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Inter-agency governance risk in managing hospital responses to extreme weather events in New South Wales, Australia: a facilities management perspective of shared situational awareness

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Inter-agency governance risk in managing hospital responses to extreme weather events

Abstract

Extreme weather is predicted to become more frequent and severe into the future. While our understanding of hospital infrastructure vulnerability to such events has advanced considerably in recent years, current approaches to healthcare facilities management treat hospitals in isolation from their surrounding governance infrastructure. However, recent research indicates that if hospital resilience is to be properly understood, health infrastructure must be managed holistically, as part of a much larger governance system of interdependent organisations. The inter-agency governance risks associated with this system are currently ignored in the facilities management literature. To explore these risks, an in-depth case study of twenty four agencies in the state of New South Wales, Australia is presented. The results show that facilities managers are embedded in a highly complex and dynamic array of governance boundaries which are largely unresolved and misunderstood. A number of practical strategies are presented which could be adopted to significantly improve facilities manager's integration into this system. These include: mapping hospital dependency on other agencies to build surge capacity; resolving overlapping operational boundaries with other agencies; pro-active risk reduction for critical external support infrastructure; understanding potential conflicts with the objectives external agencies in responding to an extreme weather event.

Keywords: Facilities management, hospitals, risk, inter-agency, governance, extreme weather events

Introduction

Extreme weather events (EWEs) are defined as weather patterns that exceed a particular threshold and deviate significantly from mean climate conditions (Linnenluecke and Griffiths, 2010). Warnings that climate change is likely to lead to more frequent and intense EWEs are becoming increasingly frequent (see for example SSEFR 2011) and there is accumulating evidence that such events will test the limits of critical infrastructure and service resilience. Health infrastructure has been found to be especially vulnerable, with many recent examples of hospitals being overwhelmed, forced to close or having to evacuate their patients during an EWE (Carthey et al 2009, McGeorge et al 2011). Hughes and McMichael (2011:1) point out that such events present not only direct physical risks to health infrastructure but indirect risks arising from increased hospital admissions from vulnerable elements of the population such as the aged, chronically ill and clinically obese.

In investigating the vulnerability of health infrastructure to EWEs from a facilities management perspective, Loosemore et al (2012) used rich picture diagrams to demonstrate that hospital facilities cannot be treated in isolation from the wider systems in which they exist. To understand the full impact of an EWE, they must be seen as part of a much larger healthcare system. Loosemore et al's research supports the findings of Arboleda et al (2009) and PCI (2011) and showed that although the facilities management literature acknowledges that the health system is complex, it provides little insight into the interdependencies between critical health subsystems and of the 'cascading uncertainties' which can be produced when the system is under duress. It is clear that an understanding of how to create and manage resilient healthcare facilities depends, in part, on developing a conceptual understanding of

the complex relationships between the various inter-organisational governance relationships within the healthcare system. This means considering relationships with emergency services such as the police; the army; the fire service; water, electricity and gas authorities and private providers; off-campus hospital suppliers; polyclinics; and aged care facilities. The inter-agency governance arrangements which determine how these external agencies interact with the hospital organisation and with each other is critical for a healthcare system to successfully respond to an EWE. Yet the issue of inter-agency governance has not been addressed in facilities management research. As Heng and Loosemore's (2011) analysis of the brokerage role of health facilities managers found, gathering and channelling critical business information to support the facilities management function is difficult to achieve in practice, even within hospitals, let alone with external agencies. Heng and Loosemore (2011) found that the facilities management team is relatively disempowered in these wider organisational structures, which means that they are usually not in a position to demand that other business units share their information about facilities-related risks. For political and tactical reasons associated with exerting power over scarce and valuable space-related resources, many individuals with specialised knowledge and information about facilities risks are often unwilling to share it.

It is within this context that the aim of this paper is to explore the implications of inter-agency governance for the facilities management of public hospitals during EWEs. This will add an important inter-organisational dimension to the facilities management debate, which hitherto has been confined to intra-organisational issues.

Inter-agency responses to EWEs: moving from command-and-control to relational theories

Inter-agency governance is defined as the processes involved in co-ordinating and controlling resources and actions of organisations, which are deployed to prevent and prepare for, combat, as well as recover from the impacts of an EWE (Ansell and Gash 2008). Research into the inter-agency responses to EWEs in which facilities managers are embedded has largely been informed by disaster management theory which has evolved to understand and manage such events. The earliest attempts to conceptualise this process can be traced back to Samuel Prince's seminal work (Prince 1920) which derived a 'social theory' to explain human response to disaster. Building on this early work, research interest in collective community behaviour and organisational reactions to disasters flourished after World War II. This culminated in the work of Mileti and Drabek (1975) which synthesised a significant proportion of the early literature and created the concept of the Disaster Life Cycle which established the fundamental concepts of mitigation, preparedness, response and recovery used in most contemporary disaster management plans and facilities management literature. Drabek (1986) refined this work and introduced the concepts of emergent behaviour and human systems in disaster response, igniting the current debate over the validity of the centralised or bureaucratic model promoted in disaster management.

Contemporary disaster management theory can be divided into two camps (Uhr 2009). The first is the 'traditional' perspective which has its origins in civil defence and classical organisational theory. This emphasises the importance of a centralised authority for a successful disaster response and the value of agreed, well-practiced operating procedures (Draber and McEntire 2002). The second, more contemporary view acknowledges emergent

behaviours and is orientated towards decentralised or self-organising models operating on the basis of cooperation and collective problem solving (Mendonca et al. 2007). While these perspectives are different, underpinning both approaches, but yet missing from the facilities management literature, is agreement about the need to consider multi-agency governance during a disaster event to ensure inter-agency responses are coordinated. However, as highlighted by Quarantelli (1997), there is little consensus about what this actually means. Some view good inter-agency governance as simply informing other groups about what they will be doing, other see it as centralising decision-making within a particular agency or amongst a few key officials, while others see coordination as mutual agreements about how particular tasks should be carried out. This distinction is important from a facilities management perspective because in both models the facilities manager has to integrate themselves into the governance arrangements to ensure they are involved in and informed about the response strategy in advance and as it evolves.

Recent analysis of multi-agency responses to natural disasters (Houghton and Baber 2006; McMaster and Baber 2009) suggests that part of the difficulty managers face is that under normal operating conditions, emergency services practice what has been termed 'sequential single agency response'. This is where each service undertakes a discrete role and takes the lead role at different times in delivering services to the community. Typically, the procedures adopted by each agency have been optimised to respond to the most frequent scenarios they individually encounter. The 'boundaries' defining what each agency or emergency service will tackle are often standard operating procedures that are ingrained, linear and inflexible and which do not adequately consider the dynamic inter-agency interdependencies required to ensure an effective response to an EWE. However, in contrast to normal operating conditions, during an EWE event, multiple agencies are required to work on multiple tasks

simultaneously, under time pressure and towards a common goal. This need for flexibility breaks traditional modes of operation and requires an element of adaptive capacity which is often missing from the multiple agencies involved in a response.

To avoid these problems, the field of disaster management has long advocated the value of building a common operational picture (COP) – a single representation of relevant multi-agency response - to improve coordination between agencies. This has spurred a broad body of research into the value and use of Emergency Operation Centres (EOCs) adapted from the military with supportive research and development in ICT systems interoperability (Perry 1995). Post assessment of real-life responses to recent disasters demonstrates that the use of EOCs and their role in providing a COP improves the effectiveness of interagency responses (McEntire 2002; Department of Homeland Security 2012, Sommers 2009, Blanke and McGrady 2012). However, this research also suggests that simply sharing information and providing top-down coordination does not guarantee inter-agency coordination. So while the concept of COP remains relevant, emphasis has recently shifted from gathering and sharing information to consideration as to how it can be used to promote ‘shared situational awareness’ (Endsley 1995; Wickens 2008). This most recent research has raised doubts about effectiveness of the traditional command and control model (Mendonca et al. 2007; Arslan et al. 2010). It is argued that while a central coordinating authority or control centre is of value in coordinating responses, imposing a hierarchical, military-type command structure is counterproductive if the desire is to encourage collaboration and cooperation between agencies. Secondly, reliance on rigid plans, decision protocols and standard operational procedures inhibits the opportunity for improvisation and adaption to novel conditions which typically arise during an EWE. In reality, the ability to develop an all-inclusive plan covering every eventuality is impossible, and an ability to adapt and improvise is an imperative. Most

importantly, this research is also showing that even with an EOC and COP, inter-agency coordinating is highly dependent on pre-existing relationships between responding agencies established prior to the event (Danczyk 2007; Patton 2007; Ansell and Gash 2008; McMaster and Baber 2008; 2009, Department of Homeland Security 2012). Agencies that have regular contact and the opportunity to practice working together in disaster rehearsals and emergency drills develop greater situational awareness, can resolve potential conflicts in advance, develop higher levels of trust, work more collaboratively, and adapt more effectively to the dynamic challenges presented by events like EWEs (Uhr 2009).

Method

Regardless of the governance philosophy adopted, hospital facilities managers are required to manoeuvre within this inter-agency landscape and ensure that their interests in infrastructure resilience are represented in responding to an EWE. To investigate the challenges that hospital facilities management might face in managing within this network of interactions, we conducted an in depth analysis of one such system in the form of an instrumental case study of the complex inter-agency governance structure responsible for managing healthcare delivery in New South Wales, Australia. New South Wales (NSW) provides an ideal context in which to study interagency response to EWEs from a facilities management perspective. NSW is Australia's fifth biggest state with a population of about 7 million and an area of 801,428 km². This area is bigger than California and New Mexico put together and about 3.25 times larger than the UK. NSW has suffered a number of extreme weather events in recent years, affecting more than 230 public hospitals which provide a wide range of services including emergency care, elective and emergency surgery, medical treatment, maternity services and rehabilitation programs. In addition to general admissions, many of these

hospitals also offer day surgery and some services are delivered to local communities on an outpatient basis. The agencies that are involved in allowing this health system to function are listed in Table 1 under three sub-systems: NSW Health infrastructure; Emergency Services and; Critical Infrastructure.

INSERT TABLE 1 HERE

The agencies listed in Table 1 were the focus of our analysis which ensured that in addition to analysing the governance structures supporting the operation and maintenance of different types of health infrastructure in NSW, we also considered the emergency services and critical infrastructures that underpinned its operation. This allowed the various agencies with governance control or responsibility within and across the three sub-systems (NSW Health infrastructure, Emergency Services and Critical Infrastructure) to be compared; highlighting not only the potential conflicts and synergies within each sub-system, but also between them when required to work cooperatively in an EWE scenario.

The full complexity of this situation is illustrated in Table 2 which quantifies some of the response agencies in each of the categories in Table 1.

INSERT TABLE 2 HERE

In terms of decision-making responsibility during an EWE, six aspects of governance control were analysed:

1. Healthcare service delivery
2. Operational planning (administrative control)
3. Asset management (physical infrastructure)
4. Land use, planning and building control (site and surrounding area)
5. Support services and procurement (purchase of services)
6. Funding and financial control

Data about these seven governance control arrangements was collected using various sources. These included: published governance structures for operating and maintaining public hospitals in New South Wales; hospital, agency and community disaster management plans; government policy and legislation; building control and standards guidance; published agency and government analysis of past EWE disaster responses; annual reports of responding agencies; government inquiries in EWE responses; internal discussion papers and; disaster and emergency agency websites. This broad range of data was essential in identifying the complex intra-governance issues to explain how hospital facilities managers must interact with supporting emergency services (police, fire and rescue, ambulance and voluntary emergency services) and critical infrastructure (transport, public utilities and telecommunications) during normal and disaster conditions.

A single case study approach of NSW (albeit with multiple internal dimensions), like every approach, has well-recognised limitations, particularly around representativeness and generalizability. However, this approach enabled us to research this issue more intensively

than we could have done across multiple case studies. As illustrated above, the number of potential agencies involved in the response to an EWE in our case study is very large, introducing complex and dynamic interdependencies which require an in-depth approach to properly understand. Furthermore, in response to the potential criticism that case study research findings are not generalisable, Flyvbjerg (2011, 310) argues that “while it is correct that the case study is a detailed examination of a single example, it is not true that a case study cannot provide reliable information about the broader class”. Indeed, Flyvbjerg (2011) argues that ‘the force of example’ is underestimated in organisational research and that when done well, contain no greater bias toward verification of the researcher’s preconceived notions than other methods of inquiry. Indeed, according to Flyvbjerg, experience indicates that the case study contains a greater bias toward falsification of preconceived notions than toward verification. While the advantage of large samples is breadth and representativeness, the advantage of case studies is depth and validity.

Results and discussion

The discussion in this section focuses on the potential obstacles and opportunities presented by the current governance structures and approaches to inter-agency coordination to hospitals undertaking effective EWE management in our case study. To test the efficacy of current governance structures, two scenarios are analysed. The first scenario explores how hospital facility managers can support a community’s response to an EWE. The second scenario explores how hospital facility managers can avoid its operations being disrupted and thereby itself becoming a casualty of an EWE.

Scenario 1: Hospital infrastructure in supporting the community's response to EWEs

The complexity of inter-agency governance is illustrated by the following description of the range of agencies involved in planning for, responding to and recovering from an EWE response. In NSW, as in most parts of the world, responsibility for the formulation and maintenance of disaster plans is delegated to the lowest possible level, which in administrative terms is to local government, with a mechanism to elevate to higher order controls as necessary, at a district and even state-level. In total, 152 Local Governments exist across NSW and for the purposes of regional disaster management, Local Governments Areas (LGAs) have been grouped into 11 Emergency Management Districts. While whole-of-community plans are formulated by Local Government for each of their areas and coordinated across the 11 Emergency Management Districts, responsibility for the health response as part of these plans occurs across a different set of operational boundaries, creating the risk that disaster planning for hospitals is undertaken in isolation from whole-of-community disaster plans coordinated by Local Government officials. Under the provisions of the NSW Health Plan (NSW Health 2008), responsibility for disaster management for individual hospitals (both public and private) is allocated to 17 Local Health Districts (LHDs). This is done through Health Services Functional Area Coordinators (HSFAC) in each hospital. However, in terms of ensuring the ability to build adequate surge capacity within their hospitals, LHDs have limited influence over the centralised procurement from warehousing facilities supplying support services such as linen, catering, IT or consumable medical supplies within their districts. These components are controlled at a state-wide level by NSW Health. In the same way, during an EWE, LHDs will have little influence in mobilizing other agency resources. These types of inter-agency governance risks, caused by overlapping or misaligned operational boundaries are rarely highlighted or discussed and they

significantly increase the likelihood that hospital facility managers will not be able to provide the health care support that the community requires and expects during an EWE. To address this gap in knowledge, Figure 1 summarises our analysis by abstracting the main factors faced by NSW hospitals in supporting a community's EWE response effort. Figure 1 emerged from a mapping exercise which sought to map the physical infrastructure operated by NSW Health, various emergency response services and infrastructure support services around transport, telecommunications and utility supplies listed in Table 1.

INSERT FIGURE 1 HERE

Figure 1 shows that hospitals are fixed pieces of critical infrastructure, and like other respondent agencies, the organisation will deploy medical teams into the field as part of the EWE response, as well as receive in-bound casualties. Given that hospitals are not geared to provide their own disaster transport, they are highly dependent on other emergency service agencies to assist with the deployment of medical teams and supplies into the disaster field and also to transfer casualties from the field for treatment in hospital. Therefore the quality and timeliness of the 'health' response is dependent on the cooperation of other agencies. Our analysis indicated five critical issues that potentially impact a hospital facilities manager's ability to respond effectively to an EWE. These are: realistic estimates of surge capacity; time to prepare; dependency on other agencies to build surge capacity and to provide transport solutions; assumptions of access to and from the disaster field and; resolving overlapping or misaligned operational boundaries between other agencies. These are discussed in more detail below.

Realistic estimates of surge capacity

Our analysis indicates that community disaster plans work on the assumption that hospitals will remain operational during an EWE and will have the capacity to expand and change their operating model and infrastructure to deal with an influx of casualties with abnormal healthcare requirements. Surge capacity is a recurrent problem in hospitals and while financial constraints are often blamed for this, other issues identified in post disaster reports include fragmented governance of surge resources, offsite storage of resources, over-loaded supply chains and poor communication about overflow management.

Hospitals need time to prepare

Hospitals need time to prepare, not only to deploy a response team, but also to be sufficiently resourced to receive mass casualties as well as to assist with the health response during the community's recovery period. Post disaster reports show that a hospital's surge capacity will be dependent on the accessibility of additional staff and supplies. It will also depend on providing sufficient treatment space through a range of measures including cancelling elective surgery, diverting emergencies not related to the disaster to other hospitals and potentially transferring patients.

Dependency on other agencies to build surge capacity

All hospitals rely on other agencies to transport supplies and patients to and from site. However, during an EWE, resources may be difficult to secure given most will be involved in preparing for deployment as part of the overall response or, depending on the nature of the EWE event, involved in the planned evacuation of the threatened community.

Assumptions of access to and from the disaster field

There is an assumption that access to and from the disaster field will be possible during the course of a disaster response and recovery period. Not only does this assumption rely on surrounding infrastructure remaining operational (for example, roads, helipads or airports), it also relies on transport vehicles and equipment being capable of handling the conditions within the disaster field. As identified recently during severe floods in Australia and the UK, the inability of the available responders to negotiate flooded roadways or rough terrain significantly impacted the effectiveness of hospital responses.

Overlapping or misaligned operational boundaries

Impacting all three dependencies identified above is the potential overlap and/or misalignment of operational boundaries of the various responding agencies. Since EWEs typically affect a wide catchment area, they are likely to be covered by more than one local disaster plan, and potentially even some regional or district-based disaster plans. This requires hospitals to be familiar with the procedures and arrangements contained within multiple disaster plans, and also to build operational relationships with a wide range of stakeholders and responding agencies.

In each of these areas, our analysis revealed a range of enablers and barriers to effective inter-agency response to EWEs and these are presented in Table 3.

INSERT TABLE 3 HERE

Scenario 2: Hospital site becoming part of the disaster zone

Figure 2 summarises our analysis of this scenario by abstracting the situation faced by hospitals in avoiding becoming a casualty during an EWE.

INSERT FIGURE 2 HERE

Figure 2 and our analysis of past disaster response reports indicated five critical issues that potentially impact a hospital's performance in response to an EWE: funding of asset development; coordinating with agencies external to the health system and; potential conflicts between external agencies. These are discussed in more detail below.

Funding of asset development

In Australia, the state government will typically own a hospital's physical assets including the site, and through its various agencies, oversee and fund its upgrade or renewal. Individual hospital facilities managers and regional health boards tend to have funding and delegated responsibility to manage the operation including routine maintenance of individual sites and supporting built infrastructure. On face value this split in agency responsibility appears innocuous. However, under this arrangement, individual hospital facilities managers have limited influence over decisions to upgrade or renew their hospital's site or its built assets. Within the ranks of state government itself, the division of responsibility between departments is equally important. While the relevant state or national health department may have responsibility for setting priorities for capital works (renewal or upgrade) across the portfolio supporting the public health system, state treasuries will ultimately dictate the health budget and health departments must compete with other demands for public funding. A

second issue is that at a state level, decisions regarding capital expenditure on the upgrade or renewal of assets within an individual site are typically prioritised, with reference to the entire hospital portfolio. What may be of high priority to an individual hospital in its disaster planning may not necessarily be considered so by government at the state level.

Coordination with agencies external to the health system

As discussed above, during an EWE, hospitals often rely on interactions with agencies outside the health sector, with whom they do not have routine contact. Although most health systems attempt to ensure independence through the provision of backup sources such as the installation of generators, it does not necessarily reduce the reliance on other agencies to assist. For example, as illustrated during a recent heatwave in Australia, back-up generators can fail, requiring emergency support from external services during the outage period. The global trend towards privatisation of public utilities (power, gas, water supply and telecommunication) has introduced an increased level of complexity into coordinating these types of critical dependencies.

Potential conflict between external agencies and hospital objectives

One major problem for a facilities manager in dealing with an EWE is that external agencies may have conflicting objectives to those of the hospital. For example, local aged care facilities often lack a disaster plan and tend to evacuate their patients and residents to tertiary hospitals during an event such as a flood, to prevent them being cut-off. Not only could patients become stranded en-route, but the arrival of many new vulnerable old people into a hospital at a time when it is already under stress puts undue strain on the response effort. Similarly, in a heat wave, electricity providers experiencing a surge in electricity demand from the community might have to ration electricity supply to prevent disastrous outages.

This may result in the cancellation of non-critical health services to the community until the heat wave has passed.

In each of the above areas our analysis revealed a range of enablers and barriers to effective inter-agency response to EWEs under this scenario are presented in Table 4.

INSERT TABLE 4 HERE

Conclusions

The aim of this paper was to explore the implications of inter-agency governance for the facilities management of public hospitals during EWEs. It was argued that past research on facilities management governance issues has taken an intra-department focus and there is a need to balance this with inter-organisational insights. By studying these issues under two distinct scenarios within an in-depth single case study of NSW Australia, this paper has illustrated how both scenarios present different sets of issues which impact on a hospital's performance during an EWE and therefore warrant separate attention and planning as part of facilities manager's disaster management responsibilities. What is evident is that in responding effectively to an EWE the management of hospital facilities cannot be seen in isolation from the wider management of the disaster and emergency management system. It is also clear that facility managers cannot effectively play a role in maintaining healthcare to the community during an EWE if they fail to build, nurture and understanding their relationships with other agencies involved in a disaster response. This needs to happen before, during and after every event. These external relationships are critical in facilities managers understanding and planning how the hospital facility will provide adequate and appropriate treatment space to cope with a surge and change in patient demand profiles, additional staff

and how it will access and manage sufficient medical and other resources to do so.

Furthermore, access to and from the hospital during the course of the disaster response and recovery period is critical and depends on surrounding infrastructure remaining operational and on sufficient transport and equipment being available. Impacting on all these requirements is the potential overlap and/or misalignment of operational boundaries of the various responding agencies, requiring hospital facility managers to be familiar with the procedures and arrangements contained within multiple disaster plans, and also to build operational relationships with a wide range of stakeholders and responding agencies and understand any conflicting objectives which may affect a hospital's operational capacity. While the limitations of this research is that it was based on one case study of NSW, and while further research is clearly needed into the inter-agency challenges of the facilities management function, its value is that it reveals for the first time, a set of issues and skills which are not typically covered in facilities management research literature. In particular, it highlights the importance of: adopting a systems perspective in understanding the health system as a whole; understanding the power, politics and economics of governance; stakeholder management; inter-agency relationship building and; of understanding the objectives, plans and constraints of other organisational functions (external and internal) which the facilities manager depends on.

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TABLES

Table 1: Agencies involved in delivery of NSW healthcare

NSW Health Infrastructure	NSW Emergency Services	Critical Infrastructure (Transport, Public Utilities, Telecommunications)
<ul style="list-style-type: none"> • Public Hospitals • Private Hospitals • Primary Health Care Providers • Aged Care Providers 	<ul style="list-style-type: none"> • NSW Ambulance Service • NSW Police Force • NSW State Fire and Rescue Service • Volunteer Rural Fire Services • Volunteer Ambulance Officers • State Emergency Services 	<ul style="list-style-type: none"> • National Road Network • State Roads • Local Roads • National Interstate Rail Networks • Metropolitan & State Rail Network • Public / Community bus Networks • Airports • Power Generation • High Voltage Electricity Supply / Distribution Network • Electricity Supply Distribution to Sites including Street Lighting • Gas Supply Network • Potable Water & Sewage Supply – Bulk Supply • Potable Water & Sewage Distribution Networks and Infrastructure (Local) • Voice and Data Communications – Network Infrastructures / Licensed Carriers.

Table 2: Response agencies and operational districts contributing to an EWE response in NSW.

Response Agencies	Operational Divisions or Regions across NSW
NSW Local Governments	152 LGA across NSW
Public Hospitals (receiving hospitals)	17 Local Health Districts
Ambulance Service	226 Ambulance Stations; 5 Regional Control Centres
Police Service	80 Local Area Commands, 6 Regional Commands
Fire & Rescue Service NSW	338 Stations; 4 Regional Commands
Volunteer Rural Fire Service	16 Districts; 4 Regional Commands
State Emergency Services	228 Units; 17 Regions based on River Catchments
Critical Infrastructures	Stakeholders / Operational Licences across NSW
Electrical	Transgrid + 3 HV Distributors & 12 Retail Licences.
Gas Supply `	12 Licensed Network Operators
Water	2 Bulk Suppliers, 2 Metropolitan & 105 Rural Water Utilities
Communications (voice & data)	189 Active Licensed Carriers (321 licences issued in total)

Table 3 Inter-agency enablers and barriers to hospital EWE response

Critical issues	Enablers	Barriers
Realistic estimates of surge capacity.	<p>Ensuring that assumptions on which surge capacity has been estimated are articulated and fully understood both within the Health System and agencies responsible for coordinating the whole-of-community response.</p> <p>Estimates of surge capacity need to include inter-dependencies such as capacity of secondary receiving facilities, as well as any demands drawn on central supplies and pool of rostered staff.</p>	<p>Split in decision-making responsibility between agencies controlling resources essential in building a hospital's surge capacity.</p> <p>Just-in-time inventory systems providing minimum on-site storage.</p> <p>All hospitals rely on the same shared centralized warehousing facilities and suppliers.</p> <p>Restructuring has led to steady decline in health-care worker to patient ratios and many staff are rostered.</p> <p>Surge capacity relies on ability to transfer patients to other facilities which have the same expectation.</p>
Hospitals need time to prepare	Hospitals need to identify their	Hospital administrations / health

	<p>interdependencies on other agency's resources to build their surge capacity i.e. transport, draw on central supplies, staffing pool & secondary receiving hospitals.</p> <p>Accelerating the amount of early warning given to hospitals by identifying and agreeing what 'triggers' hospitals to initiate alert status.</p>	<p>sector will rarely be responsible for activating a disaster plan (possible exception being the threat of a disease epidemic) and therefore will be reliant on others to provide sufficient warning.</p> <p>Risk in hospitals over-reacting resulting in potentially costly preparation that may not be necessary or taking action that is uncoordinated with whole-of-community COMMAND AND CONTROL efforts.</p>
Dependency on other agencies to build surge capacity & to provide transport solutions.	<p>Opportunity for hospitals / health systems to pre-contract resources from other agencies in preparation for a disaster scenario and for these arrangements to be identified and well-articulated within disaster plans.</p>	<p>Competing demand placed on resources prior and during a disaster.</p>
Assumptions of access to and from the disaster field	<p>Assumptions regarding transferring existing patients to receiving hospitals or alternative facilities, need to be identified and well-articulated within disaster plans.</p>	<p>Hospital administration may have little influence over the activities or allocation of resource of agencies providing them with a transport solution.</p> <p>Agencies providing a transport</p>

		<p>solution may themselves be</p> <p>impacted by the disaster.</p>
<p>Overlapping or misaligned operational boundaries</p>	<p>Where feasible, align day-to-day operational boundaries of response agencies with those adopted for disaster management purposes.</p> <p>Hospital administrations need to identify which local and district plans they have been included within and become familiar with the command and control structures in-place for each.</p>	<p>Those responsible for the formulation of whole-of-community response need to be aware of the call on a hospital's resources by other local or district plans.</p>

Table 4: Summary of issues identified impacting disaster planning preventing a hospital from becoming a casualty during a disaster

Critical issues	Enablers	Barriers
Funding of asset development	Hospital administrations are in the best position to evaluate the vulnerabilities of their site and infrastructure, and the resourcing priorities needed to prevent a hospital becoming a causality of a disaster.	Hospital administrations generally have little influence in decisions regarding the prioritisation or allocation of resources supporting the renewal or upgrade of hospital sites or buildings.
	Capacity building in terms of education, skills and resources should be directed to the development of strategies aimed at mitigating the impacts of natural disasters on public hospitals.	Many hospitals are not resourced and staffed to defend their site or built infrastructure against impacts of a weather-induced disaster and are therefore reliant on the assistance of other agencies when sites come under direct or indirect threat.
	Site and building adaption aimed at mitigating the impacts of a disaster need to self-deploy or be able to be activated by hospital staff.	The decision to abandon a hospital site and evacuate staff and patients will be made by command and control for the whole-of-
	Hospital administrations in co-operation and agreement with other	community response rather than the Hospital Administration or

	<p>agencies should determine pre-disaster what would trigger evacuation versus the ability to defend a site.</p>	<p>Health Department owning the asset. The priorities and decision-making by command and control may be very different to the priorities of a hospital's administration or health system particularly in relation to defense of their infrastructure</p>
<p>Coordinating with agencies external to the Health System</p>	<p>Hospital disaster plans need to identify and build relationships with agencies external to the health system involved in defending their site or assisting in keeping the hospital operational in the event it becomes isolated or services are disrupted during the course of a disaster.</p> <p>Hospitals need to identify their requirements in terms of maintaining their operational capacity in the event they become physically isolated or service supplies are disrupted both during and post event.</p> <p>Given that hospitals will generally have limited capacity to stockpile (both in terms of site storage but</p>	<p>Lead and responding agencies will likely change in response to the type of disaster presented leading to potential confusion over responsibilities for response.</p> <p>External agencies will be responsible for re-supplying sites should the hospital become isolated or utility services become disrupted, however the hospital will have little influence in the assignment or prioritising the activities of these agencies during or post disaster.</p>

also having the time to source or gather additional supplies), plans need to incorporate strategies allowing sites to be re-supplied and for staff to be relieved.

Potential conflicts between external agencies

Hospital administrations in co-operation and agreement with other agencies should determine pre-disaster at what point priority for resources and access needs to switch from supporting the response effort to defending the hospital site and infrastructure from becoming causality.

The decision to defend a hospital site and the allocation of resources for this task will be made by command and control for the whole-of-community response rather than the hospital administration or Health Department owning the asset. The priorities and decision-making by command and control may differ to those of the hospital's administration or health system and therefore if such 'triggers' are not agreed to pre-disaster, could result in conflict compromising timely action from being taken.

FIGURES

Figure 1: Scenario 1 - hospitals supporting the community response

Figure 2: Scenario 2 – conditions needed to avoid the hospital being a casualty of the disaster