

Inter-Agency Communication and Information Exchange in Disaster Healthcare

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ABSTRACT

In a disaster, the main agencies of healthcare and relief are usually health and disaster management organisations. Although these two disciplines share the same vision of care provided to disaster victims, post-disaster studies have shown that poor communication between them can negatively impact the collaboration needed to ensure the quality and coordinated delivery of effective healthcare. This paper presents the current findings of an on-going investigation to determine and reduce the barriers to smooth and effective communication and information exchange. The long-term aims are to establish joint agency training to improve communication and to specify the requirements of a knowledge-based system based on the timely exchange of information contained in dynamic datasets defined by inter-agency needs.

Keywords

Disaster healthcare, disaster e-health, disaster management, disaster medicine, e-health

INTRODUCTION

Disaster management¹ agencies have a broad remit for dealing with the mitigation, preparedness, response, and recovery phases of a disaster. Their responsibilities include infrastructure, transport, resources, supply chains, and related domains, as well as the safety and general well-being of disaster victims (International Federation of Red Cross, 2017). The healthcare of those affected by disasters is a more focused range of activities delivered by public health professionals, paramedics, and disaster medicine specialists using rigorously defined protocols and clinical competencies (Subbarao et al, 2008).

Despite many common values and similar operational characteristics, disaster managers and health professionals have frequently failed to share their tools and personnel (Bissel, 2005; Fountain et al, 2013; Russo, 2011), a circumstance that can lead to delayed, substandard, and even unavailable healthcare. This paper describes a study to identify some of the communication-related issues that can impact the fundamental characteristics of effective healthcare, *viz* care quality, patient access and safety, and cost-effectiveness (WHO, 2010), and its delivery in disaster situations. The categorised issues have been used as a framework for semi-structured interviews with disaster managers and clinical personnel to understand their key needs for information exchange. The long-term goals are to use the findings to develop training that reduces barriers to communication, and to specify the requirements of an information system that can be used to facilitate inter-agency collaboration and coordinated action.

¹We use the term ‘disaster management’ instead of the more common ‘emergency management’ for consistency with the phrase ‘disaster medicine’. The term ‘emergency medicine’ is avoided since it is commonly used for mainstream (ER) care.

METHODOLOGY

A comprehensive literature study was undertaken to reveal the obstacles that hinder information exchange and seamless collaboration between agencies responding to the health demands of disaster victims. The review attempted to answer three main research questions; What are the barriers to effective communication between clinical and emergency personnel during disasters? What essential information do these practitioners need to communicate in emergency situations? How can communication between emergency management and emergency medicine practitioners be improved?

Databases searched included TRACIE: Healthcare Emergency Preparedness (Information Gateway), Disaster Lit: The Resource Guide for Disaster Medicine and Public Health (National Library), The International Disaster Database (EM-DAT), Google Scholar, Scopus etc. Journals consulted included The American Journal of Public Health, International Journal of Emergency Management, American Journal of Disaster Medicine, Disaster Medicine and Public Health Preparedness, Prehospital and Disaster Medicine etc. Grey literature used involved government reports, policy statements, etc. The search also covered websites of international humanitarian organisations including IFRC, UNOCHA, and WHO.

Search keywords such as *cross-agency collaboration*, *information exchange*, *disaster medicine* and *disaster management* revealed 56 relevant articles from different disciplines including information and communication technologies, healthcare, humanitarian relief and public policy. Analysis of the articles extracted re-occurring themes that researchers report as having a significant influence on inter-agency communication and representing potential barriers to concerted action.

Semi-structured interviews were then held with disaster managers and disaster-healthcare practitioners to discover their perception of the identified themes (see below). Interviews (15) lasting typically 60-90 minutes were recorded with six senior health disaster personnel with extensive expertise in disaster preparedness and response, and eight disaster managers across various governmental agencies and non-governmental organisations. Types of disasters to which participants responded ranged from the Christchurch earthquake in 2011, the Syrian War, and the West African Ebola virus epidemic. One interview was also conducted with a United Nations special representative to gather the views of a senior decision-maker from an international humanitarian organisation.

THEMES THAT NOTABLY INFLUENCE INTER-AGENCY COMMUNICATION AND INFORMATION EXCHANGE

The themes that emerged from the literature review fell into five broad categories; authority and leadership, culture and trust, situational awareness, technology and legislation. These categories are used here to summarise the results. Full details are available elsewhere (Abbas et al, 2018).

Authority and Leadership

A potential cause of sub-optimal collaboration between disaster management and health professionals is the different authority structures that determine operational modalities and the way each agency responds to crises (Abbas et al, 2016) Disaster managers have traditionally been trained according to a military command-and-control model but there is increasing awareness that this model has limitations in situations that demand rapid, adaptive decisions (e.g. between civil defence, fire fighters and clinicians) and coordinated responses between the responding groups. Similar limitations apply to planning, which is often intra- rather than inter-agency (Local Government New Zealand, 2014).

Whilst disaster medicine (often seen as a poor relation of mainstream emergency medicine (Hayes et al, 2012; Smith et al, 2012) is based on multi-disciplinary teamwork, it is extremely hierarchical and less familiar with the need to collaborate in real time with agencies external to its domain. These distinctions can lead to different priorities and territorial misunderstandings making it difficult for disaster victims in need of treatment to receive seamless care. Moreover, authority differences can impose a leadership conflict when responding collectively to critical situations. For example, who is responsible for declaring a state of emergency (MCDEM, 2012)?

Uncertainties can still occur even when plans to resolve this difficulty are in place.

Culture and Trust

Disaster management is a comparatively new discipline with a necessarily pragmatic approach to evolving situations. In contrast, disaster medicine is a scientifically based domain very conscious of its academic credentials and focused on strict, set protocols. The way each domain perceives information depends on the tasks it has to perform. Medical responders have their own evidence-based criteria for ranking emergencies whereas disaster managers have to correlate diverse information from multiple disciplines such as geography, geology, and meteorology. It is therefore probably naive to expect the two sectors to communicate smoothly without efforts to resolve issues that may stem from their different cultural origins.

A critical factor for successful cross-agency collaboration is trust (Zaheer et al, 1998). Mutual trust implies that collaborators will observe agreements and ethical principles (integrity), willingly share, rather than withhold, information, and contribute their resources and competence to the collaborative relationship in a complementary way (Dubai School of Government, 2009). Trust eases the need for controls and monitoring tasks that can waste critical time in disaster stations, and encourages flexibility and a focus on goals rather than processes (Zaheer et al, 1998).

Situational Awareness

Situation awareness (SA) is about knowing and recognising what is going on around us (McIlvaine, 2007). In Endsley's seminal work (Endsley, 1988), SA comprises three elements; perception (understanding the importance of information about a given situation), comprehension (how the perceived information is combined, interpreted, stored, and retained), and projection (the ability to forecast future situations from current and previous ones). Whilst each person in a team needs to have some level of SA to perform their allocated tasks, concerted and appropriate decision making and action are only possible if they have a shared understanding of these situational elements and an awareness of other team members' requirements and the tasks they perform.

Situational awareness is critically dependent on information flow and the realisation that data items of limited value to the members of one domain can be crucially important to their counterparts in other areas. Thus, clinicians may need disaster managers to list for them the numbers and type of particular injuries suffered by disaster victims so that care personnel can determine the numbers of doctors and nurses, and the extent of equipment and medications, that are needed. Similarly, if an environment becomes unsafe, clinicians may need to advise responding managers that evacuating some critically ill patients is more dangerous than letting them remain.

Technology

The previous sections spotlight human and organisational issues that hinder or expedite communication in disasters. Much of this communication, however, is facilitated by information technology particularly in the first few hours after a disaster event occurs; a critical time for making decisions such as triage evaluation (Donner et al, 2012). Underutilisation of ICTs in disaster response by both the disaster management and medicine sectors almost certainly reflects understandable concerns about the costs and complexities associated with their adoption, application, and likely impact on practitioners and victims (Kabashiki, 2013). Technical interoperability between agencies is a significant concern due to potentially incompatible systems and access restrictions based on information security and perceptions of data ownership.

Overcoming these technical barriers through a collaborative approach based on multiple information channels, better ICT preparedness, and public education on the use of alternative communications channels during an emergency, provides numerous benefits. These include avoidance of misleading information, enhanced health information management, access to health records regardless of time and geography, improved communication between both healthcare providers and consumers, and better use of scarce commodities (Coiera, 2015).

Legislation

Information sharing is closely related to trust. However, in the healthcare context, there is also a legal dimension to information sharing that stems from the need to protect patients' privacy and confidentiality. Health practitioners may be unwilling or unable to share patient medical records even between members of the same agency let alone cooperate with other professional organisations (Lips et al, 2011). Other issues arise when agencies have different interpretations of privacy legislation and how it should be applied, and when government agencies deal with non-governmental organisations (NGOs) and community-based service providers that are not covered by government exchange protocols. A trade-off between protecting patients' confidentiality and achieving a flexible level of information sharing that enables cooperation is crucial to the success of cross-agency collaboration.

Thus, there is a need to emphasise legal interoperability, and with it, accountability, in a collaborative disaster response. Legal interoperability covers laws, policies, procedures, and cooperation agreements needed to allow the seamless exchange of information between different organisations, regions and countries (EHealth Governance Initiative, 2012).

INTERVIEWS TO DETERMINE INTER-AGENCY COMMUNICATION AND INFORMATION EXCHANGE NEEDS

This section describes preliminary findings of the interviews carried out to discover practitioner requirements for inter-agency communication and information exchange in disasters. Interviewee comments are paraphrased and woven into the text using italics. The Discussion section suggests early recommendations from the outcomes.

Although the context of the interviews was disaster healthcare, many of the issues raised are common to other

disaster situations. Moreover, whilst the presentation here endeavours to group themes according to the categories identified earlier, the findings revealed that the perceived category of a theme could vary depending on both a practitioner's experience and the context of an interview. Thus, a theme seen as a leadership problem in one interview could be better understood as a cultural issue in another, or even seen in a further interview as a legal issue with overtones of authority. This multi-dimensional aspect is evidently a consequence of the complexity of disaster situations and the ways in which those involved struggle to make sense of them.

Many of the communication issues raised by interviewees concerned aspects of authority and leadership. These covered the lines of command between local, regional, and national agencies, often noting '*a misperception of what it is that agencies deliver*' and '*the confusion that comes from what they all mean, the differences between them and how they work together*'. A common problem was '*knowing who to talk to*', an issue not confined to relevant contacts in key agencies such as Civil Defence or health organisations, but extending to knowing which agency to refer to when an unusual event requires specialist action. An example quoted was of an agricultural corporation now brought into the emergency strategy to deal with food safety matters.

One interviewee spoke of the '*family of disaster management disciplines including process and risk communication, crisis management, business continuity management, risk management, emergency management*' which emphasises that '*the perception that there is always going to be one leading agency is not correct*'. There was general acceptance that the specialised nature of responses, e.g. fire and healthcare services, required multiple leadership but regret that '*there existed no all-government centralised contact list*' that could help to coordinate action.

The cultural and trust issues indicated by the interviews paralleled closely those found in the literature review. There is '*no single voice guiding disaster management professionals on what best practice means in emergencies*', a comment lamenting that disaster management '*doesn't have the recognition*' that is self-evident for disaster medicine because '*we haven't set it up for ourselves*'. A consolation was that '*the profile of disaster management has been raised over the past eight or so years in organisations and agencies in the health sector*' and '*we are slowly getting there*'. This improvement in status is facilitated by '*regional disaster management advisors who work, train, and help medical personnel in the disaster management aspect*', a collaboration that '*builds relations enabling disaster managers to identify clinical directors and health officers during response*'. A note of caution was, however, noted in another interview which observed that the reverse process, in which disaster managers are trained by health-sector staff to go back to their agencies and train their own staff, '*doesn't work when people don't want it to work*', suggesting a trust issue.

Trust is a key component of both resource and information sharing. Different agencies collect and '*own*' the data they need to perform their main responsibilities but, in an emergency, data owned by one agency may become critical for another agency to function properly. Territorial '*data ownership*' can therefore lead to sub-optimal responses including healthcare. The scope of the data that health professionals need from other agencies is normally quite limited concentrating on '*how many are injured, the priority of injury types, where patients are sent, and when discharged*'. In return, health organisations routinely share '*GPS locations of facilities, and resource data such as staff and bed numbers*'. Other data exchange themes arising from the interviews concerned patient privacy and confidentiality, and the desirability for data to be handled electronically rather than manually.

When asked about formal mechanisms for improving situation awareness (Endsley, 1988), interviewees pointed instead to effective information exchange as the key requisite – '*it's actually knowing that you need to talk to people and knowing what you need to talk about*' as well as sharing timely information across a system designed to build a dynamic, holistic picture of a disaster event. Systems of this type, known as Common Operating Picture (COP) systems (HFIDTC, 2009), collect and integrate data from automated sensors, satellite feeds, and geospatial and mobile systems. Even so, COP systems requirements must involve all disaster stakeholders if they are to meet the challenges confronted by responders. These requirements echo the value of cross-agency, or even better, joint agency, training to engender shared situation awareness.

Another aspect of situation awareness that drew attention in interviews was the difficulty of media communication in disaster situations. '*It's problematic to give out misleading information to the public*' and to the broadcast media, so '*be first, be right, be credible*'. The same question of control arises with social media both with regard to spreading false news and advice, which may have unforeseeable consequences such as patients using inappropriate medical interventions when normal clinical guidance is unavailable. Nevertheless, interviewees saw many situational awareness benefits to social media; timely information, alerts to find help or minimise threats, ability to gauge public opinion and adjust recommendations, check understanding etc. '*Social media exchanges are so much part of modern society that they should be central to the development of disaster response strategies*'.

Interviewees were vocal in underscoring the crucial role of information technology in disaster management and disaster healthcare but equally critical about the design and performance of current systems. Interoperability and

scalability of different agency systems were seen as troublesome issues as were flexibility – ‘*in any given moment, I might like pure numbers and figures in a spreadsheet but then I'd like this shown to me in a graph and I'd like that graph to be interactive so that I can drill down into it to find the data*’ and usability – ‘*we've got to scroll through massive documents and situation reports when all we really want to know is a couple of quick numbers to help us make a decision*’. The target is a single, usable, knowledgebase system, that is dynamically updatable, and accessible to every disaster agency providing them with customised and interactive data. In this respect, the concept of minimum datasets (MDS) attracted considerable interest. An MDS is a minimum set of data elements used by several countries for mandatory collection and reporting in a selected health area of interest (AIHW, 2017, Svensson-Ranallo et al, 2011). Many participants felt that specialised MDS could be useful for disaster healthcare (Borsato et al, 2000) and the notion of separate dynamic MDS for baseline (i.e. demographic), healthcare, and humanitarian purposes attracted a lot of discussion and encouragement for further development.

Other noteworthy topics mentioned by practitioners were the need to use data systems not just for disaster responses but for forecasting and preparedness planning (e.g. by using epidemiology data), and, by contrast, to see graphical information systems (GIS) not just as a ‘*planning and intelligence tool*’ but as a ‘*huge communication tool*’.

Many countries have robust legislation to preserve patient privacy and confidentiality during information exchange (Yarmohammadian et al, 2010). However, the legislation is typically designed to provide safeguards under non-disaster settings when data availability is guaranteed and exchange processes are rarely time-constrained. The chaotic conditions and urgency attending disasters are very different; priorities can change rapidly, putting pressure on the delicate balance between confidentiality, informed consent, and intervention. Interviewees were largely comfortable with their current systems which didn't ‘*touch the privacy code area*’ but there would seem to be value in studying the extent to which a code could be relaxed in a crisis and how circumstances could be normalised thereafter.

Another legislative area of interest to practitioners related to the ‘*knowing who to talk to*’ theme mentioned earlier. It was suggested that there should be an ‘*all-government centralised contact list*’ that legislated who must be contacted in a given set of circumstances, what information should be exchanged, and what to do with it. This directive alludes back to the minimum dataset concept mentioned above and suggests a fruitful avenue of research. Finally, an interviewee pointed out the need to consult with agencies such as the Red Cross when aspects of international humanitarian law and aid were involved.

DISCUSSION

As explained, this paper describes an on-going study to identify the barriers to smooth and effective communication and information exchange in disaster healthcare. Although the findings are preliminary and subject to more detailed analysis, we can see how they can contribute to the long-term goals to develop training and systems that reduce these barriers and yield better healthcare in disaster scenarios.

A central, recurring theme in the interviews was the ‘*knowing who to talk to*’ requirement aimed at ensuring that responders always have access to the information they need to perform their assigned tasks. Practitioner responses regard this obligation as so critical that they recommend it is supported by legislation or comprehensive regulations that prescribe a centralised contact system with clear, even automated, instructions on who to communicate with, what information to exchange with them, and how to act on it including who else to contact.

Respondents were highly supportive of joint agency training co-designed by civil defence and health authorities as a way of ensuring that disaster managers and clinicians and other health personnel were made aware of the information needs of all responders (Hayes et al, 2012). The consequent improvements in situation awareness would enhance collaboration and coordinated action.

Many comments highlighted the importance of information exchange that was restricted to essential data elements eliminating unnecessary data that could become a fatal distraction in the stressful environment of a disaster. As mentioned, this idea prompted the suggestion of an information exchange system built around customised and dynamic minimum datasets. In a fully-fledged form, such a system would collect multimedia data from sensors, feature COP and GIS components, and use adaptive artificial intelligence algorithms to route extracted information between appropriate contacts and agencies.

CONCLUSIONS AND FUTURE WORK

The authority, cultural, situation awareness, technical, and legislative challenges identified in this study have revealed a wide range of issues that impact inter-agency communication and information exchange in disaster healthcare

Whilst the literature review and interviews were rigorously planned and executed, the findings presented here represent only a preliminary analysis. Future work will therefore further mine the rich datasets from the interviews to refine and expand the results.

The expanded results will then be used in a Delphi study to add granularity that was not sought at the initial stage. Examples include questions designed to:

- identify themes associated with other phases of the disaster cycle, especially preparedness planning;
- elucidate themes that may depend upon the type of the disaster, e.g. floods, terrorism, epidemics;
- ascertain themes that are applicable across a range of disaster scenarios;
- consider privacy and confidentiality issues associated with inter-agency communication and information exchange;
- study the role of social media to harness its benefits and reduce the drawbacks;
- investigate the potential of minimum datasets as the basis of an efficient inter-agency, information exchange system;
- develop a prototype information exchange system and study the implementation issues need to realise the goals described in this paper;
- explore the design, content and delivery of a joint, postgraduate, disaster healthcare course for disaster managers and health professionals.

The outlined plan forms part of a programme to produce an extended road-map that is designed to support training for, and the delivery of, better healthcare in all phases of the disaster cycle. Such improvements will provide many human and economic dividends.

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