Guidelines for Smallpox Response and Management in Scotland in the Post-Eradication Era

Revised May 2004

Acknowledgement
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Executive Summary

1. This smallpox plan outlines the pre and post-event activities that need to be, or would be undertaken, in Scotland in response to a smallpox emergency.

2. Many biological agents could be used to attack civilians. However, only a few, such as smallpox virus, have the ability to cause illness or panic to the extent that existing medical and public health systems would be overwhelmed.

3. Although smallpox was declared eradicated in 1980, there remains concern that smallpox virus may exist in laboratories other than the two WHO designated repositories; the Center for Disease Control and Prevention (CDC) Atlanta, USA, and the State Research Center of Virology & Biotechnology, (the Vektor Institute) Novosibirsk, Russia.

4. If an outbreak of smallpox were to occur, several factors could contribute to a more rapid spread of smallpox than was routinely seen before this disease was eradicated. These factors include:
   • low population immunity to smallpox in the absence of naturally occurring disease and the discontinuation of routine vaccination
   • delayed recognition of smallpox by health professionals who are unfamiliar with the disease, and
   • increased mobility and crowding of the population.

5. Because of these factors, a single case of smallpox would require an immediate and co-ordinated public health and medical response to contain the outbreak and prevent further infection of susceptible individuals.

6. The plan incorporates, and extends, many of the concepts and approaches that were successfully used 30 to 40 years ago to control smallpox. It is based on the Memorandum on the Control of Outbreaks of Smallpox published in 1975 by the UK Health Departments.

7. Since UK National, Scottish and local healthcare workers, emergency planners/advisers, and a wide variety of others are at the heart of an effective response to any smallpox emergency, their advice and guidance are continually being sought.

8. The plan will continue to be updated as experience and discussions proceed, but is however, operational and would be implemented should a smallpox emergency occur.

9. Smallpox is caused by the variola virus. The only known host is the human.
10. The most frequent mode of transmission is person-to-person spread via direct deposit of infective droplets onto the nasal, oral, or pharyngeal mucosal membranes, or the alveoli of the lungs from close, face-to-face contact with an infectious individual.

11. Indirect spread (not requiring face-to-face contact) via fine-particle aerosols or fomites (e.g., contaminated clothing or bed linen) containing the virus has been reported, but is less common.

12. In the majority of cases, symptoms of disease usually begin within 7-17 days (median 12) following exposure to the virus and consist of a 2-3 day prodrome of high fever, malaise, and prostration with severe headache and backache. This pre-eruptive stage of the disease is then followed by the appearance of a maculopapular rash (eruptive stage) that progresses to papules (1-2 days after appearance of rash), vesicles (4-5\textsuperscript{th} day), firm pustules (by 7\textsuperscript{th} day), and finally scab lesions (14\textsuperscript{th} day). The rash generally appears first on the oral mucosa, face, and forearms, then spreads to the trunk and legs.

13. Lesions are also seen on the palms of the hands and soles of the feet. The skin lesions of smallpox are deeply embedded in the dermis and feel like firm round objects embedded in the skin. As the skin lesions heal and the scabs separate, pitted scarring gradually develops.

14. Smallpox patients are infectious with the onset of fever and are at their most infectious during the first week of the rash. At this time the oral mucosa lesions ulcerate and release the large amounts of virus into the saliva. Patients are less infectious once the lesions have scabbed over. A patient is no longer infectious once all the scabs have separated (usually 3-4 weeks after the onset of the rash).

15. Atypical forms of smallpox, such as haemorrhagic or flat type, occur in around 10% of patients and these have a rapid progression with a higher mortality rate of over 95%. (See paragraph 1.33 for further discussion of mortality rates.)

16. Smallpox vaccine is a highly effective, live-virus vaccine composed of vaccinia virus, an orthopoxvirus which induces antibodies that also protect against smallpox.

17. Although smallpox vaccine is considered a relatively safe vaccine, post-vaccination adverse events can occur. Death also occurs in about one per million primary vaccinations and is usually a result of progressive vaccinia, post-vaccinial encephalitis, or severe eczema vaccinatum.

18. Several groups have a higher risk of developing post-vaccination complications. These include:
   • persons with eczema (including a history of eczema) or other forms of atopic dermatitis,
   • persons with altered immune states (e.g., HIV, AIDS, leukaemia, lymphoma, immunosuppressive drugs, etc.)
Executive Summary

• children aged < 1 year.
  In addition, because of the small risk for fetal vaccinia, vaccination is not
  recommended during pregnancy.

19. There is also a need to consider protection of close contacts of people who have
  been vaccinated in view of shedding of vaccinia virus.

20. Early recognition and appropriate management of initial cases is key to rapid
    implementation of outbreak containment measures.

21. The first and foremost public health priority during a smallpox outbreak is
    control of the epidemic. The plan aims to control an outbreak by isolation of
    confirmed and suspected smallpox cases with contact tracing, quarantine and
    ring vaccination and close surveillance of contacts to these cases, as well as
    vaccination of the household contacts of the contacts.

22. Vaccinating and monitoring a ‘ring’ of people around each case and contact, will
    help to protect those at the greatest risk for contracting the disease, as well as form
    a buffer of immune individuals to prevent the spread of disease.

23. However, mass vaccination would be considered if
    • there were multiple attacks,
    • new cases arose with no epidemiological link to previous cases or
    • there was overwhelming public demand, in the face on increased threat – for
      example driven by cases already occurring outside the UK.

24. If the initial release was overt, with a specific event, the Home Office and Police
    would co-ordinate the overall UK initial response with the formation of bronze,
    silver and gold commands. In Scotland the Justice Department would lead and the
    police would establish a command and control structure in accordance with the
    appropriate guidance to co-ordinate the police strategic, tactical and operational
    response. If the initial release was covert, the Department of Health would lead in
    the UK and in Scotland the Scottish Executive Health Department would lead.

25. Whether overt or covert, once smallpox was confirmed, central Government
    emergency co-ordination would immediately be activated and COBRA called. In
    Scotland, the Scottish Emergencies Co-ordinating Committee (SECC) would be
    called, Scottish emergency co-ordination measures would be activated
    immediately and the Scottish Executive Emergency room (SEER) set up.

26. In England as part of the plan a number of specialist healthcare and laboratory
    staff have been asked, as volunteers, to be part of Regional Smallpox Diagnosis
    and Response Groups (RSDRG). In Scotland this role is undertaken by the
    Scottish Smallpox Implementation and Planning Group (SIPG). These groups have
    a co-ordination and organisational role. These Groups will be responsible for
    ensuring that the planning is in place, including the provision of Smallpox
    Diagnostic Experts (SDE) and the composition of Smallpox Management and
    Response Teams (SMART). Members of these teams will have been vaccinated in
advance and would be able to deal quickly and safely with any potential smallpox outbreak

27. There is a Regional Smallpox Diagnosis and Response Group (RSDRG) in each of the nine English government regions. In Scotland there is a Scottish Smallpox Implementation and Planning Group (SIPG) headed by the DCMO and Scotland’s National Emergency Planning Officer on behalf of the CMO and Chief Executive of SEHD.

28. Initial and continuation training of the members of the Scottish Response Teams, is crucial for the success of any response and is being undertaken by SIPG.

29. A series of alert levels have been identified to assist planning according to the action required. Any change in the alert level would be announced by the UK Chief Medical Officers (CMOs). These are:

   **Alert Level 0:** Smallpox remains eradicated:
   No credible threat of a release.

   **Alert Level 1:** Heightened threat:
   Case confirmed outside UK.
   Confirmation of virus found outside the WHO designated repositories and intelligence suggests a credible and imminent threat of a release.

   **Alert Level 2:** Case confirmed in the UK.

   **Alert Level 3:** Outbreak occurring in the UK.

   **Alert Level 4:** Large or multiple outbreak not controlled by ring vaccination.

   **Alert Level 5:** Outbreak controlled:
   No further cases occurring.

30. Suitable buildings to be used as Smallpox Care Centres, in the event of smallpox, are being identified in Scotland as defined in Appendix 5.

31. This document is organised into multiple sections and provides guidelines for many of the specific actions and procedures that should be followed in preparation for, and in response to, a smallpox emergency.

32. These sections outline criteria for smallpox response plan implementation, notification procedures for suspected cases, responsibilities and activities including some that should take place prior to a smallpox emergency. It also provides a range of appendices, figures and tables for national, regional and local health professionals, agencies and OGDs, to assist in implementation. The document should be read in conjunction with:

   - the SEHD guidance “Managing Incidents Presenting Actual or Potential Risk to the Public Heath – Guidance and the Roles and Responsibilities of Incident Control Teams”
• the SEHD guidance “Deliberate Release of Biological and Chemical Agents in Scotland”

33. The plan is being intermeshed with emergency plans of DH, and other UK Government Departments (and their agencies and the services that they oversee) and of other parts of the Scottish Executive.

34. In summary, the plan sets out the strategies and actions that would guide us through a smallpox incident. It is designed to ensure that Scotland is fully prepared for any possible smallpox emergency should it occur inside or outside the UK.
1 Natural history and clinical features

Introduction

1.1 Following global eradication of smallpox in 1980, the smallpox virus has been retained legally under strict security in two World Health Organisation (WHO) collaborating centres: the Centers for Disease Control and Prevention (CDC), Atlanta, USA and the Laboratory for Applied Microbiology at Koltsovo in Novosibirsk Region, Russian Federation.

1.2 Although it is highly unlikely, concern remains that illicitly obtained smallpox virus could be deliberately released as a biological weapon. Without containment measures, this would almost certainly lead to rapid spread because:
   - the majority of the population of the United Kingdom, as elsewhere, is susceptible, vaccination having ceased in the 1970s
   - population mobility is far greater than thirty years ago
   - there may be delays in diagnosing the disease due to clinicians’ unfamiliarity with the presenting features.

1.3 Since smallpox no longer exists as a naturally acquired infection, the two most likely causes for its re-emergence would be:
   - a deliberate release of the organism. This may occur without warning and it is possible that many people would be exposed, either via infected person(s) or environmental release of smallpox virus. A criminal investigation would need to proceed in parallel with the public health response.
   - an accidental release in one of the two approved collaborating centres for smallpox. This is unlikely because both laboratories undergo frequent WHO inspections and have stringent safety and security procedures in place.

1.4 Since the public health consequences would be severe, it is essential that contingency plans are available nationally and locally should smallpox re-emerge in the UK or elsewhere in the world.

1.5 This interim plan outlines the strategies and approaches that would guide national and local responses to a smallpox emergency. It is based on the Memorandum on the Control of Outbreaks of Smallpox published in 1975 by the UK Health Departments.

1.6 Smallpox (variola) was one of the most severe infectious diseases affecting humans. It was present throughout the world during most of recorded history. It is specifically a human disease with no reservoir in any animal species. The infection no longer exists in nature, having been declared eradicated in 1980 following a global campaign led by the WHO.

1.7 Smallpox virus is a DNA virus. It is a member of the genus orthopox virus, which includes vaccinia and monkeypox. Only smallpox is readily transmissible from person to person.
1. Natural history and clinical features

1.8 The last community-acquired case was in Somalia in 1977. Following eradication in 1980 the WHO recommended that all countries cease vaccination. Routine vaccination in the UK and other European countries had ceased prior to this in the 1970s. Knowledge of the natural history of smallpox is from historical records and the personal experience of a relatively small number of senior physicians, virologists and epidemiologists who dealt with the disease in the past.

1.9 Patients are infectious with the onset of fever, however the typical vesicular rash does not appear until 4 to 7 days later. The rash is preceded by a prodromal period of 1 to 3 days of fever, malaise, headache and backache followed by 2 to 4 days of a macular rash. Clinical pictures to illustrate the rash can be found on the SCIEH website: http://www.show.scot.nhs.uk/scieh/

1.10 Control and ultimately eradication of smallpox was achieved by vaccination. The vaccine is based on vaccinia virus, a live virus of low pathogenicity. Although effective in the eradication of smallpox, the vaccine can cause serious adverse effects, and for this reason vaccination in the UK was discontinued in the 1970s because the risks from vaccination outweighed the risks from disease.

1.11 In the absence of any clear evidence that smallpox may re-emerge, this remains the case. In the event of an outbreak, the containment strategy will centre on isolation of cases and vaccination of contacts. However, it is planned that sufficient supplies are available to vaccinate the entire population of the UK should this be deemed necessary.

1.12 The duration of complete immunity provided by vaccination is uncertain, but is unlikely to be more than 10 years. Individuals vaccinated in the past are therefore unlikely to be protected from infection although the disease may be less severe. They will develop immunity more quickly on revaccination.

**Incubation period**

1.13 For smallpox, this is usually defined as the time between exposure and onset of fever. The range given by most authorities is 7 to 17 days, usually 10 to 16 days, with a median of 12 days. The typical vesicular rash appears 4 to 7 days later.

**Transmission**

1.14 There is no known animal reservoir or vector for the smallpox virus. The most frequent mode of transmission is person-to-person spread via direct inoculation of infective droplets on to the oral, nasopharyngeal or respiratory mucosa during close contact with an infectious individual. From the mucosa the virus is transferred to local lymphoid tissue where replication occurs.

1.15 Patients are not infectious during the asymptomatic incubation period. They become infectious with the onset of fever. Infectiousness then increases until the onset of vesicular rash and remains high for the next 7 days.
As a precaution, for the purpose of contact tracing, patients should be regarded as infectious from 24 hours prior to the time when fever was first recognised.

1.16 Patients remain infectious until the last scabs fall off. As a precaution, WHO isolation policy during the eradication campaign required that patients remain in isolation, in hospital or at home, until the last scab had separated. However, the virus shed from the skin is not highly infectious and exposure to patients in the late stages of the disease is unlikely to produce infection in susceptible contacts.

1.17 The most efficient transmission of smallpox occurred during close contact with infected persons. Household contact produces the highest attack rate, and contact in an open ward was a major cause of spread. In outbreaks in Asia and Africa, the attack rate in households varied from 37% to 96%, with some of the variation probably related to different living conditions and crowding, as well as to strain variation among variola viruses.

1.18 Casual contact, such as working in the same building, is much less likely to result in infection, although airborne spread of virus in draughts or air conditioning systems is known to cause transmission. Contaminated clothing or bed linen can also spread the virus.

1.19 Members of the Smallpox Management and Response Teams (SMART) and those working in the Smallpox Care Centres who will be in close contact with patients, must be strict about personal protective clothing to ensure no onward transmission.

**Organism survival**

1.20 In normal environmental conditions (ambient temperature, ordinary levels of humidity and exposure to sunlight) the virus is very unlikely to survive for more than 48 hours.

1.21 Depending on the conditions, variola viruses can survive for long periods in dry scabs (13 years has been documented), however this is not considered to represent an infectious threat.

**Clinical features**

1.22 Smallpox has two distinct clinical forms: variola major, which produces severe smallpox, and variola minor, which is a much milder disease. Approximately 90% of cases of variola major in non-immune individuals would be expected to have the characteristic clinical presentation described below.

1.23 Following infection, asymptomatic viraemia develops on the 3rd or 4th day, followed by dissemination and replication in the spleen, bone marrow and lymphoid tissues. A secondary viraemia begins around the 8th day and is associated with onset of a characteristic illness around 12 days following exposure.
1.24 Variola major has a characteristic clinical presentation. The illness progresses as outlined below
- Sudden onset of high fever with malaise, prostration, headache and backache.
- A macular rash develops 1 to 3 days later, firstly on the oral and pharyngeal mucosa, spreading to the face and forearms, trunk and legs.
- The macular rash becomes papular after 1 to 2 days and then vesicular after a further 1 to 2 days. The vesicular rash is typically more prominent on the face and extremities than on the trunk (centrifugal distribution).
- The vesicular rash becomes pustular after a further 2 to 3 days. Pustules are round, tense and deep in the dermis. They may affect the palms of the hands and soles of the feet.
- Vesicles and pustules are typically at the same stage of development in any area of skin.
- The pustules form scabs after 5 to 8 days.
- The scabs gradually separate leaving characteristic pitted scarring. The scars are most evident on the face.

1.25 Full blood count shows a lymphocytosis or a predominance of lymphocytes, with many atypical and activated mononuclear cells. Haemorrhagic disease is preceded by a fall in the platelet count.

**Differential diagnosis**

1.26 Experience from the global eradication campaign was that atypical cases of chickenpox (varicella-zoster virus (VZV) and disseminated herpes simplex virus (HSV) infection presented the greatest difficulties in the differential diagnosis.

1.27 Chickenpox can be distinguished from smallpox by its much more superficial lesions, their presence on the trunk rather than on the face and extremities (centripedal distribution), and by the development of successive crops of lesions in the same area (i.e. lesions at different stages of development). The WHO has produced training materials to help health staff recognise smallpox, distinguish it from chickenpox, and avoid diagnostic errors. These materials are available electronically: [http://www.who.int/emc/diseases/smallpox/smallpox-english.ppt](http://www.who.int/emc/diseases/smallpox/smallpox-english.ppt)

1.28 Disseminated HSV infection may also present a problem for differential diagnosis. However, VZV and HSV are both herpes viruses, and should be readily distinguished from orthopox virus particles by electron microscopy (EM) of vesicular fluid preparations.

1.29 Other causes of rash such as measles virus, enterovirus, parvovirus B19 or rubella virus may also cause uncertainty but should be distinguishable clinically, as well as in the laboratory. Molluscum contagiosum is a pox virus that may resemble variola on EM, but is usually distinguishable from smallpox on clinical grounds (lesions are umbilicated from an early stage and the patient is well).
1.30 The final diagnosis in consultations for suspected smallpox with a single UK smallpox panellist are listed in Table 1. These were made over a 20-year period in an immunised population, during which there was one outbreak of variola major and one of variola minor.

**Table 1: Final diagnosis in consultations for smallpox**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smallpox</td>
<td>4</td>
</tr>
<tr>
<td>No diagnosis, but proved not smallpox (3 cases required isolation)</td>
<td>15</td>
</tr>
<tr>
<td>Chickenpox</td>
<td>113</td>
</tr>
<tr>
<td>Papular vesicular urticaria</td>
<td>34</td>
</tr>
<tr>
<td>Generalised vaccinia and other reactions to vaccination</td>
<td>23</td>
</tr>
<tr>
<td>Staphylococcal folliculitis</td>
<td>9</td>
</tr>
<tr>
<td>Erythema multiforme</td>
<td>9</td>
</tr>
<tr>
<td>Scabies</td>
<td>6</td>
</tr>
<tr>
<td>Bacterial septicaemias</td>
<td>4</td>
</tr>
<tr>
<td>Herpes simplex</td>
<td>3</td>
</tr>
<tr>
<td>Secondary syphilis</td>
<td>2</td>
</tr>
<tr>
<td>Others included measles, Coxsackie, acute leukaemia, Anaphylactoid purpura, fungal infections, septic spots, insect bites, Pityriasis rosea, sweat rash</td>
<td>18</td>
</tr>
</tbody>
</table>

**Mortality**

1.31 Estimates of mortality are complicated by the fact that documented epidemics were modified by the presence of some immune individuals in the population or by interventional vaccination. Importation into smallpox naïve and unvaccinated populations caused the highest mortality.

1.32 Some clinical forms of smallpox were highly virulent (variola major) and others much less so (variola minor). The highest mortality was seen in children aged less than 1 year, in the elderly, in pregnant women who were more susceptible to haemorrhagic disease, and in people immunocompromised due to medical disorders or treatments. There are now many more vulnerable individuals in the elderly and immunocompromised groups than in the past.

1.33 Those who are unimmunised will suffer disease of varying severity, with an overall case-fatality rate of around 30%. Approximately 40% of cases will be severe or ‘fulminant’ with a fatality rate of over 90%.

1.34 Vaccinated individuals who become ill despite vaccination suffer mild or moderate disease in 95% of cases, with a case-fatality rate of less than 1%.

**Atypical presentations**

1.35 Along with the typical presentation of smallpox, two other rare forms are described: haemorrhagic and malignant smallpox.
1.36 Cases of haemorrhagic smallpox were uniformly fatal. They occurred among all ages and in both sexes, with pregnant women particularly susceptible. Haemorrhage into the mucous membranes and the skin accompanied the rash. Haemorrhagic smallpox was most commonly misdiagnosed as haemorrhagic chickenpox, meningococcal septicaemia or acute leukaemia.

1.37 Cases of malignant smallpox were characterised by lesions that did not develop to the pustular stage but remained soft and flat.

1.38 Vaccinated individuals may develop modified smallpox, which is a mild disease, with similar prodromal features, but only a few atypical lesions, and a mortality of well under 1%. Note however that they are still infectious.
2 Planning for smallpox

Alert levels

2.1 Alert Levels have been identified to assist planning according to the actions required. Alert Levels generally proceed in a stepwise fashion, but may proceed directly to level 2 or higher.

Alert levels status will be announced by the UK CMOs.

<table>
<thead>
<tr>
<th>Alert Level 0:</th>
<th>Vaccination strategy</th>
<th>Other Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert level 0</td>
<td>Smallpox remains eradicated:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No credible threat of a release.</td>
<td>• Establish SIPG</td>
</tr>
<tr>
<td>Alert level 1</td>
<td>Heightened threat:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case confirmed outside UK.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confirmation of virus found outside the WHO designated repositories and intelligence suggests a credible and imminent threat of a release.</td>
<td>• Establish and train SMART and SDE</td>
</tr>
<tr>
<td>Alert level 2</td>
<td>Case confirmed in the UK.</td>
<td></td>
</tr>
<tr>
<td>Alert level 3</td>
<td>Outbreak occurring in the UK.</td>
<td></td>
</tr>
<tr>
<td>Alert level 4</td>
<td>Large or multiple outbreak not controlled by ring vaccination.</td>
<td></td>
</tr>
<tr>
<td>Alert level 5</td>
<td>Outbreak controlled:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No further cases occurring.</td>
<td></td>
</tr>
</tbody>
</table>

- Establish and train SMART and SDE
- Identify Smallpox Care and Vaccination Centres
- Increase number of SMART and SDE
### 2. Planning for smallpox

<table>
<thead>
<tr>
<th>Threat-case confirmed outside UK. Confirmation of virus found outside designated repositories</th>
</tr>
</thead>
</table>
| - More vaccinators  
- Key workers to maintain essential services  
**Review** list of essential personnel who should be vaccinated if alert level increases |
| - Inform all clinicians of the heightened threat and remind them of the features of smallpox and reporting systems  
- Prepare Smallpox Care and Vaccination Centres |

<table>
<thead>
<tr>
<th>Alert level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case confirmed in UK</strong></td>
</tr>
</tbody>
</table>
| Vaccinate:  
- Contacts of cases  
- Larger number of lab personnel  
- Wider groups of healthcare workers and ancillary staff  
- Key workers |
| - Initiate Scottish Smallpox Outbreak Control Centre  
- Activate Smallpox Care and Vaccination Centres  
- Begin contact tracing and monitoring  
- Initiate enhanced surveillance  
- Activate Major Incident plans |

<table>
<thead>
<tr>
<th>Alert level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outbreak occurring in the UK</strong></td>
</tr>
</tbody>
</table>
| - Continue ring vaccination of contacts of cases  
- Review triggers for implementing wider vaccination |
| - Continue contact tracing and monitoring  
- Continue enhanced surveillance  
- Review capacity and need for additional Smallpox Care and Vaccination Centres  
- More SDE and SMARTs |

<table>
<thead>
<tr>
<th>Alert level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Large outbreak not controlled by ring vaccination.</strong></td>
</tr>
<tr>
<td>- Consider mass vaccination</td>
</tr>
<tr>
<td>- Activate additional Smallpox Care and Vaccination Centres as required</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alert level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outbreak controlled - no further cases</strong></td>
</tr>
<tr>
<td>- Maintain immunity of healthcare and emergency personnel and other key essential workers</td>
</tr>
</tbody>
</table>
| - Maintain increased number of SMARTs and SDEs  
- Keep Smallpox Care and Vaccination Centres prepared in case they are required again |

### Scottish Smallpox Diagnosis and Response Groups

2.2 **Regional Smallpox Diagnosis and Response Groups (RSDRG)** have been established in each Standard Government Region in England at Alert Level 0. In Scotland, the Scottish Smallpox Implementation and Planning Group (SIPG) has been established at Alert Level 0, headed by the DCMO and National Emergency Planning Officer for Scotland on behalf of the CMO and Chief Executive of SEHD.
2. Planning for smallpox

2.3 At Alert Level 0 SIPG is responsible for all aspects of planning for possible outbreaks of smallpox in Scotland including:

- ensuring a 24 hour emergency response to suspected and probable cases of smallpox is in place
- identifying membership for the Scottish Smallpox Outbreak Co-ordination Centre (SSOCC)
- identifying, vaccinating, training and co-ordinating a team of Smallpox Diagnostic Experts (SDE) and Smallpox Management and Response Teams (SMART) and establishing the most appropriate way of working in the light of the geographic and demographic needs of Scotland
- co-ordinating and organising vaccinations to be provided at Alert Levels 0 and monitoring vaccine side effects
- identifying healthcare, emergency, laboratory and other essential personnel who will be vaccinated at Alert Levels beyond 0
- identifying and training groups of vaccinators
- identifying Smallpox Care Centres for Scotland
- identifying Smallpox Vaccination Centres for Scotland
- training clinicians in the recognition and reporting of patients with suspicious illnesses
- distributing a Diagnostic Algorithm to clinicians through NHS Boards and Hospital Trusts to aid the assessment of patients with suspicious illnesses
- developing and ensuring plans are in place for transfer of specimens to the designated Scottish Containment 3 laboratory at the West of Scotland Specialist Virology Centre (SVC), Gartnavel General Hospital, Glasgow
- developing multi-agency partnerships with local emergency services across Scotland to ensure that a co-ordinated response can be mounted to the first suspected or probable case.

Smallpox Diagnostic Experts

2.4 Smallpox Diagnostic Experts (SDE) may be Infectious Disease (ID) Physicians, or physicians from other specialties who have appropriate background and experience, who are keen to take on the role. At Alert Level 0, the SDEs will be vaccinated against smallpox and given advanced training in differential diagnosis so that they are able to assess patients with suspicious illnesses safely and accurately. A network of SDEs will be established and trained and co-ordinated by the SIPG. At Alert Levels 1 or 2, more SDEs will be vaccinated and trained. These volunteers will be identified at Alert Level 0.

Smallpox Management and Response Teams

2.5 At Alert Level 0, SIPG will have sufficient vaccinated and trained personnel to form around five Smallpox Management and Response Teams (SMART). These may function as predefined teams or as a panel of individuals who can be called upon to form a team as necessary to respond to smallpox and a probable
2. Planning for smallpox

case of smallpox. The roles and structure of the teams will be assessed by SIPG depending on Scottish requirements.

2.6 One of these Teams will be on duty at all times to respond to suspected and probable cases of smallpox. The alert to bring out the SMART team will be integrated with current public health incidents response systems. The single emergency telephone number maintained by SCIEH on behalf of SIPG will be the usual SCIEH on-call number. To ensure cover at all times in Scotland rota arrangements are being developed.

2.7 Allowing for flexibility in Scotland, each SMART will consist of the following: a Public Health Physician, ideally a Consultant in Public Health Medicine (Communicable Disease and Environmental Health) (who is team leader), a Medical Consultant (ideally an ID Physician but may be a physician from another speciality), a Public Health or Infection Control Nurse, a Clinical Nurse with experience in acute emergency medicine, and where possible a Paediatrician. It is a requirement that all members of the SMART will be vaccinated against smallpox so that they can react quickly and work safely with suspected or probable cases of smallpox. They will be given training in smallpox diagnosis and management by national specialists and additional general emergency medical training, such as Advanced Life Support. The SDEs may or may not be part of the SMART, depending on local arrangements.

2.8 At Alert Level 1, the number of SDEs and SMARTs for SIPG will be increased to allow a response to multiple cases arising simultaneously. The numbers would depend on geographical distribution and size of the outbreak, but planning and membership of additional SDEs and SMART teams should be identified by SIPG at Alert Level 0.

Smallpox Care Centres

2.9 Buildings suitable for use as Smallpox Care Centres will be identified in Scotland, at Alert Level 0, by the SIPG and arrangements made so that they can be prepared at Alert Level 1 or diagnosis of first probable case and activated within 24 hours if needed, ie at Alert Level 2, confirmed case in UK. The minimum specifications for these facilities and procedures for transport of patients are summarised in the appendices (see Appendix 5).

2.10 SIPG will identify, at Alert Level 0, doctors, nurses and support staff who would be willing to work in Smallpox Care Centres. This list of potential vaccinees will be maintained by SCIEH and shared with NHS Boards. Ideally they should have been vaccinated at some time in the past so that they could be re-vaccinated with a faster immune response and a lower incidence of side effects.

2.11 Observation and treatment wards will be maintained separately to ensure that possible cases are not exposed to infection.
2. Planning for smallpox

2.12 All possible and probable cases will be vaccinated on admission to protect them from infection by confirmed cases if the diagnosis of smallpox is subsequently excluded.

**Smallpox vaccination strategy**

2.13 Vaccine against smallpox contains a live vaccinia virus which produces cross immunity against variola major and minor.

2.14 Targeted vaccination and monitoring of contacts, together with isolation of cases, is the mainstay of containment. The containment of transmission depends on early detection of cases and tracing and vaccination of contacts.

2.15 This strategy of *ring vaccination* will be used initially to control an outbreak (i.e. Alert level 2/3), and is compatible with WHO recommendations.

**Smallpox Vaccination Centres**

2.16 Vaccination will be carried out at Smallpox Vaccination Centres at Alert Levels 2 and 3. Suitable sites will be identified by SIPG at Alert Level 0, so that they can be prepared at Alert Level 1 and activated immediately, if required, ie at Alert Level 2 (see Appendix 6).

2.17 Arrangements for the storage, distribution and administration of vaccine will be made by SIPG at Alert Level 0.

2.18 Vaccination of different groups (healthcare, emergency and essential workers, and contacts) will be required, and a strict triage system will be necessary to ensure prioritisation of vaccine supplies.

**Laboratory networks**

2.19 Laboratory networks will be an essential component to the early diagnosis and response to initial cases.

2.20 The collection and transport of clinical specimens from suspected smallpox cases, including the equipment and procedures for taking specimens is described in the Appendix 1.

2.21 Laboratory testing of clinical specimens from initial suspected cases will involve EM at the designated Containment 3 laboratory for Scotland at the West of Scotland Specialist Virology Centre (SVC) at Gartnavel General Hospital, Glasgow, followed by confirmation by PCR at a Reference Laboratory.

2.22 Rapid real-time PCR tests for orthopox, varicella zoster and herpes simplex viruses are currently being evaluated, and it is planned that these could be made available to selected Containment 3 regional laboratories in England and the
2. Planning for smallpox

designated laboratory for Scotland at the SVC at Gartnavel General Hospital, Glasgow in the future.

2.23 Pre-exposure vaccination is required for staff who might be involved in handling clinical specimens from the initial suspected cases. At Alert Level 0, a small number of staff at the designated Containment 3 laboratory for Scotland SVC, Gartnavel and the reference laboratories will be vaccinated. In the event of an Alert Level 1, a larger number of laboratory staff will be vaccinated in case they are required to handle specimens. They should be identified at Alert Level 0 and should be available to provide 24/7 cover.

2.24 It is possible that viral particles resembling smallpox may be identified on routine EM of vesicular fluid. In this event, the specimen should be sent immediately to a reference laboratory according to the procedures described in Appendix 2. The virologist must also immediately inform the referring clinician who should arrange for a Smallpox Diagnostic Expert to assess the patient.

Training

2.25 An essential part of preparedness is training. Each SMART should receive training in the recognition of smallpox and its differential diagnosis for all members of the teams organised by SIPG.

2.26 Local, regional and national testing of the plan and its components, will be an essential part of the training and the lessons learned will be used to review and update the plan as necessary.

2.27 Clinicians will be offered training and a Diagnostic Algorithm will be distributed to all clinicians to assist them with the assessment of patients with suspicious illnesses.

2.28 Diagnostic Algorithms will be distributed from the SIPG via NHS Boards who will add the contact details of local SDE.

Definition of outbreak

2.29 For the purposes of this plan, the term outbreak is used for a situation when diseases or health events occur at a greater than normal rate than expected, in a specific period and place. An outbreak can be when:

- the occurrence of a greater number of cases or events than would normally occur in the same place compared to the same duration in the past years
- a cluster of cases of the same disease occurs which can be linked to the same exposure.
3 Assessment and management of initial cases

Case definitions and laboratory investigation

3.1 The preliminary definitions given below may require revision by clinicians and public health personnel depending upon the scale of the outbreak.

3.2 **Clinical case definition.** An illness with acute onset of fever >38°C, which is persistent, followed by a rash without other apparent cause characterised by vesicles or firm pustules at the same stage of development and with a predominantly centrifugal distribution. The case definition above describes the typical presentation of smallpox. The predictive value of this clinical case definition is likely to be low in the absence of circulating smallpox. Atypical presentations (haemorrhagic and malignant), and modified smallpox must also be considered.

3.3 **Laboratory criteria for confirmation.** Smallpox viruses are classified as hazard group 4 organisms and must be handled accordingly. Clinical samples from suspected cases must be handled with due regard to the likelihood that smallpox is present, and the appropriate procedures observed. Should it be necessary to conduct work other than in a Containment 4 laboratory, a full risk assessment must be conducted.

3.4 The importance, and methods, of laboratory confirmation depend on the epidemiological situation:

- **Electron microscopy** (EM). In the initial cases or unrelated cases in a new geographical area, EM identification of orthopox virus in a patient with symptoms compatible with the clinical case definition indicates a probable case of smallpox. During an outbreak, in the presence of an epidemiological link to other confirmed cases, EM identification of orthopox virus may be regarded as confirmatory.
- **Polymerase chain reaction** (PCR) and viral isolation from culture (Containment 4 laboratories only). Confirmation using these techniques is required for initial cases or unrelated cases in a new geographical area. They may also be of critical importance in distinguishing cases of variola and generalised vaccinia. Definitive diagnosis of smallpox will be based on the DNA sequence of PCR amplicons and the characteristics of viral isolates.

EM takes 2 hours and PCR takes 6 hours from receipt of specimens until results can be provided.

3.5 In a case with strongly suspicious clinical features and no other diagnosis, failure to detect any organism with EM or PCR does not exclude smallpox, and such cases may be regarded as probable.

3.6 If a large outbreak occurs, laboratory capacity will soon be overwhelmed. In this instance, priority for laboratory resources will include:
3. Assessment and management of initial cases

- Testing of clinical specimens from cases with unclear clinical presentations following expert assessment.
- Testing of clinical or environmental specimens that will provide information about a potential source of exposure to facilitate case detection and law enforcement activities. This will depend on circumstances.

In these circumstances, specimens will be triaged by local infectious disease physicians, virologists and public health physicians, according to guidelines issued by the UK National, English Regional and Scottish Smallpox Outbreak Control Centres.

3.7 **Suspected**: a case of fever and rash consistent with the clinical case definition, without laboratory confirmation or an epidemiological link to other cases. Initial cases of smallpox, or unrelated cases in a new geographical area are likely to present as suspected cases.

3.8 **Probable**: a case of fever and rash consistent with the clinical case definition, plus:
  - For initial cases of smallpox or unrelated cases in a new geographical area - EM identification of orthopox virus or a case with strongly suspicious clinical features and no other diagnosis.
  - During an outbreak - an epidemiological link to a confirmed case.

3.9 **Confirmed**: a case of fever and rash consistent with the clinical case definition, plus:
  - For initial cases of smallpox or unrelated cases in a new geographical area - laboratory confirmation by PCR or viral isolation.
  - During an outbreak - an epidemiological link to a confirmed case and EM identification of orthopox virus or a case with strongly suspicious clinical features and no other diagnosis.

3.10 **Possible**: acute onset of fever but without a rash consistent with the case definition in a person with an epidemiological link to a confirmed case. The fever may be accompanied by prodromal symptoms such as prostration, severe headache or backache, rigors and generalised maculopapular rash. Control of an outbreak will depend on early identification and management of new possible cases, prompt isolation of cases and vaccination of contacts.
3. Assessment and management of initial cases

Table 2: Summary of case classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Fever</th>
<th>Rash</th>
<th>EM Identification of orthopox</th>
<th>PCR Positive For smallpox</th>
<th>Epidemiological link to another confirmed case of smallpox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(Initial cases or during outbreak)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Probable:</td>
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<tr>
<td>Initial cases</td>
<td>+</td>
<td>+</td>
<td>+/-#</td>
<td>-</td>
<td>-</td>
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<tr>
<td>During outbreak</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Confirmed:</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Initial cases</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
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<tr>
<td>During outbreak</td>
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</tr>
<tr>
<td>Possible</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>(During outbreak)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

* Fever and rash consistent with the case definition.
# EM not required if the case has strongly suspicious clinical features with no other diagnosis.

The diagnosis of suspected or probable cases according to the clinical case definition requires assessment by a Smallpox Diagnostic Expert.

Diagnosis and response to initial cases

3.11 Early recognition and appropriate management of initial cases is key to rapid implementation of outbreak containment measures. At Alert Levels 0 and 1, the aim will be to alert clinicians to the possibility of a case of smallpox, raise awareness of the presenting symptoms and signs, and encourage appropriate and rapid reporting of patients with suspicious illnesses for further assessment.

Management of initial cases

3.12 Patients with suspicious illnesses may present at a variety of different sites as listed below (in addition, smallpox virus may be seen on routine EM of vesicular fluid). For example:

- At a patient’s home
- At a GP Surgery
- At a hospital
- At a Port.

A patient may also be presented to the health services by means of a 999 call to the Ambulance Service.

3.13 General and specific management in the event for each of these and other scenarios is described in flowchart format at the end of this document.
3. Assessment and management of initial cases

3.14 Clinicians should assess these patients according to the Diagnostic Algorithm. If they are unable to exclude the diagnosis of smallpox, they should contact their local SDE to request a further assessment using the contact details provided on the Diagnostic Algorithm distributed via NHS Boards from SIPG. Whilst waiting for the SDE, the referring clinician should remain at the scene, isolate the patient as best as possible, and try and ensure that close contacts of the patient remain close by or record details of those who have left or have to leave.

3.15 SDE will visit the patient, at the site, to make a further assessment. They should use appropriate infection control measures including non-sterile gloves, disposable gowns, head, face and eye protection and shoe covers, in order to minimise the personal contamination and spread on clothing. There are four potential outcomes:

- Smallpox can be excluded on the basis of clinical assessment. The patient can be handed back to the referring clinician for further management.

- Smallpox is highly unlikely but laboratory confirmation of other diagnosis (e.g. atypical chickenpox) is required. The SDE may arrange to send diagnostic specimens to the designated Containment 3 laboratory at SVC, Gartnavel to confirm the diagnosis and exclude smallpox if necessary, without alerting SMART.

- Differential diagnosis includes smallpox. The patient is now a suspected case of smallpox. Responsibility for management transfers to the SDE. The SDE should contact the SMART through the number maintained by SCIEH for SIPG and request that they visit the patient on site. On arrival the SMART will take on the responsibility for the management and investigation of the patient. Appropriate treatment for other possible diagnosis should be initiated. The local Consultant in Public Health Medicine (Communicable Disease and Environmental Health) (CPHM (CD&EH)) in the NHS Board affected should also be informed.

- The clinical features are strongly suggestive of smallpox and there is no other likely diagnosis. The patient is now a probable case of smallpox. Responsibility for management transfers to the SDE. The SDE should contact the SMART to arrange immediate transfer to isolation facilities, where the physician in charge will take responsibility for the patient including laboratory investigation and further management. Note that patients should not be transferred out of an ICU. The CPHM (CD&EH) in the NHS Board affected should be informed.

3.16 Local arrangements for clinicians contacting the SDE will apply. The SDE will contact the SMART via the number maintained by SCIEH. However as indicated in the situations described in 3.15 above, they must immediately notify the CPHM (CD&EH) in the NHS Board affected who will initiate the communications listed below:
3. Assessment and management of initial cases

- the designated Containment 3 Laboratory at SVC, Gartnavel that they may expect specimens for EM. The laboratory will in turn immediately notify a UK Reference laboratory.
- the DPH, who will in turn notify:
  - Chief Executive of the NHS Board
  - Local police forces - that there is a suspected case, and that escort to and security at the scene may be required.
  - Scottish Ambulance Service Emergency Medical Dispatch Centre (EMDC) - that a Containment 3 infectious removal may be required.
  - Hospital isolation facilities - that a bed may be required.
  - The local Health Emergency Planning Officer.
  - The SEHD and SCIEH would be responsible for liaison in Scotland and with relevant UK bodies.

3.17 While awaiting the arrival of the SMART, and later while awaiting laboratory results, management of suspected or probable cases requires three key principals, irrespective of the site:
- Patient care. The patient should be kept comfortable, and supportive treatment should be provided. This may necessitate transfer to isolation facilities at any stage.
- Infection control. Entry and exit of persons and fomites from the potentially contaminated area must be strictly controlled. This may require the assistance of the police to maintain a protective cordon. Potentially contaminated fomites should be placed in yellow clinical waste bags at the earliest opportunity.
- Preliminary identification of contacts. The interval should be used for:
  - Establishing the date from which the patient should be regarded as potentially infectious – this is 24 hours prior to the time when the fever was first recognised.
  - Obtaining a detailed account of the patient’s movements while potentially infectious and during the incubation period (7-17days, usually 10 –16 days). This is both in order to identify primary contacts, and to investigate potential sources of infection. (It is more difficult to get this information from the patient after admission to hospital.). Use this information to begin drawing up a list of primary contacts.

3.18 Contacts who are present at the site should be encouraged to stay there until smallpox can be excluded or confirmed. This is to facilitate infection control, and because they may then be given immediate vaccination by the SMART if smallpox is confirmed. If this is not possible, full contact details should be obtained.

3.19 Immediate transfer may be requested by the SDE for probable cases of smallpox (unless already in ICU), or for suspected cases that are outside hospital but whose condition is causing concern or deteriorating. In this event the SDE should accompany the patient but must ensure that the referring clinician is able to maintain infection control measures at the site. The SMART will split:
3. Assessment and management of initial cases

- The Medical Consultant and clinical nurse (and Paediatrician if appropriate) will join the patient at hospital isolation facilities.
- The Public Health Consultant and Public Health or Infection Control Nurse will go to the site to ensure that infection control measures are maintained and begin contact identification and tracing.

3.20 Otherwise the SMART will attend the patient with their allocated equipment and supplies. The SMART paediatrician could replace the physician if the patient is under 16 years old.

3.21 When they reach the patient and/or site, responsibility for management transfers to the SMART, and at least one member of the Team should stay with the patient and at the site until smallpox can be confirmed or excluded.

3.22 After a clinical assessment, the SDE or SMART will send diagnostic clinical specimens for EM. A minimum of four specimens of vesicle fluid should be sent to the designated Containment 3 laboratory at SVC, Gartnavel.

3.23 Ideally one member of the SMART will personally transport specimens and hand over to laboratory staff to ensure correct delivery. On receipt of the specimens the designated laboratory will immediately dispatch at least two of them to a UK Reference laboratory for confirmatory tests. Transport of specimens from the field to the designated laboratory and from SVC, Gartnavel to UK Reference laboratories may require a blue light escort for speed. Regional variations of transport arrangements may be necessary. Safe handling, control of infection procedures during transport of specimens etc will be covered during training of the SMART.

3.24 If this is not practical, SIPG should ensure local arrangements are put in place to ensure that the sample is delivered to an identified person in the laboratory.

3.25 If diagnoses other than smallpox are also considered possible, the SDE or SMART will send additional relevant specimens and initiate or continue appropriate treatments according to normal procedures.

3.26 Further specific management depends on the location of the patient. The on duty SMART will attend and commence clinical and public health management of suspected or probable cases. If they are required to spend long periods at the site whilst awaiting results, if their workload becomes excessive, or if additional suspected or probable cases arise, they may call for support from other SMART.

3.27 EM results should be available within 6 hours of dispatch of specimens from anywhere in the UK. There are three potential EM results:
- Organism other than smallpox detected (e.g. a herpes virus) – this may be regarded as a negative result. The SDE and SMART should refer the patient to appropriate local services.
3. Assessment and management of initial cases

- No organism detected – this should be regarded as an **equivocal result**, and the diagnosis of smallpox should not be excluded until there has been confirmation by a Reference laboratory.
- Orthopox particles detected – this should be regarded as a provisionally positive result, indicating a **probable case**, pending a confirmation by the Reference laboratory.

**Action for initial probable cases**

3.28 The patient will be transferred to isolation facilities if this has not already happened. Ideally, one of the UK High Security Infectious Disease Units (HSIDU) (Newcastle General Hospital, Newcastle upon Tyne or Coppett’s Wood Hospital, North London) should be used. Contact numbers can be accessed via SCIEH. However, it may be necessary to use an alternative ID unit in Scotland if:
  - the patient’s life will be put at risk by a prolonged ambulance transfer.
  - there are large numbers of initial probable or confirmed cases and the high security units are full.

3.29 SIPG should therefore examine local hospital isolation facilities to determine which ones might be used for the care of initial probable cases of smallpox in Scotland.

3.30 The patient will be transferred in an ambulance, using standard procedures for a Containment 3 infectious removal, accompanied by the SMART Medical Consultant, Clinical Nurse, and Paediatrician if appropriate. The ambulance crew should have minimal contact with the patient who will be handled by members of the team. A police escort is likely to be required. One relative or friend (a parent if the case is a child) may also accompany the patient.

3.31 After the ambulance crew has delivered the patient to the isolation facilities, they will park in a secure area, thoroughly clean the vehicle with disinfectant (0.1% hypochlorite) and then lock it. They will then remove and dispose of protective clothing, and shower and change where these facilities are available. They will then leave their contact details with SMART before going off shift pending PCR results. If PCR is positive they will be vaccinated immediately, unless already vaccinated within the previous 6 months.

3.32 The SMART Public Health Physician and/or Public Health/Infection Control Nurse will remain at the site to ensure that infection control measures are maintained, continue contact identification and tracing, and begin vaccinating contacts if the case is confirmed using the equipment at Appendix 4.

3.33 Diagnosis of a probable case will lead to mobilisation of a public health response including preparation of Smallpox Care Centres and Smallpox Vaccination Centres, contact tracing and deployment and distribution of vaccine supplies. However, vaccination should be deferred until confirmation by PCR.
3. Assessment and management of initial cases

3.34 PCR results should be available within 12 hours of dispatch of specimens from anywhere in the UK. A positive PCR is required for confirmation of initial cases. However, in a case with strongly suggestive clinical features and no other diagnosis, smallpox should not automatically be excluded on the basis of a negative PCR result. The case should be reviewed and laboratory tests repeated if necessary.

Action for initial confirmed cases

3.35 Until further staff can be immunised, care of the initial confirmed cases, first at hospital isolation facilities and then at Smallpox Care Centres will have to be carried out by SMART members supported by SDE, HSIDU and other staff who have been vaccinated.

3.36 The site at which the patient presented (home, GP surgery, hospital ward) etc. may need to be evacuated until it can be decontaminated. Other areas which the patient may also have contaminated should be identified.

3.37 UK National, English Regional and Scottish Smallpox Outbreak Co-ordination Centres (NSOCC, RSOCCs and SSOCC) will be convened to co-ordinate the public health response and monitor the epidemiological picture in the UK, English Regions, and Scotland respectively.

3.38 The UK CMOs will declare Alert Level 2 (case in UK). Major control plans will be initiated with a response at local, regional and national level as described in ‘Deliberate Release of Biological and Chemical Agents in Scotland’.

3.39 Rapid health alerts by CMO’s Public Health Cascade and SCIEH rapid alert system will be sent out for enhanced surveillance for other cases. This will include activation of NHS24 pathways.

3.40 Designated Smallpox Care Centres will be activated as soon as the Alert Level 2 is declared by the CMOs, as these will be required to receive new patients once the high security beds are occupied. They will need to be opened within 24 hours of confirmation of the first case (see Appendix 5).

3.41 Designated Smallpox Vaccination Centres will also be activated at Alert Level 2 as soon as possible and at least within 48 hours. These will be required for vaccination of contacts of cases. (See Appendix 6).

3.42 Vaccination of contacts will proceed. Further healthcare, laboratory, emergency and other essential personnel, including a large number of additional SMARTs and SDE, as identified at alert level 0, will be vaccinated to allow a response to multiple cases arising simultaneously. These should have been identified at Alert Level 0 and additionally at Alert Level 1.

Cases arising in hospital
3. Assessment and management of initial cases

3.43 Cases may be detected in A & Es, general hospital wards, ICUs or ID units. Contacts in the hospital may be particularly susceptible to infection due to immunosuppressive disorders or treatments, or general ill health. Attack rates in hospital outbreaks of smallpox have been high and strict infection control measures are needed.

3.44 If a patient with a suspicious illness is recognised, the Hospital Infection Control Team and Hospital Management should be informed immediately. If possible, hospital air conditioning systems should be turned off immediately and remain off until smallpox has been excluded or decontamination completed. The hospital should have arrangements appropriate to their hospital layout and ventilation systems. This may necessitate deployment of alternative cooling facilities.

3.45 The Hospital Infection Control Team should assist the SMART in identifying all areas that the patient has passed through in order to guide implementation of infection control measures. The SMART will provide expert advice on strict infection control measures, which may include the closure of the A&E ward or the whole hospital.

3.46 Identification of contacts will require consideration of airflows within the hospital. Tracing of contacts will include other inpatients, discharged patients who were in contact with the case during their hospital stay, visitors to the hospital, and staff. Vaccination should be prioritised to those who have had the closest and most prolonged contact with cases.

3.47 Depending on the structure of the hospital, and airflow within it, consideration may be given to vaccinating all patients, visitors, staff and others who have been present in the building with an infectious case. At Alert Level 0, Hospital Infection Control Teams should examine their hospitals’ plans to determine airflows so that they are prepared for contagious pathogens. In the event of a case of smallpox, this will enable risk areas to be determined rapidly, allowing vaccination to be prioritised and disruption to be kept to a minimum.

3.48 Vaccination status of staff who may have close contact with a case:
- if vaccinated within the previous 6 months – no action required
- if vaccinated more than 6 months previously, but within 3 years – re-vaccinate
- if not vaccinated within the last 3 years, or never vaccinated – vaccinate immediately. They will require formal monitoring and will not be able to work during the restriction period. This will severely disrupt normal hospital activity and should be incorporated into emergency preparedness/business continuity plans.

3.49 Inpatient contacts will require cohort observation, with strict infection control procedures observed to avoid spreading infection from any secondary cases that develop. Special consideration for the management of sick inpatient contacts will be required, bearing in mind contraindications to vaccination. Note also that early symptoms of smallpox may be masked by other underlying medical disorders.
3.50 It may be necessary to close large areas of the hospital to admissions, and restrict access to essential staff only, until all inpatient contacts are free of disease for 16 days after their last exposure to infection, since secondary cases may arise elsewhere in the building during the incubation period. Subsequent decontamination may necessitate prolonged closure of large areas of the hospital. Alternative facilities for healthcare provisions will be required and these would be identified by NHS Boards. It has to be recognised that routine and elective procedures would be suspended until the outbreak was under control.

3.51 It is also possible that in the event of a confirmed case in a hospital (i.e. has had multiple transfers and contacts) the hospital may become a Smallpox Care Centre.

**Cases arising at a Port**

3.52 Cases may present at an airport or seaport. In the event of a case presenting at a port it may be possible to hold both the case and contacts against their will, as the Designated Medical Officer (DMO) acting under Port Health Regulations can advise the immigration authorities that passengers should not be allowed to enter the country.

3.53 It is possible that the Public Health (Aircraft) (Scotland) Regulations or the Public Health (Ships) (Scotland) Regulations have not resulted in prior notification of the case to the Local Authorities designated with the port health function and the case has presented at the port (Figure 7).

3.54 If there is prior notification to Local Health Authorities port health function, then the DMO should board the aircraft or ship, the case should not be allowed to leave until an assessment has been made by the SDE and SMART team according to criteria in paragraph 3.15. Contacts should be held in a separate area.

3.55 If the diagnosis is confirmed then all those on the same plane should be treated as Category A contacts. Contacts on a ship may be Category A or B depending on proximity and duration of exposure. The patient may have had other contacts during their journey through the port, and these will have to be contacted through passenger lists or an official announcement made asking them to identify themselves. This would apply retrospectively if it was recognised that a case presenting elsewhere had entered through a port during the infectious phase.

3.56 Health services that provide care for asylum seekers in detention, induction and accommodation centres should be aware of the possibility that a case may present in a new entrant to the country.
3. Assessment and management of initial cases

Co-ordination of the Public Health Response in the UK and Scotland

3.57 Isolation of cases and effective identification, tracing, vaccination and monitoring of contacts is essential to prevent the spread of infection. Any delay in intervention is likely to make a large impact on the size of the outbreak. Following briefing by the SMART, the local CPHM (CD&EH) of the NHS Board affected will be responsible for contact identification, tracing and monitoring contacts.

UK

3.58 In order that these activities are properly organised, UK National, English Regional and Scottish Smallpox Outbreak Co-ordination Centre (NSOCC, RSOCCs and SSOCC) will be established following the first confirmed case of smallpox. SSOCC will be required in Scotland since cases in Scotland may have contacts anywhere in Scotland or elsewhere in the UK.

3.59 UK-NSOCC will be located in the emergency room of the Health Protection Agency (HPA). It will be accountable to the DH. The DH will also set up its own emergency team. Firm links between both teams and the NHS would need to be established.

3.60 The role of UK-NSOCC is the collation and analysis of epidemiological and laboratory information in England and in the UK overall to assist identification of contacts and the source of infection, and the overall co-ordination of the public health response at a UK level.

Scotland

3.61 SSOCC will be located at SCIEH and will be accountable to SEHD. SEHD will also set up its own emergency team which will form part of the Scottish Emergencies Co-ordinating Committee SECC) in the Scottish Executive Emergency Room (SEER). Firm links and lines of communication between SSOCC and the SEHD team of SECC and NHSScotland will need to be established.

3.62 The role of SSOCC is the collation and analysis of epidemiological and laboratory information in Scotland to assist identification of contacts and the source of infection and contribute to the overall co-ordination of the public health response in Scotland working with the SEHD team of SECC at the SEER.

3.63 The SIPG should form the foundation of the SSOCC and will be headed by the Clinical Director of SCIEH on behalf of the CMO. The SSOCC will liaise with the Joint Health Advisory Cell (JHAC). SSOCC will be accountable to SEHD and will liaise closely with UK-NSOCC and the SEHD team of the SECC at the Scottish Executive.
3.64 At Alert Level 1 and above SIPG will disband to permit the release of members to SSOCC as above and to SEER or NHSScotland responsibilities. The SEHD will provide a team to direct the strategic level response to any outbreak, to provide health advice to Ministers, to communicate with the DH Co-ordination Centre and to communicate with NHSScotland. It will be located in the SEER with other SE and Scottish Agencies as appropriate and operate as part of the Scottish Emergencies Co-ordinating Committee. This SEHD team will be headed by CMO and comprise Public Health and Emergency Planning officials together with a medical epidemiologist from the SSOCC at SCIEH (another medical epidemiologist will remain at SCIEH to head SSOCC). There will also be input from CMO’s consultant advisers in Infectious Diseases and Virology as appropriate.

3.65 SSOCC should include input, advice and liaison with groups listed below.

- NHS Boards - including CPHMs (CD&EH) and nurses, ID physicians, frontline clinicians, virologists, hospital infection control specialists and others as appropriate.
- Data handling, administrative and support staff.

3.66 The role of SSOCC may also include:

- Co-ordinating assessment and management of cases – through the Scottish network of SDE
- Identifying and trace contacts, and arrange vaccination and monitoring of contacts
- Monitoring side effects of vaccination
- Establishing essential communication lines
- Arranging vaccination of essential personnel
- Ensuring infection control including decontamination of affected areas
- Collecting information about the movement of smallpox cases during the incubation period to help identify the source of infection.

3.67 Lines of communication and accountability between NSOCC, RSOCCs, the Scottish Executive and SSOC and local clinical, laboratory and public health services are summarised in the following tables.
3. Assessment and management of initial cases

Command, Control and Communication in UK

National
- Scotland Office
  - DAs (SEHD)
  - SCIEH/SSOCC
  - SECC/SEER
- SofS
  - DH Co-ordination Centre
  - COBR
  - Cabinet Office CCS
  - OGDs
  - HO (CBRN)
  - ODPM
  - Health Departments
  - External Expert Group
  - HPA - NSOCC
- Regional Government
  - Regional Resilience
- Regional
  - NHS Boards
  - Ambulances
- Sub-Regional
  - Strategic Health Authorities
  - Lead PCT PCTs
  - HPA
  - RDPH
  - HPA - RSOCC
- Local
  - Hospitals
  - Primary Care
  - Lead PCT PCTs
  - NHS Trusts
  - Ambulance/Hospitals
- COVERT
  - Police
  - Fire
  - Local Authorities
  - Tactical (SILVER)
  - Operational (at scene) (BRONZE)

THREAT

OVERT
3. Assessment and management of initial cases

Lines of communication and accountability in UK including Scotland during an outbreak

Cases

- Diagnostic specimens
- Laboratory
- Results

Clinician

- Contact Monitoring
- CPHMs (CD&EH)
- DsPH

Contact identification and tracing

Collation and analysis of information in Scotland
Co-ordination of Scottish response

Collation and analysis of UK information and co-ordination of overall UK response

Media and public communications and instructions to NHS

Other REs/RDPHs

SSOCC

SCIEH

HPA

NSOCC

DAAs
SEHD

DH emergency operations room

Media and public communications and instructions to NHSScotland

SECC
SEER

Scotland Office

COBRA

SECC
SEER

Scotland Office

COBRA
3. Assessment and management of initial cases

Lines of communication and accountability in Scotland during an outbreak

- Clinician
- Cases
- Contact monitoring
- Contact identification and tracing
- Smallpox Diagnostic Experts (SDE)
- Smallpox Management and Response Teams (SMART)
- Diagnostics specimens
- Laboratory
- Results
- DsPH CPHMs (CD&EH)
- Smallpox Control Team (NHS Board)
- Smallpox Outbreak Control Centre SSOCC (SCIEH)
- SEHD Smallpox Management Team (SMT)
- SEER/SECC
- Scotland Office
- Cabinet Office Briefing Room (COBR)
- UK-NSOCC HPA
- DH Emergency operations room
- DH Co-ordination Centre
- Police – Operational and Other Emergency Services
- Police Tactical
- Police Strategic
- HDs External Expert Group
- *once JHAC established

LAs
4. Management of cases and contacts

Isolation of cases

4.1 Cases may arise in individuals who are being monitored as contacts, or in individuals who have no known epidemiological link to other cases. **Probable and confirmed cases** will be transferred directly to a treatment ward at a Smallpox Care Centre as soon as this is available. **Possible cases** will be transferred to an observation ward at a Smallpox Care Centre until the diagnosis of smallpox can be confirmed or excluded. Some of these may be due to side effects of smallpox vaccine.

4.2 A large number of **suspicious illnesses** are likely to be reported to RSOCC due to heightened awareness and anxiety among clinicians. These should be assessed and managed as during Alert Levels 0 and 1 with assessment by an SDE and further management by an SMART if necessary.

4.3 **Suspected cases** in the community whose clinical condition gives cause for concern prior to the availability of laboratory results should be transferred to the Smallpox Care Centre observation ward.

Care of cases

4.4 Smallpox is a severe viral infection, the care of which has **three** main components:

- Clinical care and support for the sick patients
- Maintenance of infection control during the infectious period
- Providing adequate healthcare input to ensure continued care until the patient is convalescent.

4.5 No antiviral drug is currently known to be effective against smallpox virus. It must therefore be assumed that patients suffering from smallpox will require support through the natural course of infection. Cidofovir has been used to successfully treat the pox infections *molluscum contagiosum* and *orf* in humans. The effectiveness of the drug against established smallpox disease is unknown. Depending on supplies, it may be available as a therapeutic option in some cases.

4.6 Transfer to ICU should be avoided in order to contain the infection. The equivalent of high dependency care should be provided in the Smallpox Care Centres. The levels of care that could be provided would depend on the number of cases.

4.7 Those with severe disease will require pain relief, hydration, nutrition, maintenance of personal hygiene and airways support, with skin care and treatment for secondary bacterial infections if necessary during the rash phase.
Patients with milder disease may remain self-caring in many respects, but should be isolated while infectious, to reduce the risk of generating further cases.

4.8 The early rash is accompanied by red and blistering lesions in the throat and upper airway. In severe cases these can be extremely painful and opiate analgesics may be required. If throat swelling threatens the airway, boluses of hydrocortisone may be given to relieve oedema, as for croup or bronchiolitis. The intravenous dose for an adult is 200 mg, and for a child, 5 mg/kg. Although corticosteroids may reduce fever, they have little effect on the evolution of the illness, and do not worsen the outcome of established viral diseases.

4.9 Oral hydration, and nutrition with soft food, is preferable as long as it can be adequately maintained. Intravenous hydration is possible in many cases, but a severe skin rash makes the care and maintenance of a peripheral intravenous cannula difficult. It may then be necessary to install a central venous cannula, which will require appropriately trained and vaccinated staff and radiological confirmation of correct positioning of the line.

4.10 An extensive rash will result in widespread exudation and crusting, including the scalp area. It may be beneficial to cut the hair short before this happens, to facilitate the shedding of crust and scabs, and to facilitate the maintenance of skin hygiene. Skin swelling can be a major problem, due to the extensive, deep-seated lesions. It is strongly advisable to remove rings and other body jewellery at the onset of the rash, to avoid constriction and ischaemia of digits or of other body areas. The more severe and extensive rashes are painful, and analgesia should be provided.

4.11 Skin hygiene contributes importantly to the avoidance of secondary infection, but infection of broken vesicles and pustules, and of denuded skin areas with Staphylococcus aureus or Streptococcus pyogenes cannot be avoided in all cases.

4.12 Treatment with oral or parenteral flucloxacillin or co-amoxiclav is appropriate (oral clindamycin is an alternative, with a higher risk of diarrhoeal adverse effects; co-trimoxazole is a second choice, with a risk of skin, bone-marrow or liver toxicity, particularly in older adults).

4.13 Hospital-acquired resistant organisms such as MRSA may require treatment based on the result of culture and sensitivity data. Secondary bacterial infection of the respiratory tract is much less common, but may be caused by staphylococci or streptococci or rarely Haemophilus influenzae. Advice should be sought from the medical microbiologist and local antibiotic policies should be followed.

4.14 There is often mild conjunctivitis, which requires no specific treatment. Pocks may affect the conjunctiva, but usually heal without affecting sight. The eyes may be closed by oedema as the rash reaches its height. Eye toilet using sterile saline is then helpful. Chloramphenicol eye ointment may be given for short periods of time if secondary bacterial conjunctivitis occurs.
4. Management of cases and contacts

4.15 As the fever subsides and the rash begins to heal, the patient will gradually become more mobile. Emotional support may be required at this stage, especially if there is significant facial scarring.

4.16 The need for continued isolation, until scabs have all been shed, may also be very trying for patients who are mobilising well. The last deep scabs (or ‘seeds’) tend to remain in the thick skin of the soles of the feet. In some circumstances it may be beneficial to remove these, using a needle to release them from hardened pockets of skin. The patient who is free of scabs can be released from isolation.

Contacts: Classification

4.17 Rapid identification and tracing of contacts is essential since vaccination should be carried out as soon as possible and at most within 4 days of exposure to infection, because the degree of protection diminishes as the interval between exposure and vaccination increases. Contacts should be checked for symptoms before vaccination, to ensure that they are not co-primary cases.

4.18 If the diagnosis of smallpox in possible or probable cases is subsequently excluded, contacts who have been identified but not yet traced need not be vaccinated or followed up further.

4.19 Primary contacts are persons who have had contact with confirmed cases of smallpox during the infectious period or with contaminated fomites. As a precaution, the infectious period should be regarded as from 24 hours prior to the first recognised symptoms until the last scab has been shed.

4.20 Primary contacts may be divided into two categories, A and B according to their risk of infection. These categories should be regarded as a guide. Individuals’ risk of infection should always be considered in the context of the proximity and duration of exposure.

4.21 Contacts may be asymptomatic or symptomatic. Symptomatic contacts are people who fit the contact definitions, and in addition have prodromal symptoms that may indicate early smallpox infection. These are prolonged high fever (above 38°C) and/or constitutional symptoms such as prostration, severe headache or backache, rigors and generalised maculopapular rash.

4.22 Secondary contacts are people in close contact with Category A primary contacts.

Category A contacts

4.23 Category A contacts are people who are likely to have been exposed to infection through face-to-face close contact with a case or contaminated fomites. They include:

   Household contacts: all persons usually resident at the same address as infectious cases of smallpox, and other visitors who have spent substantial periods of time at this address during the infectious period. Note that in
4. Management of cases and contacts

documented outbreaks the secondary attack rate among household contacts was around 50%.

**Face-to-face contacts**: all persons who have had prolonged interactions with infectious cases of smallpox within a distance of 2 metres (6.5 feet). These may include contacts at work, in social settings, and unvaccinated healthcare and emergency workers.

**Fomite contacts**: all persons who have had direct contact with clothing or articles that have recently been used by infectious cases of smallpox. Again these may include contacts at work, in social settings, and unvaccinated healthcare and emergency workers.

4.24 As a prompt, Category A contacts may be identified by asking about family members, relatives, close friends and close work colleagues who may have had contact with infectious cases of smallpox.

4.25 Other persons thought to have shared a common exposure with cases of smallpox, including the initial release of the virus.

**Management and monitoring**

4.26 Category A contacts should be vaccinated as a matter of urgency.

4.27 There are **no contraindications** for vaccination of Category A contacts. Vaccinators at Smallpox Vaccination Centres will have access to expert advice. If a Category A contact has severe skin disease or immunosuppression, they may be given VIG to prevent vaccine complications. If vaccination is indicated, depending on supplies, they may be given VIG to prevent vaccine complications. Adverse effects may be treated with cidofovir, although renal toxicity may limit its use. Category A contacts will be asked to return to a separate part of the Smallpox Vaccination Centre for assessment of their papule by a trained clinician (to avoid possible risk of transmission to others).

4.28 Category A contacts must be formally monitored for the development of symptoms for a period of 16 days from the last exposure to an infectious case. Formal monitoring involves daily recording of body temperature, measured orally, and daily reporting of this, and the presence of other constitutional symptoms to a designated Smallpox Contacts Telephone Number, which will be dedicated solely for this purpose.

4.29 An oral thermometer preferably single-use and disposable, a temperature chart, instructions on the measurement and recording of body temperature, general advice, and the Smallpox Contacts Telephone Number will be provided. In addition, a mobile telephone may need to be provided to those who do not have access to a mobile or land telephone at home.
4. Management of cases and contacts

4.30 Category A contacts who fail to make their daily health report or return for follow-up will be actively traced by the local CPHM (CD&EH), by telephone or in person.

Restrictions on activity (Quarantine)

4.31 Legal/Emergency powers may be invoked to restrict activities if smallpox cases do occur.

4.32 Category A contacts who develop a fever or other constitutional symptoms must stay at home and immediately telephone the Smallpox Contacts Telephone Number.

4.33 The restriction period is the time during which Category A contacts are at greatest risk of developing symptoms and becoming infectious. The incubation period for smallpox is usually 10 to 16 days, and as a precaution patients should be regarded as infectious from 24 hours prior to the first recognition of symptoms.

4.34 The restriction period therefore extends from 9 days after the first exposure until 16 days after the last exposure to an infectious case. During this time, restrictions on activity of Category A contacts apply. Contacts should stay at home. They must:
- stay away from work or school
- avoid contact with unvaccinated individuals
- stay away from crowded areas/gatherings
- remain within their local area

4.35 If they develop any symptoms however minor, they must remain at home and report to Smallpox Contact Telephone Number. Arrangements for the delivery of food and other essential items will be arranged with local authorities.

4.36 Outside the restriction period, and as long as they are well, Category A contacts may continue normal activities, although they must not travel abroad and should be advised to stay within their local area until the end of the formal monitoring period and until their vaccination site has completely healed.

4.37 There is no legislation to enforce compliance with restrictions on activity. However, in what will be a mainly susceptible population, the onset of symptoms in smallpox cases will be rapid and debilitating, and the patient is unlikely to continue their normal activities.

Action to be taken in the event of symptoms

4.38 Category A contacts who develop prodromal symptoms should be regarded as possible cases and transferred immediately to the observation ward of a Smallpox Care Centre. Those who also develop a vesicular rash should be regarded as probable cases and transferred to the treatment ward.
4. Management of cases and contacts

Category B Contacts

4.39 Category B contacts are people who have a lower chance of having been exposed to infection via aerosol. They include all persons who have shared rooms or other enclosed spaces with infectious cases of smallpox, and who do not fall into the groups of face to face or fomite contacts described above.

4.40 It is accepted that it is difficult to be specific about the definition of Category B primary contacts. However, these may include work colleagues, and people who have visited the same premises or travelled on the same public transport (buses, trains, tubes) as smallpox cases. People who have shared air-conditioned buildings with infectious cases should be managed as Category B contacts. However transient or distant contacts should not be managed as Category B contacts. SSOCC may need further advice as required to assist identification of Category B contacts.

4.41 It is accepted that the majority of individuals who fall into this category will be at minimal risk.

Management and monitoring

4.42 Category B contacts should be vaccinated unless they have contraindications in which case the risk from vaccination should be weighed against the risk from disease.

4.43 Category B contacts do not require formal monitoring. However, their details should be recorded, and they should be given an advice sheet including the Smallpox Contacts Telephone Number that they must call immediately if they develop a fever or other constitutional symptoms during the 16 days following their last exposure to infection.

4.44 Category B contacts will be given written instructions describing what the papule should look like. They need only return to the Smallpox Vaccination Centre for professional assessment if they are concerned that their papule has not formed.

Restrictions on activity

4.45 If asymptomatic no restrictions on activity are necessary for Category B contacts, however, they must not travel abroad until they have been free of symptoms for 16 days following their last exposure to infection, and until their vaccination site has completely healed.

Action to be taken in the event of symptoms

4.46 Category B contacts who have a fever or other constitutional symptoms or who develop prodromal symptoms will be assessed and referred to the observation ward of a Smallpox Care Centre if it is likely they are a possible case. Those who
also develop a vesicular rash should be regarded as probable cases and transferred to the treatment ward.

**Secondary Contacts**

4.47 Secondary contacts are people who will have ongoing household contact with Category A primary contacts during the formal monitoring period.

4.48 They may therefore be exposed to infection if the primary contact becomes symptomatic. They include all persons usually resident at the same address as the primary contact, and other visitors who will be required to spend substantial periods of time at this address during the formal monitoring period.

**Management**

4.49 All secondary contacts of Category A contacts should be vaccinated.

4.50 If they have any contraindications to vaccination then they should avoid contact with the primary contact until the primary contact’s vaccination site is completely healed because of the risk of transfer of vaccinia infection. This may mean leaving the house.

4.51 No monitoring or restrictions on activity are necessary unless the primary contact becomes symptomatic, and therefore becomes a possible or probable case.

4.52 If smallpox is confirmed in the primary contact, then the secondary contacts become Category A contacts themselves and must be managed accordingly.

4.53 Secondary contacts will be given written instructions on what the post-vaccination papule should look like. They only need to return to the vaccination centre for professional assessment if the papule has not occurred by day 3.

**Transient and distant contacts**

4.54 There may be large numbers of people who are concerned about having been exposed through brief or remote contact with smallpox cases but who do not fall into the groups of Category A or Category B contacts, and are therefore not at risk of infection. These may include passing contacts for example in the street or shops, and people who have spent short periods of time in large well-ventilated areas with smallpox cases.

4.55 These individuals do not need to be traced and do not require vaccination. However, they may identify themselves once details of the case become public. Their details should then be recorded, and they should be given an advice sheet for reassurance. This will require a clear communication message and rationale for them not receiving vaccination.
4. Management of cases and contacts

4.56 These individuals should not be offered vaccination because this would divert resources away from the essential measures of tracing and vaccinating all Category A and B contacts. It is accepted that this may be difficult to enforce because of public pressure. Contingency plans for wider vaccination may be necessary.

Identification and tracing of contacts

4.57 SDE, SMART and clinicians at Smallpox Care Centres will establish the time from which cases of smallpox have been infectious. They will then:
- compile a list of household contacts.
- obtain a detailed account of the patient’s movements during the infectious and incubation periods. This is both in order to identify other primary contacts, and to investigate potential sources of infection.

4.58 Information about household contacts and the patient’s movements during the infectious period will be passed to SSOCC for further investigation and action.

4.59 Vaccination and monitoring of household contacts can be arranged immediately. Other Category A and B contacts will need to be traced urgently so that vaccination and monitoring can be arranged. This will be done through CPHMs (CD&EH) and their health protection teams.

4.60 It may be possible to trace contacts through official lists and social networks. However, if this is not possible, consideration should be given to making a public announcement asking contacts to identify themselves. This should be done with consideration to maintaining the confidentiality of smallpox patients.

4.61 A Smallpox Contact Tracing Number will be required at SCIEH so that contacts can identify themselves to SSOCC. They may also identify themselves to their GP or through NHS24, which will help to categorise contacts by using telephone triage to grade individuals’ risk of exposure to infection.

4.62 At the same time as making arrangements for formal monitoring of Category A contacts, their secondary contacts should be identified and offered vaccination.

4.63 Full details of all contacts identified will be recorded on a database along with the management and outcome of each.

Unimmunised primary contacts

4.64 These include primary contacts who refuse vaccine, fail to respond to vaccination, or who are vaccinated late (more than 3 days after their first exposure to infection).

4.65 Primary contacts who fail to show a response to a first dose of vaccine after 3 days should be re-vaccinated.
4.66 Non-responders and those vaccinated late may be given additional prophylaxis against smallpox concurrently with (re) vaccination in an effort to attenuate disease. Supplies of additional prophylactic treatments should be prioritised to those most at risk of disease:
- Contacts vaccinated between 3 and 8 days after first exposure to infection may be given VIG.
- Contacts vaccinated more than 8 days after first exposure may be given cidofovir.

4.67 Unimmunised primary contacts will also require additional monitoring and/or restrictions on movement:
- those in Category A will be asked to stay in isolation accommodation until the end of the incubation period
- those in Category B should be followed up as Category A contacts with a period of formal monitoring and identification and vaccination of secondary contacts.

4.68 **Isolation accommodation** will be required for unimmunised Category A contacts. Appropriate facilities, with individual rooms will need to be identified, which may include local hotels, university halls of residence etc. Staff, who have been vaccinated, will also be required to provide pastoral care and ensure contacts stay in their rooms and mixing does not occur.

**Special issues**

4.69 Individuals in certain groups such as illegal immigrants and overstayers, and homeless persons and drug users may pose problems. If they are cases, they may be reluctant to trust and engage with healthcare services when they become ill, thereby delaying access to healthcare and exposing more contacts. Even if they are close contacts, their details may not be volunteered by smallpox cases, which may mean that vaccination is delayed or overlooked. There could be difficulties explaining the need for admission to a centre, restricting their movements and logistical issues of monitoring for the development of symptoms.

4.70 Clear advice is needed to emphasise the severity of the problem, and guarantees may be required to protect the confidentiality of contacts and to protect illegal immigrants and over-stayers from prosecution. Engagement through voluntary and community groups may be effective. Interpreters should be available locally, and information sheets for those for whom English is a second language have been drawn up.
4. Management of cases and contacts

Summary of management of cases and contacts

Patient with suspicious illness

Clinical to assess according to diagnostic algorithm

SDE to assess

Suspected case

SMART to investigate

Probable case

Confirmed case

Contact identification and tracing

Smallpox excluded

Smallpox Care centre
  Treatment ward
  Observation ward

Secondary contacts

Category A
  Formal monitoring

Category B
  Informal monitoring

Possible case

Probable case

Secondary contact becomes Category A

Symptom free after 16 days

Fever

Discontinue follow up

Fever plus rash

V A C I N A T E
5 Vaccination

General principles

5.1 Vaccine against smallpox contains a live virus, vaccinia, which produces cross immunity against variola major and minor.

5.2 Targeted vaccination and monitoring of contacts, together with isolation of cases, is the mainstay of containment. The containment of transmission depends on early detection of cases and tracing and vaccination of contacts. This strategy of ring vaccination will be used initially to control an outbreak, and is compatible with WHO recommendations.

5.3 Smallpox vaccination carries a risk of complications, which occurred at a higher frequency than that now acceptable for a modern vaccine. These complications occurred more frequently in people who were immunosuppressed, people with eczema and pregnant women. Because of this, mass vaccination of the population is not a first line option either prior to or in the event of an outbreak.

5.4 There is a need to consider protection of close contacts of people who have been vaccinated in view of shedding of vaccinia virus (e.g. children with eczema should not share a house with someone who has been vaccinated until their vaccination site has completely healed).

5.5 Vaccinated individuals shed vaccinia virus until the pock has completely healed. Individuals who have been vaccinated should avoid contact with others who may be at risk from vaccinia. These are: people who are immunosuppressed, people with eczema and pregnant women. Individuals in these categories who normally live in the same household as vaccinees should move to alternative accommodation.

Efficacy and ‘take’ rate

5.6 Successful vaccination produces a characteristic papule after 3 days. This evolves into a vesicle at 4 to 5 days and a pustule at 6 to 7 days. The pustule is a reliable indication that protective antibody levels have developed, i.e. there has been a successful take. A more rapid response is seen in persons who have had previous vaccination.

5.7 Take rates depend, amongst other things, on potency of vaccine, age of vaccinee, past vaccination history and vaccination technique. For primary vaccination, take rates have historically varied from 85% to 99.9%. The primary take-rate of an appropriately potent \(10^8\) pock-forming unit/ml and properly administered vaccine is likely to be greater than 99%. For re-vaccination, take rates have been lower, from 54% to 93% with a mean of about 70%. With the cessation of routine
vaccination so long ago now, residual immunity is likely to be negligible, and any vaccination now may resemble the primary vaccinations of the past.

5.8 For pre-exposure vaccination, a successful take provides full protection against smallpox. Post-exposure vaccination given up to 3 days after exposure also provides protection, although it may not completely prevent infection, and patients may develop mild modified disease.

**Contraindications and complications**

5.9 Contraindications to vaccination include eczema, immunosuppression and pregnancy, among others. Full details can be found in the appendices.

5.10 Serious adverse effects associated with vaccination include inadvertent inoculation at other sites, generalised vaccinia, eczema vaccinatum, progressive vaccinia and post-vaccination encephalitis.

5.11 Surveys from the US have found that the overall risk of serious adverse events was between 50 and 1000 per million vaccinees, with inadvertent inoculation and generalised vaccinia the most common complications.


5.12 However, these data may not be directly applicable to the current UK situation for the following reasons:

- A different strain of vaccine virus will be used (Lister instead of New York Board of Health)
- There are more people at risk of adverse effects because the prevalence of eczema and immunosuppression is higher than in the survey populations.
- The incidence of complications is up to ten times higher in primary vaccinees than re-vaccinees.

5.13 In the same surveys, the risk of fatal complications was approximately 1 per million in primary vaccinees. In a study in England and Wales in the 1950s it was estimated at 3 per million. Death is most often the result of post-vaccinial encephalitis or progressive vaccinia. Fatal complications occur in approximately 1 per 4 million in re-vaccinees.

5.14 Contra-indications are relative. Those in close contact (i.e. Category A) of a case, will be offered vaccine and there is no contra-indication.

5.15 In mass population vaccination, the offer of vaccination to individuals with no contact with the disease would depend on circumstances-in particular the potential vaccinee's proximity to the Region affected and the number of cases.

5.16 See ‘Contra-indication to vaccination at different alert levels’ table at the end of this chapter.
5. Vaccination

Vaccination strategies at progressive Alert levels

Vaccination strategy at Alert Level 0 (No credible threat of release)

5.17 A central register will be kept of all persons vaccinated. A register for Scotland will be held at SCIEH and data provided to HPA/CDSC for a UK register in accordance with the Data Protection Act and Caldicott requirements. People on the register will be contacted annually to ensure that their details are correct. This provides a list of staff who can be accessed should the need arise.

5.18 The risk of adverse effects of vaccination must be balanced against the risk of leaving vulnerable those specialist healthcare and laboratory workers who would be first to be exposed in the event of a case and who would not have adequate time for vaccination to become fully effective. Some specialist healthcare and laboratory workers will therefore need to be vaccinated at Alert Level 0 to act as a first line of defence, even without an identifiable, specific threat. In the event of a case occurring, they will then be able to make the diagnosis, care for the patient, analyse clinical specimens, and initiate public health action to contain the outbreak. To maintain immunity, revaccination will be required every three years.

Those vaccinated at Alert Level 0 will be:
- Staff at the designated Category 3 laboratory at SVC Gartnavel where diagnostic clinical specimens may be sent for EM diagnosis. (Staff at the two UK Reference laboratories are already routinely vaccinated to protect them against other orthopox infections.)
- The SDEs
- The SMARTs
- Selected ambulance staff who would support the SMART
- High security ID staff
- A small number of vaccinators, including Occupational Health staff and other healthcare staff who would be ready to vaccinate and train others in the event of cases.

Essential service personnel who would be vaccinated at alert level 1 should also be identified. It is recognised that the alert level may not progress in a sequential manner. Other groups for vaccination may be identified or the identified groups may receive a different priority depending on the nature of the incident.

Vaccination strategy at Alert Level 1 (Case confirmed outside the UK)

5.19 At alert level 1 the following staff will be vaccinated:
- Additional SDEs and SMARTs
- Medical, nursing and support staff (porters, cooks, cleaners, laundry staff, etc.) who might be required to work at Smallpox Care Centres
- All Front-line clinical staff, dermatologists, public health and port health staff
5. Vaccination

- Additional vaccinators
- Front-line Ambulance crews
- All laboratory staff who might handle diagnostic clinical specimens (for EM and/or PCR)
- Epidemiological staff who might be involved in contact tracing
- Pathologists and mortuary staff who might handle infected bodies
- Environmental health officers who might decontaminate premises and/or be involved in a port health response
- Individuals who might be required to join SSOCC
- Front line staff of ‘blue light’ services
- Other workers from key industries necessary to maintain essential services, such as gas, water, electricity, fuel, telecommunications, food, transport etc. depending on the nature of threat.

5.20 SIPG should have identified these personnel within Scotland at Alert Level 0. To maintain immunity, **re-vaccination will be required every three years**.

5.21 Vaccination will also be offered to the following:

- All healthcare workers and ancillary staff
- Other ‘blue-light’ service staff

5.22 Should there be any cases outside the UK the DH will work closely with the WHO. Legal/emergency powers may be necessary to enforce travel restrictions.

5.23 Vaccination may be considered for travellers from the UK to infected countries, or from the UK in the event of an outbreak to countries that remain smallpox free.

5.24 All staff identified above where possible will be vaccinated in their workplace.

5.25 Essential personnel will be **screened** to ensure that neither they nor their household contacts has any contraindications to smallpox vaccine. An immune response will be verified before essential personnel are allowed to become involved in smallpox diagnosis, patient care, analysis of specimens or public health action.

5.26 Essential personnel will be **re-vaccinated every 3 years** in order to guarantee immunity.

5.27 The household contacts of immunised essential personnel will be vaccinated if there is a possibility that the worker has come into contact with smallpox. This is as a precaution in case infection is brought into the household either via contaminated fomites or if staff members develop modified disease.

**Vaccination strategy at Alert Level 2 (Case confirmed in UK)**

5.28 In the event of confirmed smallpox in the UK vaccination of key workers responsible for maintenance of essential services and utilities will continue.
Vaccination of personnel supporting the essential services may also need to be considered e.g. contractors and suppliers.

5.29 Eligible healthcare, laboratory and other essential personnel who were not vaccinated at Alert Level 1, will be vaccinated.

5.30 The contraindications to vaccination would change at this level because now many of these workers would be at risk of disease. Vaccinated staff would have to take precaution to avoid spread of vaccination virus to susceptible household contacts. If necessary, priority will be given to workers in the regions where there are cases.

5.31 Smallpox Vaccination Centres will be activated on confirmation of the first confirmed case for vaccination of contacts of cases. Vaccination will be provided by staff trained as vaccinators. Details of the contacts vaccinated will be maintained on databases that will be maintained by the SCIEH for Scotland.

**Vaccination strategy at Alert Level 3 (Outbreak occurring in the UK)**

5.32 As multiple cases occur vaccination of the above key groups would continue.

**Vaccination strategy at Alert Level 4 (Large outbreak not controlled by “ring”)**

5.33 Circumstances may arise when mass vaccination may be required to raise the level of immunity to smallpox:

- A large number of cases occurring simultaneously all over the country
- Uncontrolled spread resulting from large or multiple deliberate release
- Many secondary cases occurring without identifiable contact with a primary case, implying that contact tracing and enhanced surveillance for cases has been ineffective.

5.34 Public demand may also influence the decision to implement mass vaccination. General public demand for vaccination is not necessarily inevitable if public relations are good from the outset.

5.35 Decisions about whether to implement mass vaccination must be taken with due consideration of:

- the risk of adverse effects from vaccination, which may exceed the risk from disease
- vaccination complications, especially generalised vaccinia, may create difficulties in the diagnosis of smallpox
- vaccination resources, including vaccine supplies; there is a danger that mass vaccination could divert resources from essential outbreak control measures.
5. Vaccination

Vaccination strategy at Alert Level 5 (Outbreak controlled)

5.36 Following an outbreak at Alert Level 5, in order to maintain an immunised workforce/response team identified healthcare, emergency, laboratory and other essential personnel should be re-vaccinated every 3 years, and in addition if they are re-exposed if this is more than 6 months since their last vaccination.

Mass Vaccination

5.37 Isolation of cases, contact tracing, quarantine and ring vaccination remain the first line strategy for containment of an outbreak of smallpox. This is consistent with WHO advice. However, mass vaccination would be considered if there were

- multiple simultaneous outbreaks of smallpox
- new cases of smallpox arising which were not epidemiologically linked with previous cases
- overwhelming public demand.

The decision to extend beyond ring vaccination will be announced by the Health Departments.

5.38 Vaccination centres would be set up in Scotland. To minimise disruption to normal primary care services, these centres would not be within existing primary care facilities.

5.39 The planning logistics and operational details of such a campaign, including staffing of the centres, vaccine delivery and equipment necessary, are being developed by the DH in collaboration with other UK Government Departments, the Scottish Executive and other Devolved Administrations.

5.40 Those with contra-indications for vaccination who had not been in contact with a case would be excluded. These contra-indications would vary depending on the Alert Level and are described in the table at the end of this chapter.

5.41 An extensive nation-wide communication exercise including national and local TV, radio and press would be mounted to inform the public about the mass vaccination programme.
### Contra-indications to vaccination at different Alert Levels
For individuals in the absence of exposure to disease (i.e. no known contact)

<table>
<thead>
<tr>
<th>Contra-indication</th>
<th>Alert Level 0</th>
<th>Alert Level 1</th>
<th>Alert Level 2</th>
<th>Alert Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Smallpox</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>eradicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of eczema (past or present) or current skin exanthema*</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pregnancy or planning pregnancy</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Immuno-suppression</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cardiac risk factors</td>
<td>X</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Under 1 year old</td>
<td>No</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Household or sexual contact of an individual with skin eruptions-recent or current eczema</td>
<td>X</td>
<td>X</td>
<td></td>
<td>#</td>
</tr>
<tr>
<td>Household or sexual contact of a pregnant woman</td>
<td>X</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Household or sexual contact of an individual of severely immuno-suppressed persons</td>
<td>X</td>
<td>X</td>
<td>#</td>
<td>#</td>
</tr>
</tbody>
</table>
5. Vaccination

<table>
<thead>
<tr>
<th>Contra-indication (continued)</th>
<th>Alert Level 0</th>
<th>Alert Level 1</th>
<th>Alert Level 2</th>
<th>Alert Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Smallpox Remains eradicated</td>
<td>Case confirmed outside the UK</td>
<td>Case confirmed in the UK</td>
<td>Outbreak occurring in the UK</td>
</tr>
<tr>
<td>Household member under 1 year</td>
<td>X</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Inflammatory eye conditions that may lead to rubbing of the eyes</td>
<td>X</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Previous allergic reaction to vaccinia vaccine</td>
<td>X</td>
<td>X</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Allergy to any vaccine ingredients</td>
<td>X</td>
<td>X</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Currently ill with an infection with a high temperature (&gt;38°C)</td>
<td>X</td>
<td>X</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Recent immunisation with a live vaccine</td>
<td>X</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Screening questionnaire for risk of HIV or pregnancy</td>
<td>Tested for both</td>
<td>Yes</td>
<td>Yes</td>
<td>Public announcement</td>
</tr>
</tbody>
</table>

*Examples of skin exanthema - acne, burns, recent incisions, impetigo, contact dermatitis*
6 Enhanced surveillance during an outbreak

Identification of the source of infection

6.1 There may have been an overt release of virus. All those deemed to have been exposed, according to an evaluation at the site and time of release, will then be managed as Category A contacts.

6.2 It is more likely that the virus will be released covertly. Detection of the location of the event will depend on analysis of information given by patients about their movements during the incubation period. This information will be collated and analysed by SSOCC for Scotland in order to identify potential sources of infection, which may be other cases or the initial release.

6.3 If a potential source of infection is identified from common exposure histories, then others who have shared the same exposure should be regarded as Category A contacts and traced as a matter of urgency.

Case finding following a release

6.4 At Alert Level 1, clinicians (via CMO Public Health cascade and SCIEH rapid alert system) will be informed of the nature of the heightened threat, reminded of the presenting clinical features and case definitions, and the procedure for reporting and assessment of patients with suspicious illnesses as well as other sources of relevant information.

6.5 At Alert Levels 2 and 3, cases may arise in individuals who are being monitored as contacts, or in individuals who have no known epidemiological link to other cases. The latter will be assessed by one of the expanded number of SDE.

6.6 More intensive surveillance will be necessary to ensure that all cases are recognised and control measures implemented as early as possible. Clinicians will again be reminded of the presenting clinical features and case definitions, and the procedure for reporting and assessment of patients with suspicious illnesses.

6.7 SDE will be issued with Smallpox Reporting Forms including a Smallpox Reporting Telephone Number for reporting of suspected cases to SSOCC.

6.8 Active surveillance of hospitals may be required in order to reliably exclude additional cases. All hospital inpatients with suspicious illnesses, and recent unexplained deaths, should be reviewed retrospectively to exclude the diagnosis of smallpox.

6.9 NHS24 will activate algorithms combining details about symptoms and exposures in order to assess the significance of symptoms in concerned individuals and provide reassurance or referral to local experts as necessary.
6. Enhanced surveillance during an outbreak

Handling data

6.10 Even a small outbreak may generate considerable quantities of epidemiological data. Forms and tools to assist with the collection, collation and analysis of information about cases and contacts can be found in the plan appendices. These include:

- Smallpox case reporting form.
- Contact identification and monitoring form.

6.11 Epidemiological data will be collected in Scotland by SCIEH and passed to SSOCC for collation and analysis.

6.12 Epidemiological data will be used to inform real-time modelling of the spread of the outbreak and the effectiveness of interventions in order to inform further outbreak control measures.
7 Communication

7.1 A smallpox outbreak will necessitate extensive communication activities. In Scotland these will be run from the Executive and co-ordinated with DH, other Government Departments and the other Devolved Administrations according to defined strategies and procedures and will evolve in the event of an outbreak. These are likely to change as the outbreak profile emerges. Thus communication activities should have been occurring before any cases of smallpox are suspected, as well as strategies and procedures being in place should any cases arise.

Public and media

7.2 Pre-event disclosure of relevant information as part of a phased response to a credible threat is essential to establish public trust and co-operation in the event of smallpox cases arising.

7.3 Prior to any smallpox case, there needs to be communication between the SEHD, SCIEH and NHSScotland and the DH and HPA about these interim guidelines and their interpretation for local planning purposes, including information for the public and media responses.

7.4 There also needs to be inter-agency working at all levels with health and emergency services working with UK National, Scottish and Local emergency planning departments so that their roles in communicating to the public and media are known and understood should cases of smallpox occur.

7.5 Good communication during an event can reduce public anxiety and enhance the workings of emergency service responders and healthcare workers. The public should understand that a plan is being followed and given explanations for various actions being undertaken. Therefore, one of the primary communication objectives is to instil and maintain public confidence by providing the public with information that addresses their questions, fears and concerns. General information about smallpox, and updates on the status of any outbreak could be provided on a dedicated and robust website.

7.6 The purpose of smallpox communication arrangements would be to help local, regional and national public health staff effectively educate the public, health care professionals, policy makers, partner organisations and the media about smallpox, smallpox immunisation, and important health strategies related to smallpox (e.g. isolation and restrictions of movements) prior to an outbreak or confirmed cases of smallpox.

As communication plans develop they will be updated in the appendices.
Management of initial suspected cases - patient at home

**Patient with suspicious illness**

- **GP to assess patient according to Diagnostic Algorithm**

**Diagnosis of smallpox cannot excluded**

- **Call local Smallpox Diagnostic Expert (SDE)**
  - (contact details will be on the diagnostic algorithm)
  - they will visit to make a further assessment

**Suspected case of smallpox**

- **Call SMART**
  - they will visit to take over - further management

**Probable case of smallpox can be diagnosed clinically**

- **Call SDE**
  - SDE assumes responsibility for patient care and infection control

- **Call SMART**
  - SMART assumes responsibility for patient care and infection control

- **Send clinical specimens to the Regional smallpox diagnostic laboratory**

**Smallpox can be excluded on the basis of clinical assessment and laboratory test results**

- **GP to assess patient according to Diagnostic Algorithm**

**Smallpox has been excluded on the basis of clinical assessment and laboratory test results**

- **Stand down all action**
- **Inform all those notified**
- **Person responsible for patient care will refer them to appropriate local services**

**Patient must remain in the home**

- **Contacts who are present should be encouraged to remain in the home**
- **GP must remain at the premises while they remain responsible for patient care**

**Patient’s condition causes concern or is deteriorating**

- **Transfer patient to isolation facilities**
  - Category 3 infectious transfer to high security ID unit (the ambulance crew should provide their contact details)
  - Person responsible for patient care to accompany them
  - (If SMART has not already assumed responsibility for the patient, they will need to be informed of the transfer and arrange to assess at the destination)

**SDE assumes responsibility for patient care and infection control**

- **PCR positive**
  - Result should be available within 2 hours of dispatch of specimen

- **Probable case**

  - **Initiate wider action for initial probable cases**
  - **Send clinical specimens to the Regional smallpox diagnostic laboratory**

- **Confirmed case**

  - **Vaccinate all contacts present in the house**
  - **Vaccinate the GP**
  - **Vaccinate the ambulance crew**
  - **Begin tracing and vaccination of other contacts**
  - **Evacuate and seal the premises until it can be decontaminated**

**SMART assumes responsibility for patient care and infection control**

- **EM positive**
  - Result should be available within 12 hours of dispatch of specimen

**Probable case**

- **Initiate wider action for initial probable cases**

**Confirmed case**

- **Vaccinate all contacts present in the house**
- **Vaccinate the GP**
- **Vaccinate the ambulance crew**
- **Begin tracing and vaccination of other contacts**
- **Evacuate and seal the premises until it can be decontaminated**
**Management of initial cases - patient at GP surgery**

- **Patient with suspicious illness**
  - GP to assess patient according to Diagnostic Algorithm

- **Suspected case of smallpox**
  - Call local Smallpox Diagnostic Expert (SDE) (contact details will be on the diagnostic algorithm)
  - they will visit to make a further assessment

- **Probable case of smallpox can be diagnosed clinically**
  - Call SMART - they will visit to take over - further management

- **Diagnosis of smallpox cannot be excluded**
  - Call SDE - assumes responsibility for patient care and infection control

- **Confirmed case**
  - Patient must remain in the room
  - In the room, accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed)
  - if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites
  - Patients must remain in the room
  - Accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed)
  - if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites
  - The GP should stay at the surgery to assist with the movement of patients and visitors, and with identification of further contacts

- **Smallpox can be excluded on the basis of clinical assessment and laboratory test results**
  - GP to assess patient according to Diagnostic Algorithm
  - Patient’s condition causes concern or is deteriorating
  - Transfer patient to isolation facilities
    - Category 3 infectious transfer to high security ID unit (the ambulance crew should provide their contact details)
    - Person responsible for patient care to accompany them
    - If SMART has not already assumed responsibility for the patient, they will need to be informed of the transfer and arrange to assess at the destination

- **Probable case** of smallpox can be diagnosed clinically
  - Send clinical specimens to the Regional smallpox diagnostic laboratory
  - Epitope positive – results should be available within 6 hours of dispatch of specimen
  - Call SMART
  - Initiate wider action for initial probable cases

- **Confirmed case**
  - Initiate wider action for initial confirmed cases

- **Signs of vaccination** should be placed into yellow bags
  - Contacts who are present should be offered refreshments and communication with relatives and friends arranged
  - Identification and tracing of further contacts should be initiated – surgery records of all patients and visitors that day should be checked
  - Details of the patient’s movements during the incubation period should be collected

- **Smallpox can be diagnosed clinically**
  - Send clinical specimens to the Regional smallpox diagnostic laboratory
  - SMART assumes responsibility for patient care and infection control
  - Vaccinate all contacts present in the surgery
  - Vaccinate the GP
  - Vaccinate the ambulance crew
  - Begin tracing and vaccination of other contacts
  - Evacuate and seal the premises until it can be decontaminated

- **Smallpox cannot be excluded**
  - SDE assumes responsibility for patient care and infection control

- **Initial probable cases**
  - GP must remain at the surgery while they remain responsible for patient care
  - Isolate the patient in a single clinical room along with any accompanying relatives and friends
  - any accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed)
  - if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites
  - Patients must remain in the room
  - Accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed)
  - if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites
  - The designated ID physician and then SMART must remain at the premises while they remain responsible for patient care

- **Initial confirmed cases**
  - GP must remain at the surgery while they remain responsible for patient care
  - Isolate the patient in a single clinical room along with any accompanying relatives and friends
  - any accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed)
  - if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites
  - Patients must remain in the room
  - Accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed)
  - if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites
  - The designated ID physician and then SMART must remain at the premises while they remain responsible for patient care
Management of initial cases - patient in Accident and Emergency

Patient with suspicious illness

Senior A&E medical officer to assess patient according to Diagnostic Algorithm

- Call local Smallpox Diagnostic Expert (SDE) (contact details will be on the diagnostic algorithm) - they will visit to make a further assessment

Suspected case of smallpox

- Call SMART - they will visit to take over - further management

Probable case of smallpox can be diagnosed clinically

- Send clinical specimens to the Regional smallpox diagnostic laboratory

Diagnosis of smallpox cannot excluded

- Call SMART

SDE assumes responsibility for patient care and infection control

- Isolate the patient in a side room along with any accompanying relatives and friends.
- Isolate the patient in a side room along with any accompanying relatives and friends.
- Turn off hospital air conditioning.
- The ambulance used for transfer of the patient should be taken out of service.

Probable case of smallpox can be diagnosed clinically

- Initiate wider action for initial probable cases

Confirmed case

- Initiate wider action for initial confirmed cases

Smallpox can be excluded on the basis of clinical assessment and laboratory test results

- Send clinical specimens to the Regional smallpox diagnostic laboratory

- SMART to notify the designated Regional category 3 laboratory and the RE or RDPH who will notify local and national emergency and communicable disease control services.
- Alternative emergency healthcare provisions will be required whilst A&E remains closed.

Probable case of smallpox can be diagnosed clinically

- Send clinical specimens to the Regional smallpox diagnostic laboratory

EM positive (result should be available within 2 hours of dispatch of specimen)

- Turn off hospital air conditioning.
- The ambulance used for transfer of the patient should be taken out of service.

PCR positive (result should be available within 12 hours of dispatch of specimen)

- Call SMART

Transfer patient to isolation facilities

- Category 3 infectious transfer to high security ID unit (the ambulance crew should provide their contact details)
- Person responsible for patient care to accompany them
- If SMART has not already assumed responsibility for the patient, they will need to be informed of the transfer and arrange to assess at the destination

- Vaccinate all contacts remaining in the department, including staff.
- All inpatients who have had contact with the patient should be vaccinated and transferred to a dedicated ward for care and monitoring.
- Begin tracing and vaccination of other contacts – this may necessitate vaccination of the entire hospital.
- Evacuate and seal the A&E until it can be decontaminated.

EM positive (result should be available within 2 hours of dispatch of specimen)

- Turn off hospital air conditioning.
- The ambulance used for transfer of the patient should be taken out of service.

PCR positive (result should be available within 12 hours of dispatch of specimen)

- Call SMART

Transfer patient to isolation facilities

- Category 3 infectious transfer to high security ID unit (the ambulance crew should provide their contact details)
- Person responsible for patient care to accompany them
- If SMART has not already assumed responsibility for the patient, they will need to be informed of the transfer and arrange to assess at the destination

- Vaccinate all contacts remaining in the department, including staff.
- All inpatients who have had contact with the patient should be vaccinated and transferred to a dedicated ward for care and monitoring.
- Begin tracing and vaccination of other contacts – this may necessitate vaccination of the entire hospital.
- Evacuate and seal the A&E until it can be decontaminated.

- Patient must remain in the room.
- If the patient requires critical care, this should be carried out in A&E, avoiding transfer to ICU.
- Accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed) – if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites – this may necessitate a change of clothes.
- Ambulance patients and visitors to A&E who have had close contact with the suspected case (face to face contact or direct contact with body fluids) should be advised to remain in a separate room – if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites.
- Staff who have been directly involved in caring for the patient should remain in the department.
- The hospital Major Incident Plan should be activated. This should ensure that:
  - Those with minor ailments are sent home or to alternative healthcare providers
  - Those with more serious disorders are transferred to a ward - they should be placed on the same ward.
  - The department is cleaned of all unnecessary people.
  - No further patients or visitors enter the department - access to staff should also be restricted.
- Potentially contaminated fomites should be placed into yellow bags, and extreme care must be taken not to allow contaminated fomites to leave A&E.
- Contact details of patients, visitors and staff should be taken before they leave the department so they can be traced for vaccination if required.
- A&E must remain closed and traffic through it strictly controlled until smallpox has been excluded or decontamination has been carried out.

- Stand down all action
- Inform all those notified
- Person responsible for patient care will refer them to appropriate local services

- Patient must remain in the room.
- If the patient requires critical care, this should be carried out in A&E, avoiding transfer to ICU.
- Accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed) – if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites – this may necessitate a change of clothes.
- Ambulance patients and visitors to A&E who have had close contact with the suspected case (face to face contact or direct contact with body fluids) should be advised to remain in a separate room – if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites.
- Staff who have been directly involved in caring for the patient should remain in the department.
- The hospital Major Incident Plan should be activated. This should ensure that:
  - Those with minor ailments are sent home or to alternative healthcare providers
  - Those with more serious disorders are transferred to a ward - they should be placed on the same ward.
  - The department is cleaned of all unnecessary people.
  - No further patients or visitors enter the department - access to staff should also be restricted.
- Potentially contaminated fomites should be placed into yellow bags, and extreme care must be taken not to allow contaminated fomites to leave A&E.
- Contact details of patients, visitors and staff should be taken before they leave the department so they can be traced for vaccination if required.
- A&E must remain closed and traffic through it strictly controlled until smallpox has been excluded or decontamination has been carried out.

- Stand down all action
- Inform all those notified
- Person responsible for patient care will refer them to appropriate local services

- Contact details of patients, visitors and staff should be taken before they leave the department so they can be traced for vaccination if required.
- A&E must remain closed and traffic through it strictly controlled until smallpox has been excluded or decontamination has been carried out.

- Stand down all action
- Inform all those notified
- Person responsible for patient care will refer them to appropriate local services

- Contact details of patients, visitors and staff should be taken before they leave the department so they can be traced for vaccination if required.
- A&E must remain closed and traffic through it strictly controlled until smallpox has been excluded or decontamination has been carried out.
**Management of initial cases - patient in Intensive Care Unit**

- **Patient with suspicious illness**
  - Stand down all action
  - Inform all those notified
  - Person responsible for patient care will refer them to appropriate local services

- **Senior physician to assess patient according to Diagnostic Algorithm**

- **Diagnosis of smallpox cannot excluded**
  - Call local Smallpox Diagnostic Expert (SDE)
    - (contact details will be on the diagnostic algorithm) they will visit to make a further assessment
  - SDE assumes responsibility for patient care and infection control

- **Suspected case of smallpox**
  - Call SMART
    - (they will visit to take over - further management)

- **Probable case of smallpox can be diagnosed clinically**
  - Call SMART

- **Probable case**
  - Send clinical specimens to the Regional smallpox diagnostic laboratory
  - Call SMART

- **Confirmed case**
  - Isolate the patient in a side room along with any accompanying relatives and friends.
  - Physician who has already been exposed must remain with the patient.
  - Inform Hospital Infection Control Team and Trust Management.
  - Turn off hospital air-conditioning.

- **Patient must remain in the room.**
  - Accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed) - if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites – this may necessitate a change of clothes.
  - Visitors to ICU who have had close contact with the suspected case (face to face contact or direct contact with body fluids) should be advised to remain in a separate room – if they wish to leave, they must leave their contact details, and extreme care must be taken to avoid removing potentially contaminated fomites.
  - Other visitors should be asked to leave after leaving their contact details.
  - No further patients or visitors should be admitted to ICU.
  - Staff who have been directly involved in caring for the patient should remain on ICU.
  - Staff may leave at the end of their shift as normal after leaving their contact details.
  - Access to ICU should be restricted to staff who have already been exposed during previous shifts.
  - Potentially contaminated fomites should be placed into yellow bags, and extreme care must be taken not to allow contaminated fomites to leave ICU.
  - Contact details of patients, visitors and staff should be taken before they leave ICU so they can be traced for vaccination if required.

- **EM positive**
  - Result should be available within 6 hours of dispatch of specimen

- **PCR positive**
  - Result should be available within 12 hours of dispatch of specimen

- **Probable case**
  - Initiate wider action for initial probable cases

- **Confirmed case**
  - Initiate wider action for initial confirmed cases

- **Further care of the patient must only be carried out by immunised staff observing appropriate infection control procedures**

- **Vacinate all contacts remaining on ICU, including staff**
  - All other patients should remain on ICU for monitoring until 16 days after their last exposure to infection – this may require appropriate recuperation facilities for those who have recovered from their acute illness.
  - ICU should remain closed to admissions and visitors and access to staff should be restricted to those who have already been exposed.
  - Begin tracing and vaccination of other contacts – this may necessitate vaccination of the entire hospital.
  - ICU may be decontaminated once all monitored contacts have left - other areas of the hospital may also require decontamination.
Management of initial cases - patient at Port Health Control Unit

Patient with suspicious illness presents at Port Health Control Unit

Port Medical Officer (PMO) to assess patient according to Diagnostic Algorithm

Patient’s condition causes concern or is deteriorating

Transfer patient to isolation facilities
  • Category 3 infectious transfer to high security unit ID unit (the ambulance crew should provide their contact details)
  • Person responsible for patient care to accompany them
  • No other patients or visitors should enter the unit until smallpox has been excluded or decontamination completed

EM positive
  • Result should be available within 6 hours of dispatch of specimen

PCR positive
  • Result should be available within 12 hours of dispatch of specimen

Suspected case of smallpox

Call local Smallpox Diagnostic Expert (SDE) (contact details will be on the diagnostic algorithm) they will visit to make a further assessment

Probable case of smallpox can be diagnosed clinically

Send clinical specimens to the Regional smallpox diagnostic laboratory

Smallpox can be excluded on the basis of clinical assessment and laboratory test results

• Isolate the patient in a non air conditioned single room along with any accompanying relatives and friends.
• Patient must remain in single non air conditioned room
• Accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed) – They may not leave without permission from the SMART. Extreme care must be taken to avoid removing potentially contaminated fomites – this may necessitate a change of clothes
• Venilated persons in the Health Control Unit who have had close contact with the suspected case (face to face contact or direct contact with body fluids) should be advised to remain in a separate room. They may only leave with the permission of the SMART. Extreme care must be taken to avoid removing potentially contaminated fomites from the premises

SDE assumes responsibility for patient care and infection control

SMART assumes responsibility for patient care and infection control

Diagnosis of smallpox cannot be excluded

Call SMART - they will visit to take over - further management

Probable case of smallpox can be diagnosed clinically

Probable case

Call SMART

Confirmed case

• Initiate wider action for initial confirmed cases
• Vaccinate all contacts still present at port
• Vaccinate the PMO and other staff in contact
• Vaccinate the ambulance crew

Suspected case of smallpox

Send clinical specimens to the Regional smallpox diagnostic laboratory

Smallpox can be excluded on the basis of clinical assessment and laboratory test results

• SMART to notify the designated Regional category 3 laboratory and the RE or RDSPH who will notify local and national emergency and communicable disease control services
• Hold plane or ship do not allow further passengers to board.

• Isolate the patient in a non air conditioned single room along with any accompanying relatives and friends.
• Patient must remain in single non air conditioned room
• Accompanying relatives and friends should also remain in the room (this is so that they are available for immediate vaccination if the case is confirmed) – They may not leave without permission from the SMART. Extreme care must be taken to avoid removing potentially contaminated fomites – this may necessitate a change of clothes
• Venilated persons in the Health Control Unit who have had close contact with the suspected case (face to face contact or direct contact with body fluids) should be advised to remain in a separate room. They may only leave with the permission of the SMART. Extreme care must be taken to avoid removing potentially contaminated fomites from the premises

• Other ambulant persons may not leave the PHCU until given permission by the SMART
• If patients require transfer to hospital, extreme care must be taken to avoid removing potentially contaminated fomites from the premises

The designated ID physician and the SMART must remain at the port while they remain responsible for patient care

• Potentially contaminated fomites should be placed into yellow bags
• Contacts who are present should be offered refreshments and communication with relatives and friends arranged
• Identification and tracing of further contacts should be initiated
• Details of the patient’s movements during the incubation period should be collected

• Vaccinate the PMO and other staff in contact
• Vaccinate the ambulance crew

Patient’s condition causes concern or is deteriorating

Transfer patient to isolation facilities
  • Category 3 infectious transfer to high security unit ID unit (the ambulance crew should provide their contact details)
  • Person responsible for patient care to accompany them
  • If SMART has not already assumed responsibility for the patient, they will need to be informed of the transfer and arrange to assess at the destination

• Vaccinate all contacts still present at port
• Vaccinate the PMO and other staff in contact
• Vaccinate the ambulance crew
• Begin tracing and vaccination of other contacts
• Evacuate and seal the Port Health Control Unit until it can be decontaminated
Glossary

CAMR Centre for Applied Microbiology and Research
CCDC Consultant in Communicable Disease Control
CCS Civil Contingency Secretariat
CDC Centre for Disease Control and Prevention
CDCN Communicable Disease Control Nurse
CDSC Communicable Disease Surveillance Centre
COBR Cabinet Office Briefing Rooms
CPHL Central Public Health Laboratory
CMO Chief Medical Officer
CPHM (CD&EH) Consultant in Public Health Medicine (Communicable Disease & Environmental Health
DH Department of Health
DA Devolved Administrations
DMO Designated Medical Officer
DPH Director of Public Health
EM Electron Microscopy
EPCU Emergency Planning Co-ordination Unit
GP General Practitioner
HPA Health Protection Agency
HEPA Health Emergency Planning Advisor
HIV Human Immunodeficiency Virus
HO Home Office
HSV Herpes Simplex Virus
HSIDU High Security Infectious Disease Unit
ICN Infection Control Nurse
ICU Intensive Care Unit
IDU Infectious Disease Unit
IM Intra Muscular
IV Intra-Venous
JD Justice Department
JHAC Joint Health Advisory Cell
LA Local Authority
MRSA Methicillin Resistant Staphylococcus Aureus
NEPO National Emergency Planning Officer
NHS National Health Service
NHSScotland National Health Service Scotland [Check]
NSOCC National Smallpox Outbreak Co-ordination Centre
ODPM Office of the Deputy Prime Minister
OGDs Other Government Departments
PCR Polymerase Chain Reaction
PCT Primary Care Trust
PHCU Port Health Control Unit
PHLS Public Health Laboratory Service
PIL Patient Information Leaflet
PMO Port Medical Officer
PO Proper Officer
QA Quality Assurance
RDPH Regional Director of Public Health
RE Regional Epidemiologist
RSDRG Regional Smallpox Diagnosis and Response Groups
RSOCC Regional Smallpox Outbreak Co-ordination Centres
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>SCC</td>
<td>Smallpox Care Centre</td>
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<tr>
<td>SCIEH</td>
<td>Scottish Centre for Infection and Environmental Health</td>
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<tr>
<td>SE</td>
<td>Scottish Executive</td>
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<tr>
<td>SECC</td>
<td>Scottish Emergencies Co-ordinating Committee</td>
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<tr>
<td>SEER</td>
<td>Scottish Executive Emergency Room</td>
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<tr>
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<td>Smallpox Diagnostic Expert</td>
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<tr>
<td>SEHD</td>
<td>Scottish Executive Health Department</td>
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<tr>
<td>SIPG</td>
<td>Smallpox Implementation Planning Group</td>
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<tr>
<td>SMART</td>
<td>Smallpox Management and Response Team</td>
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<td>Scottish Smallpox Outbreak Co-ordination Centre</td>
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<td>Scotland Office</td>
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<td>SVC</td>
<td>Smallpox Vaccination Centre</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>VIG</td>
<td>Vaccinia Immunoglobulin</td>
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<tr>
<td>VZV</td>
<td>Varicella-Zoster Virus</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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