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Assessing and improving cross-border chemical incident preparedness and response across Europe

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ABSTRACT

Good practices in emergency preparedness and response for chemical incidents include practices specific to the different functions of exposure assessment (e.g., within the monitoring function, the use of mobile monitoring equipment; within the modelling function, the use of rapid dispersion models with integrated mapping software) and generic practices to engage incident response stakeholders to maximise exposure assessment capabilities (e.g., sharing protocols and pre-prepared information and multi-agency training and exercising). Such practices can optimise cross-border collaboration.

A wide range of practices have been implemented across MSs during chemical incident response, particularly during incidents that have cross-border and trans-boundary impacts. This paper proposes a self-assessment methodology to enable MSs, or organisations within MSs, to examine exposure assessment capabilities and communication pathways between exposure assessors and public health risk assessors. Where gaps exist, this methodology provides links to good practices that could improve response, communication and collaboration across local, regional and national borders.

A fragmented approach to emergency preparedness for chemical incidents is a major obstacle to improving cross-border exposure assessment. There is no one existing body or structure responsible for all aspects of chemical incident preparedness and response in the European Union. Due to the range of different organisations and networks involved in chemical incident response, emergency preparedness needs to be drawn together. A number of recommendations are proposed, including the use of networks of experts which link public health risk assessors with experts in exposure assessment, in order to coordinate and improve chemical incident emergency preparedness. The EU's recent Decision on serious cross-border threats to health aims to facilitate MSs' compliance with the International Health Regulations, which require reporting and communication regarding significant chemical incidents. This provides a potential route to build on in order to improve chemical incident preparedness and response across Europe.

1. Introduction

Chemical incidents have the potential to affect wide areas, leading to exposures that can adversely affect public health. They can arise from accidental or intentional spills, leaks and releases and, in addition to toxic hazards, can also generate risks associated with fire and explosion. An effective emergency response during a chemical incident requires the affected country to have the ability to undertake a timely assessment of public exposure and consequent risks to public health. A four-step risk assessment process is commonly understood by public health risk assessors: it is described by the World Health Organization (WHO) (2009, 2010) and comprises hazard identification, dose–response assessment, exposure assessment and risk characterisation. While these are accepted principles, different countries' organisational approaches to these steps vary, and Member States and the organisations within them differ in their capabilities: in some countries exposure assessment is rudimentary; in others it is

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sophisticated, and is supported by dedicated resources, such as organisations that are resourced to characterise chemical hazards, undertake environmental monitoring, or comprehensively assess risks to public health during chemical incidents.

Emergency response is complicated in cross-border incidents, particularly if the borders in question are international and the incident affects more than one country. The aftermath of significant transboundary incidents is typified by retrospective efforts to improve international cooperation and collaboration. Published reports from past incidents describe lessons learned and illustrate some of the problems that may be encountered during an international cross-border response (Giger, 2009; Stec et al., 2001). For example, each affected country may carry out exposure assessment and risk assessment independently, but their assessments may not always come to the same conclusion. Cooperation between them may be hampered if responders speak different languages, have different approaches to environmental monitoring and dispersion modelling (if, indeed, either is undertaken at all) or apply different standards during risk assessment. Furthermore, responders on one side of the border may be unfamiliar with response arrangements on the other: they may not know who their counterparts are or much about their roles, coordination or capabilities.

In order to gain a better understanding of cross-European exposure assessment during chemical incidents, a review has undertaken to identify and describe what arrangements each of the 27 EU Member States (MSs) have in place for exposure assessment to support public health risk assessment during chemical incidents (Stewart-Evans et al., 2012). Information was collated to ascertain which MSs had organised collaborative cross-border arrangements for exposure assessment. Existing practices have been examined to find approaches that could be shared to improve emergency response elsewhere. These practices focussed on exposure assessment and comprised those that were specific to cross-border preparedness and response, certain functions of exposure assessment (such as observation of exposures and their effects, environmental monitoring, meteorological prediction and dispersion modelling), risk assessment and generic practices in preparedness and response that could be applied universally (Stewart-Evans et al., 2012).

It is important to note that exposure assessment falls between disciplines. Exposure assessment functions are often undertaken as part of wider professional roles, and so it may not always be the primary focus of those undertaking it (for example, on-site environmental monitoring may be carried out by emergency services who are focussed on the operational response to an incident: prioritising fire-fighting, establishing cordons and so on). Furthermore, exposure assessment may not be specifically undertaken for the purpose of informing public health risk assessment: it may be intended to protect the health and safety of first responders or to evaluate the effects of chemicals on ecological receptors. For the purposes of this paper, the terms 'exposure assessor' and 'risk assessor' are used to describe those carrying out these functions. These roles may be performed by personal from a wide variety of professional backgrounds: they may be emergency service personnel, civil servants, public health workers or belong to other professional groups.

2. Material and methods

The initial information-gathering stage involved the collection of publicly-available information regarding each MS's organisation of, and capacity for, exposure assessment and risk assessment, environmental monitoring and dispersion modelling capabilities, and arrangements for cross-border incidents. These included treaties and agreements for collaborative working and mutual aid. Through professional networks and canvassing of European organisations involved in chemical incident response, European experts were identified whose job roles were related to the different aspects of exposure assessment during chemical incidents. They included emergency responders, representatives of governmental environmental and health organisations (such as those with responsibility for environmental regulation and enforcement, chemical safety, meteorological prediction, poisons advice or public health risk assessment), and academics.

A web-based survey and follow-up telephone interviews were undertaken to gather further information. Experts from 26 MSs returned information about exposure assessment capabilities and practices in their country. There were 131 responses to the survey, with the highest number of responses received from the UK and the Netherlands; for most of the MSs, 2–3 responses were received. In total, 81 questionnaires were completed, an approximate completion rate of 16% based on the survey having been sent to 514 recipients.

Two international workshops were then held to solicit feedback from experts from a range of organisations, including emergency services and governmental, environmental and public health bodies. Chemical incident exercise scenarios were used to explore good practices, unmet needs and success factors in exposure assessment, with a particular focus on cross-border incidents.

The approach followed has been fully described by Stewart-Evans et al. (2012).

3. Results/discussion

Similarly to infectious diseases, emergency preparedness and response for chemical incidents is governed by the policies and legislation of MSs, which vary. Dissimilarly, chemical incident preparedness and response involves a number of disciplines, not just those within the health service and related services; consequently, exposure assessment and public health risk assessment are not always well-connected.

Harmonised legal tools are necessary for the implementation of strategies, policies and plans (Martin and Conseil, 2012). International, multinational and bilateral agreements exist (these are listed elsewhere, e.g., British Institute of International and Comparative Law, 2010; DG SANCO, 2011; Joint UNEP/OCHA Environment Unit, 2009), but it is relatively rare for exposure assessment for chemical incidents to be considered in prescriptive or technical detail – agreements often focus on the principles, rather than the specifics, of response – and there is a need for detailed agreements regarding exposure and risk assessment to be formulated between responders at the local level.

There are a number of international mechanisms that facilitate mutual aid (e.g., DG ECHO, 2011, 2012; Joint UNEP/OCHA Environment Unit; UNECE; WHO, 2013); mutual aid comprises resources (such as monitoring equipment), capabilities (such as meteorological prediction or dispersion modelling) and information (such as chemical hazard and dose–response information and expert advice). Whilst a number of MSs have developed dedicated monitoring and modelling capabilities specifically for the protection of public health during the emergency response to chemical incidents, there are relatively few examples of integrated and coordinated cross-border response, and more needs to be done to address barriers to cross-border working and unmet needs in exposure assessment. Collaboration across borders is most likely to exist when MSs have a shared interest, such as an industrial area along a border or a river that passes through more than one country (such as the Rhine and Danube, where there are emergency response plans supported by legal conventions for international cooperation).

3.1. Good practices in exposure assessment

A number of universal good practices were identified that can be applied across MSs to improve collaboration and cooperation during the response to chemical incidents. Stewart-Evans et al. (2012) distinguished between universal good practices in preparedness and response, practices that applied to each of the specific functions of exposure assessment (and which tended to be technical in nature),