Healthcare resilience to extreme events: A hospital staff perspective

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# Abstract

The coronavirus (COVID-19) pandemic demonstrated how vulnerable and unprepared most healthcare sectors are to major disasters. Several studies have been published reporting factors that affect staff attendance during extreme events. However, these factors are limited and do not provide a full picture of why staff attend or unattend workplaces during major emergencies, and the impact of staff absence on healthcare service delivery. This study presents factors influencing staff attendance during an extreme event and the impact of staff attendance on the continuity of the healthcare service in one of the several independent British Isles hospitals. This study highlighted that staff attendance depends on many contributors such as workload, stress, motivation, proximity of work to home, transportation networks, and dependencies. The absence of any staff member, despite their role, level or background will have an impact on the functionality of the hospital. The study concludes that staff absence would severely impede the continuity of the healthcare service, impacting on services which provide ventilators and other essential services required during extreme events such as the COVID-19 pandemic and extreme weather events.

**Keywords**

Extreme events, Staff attendance, Healthcare resilience, COVID-19 pandemic, staff dependency

# Background and literature review

Most of us are now aware during these challenging times of COVID-19 how vulnerable the global healthcare sector can be. COVID-19 cases and death rates varied, Italy was initially the worst affected crippling their healthcare service (Al-Thobaity and Alshammari, 2020), in some ways, this reflected and exposed many countries’ crisis management plans. Likewise, many other types of hazards such as earthquakes and extreme weather events can stretch healthcare services, including staffing and supplies (UNICEF, 2020). Achour and Miyajima (2020) proposed and illustrated five fundamental and imperative contributors required for the continuity of healthcare service: these are *Building integrity*, *Critical systems* (e.g. power, water and gas supplies), *Equipment*, Supplies (e.g. PPE, medicine and food), and Staff (see Figure 1). They also highlighted other hidden contibutiors such as *Accessibility networks* (e.g. roads and trains) and Suppliers. These contributors must be performing very well before an event occurs to keep the flow of healthcare functioning (Achour and Miyajima, 2020). Staff are one of these five fundamental and pivotal contributors as they are responsible for dealing with patients (i.e. frontline of patient care) and for ensuring the continuous operation of the hospital.

Researchers such as Powell (2008) argue that staff attendance diminishes, and that healthcare authorities yet to appreciate this. Reasons for healthcare staff (e.g. doctors, nurses and clerical) attendance diminishing can be due to numerous factors such as work to home proximity, transportation, type of disaster, infrastructure, fear, family commitments and even commodities such as food and water. Davidson et al (2009) found that healthcare staff with dependents were less likely to attend. Ochi at al (2016) suggest the availability of physiological resources such as food and water contributes to healthcare staff attrition.

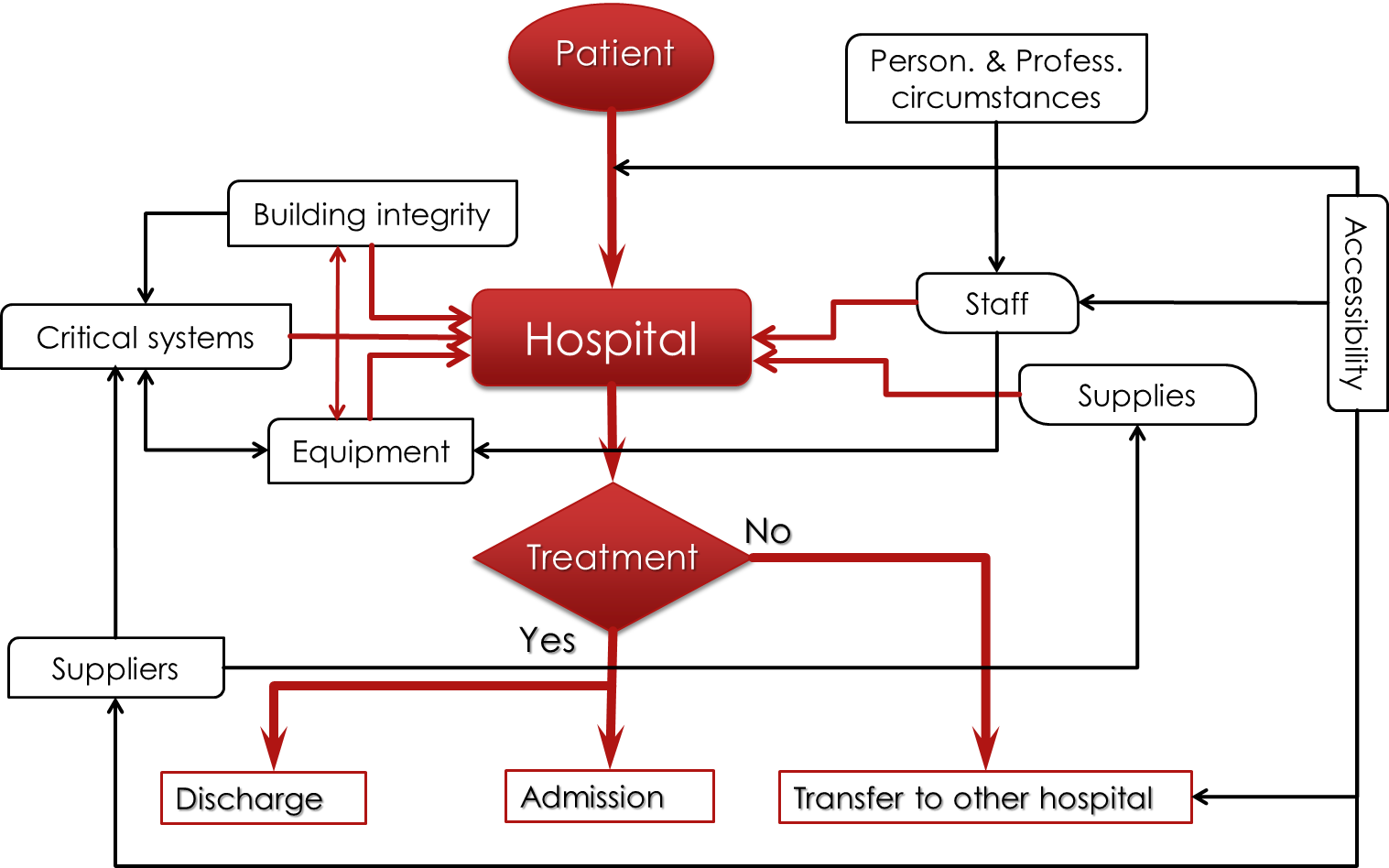


Fig. 1 A simplified model for hospital operation factors (Achour and Miyajima 2020)

Extreme events can cause a paucity of resources such as medication, equipment and more importantly staff who need to deal with the patient frontline (i.e. clinical staff) and with maintaining the functionality of the hospital behind the screen (e.g. engineers, hygiene, and security). Health authorities should assume during extreme events, there will be a shortage of staff (Achour and Miyajima, 2020; Powell, 2008; Davidson et al., 2009; Unlu et al., 2010; Chaffee, 2009) combined with a potential surge in demand. Data from the mega-triple disaster in Japan in March 2011 showed that doctors’ best attendance reached 58% and clerical staff had the worst attendance of 38%. Healthcare staff are less willing to work during a chemical, biological, contagious and radiological situations (45-52%) in comparison to meteorological and geophysical hazards (e.g. floods and earthquakes) (83-90%) (Chaffee, 2009). Japanese hospital staff had much fear from radiation exposure and decided to not report to work due to psychological fear of radiation, the closer the staff lived to the point of radiation the greater the fear (Unlu et al., 2010). Moreover, many healthcare staff members feared for their families and some could not attend due to pet care and if they had to report to work then pet arrangements would need to be considered (Davidson, 2009; Ochi et al., 2016; UNISON, 2021; Achour et al., 2018), whilst others had eldercare obligations (Achour et al., 2018).

In New Zealand, the 2011 earthquake caused significant strain on doctors some of whom lost their homes and were themselves receiving help from their local community. Hospital staff have higher chance to respond effectively to major emergencies when they are physically and mentally sound prior to the the disaster. Increasing workload, stricter performance measures with less flexibility tend to cause stress and will most likely put staff in an unfavourable position to work effectively and in an unhealthy manner post-disaster due to the stress associated with disasters (Achour et al., 2018). Furthermore, staff who remain at their duties post-disaster were susceptible to stress and psychological disorders and may need to be treated by mental health professionals along with disaster victims.

Researchers suggest that sleep and treatment of insomnia are important interventions for maintaining the healthcare team in a physiological state to effectively manage the continuity of healthcare (Valdez & Nichols, 2013). Awareness was also recommended as an approach to help reducing staff stress and assist to deliver high-quality service (Achour et al., 2018). Training and education have a positive effect on minimising stress, it was reported that once knowledge was attained, staff were willing to work during a disaster (Martens, Hantsch & Stake, 2003). These issues exhibit work pressure and prevent staff from learning how to deal with a major incident.

Recognition and motivation are other elements that have influence on the effectiveness of staff; however, these do not seem to be well captured by hospital seniors leading to less loyalty to workplace and thus higher chance to not attend during major events (Achour et al., 2018). Achour et al (2018) recommended that staff should be given opportunities to acquire new knowledge and develop new skills that will enable them to deal with major emergencies. Valdez and Nichols (2013) supported this argument stating that developing preparedness through effective training is a way to augment attendance. Monetary rewards would motivate some workers to report for work, but alternative rewards such as promotions and recognition of service awards could be offered instead (Valdez and Nichols, 2013). Offering job opportunities to healthcare staff and assisting with child care has been suggested as an approach to entice staff who tend to prioritise their family members (Achour and Miyajima, 2020; Ochi et al., 2016). Organisations, such as in Maryland and South Carolina in the U.S., established legislative mandates to ameliorate poor staff attendance in the event of public health crisis (Powell, 2008). The United Kingdom’s (2020) legislative directive (UNISON, 2021) however, encouraged staff taking time off to self isolate and supported them by offering financial support to prevent further spread of COVID-19.

The literature reveals substantial amount of information about healthcare staff (e.g. clinicians and clerical) issues overseeing the contribution of those who work behind the screen to ensure hospital operates effectively such as engineers, hygiene and security staff members. COVID-19 highlighted the important role these play in overcoming the issues with oxygen systems, maintaining the hospital environment clean, and ensuring that access to hospitals is well under control. There is very limited information about the impact of the abscense of hospital on the operation of the hospital, i.e. healthcare service delivery. This study presents factors influencing staff attendance during extreme events and the impact of staff absence on the continuity of the healthcare service delivery in one of the several independent British Isles hospitals.

# Methods

Data was collected from staff at an indepedent hospital, which is part of the British National Health Services’ independent state-run hospitals. The hospital authorities agreed to the survey being conducted and the publication of the results on condition that the name of the hospital is kept confidential. The survey was conducted in March 2020. Staff were sent a questionnaire with 49 questions covering: *Demographic information* (e.g. age and gender), *Travel*, *Job stress*, *Professional factors* (e.g. training, peer confidence) and *Personal* *factors* (e.g. dependencies and promity between home and hospital). It encompassed closed and open questions to allow staff to express their opinions and provide further details as deemed necessary. Participants were requested to rate their knowledge and confidence using a 5-point Likert scale. Data was screened and found to be eligible for the analysis. Pivot tables were used to correlate the factors affecting staff attendance with factors such as age and gender. Qualitative data (staff feedback) was analysed based on a thematic flow diagram. The diverse range of answers was narrowed down to codes, and these codes were further organised into themes. Additionally, a frequency table was applied to qualitative data to arrange correlations from most popular to least popular. The frequency table included all factors that would ameliorate attendance.

All 1,841 staff were invited to complete the questionnaire via the hospital’s global email. A total of 197 participants took part in the study representing 10.8% of the entire hospital staff. The sample size of the different sectors was medical staff 4% (N=8), nursing staff 38% (N=75), allied health professionals (AHP) 15% (N=30), clerical staff 11% (N=22), management staff 6% (N=11), estates and facilities staff 1% (N=2) and Others (e.g. facilities staff, accommodation staff, finance staff etc) 22% (N=44). Respondents ages were 65+ (3%, N=5), 55-65 (34%, N=66), 46-55 (25%, N=48), 36-45 (22%, N=44), 18-25 (2%, N=4) and unspecified (14%, N=198).

# Results

Data analysis showed that dependents, work stress and distance to work were factors can impede the attendance of staff during and after an extreme event. These factors add additional responsibility, commitment and time to the staff’s workload. Approximately 34% (N=68) of staff live within 10 miles stated they were able to attend during a disaster. Although this means that the hospitals has a chance to operate, the risk of ineffectiveness is high as hospitals require 100% of staff if not more to operate during disasters, which often cause surge in demand.

Figure 2 illustrates a self evaluation of staff who stated they are overworked and unable to undertake duties during a disaster. Work stress figures for those unable to attend due to stress (44%, N=86) was almost equal to those who could attend (49%, N=96) and some were unsure (7%, N=13). This indicates that the hospital is at risk of loosing approximately half of its staff as they may refuse to assist with additional duties/hours. Even if they wished to help, they would find it very difficult to so. A further analysis established that 39% (N=77) of staff have depenedents (e.g. children, spouses, parents and pets) indicating high risk to not be able to attend that those with no dependents (59%, N=116).

Fig. 2 Number of staff who felt unable to undertake duties during a disaster

Figure 3. Staff who found their work rewarding

Figure 4. Staff who lost the ability and willingness to attend work

The vast majority of the staff found their jobs rewarding and meaningful (89%, N=175), see Figure 3, and as a result, a significant number of staff (87%, N=171) were willing to attend work (see Figure 4). This demonstrates a significant strength, which should be used to enhance the resilience of the hospital. Another strength was found in the level of loyalty to this hospital. The vast majority of respondents worked at this hospital for at least 11 years (66%, N=130) and only 7% (N=14) worked for up to year (see Table 1).

Table 1 Years of experience of staff at the hospital

|  |  |  |
| --- | --- | --- |
| **Year in Service** | **Count (person)** | **Proportion** |
| 0-1 | 14 | 7% |
| 11-20 | 39 | 19% |
| 21-30 | 52 | 26% |
| 2-5 | 29 | 14% |
| 30+ | 39 | 19% |
| 6-10 | 24 | 12% |
| **Grand Total** | 197 | **100%** |

# Impact on service delivery

Staff were asked to assess the effect of their absence on service delivery. Results showed that 9% (N=17) of the service would suffer a severe impact. This could increase to 50% (N=98), if moderate and severe impact percentages were combined (see Table 2). This is primarily because some of staff working on this island are the only providers trained for the service so if the member of staff is absent then the service would become unavailable.

Table 2 Severity impact on the HCS following individual staff absences

|  |  |  |
| --- | --- | --- |
| **Severity impact** | **Count (person)** | **Proportion** |
| Moderate | 81 | 41% |
| Limited | 62 | 31% |
| Not sure | 31 | 16% |
| Severe | 17 | 9% |
| No impact | 4 | 2% |
| Other\* | 2 | 1% |
| **Grand total** | **197** | **100%** |

*\* Other: Participant who did not specify*

Table 3. Services that would be affected

|  |  |  |
| --- | --- | --- |
| **Services that would be affected** | **Count (person)** | **Proportion** |
| Computer to access electronic patient records, email, phone line. | 25 | 13% |
| Feeding & IV pumps | 11 | 6% |
| ECG & Ventilators | 9 | 5% |
| Diagnostic imaging. E.g. X-ray, CT scan and MRI | 8 | 4% |
| Biochemistry/haematology/transfusion analysers, manual blood cross matching | 5 | 3% |
| Dialysis machines | 5 | 3% |
| Medication supply | 4 | 2% |
| Anaesthetic provision & sterile preparation services | 4 | 2% |
| Obstetrics machines | 3 | 2% |
| Defibrillator | 3 | 2% |
| Chemotherapy systems | 1 | 1% |
| Other\* | 119 | 60% |
| Grand total | **197** | **100%** |

*\* Other: Participant who did not specify*

# Incentives

Table 4 presents the factors that could improve staff attendance during extreme events. Participants had various concerns most of which are related to different risk scenarios such as extreme weather events and pandemics. For example, 22% of the staff (N=44) considered extreme weather events (e.g. snow and floods) thought of alternative transport could be a way to help them overcoming roads risks. Staff elaborated on this by requesting the enhancement of road safety (e.g. use of salt/grit) as part of the emegreny plan and preparedness procedures. Whilst 4% (N=8) thought of pandemics expressed needs to protect themselves and their families by ensuring that workplace provides them with adequate PPEs during their duties. They understand that by being exposed to certain diseases they could risk their health, so they need clear guidance on how to keep safe and healthy in certain major incidents. This opinion was most probably influenced by the experience of Italian hospitals, which lost more than 100 doctors and nurses to the COVID-19 (Lockwood, 2020) around the same period of the data collection.

One participant articulated that some managers only focus on performance and targets so much so that they can be blind to the safety of their employees referring to the absolute measures set by the NHS to monitor performance (e.g. 4-hour waiting time policy). Leaders and managers should assess the nature and severity of the situation and take actions whilst considering the safety of their staff. Participants highlighted the issue of childcare and suggested flexible working hours (e.g. early and late working shifts) instead of typical fixed ‘9:00 am to 5:00 pm’ suggesting that this could not only improve staff attendance but also resolve issues of childcare. Approximately 11% (N=22) of the participants reported they are carers for children or elderly stating that flexible work and provision of care assistance will enhance their attendance. This explains the reason for which the UK authorities decided to keep schools open for ‘keyworkers’ despite the loackdowns spring and late 2020 and early 2021 where schools had to make arrangements to care for their children.

Participants connected their decision to attend workplace to their confidence and ability to respond to training sessions and learning opportunities provide by their hospital. Approximately 3% (N=6) emphasised the need to have regular training sessions to provide them with knowledge training about extreme events and associated emergencies and how these can be managed. Such training sessions should be comprehensive enough to include a variety of extreme events as this has been articulated another issue that informs staff decision making (3%, N=6).

Table 4. Staff opinions on how to improve attendance during extreme events.

|  |  |  |
| --- | --- | --- |
| **What would increase your chances to attend your workplace during extreme events?** | **Count (person)** | **Proportion** |
| If alternative transport provided | 44 | 22% |
| Childcare and elderly care provided | 22 | 11% |
| Safer road | 12 | 6% |
| Flexible work hours | 6 | 3% |
| Work from home | 6 | 3% |
| Adequate PPE | 8 | 4% |
| Depend on type of extreme event | 6 | 3% |
| Good communication from Team Leader / Managers | 4 | 2% |
| Support from management | 6 | 3% |
| Financial incentive | 3 | 2% |
| Accommodation within the hospital | 2 | 1% |
| Need to work basis | 2 | 1% |
| No overtime pressure | 1 | 1% |
| Emotional support | 1 | 1% |
| Training | 1 | 1% |
| Other\* | 73 | 37% |
| **Grand Total** | **197** | **100%** |

*\* Other: Participant who did not specify*

# Discussion

The findings suggest that the hospital has a good chance to enhance its staff attendance during extreme events. Staff are well motivated and are loyal to their hospitals as demonstrated by the long experience they have in serving their hospital where 66% (N=130) of the staff worked for at least 11 years and that 19% (N=39) have served for more than 30 years. This is an opportunity for the hospital to build on to increase its staff attendance during extreme events.

Staff day-to-day workload and work stress are amongst the factors that staff have highlighted as issues that have the potential to affect capability to work effectively. Almost half of the staff (44%, N=86) work under substantial stress indicating that staff attendance might be dropped during extreme events as experienced in international experiences (e.g. Japan). This drop is not due to willingness but due to incapability to attend. Literature and experience revealed that staff tend to suffer post traumatic stredd disorder (PTSD) due to the extra pressure they go through not just because of the extra workload but also because of the shocking images they might see or even decisions they have to take (e.g. prioritise care that can cause death of patients).

Living with the proximity of the hospital and travel means have been also highlighted by staff. Approxmately third of the staff live within 10miles which means that they have higher chance to attend during extreme events; however, it also means that 66% at at risk of incapability to reach their work place if road/railway networks are affected. Only a few staff members realised that road safety is an issues for them, actually this is a vulnerability for the hospital, which needs to to plan for such a scenario by finding ways to increase staff attendance when things go wrong. Transportation networks are critical for hospital access not for staff but also for supplies, patients and relatives (see Figure 1).

Another contributor to staff attendance is dependencies. Approximately 40% of staff (N=77) have dependents (children, parents etc.) indicating another risk of incapability to attend hospital during extreme events. Hospitals might have some ability to reduce such risk by setting childcare facilities for staff in their premises as some hospitals did during the 2016 Kumamoto Earthquake (Achour and Miyajima, 2020) During the COVID-19 pandemic the UK Government kept schools and childcare facilities open for keyworks’ children (e.g. hospital and food suppliers) which enhanced staff attendance; the challenge, however, that it might be difficult for the Government to do the same for other extreme events. Hospitals need therefore to develop their own solution to mitiate this risk.

The study established the important role of non-clinical staff, approximately 40% (N=78) of staff indicated that their absence affects the operation of particular services such computer and IT networks (e.g. email, phone line, patients records), CT, MRI, ECG and Ventillators. This enters in the complexity of staffing that is often overseen during extreme events. Achour and Miyajima (2020) argued that the impact of these systems on the functionality of hospitals can be major.

# Conclusion

Healthcare services are one of the most intricate and vital services in the world. Their imperativeness lies in managing an enormous volume of patients from admission to discharge to maintain flow. The influx of COVID-19 patients drastically increased demand overwhelming the services. This becomes a situation with significantly higher demand than usual which needs to be matched with capacity and resources, staffing level needs to be increased but this does not happen due to complexity of disasters, which tend to affect patients and staff either directly (e.g. illness and injuries) or indirectly (e.g. dependencies, travel etc.). The intricacy of healthcare facilities rises with the number of systems that they host and the inter-dependability between the system and the staff using the systems. This study established that vital equipment might cease to function such as the imaging scanners (MRI, CT and X-Ray) and key ventilators if specilised staff are absent. Recent healthcare disruptions caused by COVID-19 highlighted the need to globally address a current preparedness plan and staff safety such as providing PPE. This study highlighted that staff attendance depends on many contributors such as workload, stress, motivation, proximity of work to home, transportation networks, and dependencies. The absence of any staff member, despite their role, level or background will have an impact on the functionality of the hospital. The more hospitals reduce risks of staff absence, the higher chance they have to function effectively.

This study presents factors influencing staff attendance during an extreme event and the impact of staff attendance on the continuity of the healthcare service. Further research will need to be conducted in order to measure the capability of staff attendance. This will be set as the next research plan.

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