ABSTRACT

Background A mumps outbreak occurred in 2004–05 in England and Wales. The outbreak in the Avon area of England led to mass vaccination of 16- to 24-year-olds with the measles, mumps and rubella vaccine (MMR). The response to the outbreak was audited. Literature and web searches for audit standards were undertaken, and experts in the field were contacted. No comprehensive audit standards for outbreaks of communicable diseases were found. This article describes an approach to developing audit standards for outbreaks of communicable diseases.

Methods Audit standards were developed based on the memorandum of understanding between the National Health Service (NHS) and Health Protection Agency. The audit was undertaken involving 25 staff.

Results The audit standards developed identified many areas for improvement including training, strategic co-ordination, inter-organizational communication, consistency and timeliness of communication. Conducting the audit was problematic because there were not pre-defined audit standards.

Conclusions Audit standards should be developed, which include issues relating to the structure, process and outcome of responses to outbreaks. The development of audit standards for the management of outbreaks is crucial to evaluate outbreak control and make necessary improvements.

Keywords audit, MMR, mumps, outbreak

Introduction

The number of confirmed mumps cases rose across England and Wales in 2004 and 2005, with many reported outbreaks in universities. In 2002, there were 505 confirmed cases of mumps, and in 2005, there were 43,322 cases. The outbreaks predominantly affected older teenagers and young adults, who were too old to be offered measles, mumps and rubella (MMR) vaccination when it was introduced in 1988. The high uptake of the MMR vaccine in younger children reduced the circulation of mumps, which in turn prevented older unvaccinated children from being exposed to mumps and acquiring natural immunity.

In 2004, an outbreak of mumps in the Avon area led to mass vaccination of young people (aged 16–24 years) with the MMR vaccine. To identify areas for improving the response to outbreaks of communicable disease, the local National Health Service (NHS) and Health Protection Agency audited the response to the mumps outbreak. Audit is an improvement tool for reviewing services delivered against explicit standards, identifying where changes are necessary and implementing those changes.

A literature and web search for audit standards for mass vaccination programmes in response to an outbreak was undertaken, including the assessment of any standards developed by the Health Protection Agency, Department of Health and Faculty of Public Health. Experts in the field were also contacted. No comprehensive audit standards for outbreaks of communicable diseases were found. The few examples of outbreak audits described in the literature focus on individual aspects of the outbreak, for example, notifications, helplines or the interventions (Table 1). Five Scottish health boards developed structure, process and outcome
indicators including multi-sectoral collaboration in environmental services. However, outbreak control was not included. This article describes an approach to developing audit standards for outbreaks of communicable diseases.

**Methods**

An audit of an outbreak that involves mass vaccination presents broader issues than auditing a routine immunization programme. For example, mass vaccination involves cooperation across organizations, rapid communication internally and with the public and administering large quantities of vaccine. The lack of objective criteria for measuring many of these tasks presents a considerable challenge when designing and measuring audit standards.

Owing to the lack of existing standards, relevant statements contained in the Memorandum of Understanding between the Health Protection Agency and Bristol South & West Primary Care Trust and the Faculty of Public Health's media audit were turned into audit standards. The Donabedian approach of structure, process and outcome was used as the framework for constructing the audit (Table 2).

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<tr>
<th>Table 1</th>
<th>Examples of outbreak audits</th>
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<tr>
<td>Audits of surveillance looking at the process or completeness of notification</td>
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<td>Audit of an emergency telephone helpline set up during a meningococcal disease outbreak</td>
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<td>Audits of treatment in outbreaks focusing on therapeutic interventions, e.g. an outbreak of legionella pneumonia in Melbourne</td>
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<td>and the management of early syphilis in Manchester</td>
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<th>Table 2</th>
<th>Mumps outbreak audit standards</th>
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| **Structure** | Health Protection Team provided strategic co-ordination of the local multi-agency action on control of mumps  
Health Protection Team led the investigation and management of the outbreak of mumps  
An outbreak plan made clear who was responsible for deciding what extra resources were necessary |
| **Process** | Health Protection Team provided advice on health protection issues for mumps (directly or via PCTs) to health professionals, the public and local media  
Health Protection Team provided appropriate advice for the control of mumps in community settings (including development of standards, training plans, advice on problems and leading the investigation and management of the outbreak)  
Health Protection Team provided information to local PCTs about the rates of mumps infections  
Health Protection Team ensured that there were appropriate arrangements in place for the identification and protection of relevant contacts of mumps  
The Health Protection Team provided surge capacity (additional staff and resources) for the mumps outbreak  
The Health Protection Agency provided specialist advice on mumps at national or regional level to support the work of Avon Health Protection Team  
The PCT Board and/or Professional Executive Committee considered guidance drawn up by Avon Health Protection Team and, where appropriate, adopted the guidance as PCT policy  
The PCT encouraged reporting of mumps infections to Avon Health Protection Team from its own staff and general practitioners (GPs)  
The PCT ensured that adequate resources were available to control the outbreak  
The PCT provided appropriate NHS services to support the Health Protection function  
Information about mumps was disseminated by the PCT to primary and community care staff, as advised by the Health Protection Team  
Information about mumps was disseminated by the PCT to the public as advised by the Health Protection Team  
The PCT provided Avon Health Protection Team with access to information held on the Child Health database  
Appropriate media were used in terms of the urgency of information to be put out and the geographical area to be covered  
A press release/statement was prepared for all proactive activity |
| **Outcome** | The control measures were effective in controlling the outbreak in educational settings  
The control measures were effective in controlling the outbreak in the general population  
Young people aged 16–24 years, in educational settings, were provided with the opportunity to be immunized with the measles, mumps and rubella (MMR) vaccination  
Young people aged 16–24 years, in non-educational settings, were provided with the opportunity to be immunized with the MMR vaccination  
The costs to the Primary Care Trust and Avon Health Protection Team in providing MMR vaccination to the 16- to 24-year-old population were appropriate, given the consequences of not providing vaccination |
An audit questionnaire was sent to 25 key staff involved in the strategic co-ordination of the outbreak, asking them to quantify the level of agreement with each audit statement. Staff included Directors of Public Health; Consultant in Communicable Disease Control (CCDC); leads for nursing, primary care and pharmacy; and communications managers.

It was apparent that valuable information could also be gained from staff involved at an operational level, including general practitioners (GPs), head teachers, prison health staff and nursing staff who administered the vaccine. As many of the audit standards were irrelevant to this group, a questionnaire was developed with five broad questions to find out what went well, problems encountered and suggestions for improvements. The results were then analysed thematically, and these qualitative results were presented alongside the main audit results. The results and subsequent recommendations were presented to those taking part in the audit.

Results
This audit approach was useful in identifying many issues that need to be addressed during subsequent mass vaccination programmes, such as an influenza pandemic. These included issues related to training, strategic co-ordination, inter-organizational communication, consistency and timeliness of communication. Lessons from this audit are being incorporated into local preparations for pandemic influenza.

The process highlighted the inadequacy of the Memorandum of Understanding as a basis for audit standards and the problems created by a lack of specific standards—in particular, contradictory statements regarding which organization was responsible; no mention of the appropriateness, quality or speed of response; and no reference to expected outcomes. Statements contained in the guidance are broad, with no specific measures or standards against which it would be possible to identify whether roles and responsibilities had been suitably discharged.

Discussion
Main findings
This study has found that there are no published standards for auditing outbreaks. It is surprising that no standards currently exist for auditing interventions following outbreaks of communicable diseases, given the inevitability of such events. The availability of a generic audit framework would enable organizations to audit and improve responses to outbreaks. The Health Protection Agency, Department of Health and Faculty of Public Health are all well placed to undertake this task. The Faculty of Public Health has developed an audit toolkit to ensure that the best available evidence is incorporated into practice and high standards are achieved. The toolkit could include audit standards for outbreaks under the heading ‘promoting and protecting the population’s health and well-being’.

What is already known
The literature review revealed that although audit standards exist for individual aspects of vaccination programmes, no comprehensive standards exist covering the range of issues pertinent to outbreaks.

What this study adds
Audit standards for outbreaks should cover the structural and process aspects of a mass vaccination likely to impact on outcomes, as well as specific outcome measures. Standards should address the timing, appropriateness and quality of the response. Based on the Avon experience of auditing responses to an outbreak, it would be useful to include the issues summarized in Table 3. The standards would be useful for a range of more common outbreaks of communicable diseases, e.g. Legionnaires’ disease, E Coli 0157 and meningococcal disease.

Limitations
The audit was limited in scope because the audit standards were not developed at the outset. Therefore, the audit of the mumps outbreak relied on using standards within the Memorandum of Understanding. The study is limited by only applying audit standards to a mumps outbreak.

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Table 3  Issues to be covered by audit standards

Structure
A strategic group to
Coordinate
Give direction
Ensure consistency of response across organizations
Lead on communication issues
Identify data required to monitor the campaign
Enable flexibility to transfer resources between organizations

Process
Appropriate decision-making with regard to national recommendations and cost-effectiveness
Appropriate use of an outbreak plan
Appropriate communication between organizations
Frequency of data collection
Frequency of analysing and sharing surveillance data
Timeliness of outbreak control measures
Equity of access to control measures (e.g. vaccines)
Safety precautions (e.g. use of resuscitation equipment, protecting cold chain for vaccines, storage of drugs and dealing with waste)
Appropriate training of staff (e.g. to administer vaccines)
Appropriate use of media (e.g. method and timing)
Appropriate use of methods to communicate with patients/public
Appropriate use of a telephone helpline

Outcomes
Length of time taken to control the outbreak
Cost incurred to control the outbreak
Uptake levels of vaccine, prophylaxis or other drugs
Accessibility of control measures to target group
Equity of access to control measures
Effectiveness of control measures to control the outbreak
Effectiveness of communication to target group

References