Incident planning

The legionnaires' outbreak in Barrow-in-Furness, summer 2002

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Lessons learnt from the UK's largest outbreak of legionnaires' disease.

If the term "catastrophe management" is not an oxymoron, the staff at Furness General Hospital in the north west of England are uniquely experienced in this area. In the summer of 2002 this 400 bed hospital was confronted with the UK's largest ever outbreak of legionnaire's disease.¹ The disease was confirmed microbiologically in over 170 people, with 498 suspected cases being admitted to the hospital over a 10 day period. The mortality rate was about 3%. This compares favourably with another large recent outbreak in the Netherlands, where at least 188 people were infected by a contaminated fountain at a flower show (mortality 13%)² and with sporadic cases in the UK (11% in 1998).³ We feel that this was due to prompt recognition and appropriate management rather than low virulence of the organism. The outbreak also provided an early—and very public—test for the nascent Health Protection Agency (HPA).

The trust was able to secure funding for a study reporting the hospital's response to the incident and exploring the relation between the its major incident plan (drawn up in 1997 according to national guidance⁴) and what took place in practice. The study was reported in the *Emergency Medicine Journal* in April last year.⁵ The researchers interviewed in detail 15 managerial and clinical staff involved in the outbreak. In this editorial, inspired by that paper, some of the key players in the handling of the outbreak join the paper's lead author to summarise the management of the outbreak and draw out some pointers for the future.

A case of legionnaire's disease was identified in Barrow-in-Furness on 30 July. A second case was identified in east Lancashire two days later; this person had recently visited Barrow and an outbreak control team was convened for Friday 2 August. For epidemiological purposes, the standard Communicable Disease Surveillance Centre case definition was used with the additional

condition of being in Barrow in Furness during July 2002 being applied. The standard Communicable Disease Surveillance Centre questionnaire was used together with an additional page gathering details about movements in Barrow town centre. The only common factor was a link with Barrow town centre through work, residence, or travel—all cases could be linked to within 500 metres of a council run community arts centre with a ventilation plant that anecdotally was said to vent steam and spray into a well frequented public passageway.

In fact, an astute environmental health officer had noticed the problem on the evening of 1 August and switched off the system. None the less a thorough investigation of all possible environmental sources was carried out. The investigations included visual inspection, examination of maintenance records, and microbiological sampling. In the event, all other possible sources tested negative and *Legionella* was only recovered from the suspect source in the leisure centre. The bacterium was indistinguishable from that grown from several clinical samples

It would be misleading to suggest that management of the outbreak was "led" by any one organisation or person. While management was coordinated principally by the Health Protection Agency (which took the lead on public health investigation and liaison as detailed above) and the hospitals trust (which oversaw the handling of the large influx of patients), decisions were made by liaison between these two organisations, bringing in others as appropriate. As many other agencies were involved, with differing responsibilities and accountabilities, no one organisation or person would have the power and authority to take charge and in fact, integration, networking and "lateral delegation" between all those involved were evident. All were represented in the main incident room as the outbreak progressed, which aided

communication and informed decision making. The primary care trust, through its director of public health, liaised with local general practitioners and provided guidelines on the clinical management of the disease. The local authority and the ambulance service were represented, as were both the police and the Health and Safety Executive. There were two parallel prosecutions: the Health and Safety Executive was obliged to pursue their case for breach of health and safety legislation, and the police were engaged on a manslaughter investigation. The latter demanded a forensic evidence chain from the contaminated plant to the patients. This set an uncomfortable interface with clinical practice but it had to be accommodated from the outset. Furthermore, there were initial fears about widespread panic and consequential public order implications but these proved unfounded.

The management strategy focused on managing supply (of patients to the hospital) and demand (for beds, staff, and supplies). Knowledge of the disease incubation period permitted modelling of a predicted epidemic curve, albeit without an idea of the numbers of patients infected. The first aim was effected by working with general practitioners and the local population. In essence, a "reverse cascade" system was operated. We hoped that the public would keep the pressure off general practitioners, who in turn were to help keep the pressure off the accident and emergency (A&E) department at the hospital. If patients were seen in A&E, staff tried to send as many patients home with treatment as possible, to keep the pressure off the wards, and the hospital wards tried to work proactively with critical care staff to regulate the demand for intensive care.

Meeting the demand was challenging. The hospital is comparatively small and the next nearest district general hospital is nearly 50 miles away by road. Thus it was clear from the start that affected patients would be brought here rather than anywhere else. The main resources to be managed were beds, staff, clinical, and non-clinical support services and supplies. These are detailed below but an important factor was that we were not obliged to concern ourselves with financial constraints. The UK Department of Health recognised early on that the outbreak meant a substantial loss of elective activity, and relaxed

This editorial was inspired by the following article from the *Emergency Medicine Journal*: Smith AF, Wild C, Law J. The Barrow-in-Furness legionnaires' outbreak: qualitative study of the hospital response and the role of the major incident plan *Emerg Med J* 2005;22:251–5.

its performance management requirements for the rest of the financial year. The hospital was also told that the extra cost (estimated at £5 million) would be met by central government. We aimed to keep a "buffer" of between 15 and 30 beds empty at any one time to accommodate the unpredictable demand. These were created by cancelling elective surgical admissions, permitting the conversion of all but one of the surgical/gynaecology wards to "medical" wards, and turning the surgical day case ward into an inpatient facility.

Staffing presented particular issues. While staff were more than willing to start work early, stay late, and come in while on leave or days off, it was critical to ensure that they were given enough rest to be able to sustain themselves over the three week period. Nursing staff were transferred from non-acute areas into the A&E department and other hard-pressed areas. Junior medical staff were "loaned" from other hospitals and consultant physicians worked 12 hour shifts, each shift featuring at least two ward rounds to keep abreast of changing clinical conditions.

In the intensive care unit, the decision was made not to try to open and staff more beds in case quality of care was compromised. Instead attempts were made to identify as early as possible patients who might later need intensive care treatment. Critical care staff toured the medical wards assessing patients and were assisted in this by the use of an "early warning scoring" system, only recently introduced into the hospital, whereby patients' vital signs are scored and deterioration is more promptly recognised.⁶

Two aspects of the outbreak management that were very important in practice received little attention in the hospital's existing plan. The information technology (IT) department is mentioned only as a holding area for the news media. Keeping track of patients is one of the important necessities in any major incident. The purpose made case notes designed for use in a major incident were not used in the legionnaires' outbreak. Instead, a customised computer database was established by hospital IT staff and maintained by clerical personnel in the incident room for the duration of the outbreak and for some time thereafter. This was constructed in Microsoft Access and was intended to allow us to log all potential cases, whether microbiologically confirmed or not, so that they could be followed up. The patient administration system in use in the hospital at the time of the outbreak did not carry the facility for entering the depth of clinical information necessary nor for introducing

new data fields. Information in the database was shared with the NHS Strategic Tracing System, which was also still in development at that time, and also with the HPA's surveillance mechanisms, but they were not formally linked. Useful in the future would be databases of out of hours contact details for manufacturers of drugs and medical equipment, to enable the hospitals to contact them urgently if need be.

Secondly, media handling proved to be crucial. The plan suggests only that the local radio station be asked to broadcast a request for off duty staff to report to the hospital, but no further guidance is given. In the event, there was considerable, intense, sustained international media interest in the outbreak. We took the decision very early on to be open with the media but also proactive, by scheduling frequent press conferences and issuing press releases every four hours containing as much information as possible. Controlled access was also arranged to a range of senior staff and (with permission) patients and relatives. The media were asked not to approach patients and staff otherwise and to stay in public areas of the hospital. This strategy proved successful in that the media's demand for news was satisfied and patients and staff were protected from intrusion. Furthermore, the frequent updates were also noted by staff working inside the hospital, thus addressing the needs of internal communication to some extent as well. In addition, the local population seemed to respond by not consulting health services about non-urgent matters during the epidemic. Direct communication with the local community health services was through the primary care trust. Progress was also communicated formally to the local strategic health authority; representatives were present at outbreak team meetings and press conferences and regular reports were also made. Usually, too, we would have kept the Department of Health up to date with developments as a matter of course, but coincidentally the member of parliament for Barrow was a health minister at the time and took a close personal interest in events.

There was some initial debriefing within the trust, but probably the major impetus came with the funding for our study, which allowed participants to reflect on what had happened, and also enabled us to record and report on the response to the Department of Health for future use. We feel that a number of aspects could have been improved on. Firstly, no satisfactory formal system was in place for contacting senior staff in other hospitals in the North West Region. This would be essential if a

future incident covered a wider geographical area. Allied to this was the difficulty persuading people outside the immediate area to appreciate the severity of the problems we faced. Once this was understood (again more via the national news media than by direct contact) the necessary help was more forthcoming. Secondly, communication inside the hospital was felt to be poor initially, with staff learning more about the situation from the external news media than from internal sources. This was quickly addressed by issuing the same information both inside and outside the hospital. Thirdly, as suggested above, there was considerable initial negotiation with the police as to what information could be released to them in view of patients' right to confidentiality. We feel that it is worthwhile developing policies on this as part of major incident planning, bearing in mind the different possible situations that might arise. Thus valuable time and energy can be saved once incidents have started.

Nevertheless, this outbreak provides a new perspective on major incident planning and management. It has potential parallels with the management of large epidemics of influenza, for instance, or bioterrorist attacks. The novelty and duration of the outbreak meant that staff had to rely on their own knowledge and experience to improvise solutions and in fact the research suggested that it was this local, situated human knowledge that contributed to our success.^{5,7}

What lessons can be learned from our experiences? The geography of the outbreak was perhaps unusual, in that because of Barrow's position, cases were concentrated in a well circumscribed area. Had the outbreak taken place in a city, a larger number of hospitals, primary care trusts, and public health agencies would have been involved. Thus we suggest that, although the successful management of such incidents depends on multi-agency cooperation,⁸ incident plans should identify who will take the lead in making sure that all the necessary links are made as rapidly as possible to enable this. Furthermore, policies for handling the news media, and training for staff likely to deal with them, are to be recommended.

Information technology has much to offer the recognition and management of major incidents. As noted earlier, existing systems were not set up with outbreaks in mind. It may be tempting to try developing specific national software, but we suggest that there is likely to be little benefit in a national system that cannot be modified to meet the

(probably unique) information needs of each possible emergency situation.

However, electronic patient records proposed as part of the UK government's national IT strategy Connecting for Health⁹ are likely to be an advance in that the necessary clinical data should be routinely available and linked together. A vital aspect of emergency management will be to design plans, policies, and systems that permit scope for local knowledge and the improvisation born of human experience, and that permit the informal networks that contribute so much to clinical and organisational excellence to be supported and sustained.

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Community acquired legionnaires' disease: lessons for surveillance from recent outbreaks

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Sharing of multi-agency intelligence on cooling towers is needed for better prevention and control of outbreaks

Ever since the recognition of the clinical syndrome of epidemic atypical pneumonia and the identification of the causative role of legionella organisms, legionnaires' disease has posed considerable logistical problems for public health services. Outbreaks continue to occur and may be explosive, high profile, and difficult to control despite appropriate tactical mobilisation and cooperation between the statutory organisations charged with surveillance and response.^{1 2}

Hospital water systems initially featured as important preventable sources of legionella and a risk to susceptible groups, but nosocomial cases are now uncommon in the United Kingdom because of the successful implementation of proactive control measures directed towards reducing the risk from hot water and cooling systems.³

More recently surveillance for legionnaires' disease has focused particularly on the rapid identification and alerting of travel associated cases supported by an extensive European surveillance

network that has resulted in a number of notable successes in identifying linked cases associated with travel or specific high risk premises, particularly hotels.⁴ This network has enabled rapid communication of intelligence on suspected clusters and timely alerting of the travel industry and national control and enforcement agencies so that appropriate remedial action is taken to protect travellers.

Community acquired cases of legionnaires' disease remain a challenge and additional measures are now required if the public health impact of legionella in the environment is to be reduced still further. A critical review of existing surveillance data suggests some more strategic questions need to be addressed as recurring themes, risks, and exposure settings can be identified. Key among these is the pre-eminent role of wet cooling towers as significant sources of legionella organisms at the population level.^{5–18} The recent outbreaks in Barrow-in-Furness and Hereford, illustrate the continuing role of wet cooling

towers as significant exposure settings, particularly for vulnerable members of the local community.^{1 5 6}

The prevention of all sporadic cases of community acquired legionnaires' disease is arguably an unrealistic goal with a total of 2338 cases confirmed in England and Wales during the period 1980 and 2004.¹⁹ However, a further reduction in cases can be achieved through reducing the risk of exposure to significant community sources, such as wet cooling towers, that possess the potential for aerosol dispersal. In the United Kingdom this will require closer partnership working at local level between agencies such as the Health Protection Agency, local authority environmental health departments, and the Health and Safety Executive. Businesses are required to register cooling towers with the relevant local government authority in which the plant is situated. National guidance developed by the Health and Safety Executive clearly stipulates the responsibilities of businesses to ensure the appropriate maintenance and operation of wet cooling tower systems.²⁰ Compliance is monitored by local authorities and the Health and Safety Executive. Potential conflicts of interest can arise where a local authority may be expected to monitor compliance with maintenance standards for a cooling tower that it also owns. Memoranda of Understanding (MOU) may be able to address this by reciprocal agreements between neighbouring local authorities or with the Health and Safety Executive. This is widely accepted as good practice, but perhaps should be given further weight by being reflected more explicitly in codes of practice by the Health and Safety Executive.