Preserving lessons learned in disease outbreaks and other emergency responses

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Abstract

Background Public health departments often miss the opportunity to both learn from outbreaks and disasters and share any ‘lessons learned’ with other public health partners. These missed opportunities inhibit the public health system’s ability to improve, change and adapt in an organized way.

Methods In 2003, Western Pennsylvania experienced the largest documented hepatitis A outbreak in US history. The authors documented the key facets of both the outbreak and the response, and in the process developed improved methods for capturing the historical record in an efficient and comprehensive fashion. This process incorporates key aspects of oral history, along with typical public health parameters such as epidemic curves and environmental risk factors, and allows for creation of unique tools for documentation and sharing with diverse audiences.

Conclusions Learning from experience is an essential part of reducing mistakes, improving public health response, and the methods described herein show one way that ‘lessons learned’ can become a valuable teaching/training tool for students and practitioners.

Keywords education, employment and skills, management and policy, public health

Introduction

Public health departments (PHDs) provide essential services on a daily basis, including the prevention of and response to infectious disease outbreaks, and more recently, emergency preparedness. However, PHDs have never been structured to take the best advantage of lessons learned or to share these experiences in an efficient way. One challenge is that staff are typically under pressure to rush back to ‘regular’ duties once the event is over. Detailed analysis is often considered a research function—overlooked and underappreciated.

In 2003, the largest documented hepatitis A outbreak in the USA occurred in Western Pennsylvania. The authors set out to preserve the outbreak story by identifying lessons learned, developing those lessons into teaching and training tools and creating products designed to be shared. Products included:

(i) complete study on CD:
(a) one-hour narrated PowerPoint with embedded video;
(b) case study exercise, including PowerPoint slides for teaching;
(c) PowerPoint lecture on preserving lessons learned;
(d) archive of press releases, literature and audio and video interviews.

(ii) Internet training modules:
(a) University of Pittsburgh Internet-based Studies in Education and Research;
(b) PA Prepared Health and Emergency Preparedness Online Learning.

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This article explores the process of studying events by gathering, preserving and presenting data. Although the focus is a disease outbreak, the model is appropriate for documenting other significant events.

**Background**

A comprehensive literature review finds rare examples of previous work, looking at pieces rather than the whole event, including using oral history in public health, preserving background materials and case studies. Numerous authors describe the epidemiology of conducting an outbreak investigation, which is also taught in schools of public health and practiced in the real-world setting. Numerous articles describe public health responses to an array of challenges, including disasters such as tornados and epidemics of influenza-like illness, West Nile virus and hepatitis A.

In recent years, PHDs have gained experience producing ‘After Action Reports’, but these almost exclusively follow drills and exercises—not real-life events. Morbidity and Mortality Weekly Review (MMWR), published by the Centers for Disease Control and Prevention (CDC), provides some excellent reports, including earthquakes, SARS or rubella, but these do not delineate decision-making strategies and methods.

Reviewing and analyzing the full range of activities associated with an outbreak or disaster is rarely undertaken. Potter et al. reviewed 116 individual articles describing 59 different outbreaks, and noted that ‘Few reports have written with specificity to document the chronology of outbreak response, or the dissemination of information to protect health care workers, or the communication with law enforcement and emergency operations that are important in response to bioterrorism. We conclude that the published record of infectious disease outbreaks can, in the future, be used as a source for practice based evidence...’. Phua and Kee conclude that research is needed on non-biomedical factors of infectious disease outbreaks. The lessons learned should be preserved in a comprehensive fashion, and good tools should be created to disseminate this information broadly.

**Methods**

This article focuses on preserving information from an outbreak, not conducting the investigation, and steps to take pre-, during and post-event. Some of the steps described below already take place during illness investigations and outbreak responses.

### Pre-event

Planning the process should begin before the emergency occurs. Actions include:

- identify and meet with stakeholders;
- establish consensus for the importance of preserving lessons learned;
- identify needed skills and resources;
- decide roles and responsibilities;
- create written protocols for preserving information;
- create agreements/relationships with stakeholders.

Preplanning must address the challenge that PHD staff are busy during an emergency, and identify people who can document the process in parallel to the response, including:

1. **agency retirees**, who have special value because they understand the system.
2. **academics partners** may be interested in analyzing these events and system responses for teaching, training or research.
   - ‘Centers for Public Health Preparedness’, 27 CDC-funded centers at accredited schools of public health in the USA.
   - ‘Centers of Public Health Practice’, which exist at a number of public health schools.
   - Asian Disaster Preparedness Centre (Thailand).
   - Canadian Centre for Emergency Preparedness.
   - University departments or schools of public health, medicine and history.
3. **service partners**, who are not otherwise involved.
   - Clinical colleagues
   - Health Protection Agency (UK).

Students can also make significant contributions, especially from schools of public health that have student response teams.

**During the event**

Information should be preserved in real time. Put basic information aside. One PHD in California developed an ICS-type response chart with a new position—the Internal Information Officer. This person was to be cc’d on all important communication and aggregate items such as:

- e-mails;
- notes;
- labs slips and other forms;
- official notices, including press releases;
- records of phone inquiries and responses.
External data gathering starts during the event, and continues afterwards. Print or on-line news media, including original press releases of official agencies and MMWR, provide significant data in a chronological framework.

**Post-event**

The largest task is gathering of post-event data, consolidation and analysis of this information, and dissemination of the findings in a practical and useful form. An academic partner may be best equipped to lead this phase.

The people involved in the outbreak are an often overlooked source of valuable information. Oral history techniques can be used to gather data from participants. This provides a rich and vibrant data set that can be preserved for future study. In the words of the Oral History Association, ‘Oral history is a field of study and a method of gathering, preserving and interpreting the voices and memories of people, communities, and participants in past events’. The oral historian creates a set of research questions and develops an interview to answer them. Table 1 shows the interview questions that were used in the study of the 2003 hepatitis A outbreak. The questions should be open ended, such as ‘what triggered your involvement’, but should also seek to answer specific, unresolved questions.

Using oral history can be easy if one is prepared. Those with experience in group facilitation, interviewing, etc., can learn the basics at courses offered by regional and national oral history associations or through university classes.

The process is completed by using all the gathered information to create materials in which the lessons learned may be shared. The authors created a CD on the hepatitis A outbreak, described in the Introduction section, which would allow anyone to identify and utilize the lessons learned. The training materials included embedded video clips from the oral history interviews to bring an added dimension to the facts of the case. The versatility of the material developed includes the opportunity to use it as an online training module, a 1 h classroom/training presentation, or the basis of a half-day case study or tabletop exercise. The case study allows students to find their own solution, but then learn about what was actually done, comparing and contrasting their ideas to the actual solution.

Other fruitful approaches include mentoring and/or peer-review by colleagues in order to share experience and promote good practice.

A final step in using the information can be the presentation of the outbreak material in a scholarly article. This is one of the best ways of ensuring that facts about the outbreak are available, and that others have the opportunity to adapt their activities based on lessons learned.

### Table 1 Oral history questions for the 2003 hepatitis A outbreak

<table>
<thead>
<tr>
<th>Question</th>
<th>Subtext</th>
</tr>
</thead>
<tbody>
<tr>
<td>What specifically triggered your involvement?</td>
<td>Tell me the whole story. Try to get them to go day by day.</td>
</tr>
<tr>
<td>What happened from there? Tell me the whole story.</td>
<td>Try to get them to go day by day.</td>
</tr>
<tr>
<td>When was outbreak first noted?</td>
<td>When did you think/know that it was an outbreak?</td>
</tr>
<tr>
<td>When did you think it was a common source?</td>
<td>When did you think it was a common source?</td>
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<tr>
<td>When did you think it was Restaurant Z?</td>
<td>When did you think it was Restaurant Z?</td>
</tr>
<tr>
<td>When did you mobilize people to investigate?</td>
<td>When did you mobilize people to investigate?</td>
</tr>
<tr>
<td>When did you mobilize people to inspect?</td>
<td>When did you call for Federal help?</td>
</tr>
<tr>
<td>When did you begin to take preventive action?</td>
<td>When did you begin to take preventive action?</td>
</tr>
<tr>
<td>Was there an ‘Aha!’ moment(s) for you in all this?</td>
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<tr>
<td>Can you tell me the story of the process of tracing this outbreak back to Mexico?</td>
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<tr>
<td>Who else had an important role? What was it?</td>
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<tr>
<td>Do you think that I should talk to this person?</td>
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<tr>
<td>What led to the decision to do prophylaxis? What this good medicine or just good PR?</td>
<td></td>
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<tr>
<td>Is it common to have deaths associated with a hepatitis A outbreak?</td>
<td></td>
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<tr>
<td>In its 12/9/2003 release, FDA noted fecal-oral transmission of hepatitis A, and it made me think that they might be concerned about secondary infections without specifically mentioning it. Did you see any evidence of secondary infections or have any concern in this regard?</td>
<td></td>
</tr>
<tr>
<td>On a scale of 1 to 10, how would you rate this response?</td>
<td></td>
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<tr>
<td>What things went well? (1 to 3)</td>
<td></td>
</tr>
<tr>
<td>What could be improved? (1 to 3)</td>
<td></td>
</tr>
<tr>
<td>What resources did you think were critical for this response? How did you get these resources? Were they sufficient?</td>
<td></td>
</tr>
</tbody>
</table>

Distribution and utilization

The authors have disseminated their products widely at state and national public health association conferences, including the 2008 and 2009 NACCHO Preparedness Summits, and meetings at CDC. In addition, the data from the hepatitis A outbreak are currently being used by researchers in Public Health Adaptive Systems Studies (PHASYS), at the University of Pittsburgh Center for Public Health Practice, one of seven CDC-funded ‘Preparedness and Emergency Response Research Centers’ developed in fall 2009 to
investigate the structure, capabilities and performance of public health systems for preparedness and emergency response activities. The hepatitis A data are being used to populate system models and to help understand wide-scale outbreaks looking at both pathogen spread and system response.

Conclusions

Lessons learned from outbreaks and other public health events can be preserved and used to direct future efforts. Innovative techniques, especially if considered in advance, can lead to the discovery of both local and systemic lessons and the creation of valuable outputs. This work is best done in real-time with retrospective consideration.

Future developments should include:

- Exploration of greater use of computer/Web based materials, such as the creation of a WIKI.
- Creation of meta-analyses, when a critical mass of such materials has been preserved. Original materials can be preserved through university archives.
- Exploration of applications of ‘root cause analysis’ (RCA), a discipline ‘for identifying the basic or causal factor(s) that underlie variation in performance, including the occurrence or possible occurrence of a sentinel event’. RCA may not be applicable since it often is resource intensive with staff dedicated to its oversight and application, but the principles of RCA might provide additional insights into capturing data and analyzing events.
- Development of performance indicators and standards for outbreak management for audit/evaluation, performance measurement or accreditation of public health organizations.

Lessons learned can prevent repetitive mistakes, guide public health workers through response and become a valuable teaching/training tool. In addition, every outbreak or disaster which is captured and shared becomes part of the historical record, and allows reflection and consideration.

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