

UK resilience to a chemical incident

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ABSTRACT

Following the deliberate chemical attacks in Salisbury last year, a review of UK resilience to chemical incidence was undertaken. The scope was not limited to deliberate attacks, related to terrorism, but was to include non-deliberate and accidental events. Chemical incidents have wide-reaching consequences irrespective of whether they are deliberate or not. The effects of these incidents manifest themselves in terms of immediate health consequences and will also include economic, political and public health effects that may have a much longer impact than the initial disruption. The economic consequences of the Novichok attack were devastating to the local population and businesses in both the short term and the long term, being felt over a year later. This review discusses the effects of these incidents on infrastructure, healthcare provision, law and order, economics and government at a local, regional and national level. The NHS Emergency Preparedness, Resilience and Response Framework was reviewed, and this provides a basic outline of advice for local government to follow in the case of chemical incidents. However, the wider issues of interdepartmental co-operation and how to maintain a response in the long term require further thought. Moreover, the methods by which interagency and regional resilience is maintained in preparing for such an event require a clearer guideline.

INTRODUCTION

Chemical incidents, both deliberate and non-deliberate release, are rare but may have far-reaching and often unintended consequences. Healthcare provision and public safety are paramount in the first instance, but the consequences following an incident encompasses more than just healthcare provision alone. Recent events in Salisbury brought to the public attention some of the risks and problems posed when faced with a deliberate chemical attack on the UK mainland. The manner in which this incident was dealt with raises discussions on UK preparedness and resilience to chemical attacks. Furthermore, in the public mindset, there is a focus on deliberate attacks rather than on the more likely event of a non-deliberate chemical incident such as an accidental spill or release of chemicals into the environment.

Examining the historical context of chemical incidents reveals that industrial accident or non-deliberate chemical release is far more common than deliberate attack. This highlights the paradoxical view in contingency planning which focuses on the less likely and, in the immediate setting, less deadly events of a deliberate chemical attack. Notable deliberate chemical incidents in the UK are the 2018 Salisbury nerve agent attacks and the assassination of Georgi Markov in 1978.

Although rare, incidents such as these do stay in the mind of the populace as the psychological effects of these are far reaching. Moreover, the apparent incidence of such events is artificially raised given the profile of the victims: Kim Jong-Nam, half-brother of Kim Jong-Un, assassinated in 2017; the attempted assassination of the Skripals in March 2018 followed by the poisoning of Dawn Sturgess and Charlie Rowley, believed to be caused by the same Novichok nerve agent.

EMERGENCY PREPAREDNESS, RESILIENCE AND RESPONSE

UK response to chemical incidents is guided by the principle of EPRR: Emergency Preparedness, Resilience and Response. EPRR is the term used by Public Health England (PHE) and the NHS to outline the UK plans to prepare for and manage incidents such as these.¹ EPRR can be separated into its components and the definitions outlined, as used by NHS England. Emergency Preparedness: the extent to which emergency planning enables the effective and efficient prevention, reduction, control, mitigation of and response to emergencies. Resilience: ability of the community, services, area or infrastructure to detect, prevent and, if necessary, to withstand, handle and recover from disruptive challenges. Response: decision and actions taken in accordance with the strategic, tactical and operational objectives defined by emergency responders. It must be noted that within this framework, no military components are used unless expressly asked for at a Ministerial level. Most chemical incidents are not related to chemical weapons; however, in incidents such as the use of the nerve agent Novichok in Salisbury in 2018, Military involvement to provide a level of expertise not held in other public services is understandable.

HISTORICAL CONTEXT

The deliberate release of chemicals, in order to cause human harm or death, is relatively rare. Chemical incidents are more likely to occur by accident and often on a small scale. For example, serious chemical spills on the roads are estimated to occur on average five times a year,² although the release of dangerous chemicals in these incidents is often minimal. The scope of non-deliberate chemical events extends to the release of chemicals used in farming, which can inadvertently be released into the environment and end up in water supplies. A chemical spill near John Lennon airport disrupted flights and local infrastructure in 2015.³ Moreover, an accidental release of titanium tetrachloride in Staffordshire in 2001,⁴ which injured 31 people, demonstrates that accidental releases can be equally



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or in fact more damaging to human life than an act of deliberate release.

The 2018 nerve agent attack in Salisbury to the Sarin gas release in Tokyo in 1995 demonstrate that chemical incidents can be used to spread physical harm, terror and fear both in centres of population and countries as a whole. Arguably few people can recall the chemical release in Staffordshire that injured 31 people, yet most people will recall the attempted assassination of the Skripals or the Alexandre Litvinenko Affair, despite the relatively low loss of life. It is important to note the psychological differences that although a non-deliberate chemical spill may cause more physical harm, the nature of terror incidents, which are well documented,⁵ means the effects are far more pervasive within society as a whole. Historically, in the context of warfare, the use of chemical weapons has been equally about causing physical harm as it has been about bringing about psychological harm,⁶ at the front or at home.

Deliberate chemical attacks are often targeted, and while indiscriminate attacks are rare, there are examples such as the sarin gas release on the Tokyo subway and the reported use of chlorine gas in Syria,⁷ which emphasise the impact they can have when they occur.

These examples show that the range of possible incidents cannot necessarily be addressed with one or two plans. The inter-connection of effects on local services, infrastructure, population and economy of the local area, region and country as a whole are different depending on the nature of the chemical release. Furthermore, the medical/emergency services burden will differ.

EFFECTS

The effects of a chemical incident can be divided into subcategories: infrastructure, healthcare provision, law and order, economic and political. These can then be described on a local, regional and national level.

Infrastructure

Cordons and no-go zones that are pervasive within PHE plans for incident control and co-ordination invariably have a disruptive effect on local infrastructure. Not all cities have ring roads that can easily be used to redirect traffic from the centres of population density. The emergency response to incidents in low population areas when compared with high population density areas will therefore differ. Notably, the recent suggestion from the Armed Policing lead for the National Police Chiefs' Council has suggested rural police should routinely carry firearms⁸ due to the likely delay in emergency response times in those areas.

Healthcare

Aside from the immediate casualties of the incident, there are direct risks to healthcare professionals, both first responders and in secondary care, from being exposed to potentially hazardous substances and indirect risks to health within the population as a whole. The very nature of isolation and containment means that the potential for indirect injury through a reduction in available medical services or facilities to the reduced availability of first responders presents a risk to general population and especially for those with baseline medical conditions that routinely present to the emergency department. A notable nuance of events such as these is the burden of worried well and capacity of the medical services to cope with these patients reduces in light of a mass casualty incident or one that requires isolation of victims.

Law and order

As police, ambulance and fire crews get drawn into an incident, the problems can evolve. Through lack of or inefficient

training, the first few hours or days in a response can be disorganised. Furthermore, as more and more personnel are called on, the risks of the incident being prioritised over other problems (fire, crime, health issues) that are themselves separate from the incident grow. Furthermore, as seen in the Salisbury incident, personnel can themselves become casualties, thus depleting available manpower further.

Economic

The economic effects of chemical incidents can be far reaching and enduring. The nature of chemicals, be they spills or deliberate release of chemical agents, means that the range of potential contamination is great. Indeed, when looking at the Salisbury example, businesses are still closed months later due to potential contamination. Furthermore, local businesses saw a drop of around 25% in revenue in the months following the incident.⁹ The effects of the incident on the economy can be direct, the closure of business, and indirect, the degradation of the moral component of the public, leading to a reduced belief in their safety and thus a reduced level of expenditure nationally.

Political

Effective plans and training cannot always replicate the complexity of chemical incidents. It is likely there will be mistakes made and things overlooked. This is true on the ground as it is in the political teams, locally, regionally and nationally, who attempt to respond to the incident and resolve the issues, both immediate and enduring. Depending on the extent of the attack and/or the nature, a small terror attack may have a great effect nationally and thus a far greater effect on all of the above than the incident alone.

Government or political breakdown may seem unlikely in the case of a small chemical spill, but far more possible in the event of a large far-reaching terrorist chemical weapon attack. This exemplifies the breadth of possible incident scenarios and thus highlights the problems with effective planning beyond and skeleton model of how to organise responders.

RISK

The complexity of managing a chemical incident is obvious. The costly planning and training that would be involved in such an undertaking must be justified by a realistic risk. The most recent National Security Risk assessment 2015 ranks radioactive or chemical release, either deliberate malicious or accidental, as a tier 3 threat to the UK.¹⁰

Most likely chemical risks are outlined in the PHE compendium of HAZMAT substances. This also outlines the physical signs of exposure to a specific substance and how to treat them.¹¹

How are UK emergency services set up to deal with the threat?

The advice for the management of chemical incidents is outlined in PHE Advice to Health Professionals for the Initial Investigation and Management of Outbreaks and Incidents of Unusual Illnesses (2010).¹²

NHS EPRR¹ planning is underpinned by the principles of:

1. Preparedness and anticipation: Each Trust should compile those risks it is anticipating along with preparation plans for them. This must include direct and indirect effects of these incidents.
2. Continuity: The ability to work within a Trust's existing functions but carried out at a greater pace on a larger scale.

3. In theory, this works, but in January 2017, over 20 Trusts were already at black alert (Level 4 critical incident),¹³ and it was unclear whether there was any spare capacity available to work at a greater pace should it have been needed.
4. Subsidiarity: Decisions should be made at the lowest appropriate level, but it is unclear whether the legal support framework is in place for this, and most decision-making in the NHS appears to be being made at higher levels.
5. Communication: The guidance demands that local Trusts have appropriate facilities to communicate effectively up and down the chain of command. The inability on occasions, and the apparent vulnerability of the NHS information system, demonstrated by the May 2017 Ransomware attack¹⁴ would suggest that there is shortfall in this aspect of EPRR. The subsequent report following the cyberattack has examined this aspect.¹⁴
6. Cooperation and integration: This comes through planning and exercise. The guidance mandates that communication exercises are carried out every 6 months, table top exercises every 12 months, live play exercises a minimum of every 3 years and a command post exercise every 3 years.
7. Direction: Provided from PHE to Clinical Commissioning Groups and local Trusts along with overall direction from the Department of Health and Secretary of State for Health. The principles guide local Trusts and give them an outline of how to carry out a response to a major incident. Of course, all this is superfluous if the incident is identified too late. First responders both medical, police and fire service are trained to respond in a STEP 123 approach to a casualty situation. STEP 123 is based on the presumption that a single casualty can be treated as a normal casualty, two should raise suspicion of a chemical or biological incident that may require a more coordinated response, and that three or more casualties should not be approached until direction has been sought from more senior members of the organisational team. When followed, this advice should prevent or minimise the spread of noxious agents. In theory, this procedure protects first responders, but first responders by their nature want to help and dive in. This has been evident in the public and emergency services responses to the collapse of the World Trade Center in 2001 and the police officer injured by the nerve agent used in Salisbury.

Once an unusual illness has been suspected, the process by which the emergency services should establish the causative agent is outlined in PHE guidance on the subject, along with a compendium of substances, their effects and the management of exposure to those agents.

PHE guidance, in addition to the established practices as taught by Major Incident Medical Management and Support courses, demonstrates how the public sector should respond to chemical incidents. Separately, the employment of the Ministry of Defence (MOD), requiring ministerial request, is reserved only for the most serious of incidents. The Command and Control (C2) structure in the MOD is clearly defined, but may be somewhat lacking in the complex interactions between the NHS, Police and Fire Services. Planning and exercising the C2 structure should be conducted every 6 months, although a table top exercise. This should ensure all relevant parties likely to assume a command role are au fait with the role they will assume.

Despite an emphasis in the PHE literature on information sharing and learning lessons, the only data available in the public domain are the annual reviews of EPRR published by NHS England.¹⁵ Minimal data are available and anything resembling a trial is unlikely to be possible, while a Delphi study¹⁶ which

questions senior experts in the field concluded that pre-incident response planning and training is currently out of date.

Despite clear guidance given to emergency services and first responders, the nerve agent attack in Salisbury demonstrates this is not always enacted well. The Delphi study concluded that appropriate knowledge of this guidance is lacking. Furthermore, the limiting factors in achieving an appropriate level of training are the cost and logistics of organising such an exercise, given that it would require a very large number of participants representing all emergency services.

Local training is important, especially with the use of personal protective equipment (PPE). This has been demonstrated well in UK centres during the West African Ebola outbreak in 2016. The training and directions for use of PPE was delivered to front-line emergency staff in both tertiary and regional hospitals. This is a good example of appropriate preparedness for an incident; however, Ebola represented a single and specific threat for which there was clear and succinct guidance on the organisational approach. Chemical incidents are by their nature not predictable and not expected. As such, a clear unified approach to all potential threats is not possible.

The major issue is time and commitment. The required simulated scale of response to a chemical incident is such that large-scale training and exercises are very difficult to run with adequate frequency that would deliver tangible results with an analysis of lessons learnt. Unless a method of regularly training and exercising emergency services in chemical incident response can be found, it is unlikely that the preparedness of local emergency services to recognise and respond to chemical incidents efficiently and effectively will improve greatly.

CONCLUSION

The guidance that currently underpins the UK's response to chemical incidents is largely dated. Local planners carry out exercises, as a statutory requirement, in order to plan for such events, but it is unclear how widely the lessons learnt are shared, that is, within local public services and regional. Importantly, a potential cross-border exercise with NHS Scotland has been postulated along with other validation exercises in the most recent annual NHS review of EPRR which does suggest a drive towards a national consensus or action plan.

The consequences of chemical attacks, releases or spills are so far reaching that there remains a dilemma: to plan appropriately is to share information openly. In the context of a non-deliberate event, this problem is inconsequential; however, in the climate of fear surrounding possible terror or deliberate release of chemicals in populated areas, publishing plans would potentially expose the system to exploitation. The risk of chemical incident is low on the national risk stratification, but the effects of a chemical event could have potentially devastating consequences. The key to minimising these consequences appears to lie in effective planning and exercising a multi-agency response from the emergency services, but importantly sharing widely the key lessons learnt so that collective learning can occur.

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