to the UK from abroad

The following sections give you guidance on what to do in each of these situations. It is likely that the autopsy will have been commanded by a coroner or the procurator fiscal in Scotland[2]. The coroner needs to be informed if the case involves an unusual illness that had not been appreciated at the time of initial inquiries. If the deceased should be moved to another mortuary for safety reasons, the coroner will need to be informed before further arrangements are enacted.

Health and safety issues should be considered as a priority in every incident, and should be discussed with the local health and safety or OHS with appropriate speed. It is reasonable to consider developing contingency plans in advance of any such incident in order to safeguard 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.

It should be remembered that strict adherence to procedures for the prevention of infection as outlined in the HSE *Safe working and the prevention of infection in the mortuary and post-mortem room* (2003) and Royal College of Pathologists *Guidelines on autopsy practice* (2002) documents will minimise the risk of transmission of most pathogens. If there is a risk of an HG4 organism then specific advice must be followed.

If the circumstances are such that the body has already been embalmed, further laboratory investigations (whether chemical, microbiological or radiological) are likely to be significantly compromised. There are no formally validated tests for work on embalmed tissues and therefore it may not be possible to produce a definitive result. However, tissue preservation may be excellent and immuno-cytochemical analysis can be as good as in surgical or rapid autopsy material and a number of agents, including VHFs, anthrax and smallpox can be identified in such fixed material.

Advice may need to be given to funeral directors and the bereaved in terms of specific procedures for handling, viewing and/ or disposal of the deceased, as outlined in the HSE *Controlling the risks of infection at work from human remains – A guide for those involved in the funeral services (including embalmers) and those involved in exhumation* (2005).

7.1 Unusual illness recognised during post-mortem examination

On recognising pathology consistent with an unusual illness during autopsy:

- do not proceed any further with the procedure
- contact the OHS for advice concerning personal safety - it is generally safer to continue with the autopsy procedure, once the body cavities have been opened, than to transfer an opened high-risk deceased patient to another mortuary. Seek specific HPA advice on what samples of tissues and body fluids should be taken and how they should be handled – see also section 7.4
- liaise with the coroner and/ or the senior clinician in charge of the case and between you ensure that you have informed infection control, the local HPU and CFI/ CRCE as appropriate
- make a list of all those pathology staff (i.e. pathologist, anatomical pathology technologists) that had direct contact with the deceased - this list should include name, age, address, GP details, contact details, the nature of their contact and any adverse health effects reported

[2] From here on, if in Scotland, substitute the procurator fiscal for the coroner

7.2 Unusual illness recognised after laboratory results from post-mortem examination
Where the laboratory investigation from a post-mortem examination indicates an unusual illness:
- liaise with the coroner and/ or the senior clinician in charge of the case and between you ensure that you have informed infection control, the local HPU, and CFI/ CRCE as appropriate
- contact the OHS for advice concerning management of any potentially exposed pathology staff
- make a list of all potentially exposed staff (i.e. pathologist, APTs) with their name, age, address, contact details, GP details and level of exposure

7.3 Unusual illness recognised clinically and a request for post-mortem examination made
The most important guidance here is:
DO NOT PERFORM A POST-MORTEM EXAMINATION ON ANY PATIENT RECOGNISED AS HAVING AN UNUSUAL ILLNESS UNTIL EXPERT ADVICE HAS BEEN SOUGHT FROM THE HPA[3]
Where experts have advised that an autopsy could be done, this should only be performed where the facilities and available equipment are appropriate to the level of risk and staff have received adequate training. The autopsy may be performed locally, in which case the extent of tissue and body fluid sampling is critical – see below. Or it may be advised that the deceased be removed to another unit with higher standards of containment and staff with more experience of the range of conditions known or suspected. If the unusual illness is recognised before the deceased has been opened in a public mortuary, it may be advisable to have the case removed to a hospital mortuary with appropriate experience; the coroner will need to be consulted first.

7.4 Sampling
If after discussion a post-mortem examination is felt to be appropriate, the suggested samples to take are:

7.4.1 Toxicological
The Toxi-box or ChEAKs (see section 4.5) can be used for sampling at post-mortem:
- bladder contents can be collected in the universal container for urine **(without preservative)**
- **peripheral** venous blood specimens can be collected - toxicological blood samples should be filled in the same order of priority as for sampling from an acutely ill patient

In addition other samples may be useful in a toxicological investigation since the concentration of chemical agents can be much higher in certain body sites than in blood or urine. The following should be collected in universal urine containers **without preservative**:
- gastric contents
- bowel content at different levels through the gut
- liver tissue
- kidney tissue
- muscle tissue (skeletal and cardiac)
- fat
- brain
- cerebrospinal fluid (CSF)
- lung tissue
- vitreous

Toxicological sample handling procedures:
- Toxi-Box/ ChEAKs samples should be handled in exactly the same way as for sampling from acutely ill patients. However, **tissue samples in universal containers should be put in individual plastic bags** within a cardboard container to keep them separate from each other and from blood and urine specimens. This is to prevent cross contamination. A second cardboard container may be necessary depending on the number of samples taken.
- An analysis request form for **toxicological investigation** (appendix 2) should accompany the sample and should be marked **high risk**.
- All samples should be transported as high risk according to local protocols.
- Where deliberate release is suspected or there are other forensic considerations, chain of evidence documentation should accompany the samples (appendix 2).
- Samples for toxicological analysis in Toxi-Boxes/ ChEAKs should be sent to the local clinical chemistry laboratory. The **laboratory should be telephoned in advance** to expect the samples.

[3] Baker DJ, Jones KA, Mobbs SF, Sepai O, Morgan D, Murray VS. (2009) Safe management of mass fatalities following chemical, biological, and radiological incidents. *Prehosp Disaster Med.* **24**(3):180-8.
Contaminated mass fatalities following the release of chemical, biological, or radiological agents pose a potential major health hazard. A United Kingdom government investigation has identified a number of areas of risk. This paper presents an outline of the findings of the study and describes specific pathways for the management of contaminated and non-contaminated fatalities. Factors determining the choice between cremation and burial are discussed. Effective decontamination remains a neglected area of study for both fatalities and casualties.

7.4.2 Microbiological

Due to the high risk of post-mortem microbial contamination and autolysis, it is preferable that any autopsies that are deemed to be appropriate should be performed within 24 hours of the patient's death, if possible. In cases suspected to be of an unusual illness only at the time of autopsy, the time from death will almost always be >1 day. It is still important to take all the appropriate samples as indicated in this document**.** To increase the validity of culture and PCR results, emphasis MUST be placed on aseptic technique for specimen collection. Possible samples to be taken are shown below. Samples should be collected with appropriate precautions.

Stained smears and tissues on glass microscope slides

Collect all stained and unstained slides and send these with the clinical material. Secondary testing such as immunofluorescence and molecular biology can be performed on this material.

Microbiological sample handling procedures:

- Use standard request forms marked **high risk** for the transfer of clinical material to the laboratory – indicate on request form the time elapsed since death
- All samples should be transported as high risk according to local protocols.
- Where deliberate release is suspected, or there are other forensic considerations, chain of evidence documentation should accompany the samples (appendix 2).
- Samples for microbiological analysis should be sent to the local microbiology laboratory. This **laboratory should be telephoned in advance** to inform them about the samples and any specific cause that may be suspected.

Possible post-mortem samples for microbiological and histological examination

Sample	**Requirements**
Serum if possible or whole blood without anticoagulant. If the mortuary does not have a safe centrifuge, the sample should be sent to an appropriate microbiology department for centrifugation and serum separation	• 2 x 5-10ml minimum • store in a container suitable for freezing at -70^{0}C
Whole blood (EDTA)	• 2 x 5-10ml minimum • store in a container suitable for freezing at -70^{0}C
Blood cultures (from peripheral venous blood)	One set (aerobic and anaerobic bottles)
Tissues e.g.: • local inflammatory lesions or abscess material • liver • spleen • lung • kidney • heart • enlarged lymph nodes • bone marrow • other organs with gross pathologic changes • vitreous	• collect samples using aseptic technique • collect samples at least **in duplicate** • tissue fragments should measure 1cc • place one of duplicate samples into sterile universal container for microbiological examination and storage at –70^{o}C • fix second of duplicate samples with 10% buffered formalin for subsequent paraffin embedding after 24 hours of fixation (since antigenicity decreases for immunohistochemical assays with prolonged formalin fixation)
Urine	• Collected aseptically in sterile container suitable for freezing and storage at -70^{o}C
Faeces/ gut contents	• Collected in sterile container suitable for freezing and storage at -70^{o}C
CSF, pleural fluid, pericardial fluid, vesicular fluid	Collected aseptically in sterile container suitable for freezing and storage at -70^{o}C

7.4.3 Radiological

A post-mortem examination hazard will only be present where it is suspected that there is incorporated radioactivity.

Where incorporated radioactivity is present then careful consideration needs to be given (in concert with police, coroner and other properly interested parties) as to whether the need to perform a post-mortem examination is outweighed by the risks of performing a post-mortem examination. If a decision is taken to perform a post-mortem examination then careful planning will be required to ensure that an appropriate safe system of working is designed (including physical adaptation of the chosen mortuary facility); that the extent of the examination needed is carefully planned; that all the wastes generated are carefully collected and disposed of appropriately; and that thought has been given to the safe processing of any toxicological, microbiological or histological tests that may be required. The potential hazards of such an examination may be better identified by the analysis of clinical specimens obtained ante-mortem and specimens, such as muscle blocks, obtained by minimally invasive means post-mortem for radiological activity.

The design and supervision of the safe systems of working for such a post-mortem examination should be jointly managed by an approved Radiation Protection Adviser on behalf of the institution providing the post-mortem facilities and an appropriate person appointed by the HPA.

Samples will be radiochemically analysed at specialist institutes. The HPA can advise on where these analyses can be made and on the requirements for transporting samples.

The choice of tissues and organs, and the amounts of each required for analysis, will depend on the radionuclide(s) involved and this should be known and discussed prior to the post-mortem examination. However, as a default the range of tissues listed above for toxicological and microbiological analyses, plus a limb long bone or a rib could be collected and where possible at least 50g of solid materials and 20ml of fluids.

GUIDANCE FOR LOCAL LABORATORIES

8. GUIDANCE FOR LOCAL LABORATORIES

Health and safety issues should be considered as a priority in every incident, and should be referred to the local health and safety or OHS with appropriate speed.

It is reasonable to consider developing contingency plans in advance of any such incident in order to safeguard 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.

8.1 Safe handling of specimens in laboratories

In practice, most of the laboratory hazard involved in samples from a patient with unknown illness will be microbiological rather than toxicological or radiological. It is unlikely that chemicals or radionuclides in specimens will be at high enough concentration to pose a threat to the health of those analysing them. However, all samples could potentially pose an infection risk. Furthermore, where deliberate release is suspected it is always possible that the exposure may have been to a mixture of chemical, biological or radiological agents. Therefore:

All laboratories should handle specimens as if potentially high risk
Always seek expert advice initially from within your own Trust and if required from the relevant HPA specialist

Decontamination and waste disposal should be performed as per standard guidelines for laboratory practice e.g. hypochlorite (5,000ppm available chlorine) disinfection for decontaminating surfaces that may have been exposed. All waste should be autoclaved or incinerated.

Prophylaxis for laboratory staff will not normally be required, especially if the specimens have been handled correctly. Follow the relevant local standard operating procedures. If there are particular concerns, or if there has been a spillage, then please seek expert advice from the relevant HPA specialist.

Procedures for managing accidents within the laboratory should already be in place. Where appropriate, decontamination of personnel may be necessary. Full written records of all accidents should be kept. A list should be maintained of all staff handling specimens. This should include name, age, address, GP details, contact details, and the nature of their contact with specimens.

The Advisory Committee on Dangerous Pathogens has advised that high risk samples can be safely processed using closed system automatic analysers for routine patient support tests.

The Toxi-Box or ChEAKs samples will be used to analyse for all possible chemical agents and will not normally be examined in local clinical chemistry laboratories.

Local microbiology laboratories will potentially constitute the most hazardous laboratory environment because of the way in which samples are processed. All clinical samples received from potential cases and cultures/material derived from those samples should therefore be processed by experienced Biomedical Scientists. A Class 1 protective cabinet in a Containment Level 3 (CL3) facility should be used for all handling until further evidence and advice allows alternatives. If a deliberate release is suspected all material should be held in a secure facility within a CL3 room.

If there is any suspicion that a Hazard Group 4 (HG4) pathogen is involved then specimens must only be processed in facilities appropriate for such pathogens and expert advice should be sought immediately. Such facilities are located at HPA CfI, HPA CEPR, and at DSTL. Some clinical material may have been received in pathology departments and been processed to some extent prior to the recognition of an incident. If this situation arises, remaining material should be retrieved and moved to the appropriate containment facility immediately.

8.2 Sample processing and referral

Particular care should be taken to ensure that laboratory records are kept to a high standard and that chain of evidence documentation is maintained where deliberate release is suspected or there are other forensic considerations. Please ensure that **as a minimum,** patient surname, forename, date of birth and specimen laboratory number, are completed on all referral forms.

To assist in the tracking of sample progress and results of investigations, laboratories (either diagnostic or specialist/ reference) which receive clinical diagnostic material from such cases should inform the microbiology or toxicology coordinator as soon as possible after receipt, and provide sufficient information to enable tracking of what material has been sent where. If there is any suspicion that a case is unusual, all the excess samples must be kept pending further notice so that they are available for further diagnostic tests as necessary.

8.2.1 Routine haematology and biochemistry
Samples can be processed in the local laboratory but should be treated as **high risk**.

8.2.2 Toxicology
Samples for toxicological analysis (Toxi-Boxes or ChEAKs) should be temporarily stored in the local laboratory (**without opening or centrifuging them**) at 4^{o}C. From here they should be rapidly transferred (at least within 24 hours) to the appropriate medical toxicology laboratory since some toxins degrade or absorb onto sample tubes with prolonged storage. The medical toxicology laboratory should be telephoned to inform them that samples will be sent to them.

Details of suitable analytical toxicology laboratories and advice should be sought from CHaPD (contact details in appendix 1).

Guidance on safe transfer of samples to the medical toxicology laboratory is given in section 8.7. Care should be taken to ensure that all laboratory records are complete and that chain of evidence documentation (appendix 2) is maintained, particularly where deliberate release is suspected or there are other forensic considerations.

8.2.3 Radionuclides
Analysis for levels of radionuclides in tissue samples and body fluids requires specialised facilities not normally present in the local laboratory. Specimens should therefore be referred to centres advised by HPA. Samples must be frozen, not in formalin.

If the laboratory has processed samples that are later known or suspected to have contained radionuclides expert assistance should be sought to monitor work surfaces, laboratory waste, apparatus and, if necessary, the staff themselves. Initially this assistance would be provided by the radiological protection advisor and local medical physics department.

8.2.4 Microbiology
The first point of contact for reporting the existence of a patient(s) who has presented with an unexplained illness of suspected infectious aetiology is the Emerging Infections and Zoonoses (EIZ) department at HPA CfI on 020 8327 7483. Specific microbiological and public health advice will then be obtained from the relevant experts, together with advice on appropriate samples and handling. **Seek advice and refer specimens as appropriate.**

Local clinical microbiology laboratories with CL3 facilities will receive specimens from cases of unusual illness and their diagnostic investigations will be supported by a range of reference laboratories (CL3 or CL4) including those at HPA CfI and HPA CEPR (see appendix 1). These reference laboratories have the capability for the investigation of clinical samples for unusual pathogens, particularly those which could be associated with a deliberate release. They are also able to subsequently confirm, identify, and perform further analyses on, potentially significant isolates, using a range of techniques including sophisticated molecular technologies.

8.3 Receipt of clinical samples by local microbiology laboratories
As part of the blind screen, hospital clinicians and pathologists have been asked to take at least two sets of blood cultures, 4 x 5ml clotted blood, and 4 x 5ml EDTA blood along with any other clinically relevant samples, and to send these to their local microbiology laboratory. Samples should have been labelled as high risk by submitting staff, and should be handled according to local protocols for such samples.

Local laboratories should immediately discuss with CfI if the cause is unknown or with the appropriate reference laboratory if a specific pathogen is suspected. Refer to *Protocol for the*

investigation of microbiologically unexplained serious illness and death:
http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1215675142361
Depending on the clinical signs and the samples available further material may also need to be sent to other reference laboratory(s). Instructions for the safe transport of specimens to national reference laboratories are given in section 8.7.

Expert advice should always be sought but it is anticipated that in most cases clinical specimens will, if practical, be aliquoted on receipt, or soon thereafter. A portion would then be used for preliminary investigations locally, and the rest placed in several containers suitable for freezing (at –70^{0}C or at the lowest freezer temperature available) for archiving or possible transfer to reference facilities at a later date. Where an illness is recognised as unusual retrospectively, any remaining samples should be retrieved and transferred to the laboratory's CL3 area.

If the local laboratory does not have operational CL3 facilities then the remaining samples should be forwarded directly to either a nearby laboratory with such facilities (depending on local arrangements), or to the appropriate national reference laboratory.

8.4 Sample investigations and storage
All samples should be handled using appropriate containment facilities. Keep all samples. Given the unknown nature of the agent involved laboratory techniques to maximise the potential of identifying any infective agent are advised. It is likely that this may involve prolonged enrichment and selective aerobic and anaerobic culture, nucleic acid amplification techniques, electron microscopy, and viral culture. The following investigations may be clinically indicated:

- **Blood cultures**
  Automated systems should detect most, if not all, bacterial agents. However, if negative after your standard interval, consider extending incubation. Please retain negative bottles for possible subsequent examination by PCR or other testing methods. Negative blood culture bottles should be stored at –70^{o}C or lowest temperature available.
- **Respiratory secretions**
  Sputum, broncho-alveolar lavage or similar for standard cultures and virology; consider extending incubation if no significant isolates after standard interval. Please retain portions of sample at –70^{o}C or lowest temperature available.
- **Nose and throat swabs**
  If a deliberate release is suspected, culturing nose swabs for *Bacillus anthracis* may be useful for epidemiological purposes.
- **Pus or tissue, or swab of local lesion/vesicular fluid**
  Pus and tissue samples for microbiology:
  - Plate directly for aerobic and anaerobic cultures, and include enrichment cultures
  - Consider extending incubation if no significant isolates after standard interval
  - Where practical a portion of the sample should be retained at –70^{o}C or lowest temperature available

  Samples for **virological investigations** should be referred if necessary for investigation by EM, immunofluorescence, culture, and PCR as appropriate
- **Serum to be retained for possible subsequent examination or refer for possible toxin assay**
  - Acute sample (taken near time of admission) and convalescent sample
  - Store at –70^{o}C or lowest temperature available
- **Whole blood in EDTA to be retained for possible subsequent molecular examination**
  - Acute sample (taken near time of admission) and convalescent sample
  - Store at –70^{o}C or lowest temperature available
- **Urine for standard tests and to be retained for possible subsequent examination**
  - Store at –70^{o}C or lowest temperature available
- **Faeces/ stools**
  - Routine culture and potential microbial toxin detection
  - Store at –70^{o}C or lowest temperature available
- **Other samples**
  If cerebrospinal fluid, pleural fluid, pericardial fluid, or any other specimens are taken as part of the clinical workup, consider extending incubation if negative after your standard interval. Retain any isolates obtained. Reserve a portion of the sample at –70^{o}C or lowest temperature available.

Collect all **stained and unstained** slides. Secondary testing such as immunofluorescence and molecular biology may be performed on this material.

- **Isolates**
  Identification should be attempted. If it is not possible to confidently identify the organism as a known non-pathogen, susceptibility tests should be set up and the isolate referred on to the appropriate national reference laboratory. **Interpreting any isolate as 'not significant', particularly those from sterile sites, in the context of a suspected deliberate release should only be done with extreme caution.**
  All bacterial isolates cultured from these patients should be retained locally for possible subsequent examination.

8.5 General guidance for local laboratories on prioritisation and transfer of samples

- **Expert advice should be sought** from CfI on which national reference laboratory to send samples to. Laboratories are listed in appendix 1.
- National reference laboratories must be informed of any samples which are being sent
- Information on packaging and transportation are given in section 8.7. **All specimens should be labelled and handled as high risk**
- The speed with which specimens/ isolates are referred will depend on the context of the investigation
- Depending on the scale of the incident and other factors, prioritisation of material for referral according to clinical manifestations and other available information may be necessary. Specialist microbiological investigations may be focussed on patients conforming fully to the working case definition to avoid swamping the laboratory investigation system(s) with potentially less relevant/irrelevant diagnostic material
- **Please ensure that any remaining samples are retained and stored** at the local laboratory. It is possible that for certain incidents a designated laboratory may act as a sample repository.
- Laboratories should complete their standard documentation and if necessary a chain of evidence form (appendix 2) on referral of samples to the national reference laboratories

8.6 Specific guidance for local laboratories on storage and referral of samples
Isolates:

- Retain *all* bacterial isolates cultured from these patients
- Refer all potentially significant isolates for confirmation and further work e.g. sub-typing or bio-toxin analysis (after antimicrobial susceptibility tests have been set up locally)
- If it is not possible to confidently identify an isolate as a known non-pathogen, or if it is unidentifiable, it should be referred for formal identification (see 8.5)
- Information on classic deliberate release agents is available at: http://www.hpa.org.uk/deliberate_accidental_releases)

Clinical specimens:
Local laboratories should receive (for acute and/or pathological samples) as a minimum, a set of blood cultures, a clotted blood sample and an EDTA sample. Some of these routine clinical samples may be referred directly to specialist reference laboratory(s). Depending on the specifics of the patient, and on the nature of the incident, and following expert advice, it may also be appropriate to refer some or all of the following additional specimens:

Specimen	Requirements
Respiratory samples	• A portion of BAL or other respiratory sample, stored frozen at -70°C (or lowest available/achievable temperature)
Pus/ tissue samples	• Pus or *non-fixed* tissue to be stored at -70°C or lowest available / achievable temperature • If only *fixed* tissue samples are available these may be examined using molecular approaches
Urine	• 5mls for further investigation, which may include toxin assay
Faeces/ stools	• Store at –70°C (or lowest temperature available/achievable) for culture/microbial toxin detection
Other body fluids	• Including cerebrospinal fluid, pleural fluid, pericardial fluid and other sterile site specimen • Please retain any sample remaining after routine examination at –70°C for possible subsequent examination

8.7 Safe transport of specimens from local to other laboratories
Both Toxi-Box/ ChEAKs and microbiological samples should be handled similarly with respect to packaging and transport. NOTE: The ChEAKs comply with transport regulations for Cat B UN3373 and no further packaging is required. The kits may also be used for the transport of radiological or microbiological Cat B samples.

Most clinical samples, **EXCEPT** those from suspected smallpox or viral haemorrhagic fever patients, are generally classified as Category B and assigned to UN3373 (Biological Substance, Category B) and should be packaged in accordance with PI650. Clinical samples and cultures assigned to UN3373 may be posted. Cultures of organisms are also usually Category B, except those included in the deliberate release group.

All cultures of *deliberate release* organisms and some clinical samples, including those taken from smallpox or VHF patients, fall into Category A - Infectious substances capable of causing disease in humans or animals (see ACDPs Appendix 1.2, Table A2 ).

Category A infectious substances are assigned to UN 2814 and must be packaged in accordance with UN Packaging Instructions PI620 (road/ rail) or PI602 (air). P620 and P602 are identical specifications but given different codes in ADR and ICAO regulations respectively (for a full description of PI see unece). Category A transfers should be individually requested through an approved courier. The service will be a next day tracked door-to-door delivery, which must be signed for at collection and receipt.

Packaging for any category of sample must meet with UN performance requirements i.e. UN-type approved packaging for Division 6.2 substances. The packaging should consist of an inner package (watertight receptacle, watertight secondary packaging, an absorbent material in sufficient quantity to absorb the entire contents placed between the receptacle and the secondary packaging) and a rigid outer package of adequate strength for capacity, mass and intended use. Packages should be marked with the proper shipping name i.e. *Infectious substance affecting humans*, the appropriate UN number (e.g. UN 2814) and the appropriate warning label (i.e. the danger sign for infectious substances).

In the event of suspected deliberate release, local support services e.g. police and armed services should be asked to transfer/ deliver materials to reference facilities as appropriate.

8.8 Recognising cases of unusual illness
Up to this point this guidance has assumed that the laboratory has become involved in investigating cases of unusual illness **after** those cases have been recognised clinically as unusual. It is however possible that it is the laboratory that first recognises cases of unusual illness. Under these circumstances you should do the following:

- Liaise with the senior clinician in charge of the case and between you ensure that you have informed infection control, the local HPU, and HPA CfI, CRCE or NPIS as appropriate
- Seek expert advice concerning management of any potentially exposed laboratory staff
- Make a list of staff that may have been exposed with their name, age, address, contact details, GP details and level of exposure.

GUIDANCE FOR PUBLIC HEALTH PROFESSIONALS

9. Guidance for public health professionals

Investigating outbreaks and incidents of disease is a core function of public health. For public health professionals specifically involved in health protection much of the guidance that follows will be standard practice. However, those not routinely involved in health protection might be called upon to take the initial public health role during an incident (e.g. out of hours) and this guidance should assist them in that function. If local plans are available, they should be followed. **Comprehensive record keeping is essential**. All information received, advice given and actions taken should be logged, signed, dated and timed. Your local generic log should be used.

9.1 Action when an incident is first reported

Section 2 outlined how outbreaks or incidents might come to light and suggested a classification for further management based on this and the basic epidemiology. This guidance recommends to all health professionals who might first recognise cases of unusual illness that they should inform the CCDC at the local HPU or their deputy immediately. Checklist 3 details useful information to obtain and record when an incident or outbreak is first reported to you.

Note that **if deliberate release is a possibility you should immediately discuss this with the police** (Figure 3). This may then trigger the guidance that has already been produced for deliberate release: http://www.dh.gov.uk/assetRoot/04/07/17/86/04071786.pdf

If a specific agent is strongly suspected from the beginning it may be more appropriate to use the specific guidance. The public health management of acute chemical incidents and biological agents is comprehensively described on the DH and HPA websites:
http://www.dh.gov.uk/PolicyAndGuidance/EmergencyPlanning/DeliberateRelease/fs/en
http://www.hpa.org.uk/deliberate_accidental_releases

For incidents which are believed to be due to radiation exposure, clinical information is readily available from your local oncology centre or contact the HPA (see appendix 1) for advice on management. The *Safety Reports Series No.2 Diagnosis and treatment of radiation* produced by the International Atomic Energy Agency is also available as a pdf at:
http://www-pub.iaea.org/MTCD/publications/PDF/P040_scr.pdf

9.2 Management of an outbreak or incident according to presentation

The first step in management of an outbreak/incident of unusual illness is to decide whether this is an acute incident i.e. requiring an immediate urgent response or whether there is more of a delay in the presentation of patients. Radiation outbreaks/ incidents may present acutely or after a delay depending on the dose incurred. Delayed presentation may have been preceded by self-medication for flu-like symptoms.
The same overall objectives apply to the management of both types of outbreaks/ incidents, to:

- care for the sick
- control the source
- determine the extent of the possible incident/exposure
- prevent others being affected
- monitor the effectiveness of the measures taken
- prevent a recurrence
- consider whether the cluster may be the result of deliberate action

It is also important to consider the needs of staff and other patients.

For both categories it is likely that broadly similar tasks will need to be carried out to manage the outbreak/incident. The difference between them lays in the speed with which things happen and hence the priorities given to different tasks. Acute outbreaks/incidents are much less likely to be due to infectious causes because of the variations that occur in the natural history of these diseases (e.g. range of incubation period).

The algorithm (Figure 1) illustrates the management of acute outbreaks or incidents which is further explained in section 9.3. Here the acute nature of presentation of cases makes speed of identification of the likely agent imperative to best inform management of known cases and prevent further cases developing. The speed of response is particularly crucial for acute incidents. It is vital to seek expert advice immediately. Figure 3 illustrates the management of outbreaks/ incidents where patients present over a longer period of time, which is further explained in section 9.4.

Checklist 3: Information for public health professionals to obtain and record on receiving reports of an outbreak/ incident of unusual illness

- Who reported the outbreak/ incident?
  - Name
  - Position
  - Organisation
  - Contact details
- How has the outbreak/incident come to light?
- Where have cases occurred? Are there any common exposures recognised at this stage?
- Over what time period have cases been detected?
- Who are the cases? Are they from a particular social group or setting?
- How many cases are recognised at the moment?
- What are the symptoms experienced by the cases? (as much detail as possible)
- Have any of the cases been seen by a specialist clinician? If so what is their working diagnosis and clinical findings?
- Have specimens been taken and where have they gone for analysis? When will results be available?
- Have there been any deaths?
- Have the ambulance service and local hospitals/ GPs been warned?
- Where are the cases being managed?
- What is being done to manage cases at the moment?
  - Has decontamination of cases taken place? How?
  - What treatment if any has been instituted?
- Who else has possibly been exposed and might be at risk of developing this illness? Has a list of these been made?
- Are there any conditions occurring which might increase the risks to others e.g. health care workers exposed, ongoing incident, weather forecasts?
- What is being done to prevent the development of new cases at the moment? e.g.:
  - Protection of emergency and health care staff
  - Evacuation/sheltering
  - Quarantine
  - Prophylactic treatment
- What agencies are involved at the moment? Get contact details. Has any agency declared a major incident? Who else has been informed?
- Is there any information available about the likely cause of the illnesses at the moment?
- Is there any evidence of deliberate action in causation of the illnesses e.g. threats received?
- Are other public health units involved?

9.3 Managing acute outbreaks or incidents

For an acute outbreak/ incident, speed is necessary to ascertain the likely aetiological agent and hence ensure appropriate treatment of cases and protection of others. These episodes are most likely to be due to chemical agents, though biological toxins may also produce outbreaks of acutely ill people. Exposures to radiation are a less likely cause, but could occur for example where an abandoned source has been accidentally or deliberately disturbed. Occasionally an outbreak might be due to epidemic hysteria. Although the features of the illness, the way it has presented and the group affected may indicate this as a diagnosis early on, it is mainly a diagnosis of exclusion where no organic cause has been identified.

The urgent priority for an acute incident is to get as much information as possible about the clinical features of the illnesses and the circumstances that may have produced exposure. This should assist in identifying the likely aetiological agent and will advise on the management of casualties and on measures to be taken to protect health care and other professionals who may have been involved in managing the incident, including decontamination. Checklist 4 summarises the actions to be taken in the immediate management of acute outbreaks/ incidents.

Checklist 4: Actions for immediate public health management of an acute outbreak or incident

GATHER INITIAL INFORMATION LISTED IN CHECKLIST 1

IF YOU SEE ANY OF THE FOLLOWING:

- Single case of disease due to uncommon, non-indigenous agent in patients with no history suggesting an explanation for illness
- New or unusual clusters of infections with a number of ill people presenting around the same time
- Cluster of patients with a similar syndrome with unusual characteristics or unusually high morbidity or mortality
- Unexplained increase in the incidence of a common syndrome above seasonally expected levels occurring in an unusual setting or key sector of the community

SEEK EXPERT ADVICE in order to advise accordingly:

- Identification of likely causative agent(s)
- Likely clinical effects of agent
- Decontamination and treatment of cases
- Ensure appropriate measures to protect others and prevent other cases occurring
- Ensure appropriate investigations are conducted on cases
- Decide whether a major incident should be declared (number of casualties, use of resources)
- Assess whether more cases are likely to occur e.g. continuing exposure, weather conditions
- Establish a list of those exposed but not ill who may need follow up with contact details
- Assess whether the cases may be the result of deliberate action

ALERT OTHERS who may need to know or be involved, for example these may include:

- PCT and SHA colleagues
- Regional colleagues (neighbouring PCTs, Regional Director, regional HEPA, Resilience Groups)
- Health care providers (hospitals, EDs, GPs)
- HPA national centres of expertise (CfI, CEPR, CRCE)
- Emergency services
- Local Environmental Health Department
- Local Authorities
- County / local multi-agency emergency planning forums (which may include many of those on this list)
- Local utilities
- Other relevant agencies e.g. EA, HSE, FSA, DWI
- Emergency Planning Coordination Unit at DH
- Devolved Administrations, including their public health service
- Media

  - Consider convening an **ICT** (see section 9.5)
  - Consider lines of **communication**
  - Consider alerting and advising affected population
  - Consider a site visit (but address personal safety issues) - note this is not usually helpful for acute incidents
  - Formulate case definition and establish a database on cases
  - Arrange follow-up

9.4 Managing outbreaks or incidents with delayed presentation (see Figure 3)

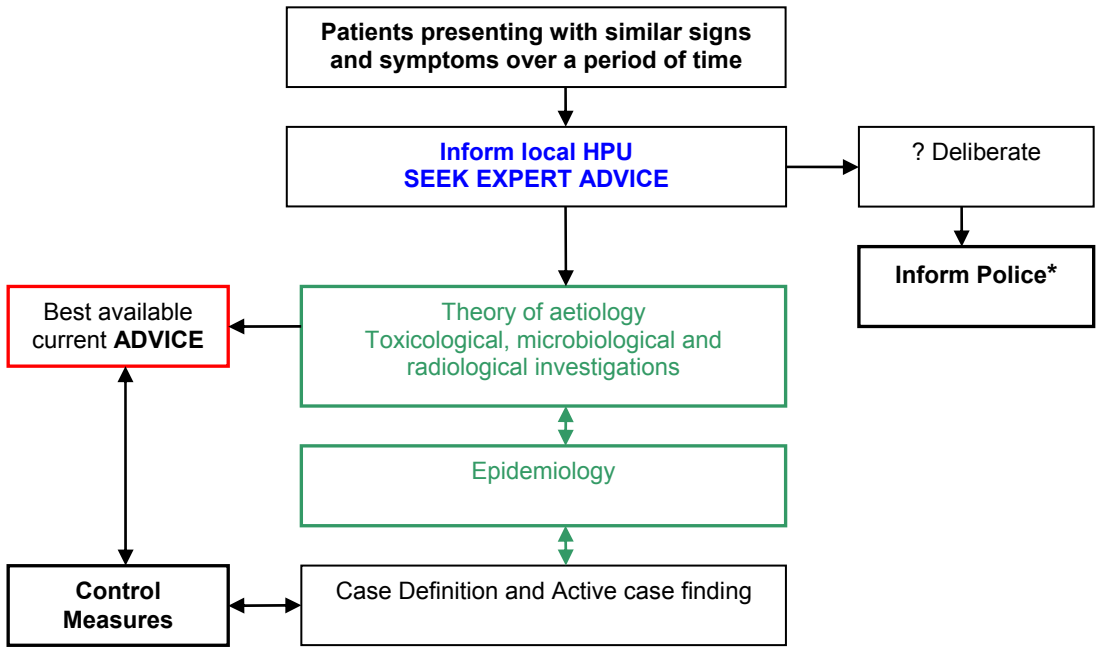
The cause of delayed onset outbreaks/incidents will usually be more uncertain than for acute outbreaks. Here an ICT should be set up at an early stage to ensure rapid investigation (see section 9.5). The important elements to be included in management are to **seek expert advice** and involvement to ensure**:**

- appropriate investigation of cases
- formulation of case definitions
- active case finding
- data collection on cases
- data collection on exposed but not ill people

- producing best available current advice on management of symptomatic cases
- producing and enacting best available current advice for public health protection including prophylaxis of persons who may have shared a common exposure
- assessment of risk to others e.g. contacts, health care worker, etc
- assessment of whether cases may be the result of deliberate action
- communication with all those who need to know

Management will essentially be an iterative process with constant refinement of the theory of aetiology and consequent advice. In the absence of a confirmed diagnosis e.g. an unknown agent, the precautionary principal should be employed until an agent is diagnosed or likely routes of transmission become known. It is important to try to ascertain the aetiological agent as soon as possible. There should be early liaison with laboratory colleagues to ensure appropriate collection and referral of samples (see section 8). It is suggested that during the management of these incidents, individuals are delegated to fulfil particular key functions and tasks which are summarised on page 48. Roles and responsibilities at local, regional and national level should be established early on in the incident.

Figure 3: Initial public health management of outbreaks or incidents with delayed presentation



*If a specific memorandum of understanding/ protocol is not in place between the local HPU/ Regional HPA Office and their local police force for dealing with such incidents, then advice on contacting the appropriate unit within the police service can be obtained from the ERD duty officer (01980 612100).

9.5 Investigation of the outbreak or incident

9.5.1 Case definitions

- A broad initial case definition should be used to avoid missing potential cases
- Subcategories of possible, probable and confirmed cases can be defined for the purpose of focusing investigative efforts
- Where cases are occurring in several districts, regions or countries it is important to ensure that standard definitions are agreed between the teams managing the incidents in different localities
- As more information becomes available the case definition may be refined

9.5.2 Active case finding

- A system may need to be instituted to actively find additional cases, and decisions will need to be taken about whether this should be done at local, regional, national or international level
- The case definitions should be supplemented with additional information to allow clinicians and pathologists to assess whether they might have cases. The contact number of a nominated medically trained individual(s) (e.g. the incident clinical adviser) should be provided in case they require additional information.

- A system should be developed for reporting of cases to a central information collection site - whether this is at a local, regional and national level depends on the extent of the outbreak or incident

Specific functions or tasks to be delegated to individuals

Function title	Function encompasses
Incident clinical adviser (e.g. Medical Director of receiving hospital)	• Advising clinicians and others reporting possible cases • Examination of clinical notes of cases where necessary • Development of proforma for collection of clinical information on cases • Collation of clinical information on cases
Incident information officers (e.g. senior clerical staff)	• Compilation and dissemination of list of essential contact details to ICT members • Receipt of case reports • Maintenance of the line-listing of cases • Regular construction and updating of epicurve • Distribution of regular epidemiological update bulletins to all who need to know • Compilation of a list of people who may have been exposed but are not as yet ill • Distribution of additional information to those who need to know e.g. changes to case definitions, clinical advice, investigative protocols etc
Microbiology and toxicology coordinators (e.g. laboratory staff of relevant specialty)	• Record and track what samples have gone to which laboratories • Chase results • Maintain database of results • Report results to incident team and local public health

9.5.3 Appropriate investigation of cases

- An initial theory of possible cause can be developed on the basis of initial clinical and epidemiological evidence
- Protocols for blind screening for toxicological and microbiological agents have been developed (see section 4.5) - expert laboratory advice should therefore be sought early in the investigation
- Decisions will need to be made with expert service providers about which national toxicology, microbiology or radiological reference laboratories to send samples to
- Nominated individuals should be assigned responsibility for chasing and compiling laboratory results and ensuring that these results are passed on to the ICT and the local public health team if this is different. Depending on the scale of the incident it may be appropriate for results to be collated at a local, regional or national level.

9.5.4 Reporting results

It is anticipated that delegated individuals within the HPA will be responsible for collating results on human and environmental samples. **All results should be reported to the relevant coordinator by laboratories processing samples**. The overall public health managerial lead for the incident will be able to direct laboratories to the relevant coordinator. This lead may be taken for example by the local HPU, a Regional Director, the chair of an ICT or STAC, or a national agency. The coordinators should be in close and continuing communication with those leading the incident.

The coordinator has responsibility to track samples and results between local and reference laboratories as well as to the HPU or ICT. Reference laboratories will communicate individual patient results to referring laboratories who should then liaise with the clinical team with responsibility for patient care. Subject to overall security considerations, it is hoped that patient name, date of birth etc will be used as identifiers for individual patients for all communications between the parties involved.

In the event of a suspected deliberate release it is possible that other bodies will need to be informed of results, for example law enforcement agencies. However, **reporting results to outside agencies should only be done by the ICT**.

9.5.5 Data collection on cases

- A line-listing of all possible, probable or definite cases should be maintained and updated. This should include as a minimum dataset: case identification, classification of case, date of presentation, location, contact details for clinician in charge of case, investigations, outcome of case (recovery, death etc).
- An epicurve of cases should be constructed and updated regularly by the incident information officer. The shape of the epicurve can give important clues as to the cause; point source versus continuing source versus propagated source.
- A proforma should be developed to gather additional epidemiological and clinical information about possible cases that need further evaluation.
- By agreement, the proforma should be completed by the patient's clinician from the case notes and where appropriate by further interview of the patient.
- The incident clinical adviser should be responsible for collating all the more detailed information.

9.5.6 Data collection on exposed but not ill people

Decisions will need to be made about how to define exposure. A list should be compiled of those who have been potentially exposed but who are not as yet ill. This should include not only the general public at risk but also health care workers and professionals from other agencies who may have been involved with the incident. The list should include name, address, and date of birth, contact details and GP details along with a classification of exposure risk.

9.5.7 Producing best available current advice on management of individual cases

- Guidance on appropriate individual management will initially be based on the working theory of aetiology.
- Advice sheets should be produced for clinicians who may encounter cases. This task would be best done by the expert advisors to the incident team and will probably need regular updating. These could be disseminated via a website such as that of the HPA.

9.5.8 Producing best available current advice for public health protection

- Guidance on appropriate public health management will initially be based on the working theory of aetiology, including how to manage exposed but not ill people.
- Information for the public should also be prepared, and this and the guidance for health care professionals should be disseminated via websites, so that it can be readily updated.

9.5.9 Assessment of whether cases may be the result of deliberate action

- On the basis of the clinical and epidemiological evidence as it evolves, repeated assessments should be made of whether cases may be the result of deliberate action.
- If deliberate action is a possibility, this should be discussed with the police immediately.
- Remember that initial cases may be the perpetrators of the crime. Seek forensic advice early if deliberate release is a possibility

9.5.10 Communication

- A focal point for contact about the incident should be identified.
- Effective communication with all those who need to know is crucial to the management of any outbreak/ incident.
- Systems need to be set up from the outset to ensure that regular updates and communications are built into investigation and management.
- A full list of all essential contact details should be compiled and disseminated to all parties involved by a nominated individual. This should be updated regularly.
- The incident information officer should disseminate regular updates of summary data and developments to all parties involved in management.
- For a list of those who may need to be alerted see checklist 4.
- A nominated press office should handle all media enquiries for the incident.

9.6 Incident control team

An incident control team (ICT) is likely to be necessary for either type of incident. This would usually be chaired by the CCDC, Regional Director or national epidemiologist, depending upon the scale and geographical spread of the incident. It should include: representatives from key organisations involved

in the management of the incident with the necessary seniority and expertise to be able to take decisions, the designated press officer and secretarial support. A suggested agenda for the first meeting is given in checklist 5.

It is not possible in this document to provide guidance beyond these initial stages of incident investigation and management, however throughout the incident the team will need to re-appraise:

- evidence regarding cause
- investigations required
- measures to manage individual cases and for public health protection
- risk assessment for public health
- likelihood of deliberate action
- resource requirements
- communications

In the event of an emergency where there is likely to be a requirement for coordinated scientific or technical advice a Science and Technical Advice Cell (STAC) should be established (arrangements for the STAC will have been agreed through the Local Resilience Forum). The STAC will provide the best possible advice in a timely, coordinated and understandable format to those involved in the response. **It will also need to consider:**

- criteria for declaring the outbreak/ incident over and dissemination of this information
- post incident report writing, including any lessons identified
- post incident health monitoring, particularly where the causative agent was chemical or radiological

Checklist 5: Suggested agenda for first ICT meeting

1.Purpose/ objectives

- Agree facts as currently known
- Agree a case definition
- Ensure that care of cases is appropriate given current knowledge of aetiology
- Decide how others should be protected given current knowledge of aetiology, who will be responsible for this and how it will be resourced
- Define measures necessary to identify the cause of the illnesses, including environmental sampling as appropriate

2. Incident/ assessment and planning

- Examine available evidence re aetiology and consider whether the incident may be the result of deliberate action
- Risk assessment -assess risks to public health given current knowledge of aetiology
- Consider who else is at risk, including health professionals and other agencies who may have been involved in managing the incident

3. Decisions/ actions

- Define mechanisms for data collection and collation
- Determine whether active case finding is necessary and how this will be done
- Define measures necessary to monitor the effectiveness of containment
- Summarise actions and those responsible

4. Allocation of roles

- Define roles and responsibilities
- Identify personnel and other resources necessary to manage the outbreak/ incident
- Identify additional expert assistance which may be required for investigation or management of the illnesses
- Assign functions both within and outside the ICT

5. Communications

- Identify who needs to know
- Agree lines of communication
- Define measures for communication to the public, press and other organisations and individuals

6. Any Other Business

- Decide the necessary frequency of meetings

GUIDANCE FOR COMMUNITY PHARMACISTS

10. Guidance for Community Pharmacists

This guidance provides advice to community pharmacists on how to deal with incidents of unusual illness such as those caused by chemical, biological and radiological agents. Although cases of these will be rare, people with suspected unusual illness may present at a pharmacy.

A community pharmacist, or pharmacy staff, may become involved with incidents of unusual illness in several ways:

- A patient suffering from an unusual illness may present at a pharmacy. Many symptoms of exposure to biological or chemical agents could present as influenza like symptoms, eye irritation, diarrhoea or vomiting etc.
- An exposure may occur in a setting where the pharmacy is situated, e.g. on the street outside a pharmacy

10.1 Action to take on recognising cases of unusual illness:

Prepare in advance by taking a look at your pharmacy and consider how you would control access and segregate patients / members of the public. At the initial assessment a person may appear to have an unusual illness by virtue of its type, severity and / or symptoms. If such a case is recognised you should:

- Think about it using the algorithm in Figure 1
- Refer for advice to usual local sources and raise your concerns as necessary (details of local resources should be kept in the pharmacy and be easily accessible)
- Discuss with your local Health Protection Unit (contact details for the local HPU should be kept in the pharmacy)

A pharmacist's direct involvement with cases will differ according to the category of incident. In an acute incident the most severely affected casualties will be taken to hospital. However, some people with minor symptoms may be unaware they have been exposed to any hazard and could present at a pharmacy. In a delayed incident pharmacists may be the first port of call for the patient, who may not be aware that they have been exposed to any hazard. It is important for the pharmacist to take a thorough history in order to determine the likely cause in situations where there is a high index of suspicion.

Where an incident of unusual illness has been recognised in another setting but could potentially affect other members of the public, the local HPU or incident control team should ensure that pharmacists are given all the necessary information in order to safely manage people entering the pharmacy and protect themselves and their staff. The guidance would help pharmacists to make the correct decisions under the specific circumstances.

10.2 Personal safety and containment

If you suspect that a person has an unusual illness consider the safety of yourself, your staff and other members of the public. It is not possible to outline appropriate measures for all possible scenarios in this document but you should call for expert advice immediately. The experts will advise you on personal safety, the further management of the suspected casualty and the management of any exposed people such as yourself and your staff. It is recommended that all pharmacies have relevant Personal Protective Equipment (PPE) such as face masks, gloves, eye protection etc readily available in the pharmacy and that pharmacist's and their staff wear the appropriate level of PPE where there is a high index of suspicion. The suspected casualty could be taken to the consultation area, or other appropriate area, as a means to isolate them, until a more thorough assessment can be made. The physical attributes of facilities will need to be considered e.g. an enclosed room with poor ventilation may be suitable to isolate a patient with an infectious agent. However, it would be unsuitable to assess a patient potentially contaminated with a volatile chemical where the concentrations of chemical in the air could build up. Another consideration would be the ease of decontamination of the consultation room. Ideally keep 'potentially contaminated' patients in a pre-designated 'dirty' area to prevent secondary contamination[4]. If you come into unprotected contact with a contaminated person you must consider yourself to be a casualty.

[4] Grynszpan D, Ruggles R, Stockley S, Checkley E, Lusmore A, Murray V. (2009) Development of a guidance pack for primary care on managing self-presenters after a chemical incident. *Chem Hazards and Poisons Report* **15**: 29-31.

10.3 Further management of cases
The local HPU will advise on the further management of cases. The suspected casualty may be sent home with advice or perhaps prophylaxis depending on the likely agent involved. Alternatively, in the majority of cases, the suspected casualty will be transferred to a hospital for further investigation and care. Always ask the HPU at what level of risk suspected casualties should be transported so that you can pass this information onto the ambulance services. Sometimes decontamination of patients may be required prior to transfer and this will usually be carried out by ambulance services at the scene.

You should not carry out any investigations on the patient – these should be done in the hospital environment or other appropriate facility.
Where a decision to transfer to hospital has been made the pharmacist should:

- Call an ambulance and let ambulance control know that the patient is potentially infected or contaminated and whether decontamination has been recommended
- Call the hospital to which the patient is to be taken (HPU may advise on which hospital to use) and inform the relevant clinician to ensure that they are aware of the situation and the suspected cause
- Inform the patient's GP if details of the GP are known and consent has been given

10.4 Further health protection for exposed people
The local HPU will advise you if any decontamination, prophylaxis or other follow-up is required for other exposed people including you and your staff. The pharmacist should make a list of all those people believed to have been exposed and this should contain the name and address of the pharmacy; name, age, contact details and likely level of exposure of potentially exposed people. Advice about environmental decontamination, which may be necessary, and how this should be arranged, will be provided from the appropriate expert advice provider (see appendix 1)

10.5 Record keeping
It is essential that you keep comprehensive records. These should include details of the potential casualty and the suspected cause, details of the advice received, source of advice and contact number, actions taken to protect self and others and who else has been informed and what information you gave them. It should also contain the details of potentially exposed people (see above). All entries should be dated, timed and signed where possible.

It is recognised that exposure to an unusual illness may cause disruption to the normal running of the pharmacy.

Bibliography

Relevant references and links to resources

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DH (2002) Deliberate release of biological and chemical agents: Guidance to help plan the health service response http://www.dh.gov.uk/assetRoot/04/07/17/86/04071786.pdf or http://www.dh.gov.uk/PolicyAndGuidance/EmergencyPlanning/DeliberateRelease/fs/en

Grynszpan D, Ruggles R, Stockley S, Checkley E, Lusmore A, Murray V. (2009) Development of a guidance pack for primary care on managing self-presenters after a chemical incident. *Chem Hazards and Poisons Report* **15**: 29-31.

HPA Deliberate and Accidental Releases - general documents and links for incident investigation http://www.hpa.org.uk/deliberate_accidental_releases

HPA biological releases - information and agent specific guidelines http://www.hpa.org.uk/deliberate_accidental_releases/biological

HPA chemical releases - information and guidelines http://www.hpa.org.uk/deliberate_accidental_releases/chemical

HPA radiological - chromosome dosimetry service www.hpa.org.uk/HPA/ProductsServices/Radiation/ChromosomeDosimetry/

HPA radiological releases - information and guidelines http://www.hpa.org.uk/deliberate_accidental_releases/radiological

HPA local services – links to Health Protection Units www.hpa.org.uk/HPA/ProductsServices/LocalServices/

HSE (2005) Controlling the risks of infection at work from human remains – A guide for those involved in the funeral services (including embalmers) and those involved in exhumation.

Joint Royal Colleges Ambulance Liaison Committee guidelines http://jrcalc.org.uk

Protocol for the investigation of microbiologically unexplained serious illness and death (2008) www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1215675142361

Triage, Monitoring and Treatment (TMT) Handbook (2009) www.tmthandbook.org

Report of the Advisory Group on Ionising Radiation on High Dose Radiation Effects and Tissue Injury (2009) www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1237362785060

Radiation Event Medical Management www.remm.nlm.gov

UN Packaging Instructions PI620/ PI602 www.unece.org/trans/danger/publi/adr/adr_e.html

Appendix 1
USEFUL CONTACT NUMBERS FOR HEALTH PROFESSIONALS ONLY

1a. Expert support agencies
1b. Specialist reference Laboratories

For contact details of local HPUs – office & out of hours telephone numbers see
http://www.hpa.org.uk/lars_homepage.htm

Appendix 1a – Expert Support Agencies

AGENCY	PHONE (24 HR)	E-MAIL
HPA Centre for Emergency Preparedness and Response (CEPR)	01980 612100	erd@hpa.org.uk
National Public Health Service for Wales	01443 824160	general.enquiries@nphs.wales.nhs.uk
Communicable Disease Surveillance Centre Northern Ireland	02890 263765	cdscni@hpa.org.uk
Health Protection Scotland	0141 300 1100 0141 211 3600	hpsenquiries@HPS.scot.nhs.uk
INFECTIOUS DISEASES **HPA Centre for Infections (CfI)**	020 8200 4400 020 8200 6868	DrComments@hpa.org.uk
CHEMICAL HAZARDS **HPA Centre for Radiation Chemical and Environmental hazards (CRCE)**	National on-call number: 0870 6064444	chemicals@hpa.org.uk
National Poisons Information Service (NPIS)	0870 2432241	
RADIOLOGICAL HAZARDS **HPA Centre for Radiation Chemical and Environmental hazards (CRCE))**	01235 831600	rpd@hpa.org.uk
Radiation and Environmental Monitoring Scotland	0141 440 2201	HPAScotland@hpa.org.uk

Appendix 1b - specialist reference laboratories for unknowns or deliberate release agents http://www.hpa.org.uk/HPA/Topics/InfectiousDiseases/InfectionsAZ/1201265894878/
Further information and links to specialist microbiology tests and reference services can be found at, http://www.hpa.org.uk/HPA/ProductsServices/InfectiousDiseases/LaboratoriesAndReferenceFacilities/
Specific information and guidelines on deliberate release agents see http://www.hpa.org.uk/deliberate_accidental_releases

DISEASE	LABORATORY	PHONE (24 HR unless otherwise stated)
UNKNOWN	Contact EIZ department at HPA CfI in the first instance (see section 8.2.4) Also see undiagnosed protocol	020 8200 4400 / 6868 020 8327 7483 (9am-5pm)
ANTHRAX	Special Pathogens Reference Unit, HPA CEPR OR HPA South West, Bristol Royal Infirmary	01980 612100 01980 612224 (9am-5pm) 0117 342 3242
BOTULISM	Food Safety Microbiology Laboratory, HPA CfI	020 8200 4400 / 6868 020 8327 7116/ 7117 (9am-5pm)
BRUCELLOSIS	Brucella Reference Unit, HPA Collaborating Laboratory, University Hospital Aintree, Liverpool OR Department of Statutory and Exotic Bacterial Diseases, Veterinary Laboratory Agency, Weybridge	0151 529 4900 OR 0193 234 1111
GLANDERS AND MELIOIDOSIS	Laboratory of Health Care Associated Infection, HPA CfI	020 8200 4400 / 6868 020 8327 7224 (9am-5pm)
PLAGUE	Laboratory of Enteric Pathogens, HPA CfI	020 8200 4400 / 6868 020 8327 6173 (9am-5pm)
Q FEVER	HPA South West, Bristol Royal Infirmary OR Special Pathogens Reference Unit, HPA CEPR	0117 342 3242 OR 01980 612100 01980 612224 (9am-5pm)
SMALLPOX	Virus Reference Department, HPA CfI OR Special Pathogens Reference Unit, HPA CEPR	020 8200 4400 / 6868 020 8327 3117 (9am-5pm) OR 01980 612100
TULAREMIA	Special Pathogens Reference Unit, HPA CEPR	01980 612100 01980 612224 (9am-5pm)
VIRAL HAEMORRHAGIC FEVERS	Virus Reference Department, HPA CfI OR Special Pathogens Reference Unit, HPA CEPR	020 8200 4400 / 6868 020 8327 3117 (9am-5pm) OR 01980 612100
CHEMICALS	HPA CRCE (formerly CHaPD)	National on-call number: 0870 6064444
RADIATION	HPA CRCE (formerly RPD)	01235 831600

Appendix 2 - Chemical incident analysis request form for use with Toxi-Boxes or ChEAKs (Chemical Exposure Assessment Kits)

CHEMICAL INCIDENT ANALYSIS REQUEST FORM

Unless you are certain which samples are required and to which analytical toxicology laboratory they should be sent, please check first with HPA (0870 606 4444)

PLEASE COMPLETE IN BLOCK CAPITALS

REQUESTNG LABORATORY (Req Lab):

ANALYTICAL TOXICOLOGY LABORATORY (ATL):

PATIENT DETAILS	Surname:	First name:	Sex:
Hospital number:		Date of birth:	Age:
Hospital/Trust:		Ward/Unit:	
Analysis requested by:		Consultant:	

SAMPLE DETAILS

Sample date	Sample time	Sample type	Req Lab No	ATL No
		Heparinised blood (10ml)		
		EDTA blood (10ml)		
		Heparinised blood (5ml) glass		
		Urine (30ml)		

EXPOSURE DETAILS

Place and nature of exposure:	
Date (dd/mm/yy) of exposure:	
Time exposure occurred (24 hr clock):	
Exposed to (give name of chemical or CAS number if available):	
Length of exposure (estimate duration in minutes):	

Name and address for report:

Telephone number:

Clinical features (Please describe these as fully as possible):

Brief Description of Incident (Incident Reference Number if relevant)

Name and address for invoice:

Telephone number:

CHAIN OF EVIDENCE FORM	A form has been completed and accompanies these specimens (Yes/No):

BEFORE REFERRING THESE SPECIMENS, PLEASE NOTIFY THE ANALYTICAL TOXICOLOGY LABORATORY AND KEEP A KEEP A COPY THE COMPLETED REQUEST FORM

Appendix 3 - Chain of evidence documentation

Chain of evidence form					
HOSPITAL/TRUST					
PATIENT DETAILS	Patient name:			Sex:	Date of birth:
	Hospital number:		Postcode:		Ward:
Requesting doctor:			Bleep number:		Consultant:
SAMPLE DETAILS					
Sample type/description		Sample date	Sample time	Laboratory/ specimen number	
HANDOVER DETAILS					
Person handing the sample(s) over			**Person receiving the sample(s)**		
Name:	Grade:		Name:		Grade:
Signature:	Date & time:		Signature:		Date & time:
Person authorising the transfer					
Name:		Signature:			Date:
Address:					Form number:

- To be used where deliberate release is suspected or other forensic considerations are important
- Please note that **a separate form must be filled in every time samples change hands**, starting from the doctor taking the samples
- All forms should be kept together and numbered in sequence
- Any break in the chain of evidence documentation may compromise the evidential value of the sample
- The consultant in charge of the case should authorise the transfer of sample(s) to the laboratory and this may be verbal as samples should not be delayed – but the consultant must sign the form as soon as practically possible
- Laboratories will have their own local protocols for who is sufficiently senior to authorise sample handover and these should be adhered to

Appendix 4 - Information to record in case(s) of unusual illness

Name of clinician recording information with contact details
Hospital
Number of cases
Is deliberate release suspected?
Is there any information about others who might be exposed/ at risk (including staff)?

For each case:

- Name
- Address
- Sex
- Age
- Occupation
- GP details
- Date and time of presentation
- Mode of presentation (walk-in, ambulance, GP referral etc.)
- Name of senior clinician in charge
- Ward
- Date/time of onset of symptoms
- Nature of symptoms/severity of illness
- Has there been an expert clinical assessment? By whom?
- Clinical findings (who performed assessment?)
- Any risk factors/exposures identified?
- Relevant past medical history/ drug history?
- Vaccination status
- Samples taken
- Investigations undertaken and results available
- Working diagnosis
- Management: decontamination, treatment
- Outcome
- Autopsy – if done where?

What is being done to prevent the development of further cases e.g. patient containment/ staff protection?

Record all staff in contact with the patient with their personal contact details.

Appendix 5: Action Cards

Concise guides or aide memoires developed for use by on-call or public health staff faced with a radiation (card 1), biological (card 2) or chemical (card 3) emergency. Latest versions available at: http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/DeliberateReleases/ImmediateAction/

Deliberate or Accidental Releases
Immediate Action and Guidance for Public Health

Card 1: Radiation

Health Protection Agency

Emergency Response

Has a Major Incident been declared?	Yes ☐	No ☐	Standby ☐

Ensure the following have been alerted

HPA		NHS		Other	
Local HPU – ask the HPU to alert those below	☐	PCT Emergency Planner	☐	Police	☐
CEPR	☐	Hospital A&E Departments	☐	Fire & Rescue	☐
Regional HEPA	☐	PCT Director of Public Health	☐	Ambulance	☐
RPD	☐				
Communications	☐				

Incident	**Details**
Location	*(including postcode)*
Date and time	
Population affected: places	
Population affected: groups	
If airborne release: wind direction	*(expressed as 'blowing from...')*

Have Police, Fire & Rescue or Ambulance Service detected radiation?			Yes ☐	No ☐
If Yes, then which service?	What level of radiation?	*(units)*	Where?	

Health Protection

Emergency plans Follow advice from applicable specific plan, eg nuclear sites, submarines, nuclear weapons transport ('LAESI') or RADSAFE (transport). Advice may include 'No need to take precautions/protection'.

If airborne hazard is suspected, the police/fire services should use FireMet/CHEMET to identify downwind hazard sector. If no specific plan, seek local radiation support through the police using the NAIR scheme (tel: 0800 834153) and, if an extended or dispersed hazard is suspected, the default public health message is **'Go In, Stay In, Tune In'**.

Reducing radiation exposure Remember: Time, Distance, Shielding. Minimise time near source, maximise distance from source, shield people from the source. 'No hands to mouth' if contamination is suspected.

Stable iodine tablets Only protect against radioactive iodine intake – only likely to be necessary for operating nuclear reactors. Specific arrangements are in place in relevant locations.

Contamination on skin/clothing If there are concerns about people who have gone home with radioactive contamination on skin/clothing they should be advised to place clothes in a sealed plastic bag, seal in a second bag and take a shower as normal to remove most external contamination.

Personal Protective Equipment Depends on type of work undertaken. Emergency services should have their own equipment and consult their occupational health service. PPE should only be used by trained personnel. Normal infection control measures (disposable gloves, aprons and masks depending on circumstances) should prevent personal contamination and intake. PPE does not protect against external beta/gamma radiation.

Urgent protection measures
Implemented in specific emergency plans as averted dose. Lower and upper levels generally applicable to 'favourable' and 'unfavourable' circumstances, respectively.

	Dose (millisieverts 'mSv')		
	Lower	Upper	Notes
Sheltering indoors	3	30	Whole body dose
Evacuation	30	300	Whole body dose
Stable iodine tablets	30	300	Thyroid dose ASAP (within 6 hours)

Page 1 of 2 **December 2008**

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www.hpa.org.uk

Radiation and its Health Effects

Radiation exposure pathways	
External	From direct contact with or proximity to radioactive material or other radiation source (eg X-ray generator).
Internal	From radioactive material entering the body through inhalation, ingestion or wound contamination.

Radiation types	
Alpha	Internal hazard only – stopped by a sheet of paper
Beta	External and internal hazard – stopped by thin sheet of plastic
Gamma	External and internal hazard – shielded by dense material

Risks from radiation exposure

Radiation is carcinogenic – in general, there is a fatal cancer risk of 1 in 20,000 (0.005%) per millisievert (mSv) of 'effective dose' with no lower threshold. Effective dose is a measure of radiation-induced harm. It takes into account exposure of different body tissues to different types of radiation. Natural radiation exposure is typically a few millisieverts every year.

High whole body radiation exposures delivered rapidly – effects in dose ranges

Less than 1 sievert *Usually asymptomatic*	1–8 sievert *Haematopoietic syndrome*	6–20 sievert *Gastrointestinal syndrome*	More than 20 sievert *CNS/CV syndrome*
• Symptoms mild or absent • Episodic nausea, vomiting in first 48 hours in 1%–10% • Mildly depressed WBC at 2–4 weeks • No foetal effects if effective dose less than 100 mSv • Counselling needed if pregnant and effective dose more than 100 mSv	• Anorexia, nausea, vomiting, fatigue: 1–4 hours after exposure, timing and severity dose related • Latent period: 2 days – 4 weeks • Bone marrow depression: leucopenia – infection; low platelets – bleeding, bruising • Serial lymphocyte counts in first 48 hours predict severity • 3–4 sievert: hair loss at 2–3 weeks • $LD_{50/60}$ is around 4.5 sievert without treatment	• Early nausea, vomiting, diarrhoea, anorexia, fatigue • Latent period: hours – 1 week • Severe gastrointestinal symptoms (fever, abdominal pain, cramps, watery diarrhoea, haemorrhage, electrolyte imbalance, dehydration) coupled with bone marrow depression • LD_{100} is about 10 sievert, death usually within 2 weeks	• Almost immediate projectile vomiting, explosive bloody diarrhoea, headache, collapse, confusion, loss of consciousness, agitation, burning sensation on skin • May be lucid interval (hours) • Neurological and cardiovascular symptoms predominate: convulsions, coma, hypotension, shock • Death within 2–3 days

Whole body doses less than 0.5 sievert are unlikely to cause acute symptoms.

Partial body exposure may occur and lead to reduced or localised effects (eg skin damage, burns, ulcers).

Assessing radiation exposure

High exposures (over 100 mSv) can be assessed by biodosimetry (chromosomal aberration, blood cell counts etc).
Doses from intakes can be assessed through direct body measurement (gamma emitters) or analysis of excreta coupled with bioassay.
Dose can often be assessed from modelled or measured environmental conditions. The HPA will assess doses to the public.

Further Information

Topic	Website	Search terms
DH emergency planning guidance	www.dh.gov.uk	Emergency planning guidance radioactivity
Effects of radiation	www.hpa.org.uk	CBRN incidents radiation
CBRN incidents	www.hpa.org.uk	CBRN incidents
Incident recovery	www.hpa.org.uk	Recovery handbook 2008

To suggest improvements to this card please email: drcomments@hpa.org.uk.

Deliberate or Accidental Releases
Immediate Action and Guidance for Public Health

Card 2: Biological Agents

Health Protection Agency

Date:

Emergency Response

If you see any of the following:

- New or unusual clusters of infections (number of ill people presenting about the same time)
- Cluster of patients with:
  a similar syndrome with unusual characteristics, *or* unusually high morbidity and mortality,
  or groups of healthcare workers suffering a similar illness
- Unexplained increase in the incidence of a common syndrome:
  above seasonally expected levels, *or* occurring in an unusual setting or key sector of the community
- Single case of disease with unusual or unusually severe symptoms and no history suggesting an explanation for illness

Stop / Think / Act !

Has a Major Incident been declared?	Yes ☐	No ☐	Standby ☐
HPA CfI 24-hour Duty Doctor contact number:	020 8200 4400 / 6868		

Ensure the following have been alerted

HPA		NHS		Other	
Local HPU (out-of-hours relevant public health on-call) – request internal cascade to:	☐	Medical Microbiologist and/or Infectious Disease Consultant	☐	Gold Command – if major incident response has commenced	☐
CfI and CEPR	☐	Director of Infection Prevention and Control/Infection Control Team	☐	Police	☐
Regional Microbiology Network	☐	Hospital A&E Departments	☐	Fire & Rescue	☐
Regional HEPA	☐	PCT Director of Public Health/ PCT Emergency Planner	☐	Ambulance Service	☐
Communications	☐	Strategic Health Authority	☐		

Incident	Details
Location *(including postcode)*	
Date and time	
Population affected: places	
Population affected: groups	
Wind direction and speed	
CHEMET requested	
Topography	

Do Police, Fire & Rescue, or Ambulance Service have information or evidence implicating a biological release?	Yes ☐	No ☐
If Yes, please give further information (e.g. suspect biological agent):		

Emergency plans Follow advice from applicable specific plans if available. Advice may include 'No need to take precautions/ protection'. If airborne hazard is suspected, the Police/Fire Services should use FireMet/CHEMET to identify downwind hazard sector. If an extended or dispersed hazard is suspected the default public health message is **'Go In, Stay In, Tune In'**

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Health Protection

In an *unknown* situation use Complete Universal Precautions. Always consider the risk to yourself/others.
Do Not attempt emergency treatment/rescue in a dangerous situation.

Infection control – protection and personal protective equipment (PPE) for healthcare workers caring for patients **If in doubt: use full PPE/Complete Universal Precautions**	
No person-to-person transmission: Anthrax (inhalational), Botulism	**No Special Precautions** Always use appropriate infection control procedures according to local policy
Rarely transmissible person-to-person: Tularemia, Glanders, Melioidosis, Q-fever, Brucellosis	**Standard Universal Precautions** Simple barrier and droplet precautions: PPE includes disposable gown, apron, gloves, surgical or FFP2 mask, eye protection for taking blood and splash hazards
Transmissible from person-to-person and from contaminated fomites: Smallpox, Pneumonic Plague, Viral Haemorrhagic Fevers	**Complete Universal Precautions** With respiratory protection: full PPE includes gown, gloves, boots, head cover, dust-mist (FFP3) respirator mask, eye protection
Decontamination of surfaces and/or spills	As per local protocol – autoclave or incinerate clinical waste

Possible Presenting Symptoms of Key Biological Agents

Agent	Incubation period	Symptoms/features
Anthrax (inhalational)	1–6 days (up to 60 days)	Initially flu-like. Abrupt onset respiratory failure. Nausea, vomiting, cyanosis, sweating, altered mental status, raised red cell count. Chest X-ray: widened mediastinum supports the diagnosis
Botulism	Hours – 8 days	Symmetrical descending flaccid paralysis, afebrile, no change in sensory awareness, double/blurred vision and speech difficulties common. Sudden respiratory paralysis possible if toxin inhaled. Nausea, vomiting, diarrhoea
Brucellosis	5–30 days (up to 6 months)	Variable, may be acute or insidious. Prolonged fever, debilitation, weight loss, general malaise, muscle and joint pain, sweating
Melioidosis/ Glanders	1–21 days (but long latent intervals)	Fever, variable may be acute with rapid progression. Pneumonia, skin or soft tissue infection with multiple abscesses possible, sepsis syndrome
Pneumonic Plague	1–4 days	Sudden onset severe febrile respiratory illness. Fulminant pneumonia often with haemoptysis. Chest X-ray: pneumonic consolidation. Complications include septicaemia and meningitis
Q-fever	7–30 days	Flu-like illness, cough. Chronic malaise and fatigue. Pneumonia, possibly hepatitis, neurological symptoms, thyroiditis, anaemia, rash, gastroenteritis, endocarditis, glomerulonephritis
Smallpox	7–17 days	Sudden onset high fever, 2–3 days later rash – more prominent on face and extremities, lesions cropping simultaneously in affected sites
Tularemia	1–21 days	Flu-like disease if pneumonic, systemic symptoms follow 3–5 days later, may be pneumonic, typhoidal or septicaemic
Viral Haemorrhagic Fevers	Varies with cause (1–21 days)	Acute febrile illness, prostration and signs of increased vascular permeability and circulatory failure. Clinical features vary with infecting agent. Haemorrhage is often a late feature

Further Information

Topic	Website	Search terms
DH emergency planning guidance	www.dh.gov.uk	Emergency planning, deliberate biological release
Accessing stocks or pods for immediate response in a major incident	www.dh.gov.uk	UK reserve
CBRN incidents	www.hpa.org.uk	Emergency response, CBRN
Deliberate and accidental releases	www.hpa.org.uk	Deliberate releases, biological releases, unusual illness, emergency clinical situations, suspect packages

To suggest improvements to this card please email: drcomments@hpa.org.uk

Deliberate or Accidental Releases
Immediate Action and Guidance for Public Health

Card 3: **Chemicals**

Health Protection Agency

Date:

Emergency Response

Has a Major Incident been declared?	Yes ☐	No ☐	Standby ☐
HPA CHaPD 24-hour contact number:	0844 892 0555		

Ensure the following have been alerted

HPA		NHS		Other	
Local HPU (out-of-hours relevant public health on-call) – request internal cascade to:	☐	PCT Director of Public Health	☐	Gold Command – if major incident response has commenced	☐
CHaPD	☐	Hospital A&E Departments	☐	Police	☐
CEPR	☐	PCT Emergency Planner	☐	Fire & Rescue	☐
Regional HEPA	☐	Strategic Health Authority	☐	Ambulance Service	☐
Communications	☐			Environment Agency	☐
				Met Office	☐

Incident	**Details**
Location *(including postcode)*	
Date and time	
Population affected: places	
Population affected: groups	
Wind direction and speed	
CHEMET requested	
Topography *(e.g. urban, undulating)*	

Have Police, Fire & Rescue or Ambulance Services detected a chemical release?	Yes ☐	No ☐
If Yes, then which service?		
Detection equipment (e.g. HAZMAT ID)		

Chemical	CAS number (if known)	Form (liquid/solid/gas)	Chemical concentration	Location/postcode/grid reference (multiple site incidents)

Emergency plans Follow advice from applicable specific plans if available, e.g. COMAH. Advice may include 'No need to take precautions/protection'. If airborne hazard is suspected, the Police/Fire Services should use FireMet/CHEMET to identify downwind hazard sector. If an extended or dispersed hazard is suspected the default public health message is **'Go In, Stay In, Tune In'**

Health Protection

What are the physical properties of the chemical(s) that you should be looking for?	
Odour/colour	Distinctive, recognisable?
Dispersion properties	Heavier (spreads at ground level) or lighter than air (more likely to disperse)

Potential sources	Due to nearby industry, transport accidents or could this be a deliberate release?
Exposure reduction	Ensure your own safety. Emergency services will adopt personal protective equipment (PPE) based on an ongoing risk assessment, usually advised by the Fire & Rescue Service. Decontamination may be required
Resultant symptoms	Has exposure caused clear symptoms? Use to identify potential chemicals (see overleaf)

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Clinical Effects

Chemical group	Exposure route		
	Inhalation	Dermal	Ingestion
Lung damaging agents and corrosives: Chlorine, Phosgene	Upper and lower respiratory tract irritation, stridor, dyspnoea, wheezing, pulmonary oedema	None if exposure to gas. Exposure to liquid at low temperature can cause burns	Oral pain, ulcerations, drooling, dysphagia, vomiting, abdominal pain, perforation
Nerve agents: Tabun, Sarin, Soman, VX	Constricted pupils, painful and dim vision, excess secretions of saliva and sweat, breathing difficulty, increased respiratory rate, muscle twitching, convulsions, coma, chest tightness, rhinorrhoea	Localised sweating, may lead to systemic effects	Vomiting, abdominal pain, nausea, diarrhoea, involuntary defecation otherwise as per inhalation
Blister agents: Sulphur Mustard (Mustard Gas), Lewisite, Phosgene Oxime	Hoarseness, voice loss at 2–6 hours. Cough developing over 1–3 days – necrotic slough may be coughed up. Dyspnoea, fever, painful swollen throat. Chemical pneumonitis and bronchiolitis. Late onset pneumonia: main cause of mortality. Bone marrow depression leading to fall in white blood cell count. *Eyes* – mild effects: watering, gritty red painful eyes, periorbital oedema; moderate to severe effects: painful blepharospasm leading to temporary blindness, corneal ulceration	Reddening and slight oedema of the skin at 4–6 hours, reddening may fade to leave areas of hyperpigmentation. Blisters filled with clear to yellow fluid appear at 13–24 hours	Nausea, vomiting, pain, bloody diarrhoea, dehydration in severe cases. Systemic effects may then occur following acute exposure: generalised malaise, anorexia
Cyanides: Hydrogen Cyanide, Cyanogen Chloride	Severe exposure: Immediate rapid deep breathing. Convulsions 20 seconds later. Collapse, respiratory arrest and fixed dilated pupils within minutes. Cyanosis unusual. Skin sometimes cherry red. Moderate exposure: Dizziness, headache, nausea and vomiting, agitation, excitation, dyspnoea, tight chest, convulsions and coma if exposure prolonged Mild exposure: Dizziness, headache, nausea, dyspnoea, tight chest, anxiety, metallic taste in mouth	Skin irritation, burns in case of cyanogen chloride. Hydrogen cyanide gas has no effect on skin	N/A

Agent-specific Interventions – *see www.toxbase.org*

NB: Pod activation via ambulance service or blood transfusion service

Agent	Intervention
Chlorine/ Phosgene	Airway and ventilation if signs of respiratory failure. Give Salbutamol +/– inhaled steroids for wheeze or bronchospasm
Nerve agents	Administer Combopen if available. Atropine and ventilatory support are the mainstay of treatment. Oximes (e.g. Pralidoxime) and Diazepam should also be given
Lewisite/ Mustard Gas	There is no specific therapy for sulphur mustard poisoning. Treatment is symptomatic and supportive. If exposure is via oral route, activated charcoal may be of use. (Gastric lavage or emetics are not indicated.) British Anti-Lewisite, Dimercaprol, is a specific antidote for Lewisite poisoning: can be given i.m. and used as an ointment
Cyanide	Give Dicobalt edetate in the case of life-threatening cyanide poisoning **only**

Further Information

Topic	Website	Search terms
Chemicals – uses, properties and effects and information on decontamination	www.hpa.org.uk/chemicals	Chemical compendium
CBRN incidents	www.hpa.org.uk	Emergency response, CBRN
TOXBASE (the clinical toxicology database of the UK NPIS)	www.toxbase.org	–
Accessing stocks or pods for immediate response in a major incident	www.dh.gov.uk	UK reserve

To suggest improvements to this card please email: drcomments@hpa.org.uk