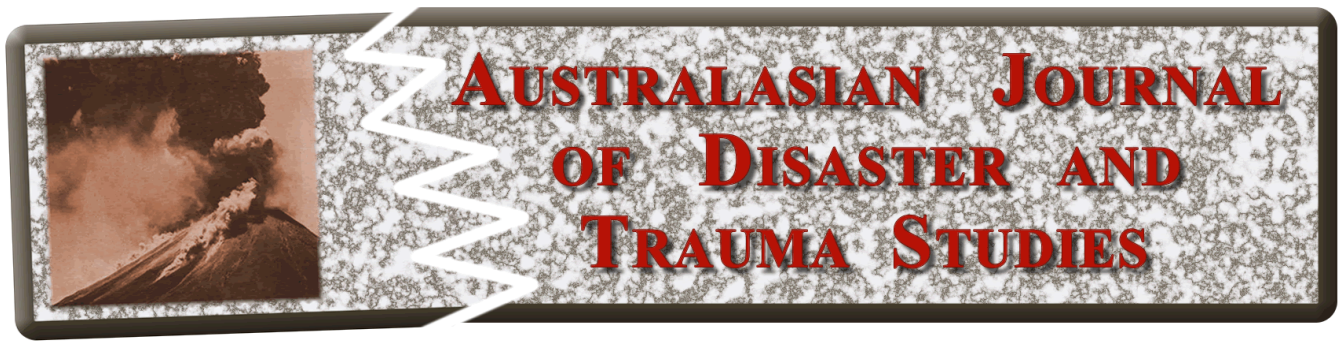

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How People Affected by Disaster Use the Internet: A study of Facebook Usage during the 2014 Hazelwood Mine Fire in Victoria.

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Abstract

This study examined how people affected by a 2014 mine fire in the Australian state of Victoria utilised Facebook. The aim was to ascertain if there are certain common things people affected by disasters do on the Internet regardless of where they live, what Internet tool they are using, or type of disaster they are facing. Content analysis was done on a Facebook page about a Victoria mine fire to determine if it was used in a manner similar to how an Internet forum was used following a 2008 earthquake in China. Results revealed that the Facebook page was used to share information, seek information, criticise, express anger, show support, and in other ways similar to how the Chinese Internet forum was used. These findings reveal that commonalities may exist in the way people use the Internet in response to disasters. This illustrates the need to develop a model of how people use the Internet in disasters and test the model by examining disasters in various countries.

Keywords: *social media, Australia, China, Facebook, fire*

Introduction

How ordinary people who are not disaster management professionals use the Internet in times of disaster is a topic that has received significant research attention. For example scholars including Sinnappan, Farrell and Stewart (2010) and Acar and Muraki (2011) have examined how people used Twitter during disasters. In these particular studies, one issue remains under-examined: whether there are commonalities in how people affected by disasters use the Internet. For example, whether there are there certain things disaster affected people do on the Internet regardless of where they live, what Internet tool they are using, or type of disaster they are facing. This was the issue the current research examined. This paper describes a study that analysed people's use of the Internet in two very different disasters: a 2008 earthquake in China and a 2014 mine fire in Australia. The aim was to ascertain whether commonalities exist in how people in the two countries used the Internet when responding to a disaster. The paper opens with a review of literature on how ordinary people use the Internet in disasters. The research questions are then outlined, the methodology is described, the findings presented, and implications as well as limitations are discussed.

Literature Review

Since the Internet's rise in popularity in the 1990s, researchers have sought to understand how people use it in response to disasters and crises. An event that spurred research on this topic was the 2001 World Trade Center attacks. Rainie (2001), for example, found that after the attacks, people used email and forums to grieve and discuss. Spiegel and Butler (2009) also found that blogs were used to share experiences and news. Researchers have also explored how people impacted by the 2004 Indian Ocean tsunami and 2005 Hurricane Katrina used the Internet. Ramos and Piper (2005) revealed that those affected by the tsunami used blogs to provide information on missing people and share observations. Macias, Hilyard, and Freimuth (2009) discovered that hurricane survivors used forums to provide emotional support while Barak (2010) found that the Internet was used to share resources, express emotions, locate the missing, and obtain mental health support, during five disasters that occurred between 1998 and 2009.

The popularity of social media websites has prompted research on how these websites are used to respond to disasters. Most of this work has focused on Twitter. Sinnappan et al. (2010), for example, revealed that during 2009 bushfires, Victorians tweeted to announce fire locations, seek information, and express emotions. Kongthon, Haruechaiyasak, Pailai, and Kongyoung (2012) found that during floods in 2011, Thais tweeted to

ask for help, provide information, and complain. After the Fukushima disaster, Acar and Muraki (2011) discovered that Twitter was used to express uncertainty and seek information to reduce uncertainty.

Despite the numerous studies that had been completed, Palen et al. (2010) argued that more research was needed because gaps exist in our understanding of how people use the Internet in disasters. One issue which is still not well examined is whether commonalities exist in how people affected by disasters use the Internet. For example, whether there are certain similar things disaster affected people do on the Internet regardless of where they live, what Internet tool used, or what type of disaster they are facing. Understanding this question can help construct a theoretical model of how people use the Internet during disasters. The current research heeded Palen et al.'s (2009) call and sought to identify commonalities as well as differences in how the Internet is used in different disasters.

Method

To determine if there are common things disaster affected people do on the Internet, the first step was finding a study on Internet use during a disaster that was done in a unique setting. A conference paper by Qu, Wu, and Wang (2009), on how people used an Internet forum following an earthquake in China, was one such study. The researchers examined how Tianya, China's 12th most popular website, was used after a 2008 earthquake in Sichuan. Tianya is a forum where a user can start discussion about an issue by writing a statement that other users can respond to. The statement and the responses it may elicit are called *threads*.

Qu et al. (2009) began by scanning 4300 threads created during the first week after the earthquake. They found that those affected by the earthquake created threads that could be classified into several categories. Having identified these categories, they examined whether the categories could be found in 100 random threads. After this analysis, the list of categories was refined and used to examine an additional 50 threads. After this analysis, the researchers agreed that the categories were indeed representative and they then proceeded to examine 2266 threads. They concluded that those affected by the earthquake created threads that could be classified into the 16 categories detailed in Table 1.

Table 1
Threads Created on Tianya Forum After the 2008 Sichuan Earthquake

Type of Thread
Information sharing: information provided to forum readers.
Information seeking: question is posed to forum readers.
Information gathering and integrating: information compiled in accessible format for readers.
Criticising: individuals, government, or others criticised.
Other opinion: opinion provided or sought without criticising.
General action: action proposed to the general public.
Individual action: individual declares that action has been taken or will be taken.
Coordinating action: attempt to organise group action.
Expressing emotion: feelings such as anger expressed.
Emotional-support: emotional support is demonstrated.
Sense-making: attempt to interpret or understand the disaster is made.
Moderation: post about how forum is moderated.
Norm-shaping: an attempt to shape forum behavior.
Flaming: anti-social attack on a person or group.
Trolling: anti-social message taunting readers.
Off-topic: message unrelated to disaster.

The researchers also found that most threads created in response to the earthquake were information-related (37.3%). The rest were opinion- (32.1%), emotion- (14.2%), action- (10.7%), and moderation- related, norm-shaping, or anti-social (5.7%). They also found that most information and opinion-related threads were created at the beginning of the disaster while most action and emotion threads were created later. The researchers speculated that immediately following the earthquake, people would have been interested in learning what happened. Hence the prominence of information threads. Qu et al. (2009) also suggested that, as the disaster progressed, people would have become more comfortable expressing emotions, calling for action, and criticising.

The researchers found that the most viewed and replied threads concerned information integrating and information gathering. Opinion-related threads ranked second in views and replies. The third category was action-related, and emotion-related threads ranked fourth. Threads that aimed to reshape forum norms ranked last in views. To explain why some threads were more popular than others, Qu et al. (2009) suggested that people valued threads that provided information and were less inclined to value threads where people simply expressed emotions.

A limitation of the China earthquake study is that it only examined threads created in the week after the earthquake. Therefore, it provided only limited insight because disaster, response and recovery efforts can last many months. Analysing how Tianya was used months after the earthquake could have provided more insight regarding Internet use during disaster. Despite this limitation, the study is a good starting point for understanding what people do on the Internet in response to a disaster.

The second step to determining if there are common things disaster affected people do on the Internet was finding a contemporary disaster that could be analysed using the framework developed in the China study. This would allow the current research to see whether thread categories identified in China could also be found where people used the Internet in response to a disaster in another country.

To ascertain whether the findings from China were relevant to other contexts, a recent disaster was chosen to be examined. This disaster was the 2014 Hazelwood mine fire in the Australian state of Victoria. The fire began on February 9 and transformed into a disaster when it spread into a large coal mine operated by a multinational company. A key threat from the fire was posed by toxic fumes which placed local towns at risk. In response, residents in these towns were advised to stay inside, schools were closed, and voluntary evacuation was provided for vulnerable individuals. As the fire burned for weeks, residents grew frustrated and created a Facebook page titled 'PROTEST: Disaster In Latrobe Valley to pressure the government and GDF Suez'. The page was used to organise a day of protest that was attended by over 1200 people (Green, 2014).

Five research questions were drafted, to determine whether findings from the China study also applied to how people used Facebook as a response to the Hazlewood mine fire. Research question one was: on a Facebook page created by people impacted by the 2014 Hazelwood mine fire disaster, were information related, opinion related, action-related, emotion-related, sense-making, community building, and anti-social threads present? Research question two was: were there other threads present that were not identified by Qu et al. (2009)? Research question three was: what thread(s) was/were most prevalent at the beginning of the disaster? Research question four was: what thread(s) was/were most prevalent in the later days of the disaster? Research question five was: what thread(s) was/were most prevalent on the page and which was/were least prevalent?

On a forum, the clicks threads received give insight into which threads users preferred. On Facebook, a thread's popularity is measured by how many people click the 'like' icon, how many times the thread is shared, and how many responses it receives. The following research questions six, seven and eight were drafted to assess thread popularity on the Facebook page: Which thread(s) received the most likes?; Which thread(s) was/were shared the most?; Which thread(s) received the most responses?

Analysis

Qualitative and quantitative content analysis was used to analyse the Facebook page. Qualitative content analysis can be ideal when a researcher does not know beforehand what will be found and is interested in generating detail rich data. Quantitative content analysis is appropriate when there are pre-determined themes and researchers want to ascertain how much they occur in the data (Creswell & Clark, 2007). This study's aim was to learn whether people were using the Australian Facebook page in ways identified and not identified in the study of the earthquake in China. Hence, the two approaches were appropriate.

The unit of analysis was a Facebook thread, which is made up of the starting message a user posts and the responses it elicits. These responses included images, text, video, likes, or shares. During data collection (March 4-20, 2014), 239 threads were identified as suitable for analysis and then entered into Hyperresearch software that helps analyse multimedia data sets. Two independent coders randomly selected 20 threads and analysed them to see if they fit into categories identified in the China study or completely new categories. After this initial analysis, the coders met to discuss their findings and found that initial inter-rater agreement was 96%. Discrepancies were resolved, before coders reviewed the remaining 219 threads, and final ratings were reached by consensus.

Results

The first research question assessed whether the Facebook page created by people impacted by the 2014 Hazelwood mine fire disaster contained information-related, opinion-related, action-related, emotion-related, sense-making, community building, and anti-social threads. Analysis showed that all these threads were present on the page. Table 2 lists how many were found for each category. Table 3 shows user interaction on the page while table 4 shows examples of each type of thread from the Facebook page.

Table 2
Threads Identified on Facebook Page

Type	Number	Type	Number
Information sharing	57	Expressing emotion	21
Information seeking	19	Emotional support	16
Information gathering and integrating	2	Sense- making	5
Criticising	34	Moderation	20
Other opinion	7	Norm shaping	5
General action	11	Flaming	1
Individual participation	19	Trolling	1
Coordinating action	21	Total threads	239

Table 3
User Interaction with Threads

Type	Number
Most liked thread: Emotional support	Liked 49 times
Most shared thread: Coordinating action	Shared 12 times
Most commented thread: Information seeking	44 comments posted
Average (mean) likes per thread	7 Likes
Average (mean) times thread shared	1.8 Shares
Average (mean) comments in response to thread	9 Comments

Table 4
Thread categories and types

Category	Type	Example
Information-related	Information sharing	“I have been advised there is a breakfast tomorrow morning at Sunrise Restaurant in Morwell from 7.15 for small businesses. It is going to be a forum Who ever would like to attend needs to RSVP”
	Information seeking	“Would someone please advise me with what is happening with the education side of this crisis?”
	Information gathering and integrating	“I spent all day yesterday looking into camps caravan park and cabins and have a list of places that have been offered you do NOT need to be morwell resident nor do u need a hcc and yes we can take our pets you can stay 1 night up to a week choice is urs.. feel free to comment or inbox me if u need help”
Opinion-related	Criticising	“The first responsibility of a government is to protect its people and that is not happening in Morwell.”
	Other opinion	“If anyone says GDF Suez is just a huge multinational company that does not care remind them that it is owned and operated by people who have homes and families. We need to remember that people caused this problem and only people can solve it. We just need to find an effective way to communicate, person to person.”
Action-related	General	“Can everyone please go to aca.ninemsn.com and share their stories about how we are being treated by the gov GDF and epa ect I think it could help alot if we all did.”
	Individual participation	“Today show have called I will be on just after 6am to talk about disaster in the Valley Tuesday Morning.”
	Coordinating	“A bunch of people have sent me leaks about what is happening in the Hazelwood mine, in the hospitals and in the communities around the fire - I am writing these leaks up for a new article about this disaster - if you are one of these people I need you to message me.”
Emotion-related	Expressing	“I'm in Moe and were sick to, its just not in morwell its on a large scale, and they sweeping it under the carpet'only morwell' NO WAY!!!!!!”
	Emotional support	“You have all been working so hard on this devastating issue. This will be a long, hard fight and we have to stand together.”
Community building	Moderation-related	“Come & join this page, we are the same people moving to a permanent page before our event page disappears like last time.”
	Norm shaping	“If you think you have put a comment on this page that attacks another member of this page please remove it.”
Anti-social	Flaming	“I don't like you I don't trust you and I sure in hell don't believe anything you say.”
	Trolling	(Actual trolling comment was removed. Below is the response it elicited). “I suggest threatening to smash woman in the side of the head with a lump of timber isn't a good reflection of your thought process.”

The second research question asked whether there were threads on the Facebook page that did not fit categories identified in the China study. No threads were found that did not fit these categories. Although some unique threads were found, these were categorised as off-topic rather than new ways of using Facebook in response to a disaster.

The third research question assessed what thread(s) was/were most prevalent on the Facebook page at the beginning of the disaster. What was found was that the most prevalent threads during this period were action-related. Among the first 15 threads created on the page, 10 were action-related. Action-related threads from the page included:

> *Kindly knock next door and make sure they are ok. There are people isolated without any support - in particular the elderly.*
>
> *Can we kill two birds with one stone? A march after visiting GDF up collins st to the steps of parliament house?*

The fourth research question asked what thread(s) was/were most prevalent in the later days of the disaster. The majority of threads in the later days of the disaster, when the fire was declared under control on the 15th and 16th of March, were opinion-related. The following thread is an example:

> *This mine fire, and the sorrow that will stem from it, should simply be known as, "HAZELWOOD"." Never to be forgotten". "FUKUSHIMA", "THREE MILE ISLAND", "CHERNOBYL".*

The fifth research question asked which thread(s) was/were most prevalent on the Facebook page and which was/were least prevalent. Information sharing threads (57) were the most prevalent while trolling (1) and flaming (1) were least prevalent. The sixth research question looked at which thread(s) received the most likes. Threads where users expressed emotional support received the most likes such as this one that garnered 49 likes: "You are the people, one voice, united. Please be kind and support each other."

The seventh research question looked at which thread(s) was/were shared the most. Threads in which a poster sought to organise a course of action among people were shared the most. An example is this thread that was shared 12 times:

> *People of Latrobe Valley are you ready for the next step in the protest campaign = Take it To the (other) Big Smoke: 12pm Rialto Tower Melbourne. We had an impressive show off force last Sunday and got this Disaster National attention - now what are we going to do? Then march to Parliament*

The last research question asked which thread(s) received the most responses. Threads in which a poster asked a question received the most responses. An example is this thread that received 44 responses: "Hi everyone, besides the holes that were drilled in the mine that go under the highway, does anyone know is there much other tunneling of any kind."

Conclusion

The current findings suggest that there may be common ways disaster affected people communicate on the Internet regardless of where they live, what Internet tool is used, or what type of disaster they are facing. Those impacted by the earthquake in China and by the mine fire in Australia used the Internet to share or seek information, support each other, express emotion, try to make sense of events, and organise action. Despite the difference in cultures and in the years they were affected, the categories identified in the China study also describe how Facebook was used by those affected by the Australian mine fine disaster in 2014.

Differences however are evident in the types of threads occurring, when threads were created, and preferences that users showed toward threads. For example, action-related threads were more likely to occur on Facebook than on Tianya. On Facebook, action-related threads were more likely to be created at the beginning of the disaster while on Tianya, information-related threads were more evident at the beginning. Although the current research outlines commonalities, rather than differences between the Chinese and Australian disasters, many of these differences probably occurred because Facebook and Tianya were utilised in disaster and cultural contexts that differed considerably.

This study reinforces a potential to develop a model of how people behave on the Internet during disasters and then test that model by examining various disasters in different countries. At the time of writing, most research literature about social media in response to disasters had not examined hypotheses, models, or theories. For example, dozens of studies describe how people used social media in particular disasters but do not look at common patterns of social media use that transcend time, location, and disaster type. This study's findings

suggest that there may be cross-cultural similarities in how people use the Internet during disaster.

However, the findings from this research should not be viewed as a comprehensive explanation of how ordinary people across the world use the Internet during disasters. More research needs to be done in order to develop such an understanding. Future research can develop a more comprehensive understanding of this issue by addressing two weaknesses in this study. One weakness is that this study relied on one framework to analyse internet social media in response to disaster. Scholars in the future can conduct a meta-analysis of research into Internet use during disaster. From this analysis, a robust model of how people use the internet in disasters could be developed. This model could then be tested against various types of disasters, on various Internet tools (e.g., Twitter, Facebook) and in different countries. A second weakness lies in the method: content analysis only gives a partial picture of Internet use. Future scholars need to interview and survey people on how and why they use the Internet in disasters, to help develop a more comprehensive picture of what people do on the Internet in response to disasters.

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The Emotional Impact of the February 2011 Christchurch Earthquake on the Junior Doctor workforce

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Abstract

On the 22nd of February 2011, a 6.3 magnitude earthquake struck Christchurch, New Zealand. The events of February 2011, the preceding and the thousands of aftershocks have had a devastating effect on those living in the region including the junior doctor workforce. The purpose of this study was to document and describe new graduate doctors personal and professional experience of the Christchurch earthquakes. As phenomenological research, this paper seeks to describe the lived experience of the junior doctor workforce who experienced the event. This article focuses on the analysis of qualitative data generated as part of a larger mixed method study designed to capture the experience of this defined cohort of front line junior staff. A phenomenological approach was used to analyse qualitative data from survey and in-depth interviews to allow the experiences of participants to be described. Qualitative data from the survey and thematic analysis of the narratives suggest that few were emotionally prepared for the events of February. Seven themes were identified and from these we have prepared a composite narrative to demonstrate themes in the language of those interviewed. The individual experience of the earthquakes had a significant impact on individuals, their emotional well-being, living circumstances, work, and learning and for some, their career direction. This study provides an insight into the experiences and reminds us of the personal impact of disaster on a workforce. We hope it can contribute to and maybe generate interest within the health research community, in further exploring these kinds of experiences.

Keywords: *Disaster, Medicine, Narrative, Thematic analyses*

Introduction

At 12.51pm on the 22nd February 2011, a 6.3 magnitude earthquake struck Christchurch, New Zealand killing 185 people and injuring 6,659 people (Christchurch City Libraries, 2014). A state of civil emergency was declared. This was to become the most costly natural disaster in Australasia. According to Christchurch City Libraries (2014), almost half the central business district was destroyed, up to 100,000 buildings were significantly damaged, and about 10,000 buildings needed to be demolished. Major damage was also done to the city's roading and lifeline infrastructure. The Canterbury District Health Board (CDHB) was stretched to the limit of its resources with the equivalent of months' worth of major trauma (150 cases) admitted through the hospital doors in just a few hours (Armagh et al., 2014). The wards and clinics were also disrupted due to significant physical damage, patient evacuation, hasty returns from operating theatres, and frightened and distressed patients and visitors, along with the volumes of incoming trauma patients. The preceding larger, but less devastating earthquake in September 2010 and the thousands of aftershocks since the events of February 2011 appear to have had had a devastating effect on those living in the region, including the CDHB junior doctor workforce.

At the time of writing, the existing body of published literature around emergency response and the experiences of emergency teams (particularly international response teams) did not focus on the junior medical workforce. There were papers published in the United Kingdom that highlighted the need for medical staff to be aware of major incident planning in their hospitals (see for example, Edwards, Donaldson,Walsh

& Karantana, 2003). In the Wessex region, a telephone survey was undertaken to assess the awareness and training of junior medical staff in the event of a major incident. The researchers concluded that most staff were not confident of their role in a major incident (Madge, Kersey, Murray & Murray, 2004). There have been a number of disasters in Australia and reports on responsiveness to these events but we did not identify any studies that focused on the emotional impact on the junior heath professional workforce. There is also literature linked to sustaining teaching activities following a natural disaster (see: Beggan, 2010; Chauvin, Hilton, Dicarlo, Lopez & Delarpio, 2006; Di Carlo et al., 2007). However these articles focus on academic rather than workplace contexts.

While not all junior doctors suffered the same degree of exposure to the events of February 22nd, either during their working day or due to loss, trauma or disruption in their personal life, every staff member was affected in some way. Many anecdotal stories of the adverse effects of the earthquakes on junior doctors at the CDHB were circulating, but there was no systematic recording of the impact of the earthquake experience on this junior component of the medical workforce. Therefore, a retrospective study was undertaken to document and describe House Officers' (HOs) experiences of the earthquakes and to identify any issues that may influence support and training in the future. This group of doctors were in their first year of practice and therefore were on provisional registration with the Medical Council of New Zealand. Provisionally registered doctors work under the supervision of vocationally registered medical staff and are part of an accredited postgraduate training programme that leads to full registration to practice, a similar system to the Australian prevocational training period. HOs are often referred to as interns, and they formed a critical part of the workforce working in general medical and surgical wards at the time of the February earthquake. Training issues that apply to this workforce had been reported elsewhere (New Zealand Medical Journal, 2014), so the focus of this paper is on describing the lived experiences of this junior medical workforce. They are experiences that we believe would be similar for new practitioners in any health field placed in a similar situation.

Methods

This study reports on the qualitative findings from a larger mixed methods research study which collected data appropriate to the response and early recovery phases of disaster management. With reference to Olshansky and Chang (2009) and Tashakkori and Tedlie (2003), mixed methods research was selected as a methodology because it involves collecting, analysing, and integrating quantitative and qualitative research in a single study. The combination of methods, provided us with a better understanding of the issues than could have been provided by either method alone. It allowed the research team to combine a variety of data collection methods in order to document and describe the experiences of the earthquake as it impacted on the junior doctor workforce. Data collection focused on their experiences on the day of the earthquake and subsequent impacts in the three months that followed. Three methods were selected as they enabled complimentary data to be collected. The methods were: 1. A survey of the total junior doctor cohort employed by CDHB on 22 February 2011, incorporating quantitative and qualitative questions; 2. A comparison of sick leave and other leave requests or resignations in this group over the three months following the earthquake; and 3. In-depth interviews with seven volunteers to provide a comprehensive description which would help us better understand and interpret the survey responses

Data collection for each method was undertaken in parallel and within three months of the event. The qualitative data from the survey and the in-depth interviews are reported in this paper. A mainly phenomenological approach was used for the analysis of the qualitative data with the survey providing the base data to capture the cohort experience with the in depth interviews informing the richness of the descriptions.

Survey

The full cohort of 36 HO's was invited to respond to an online electronic survey tool hosted by Survey Monkey. There was a mix of 10 quantitative and qualitative questions used to enquire about: personal experience on the day of the earthquake; the professional and personal impact; what was learned from the event; and how the experience has influenced their career direction. Issues specific to the junior doctor workforce that medical education units need to consider as part of

disaster planning and teaching were also explored and these results are reported elsewhere (see Sheehan, Thwaites, York, & Lee, 2013)

Quantitative data was transferred to an Excel spreadsheet for analysis. The qualitative data was copied to word organised into themes by one of the research team and coded. The coding was checked by a second researcher to establish validity and check for new themes.

In-Depth Interviews

The in-depth interviews were conducted by two researchers who were fellow house officers. Volunteers were emailed information sheets and consent was gained before the interview commenced. Interviews were one hour in duration, on average. Seven oral *stories* were recorded, transcribed and anonymised by a research assistant who did not know the interviewees. A grounded theory approach was chosen to analyse these accounts in order to avoid any prior conceptions of the views expressed (Martin & Turner, 1986). This was undertaken by two investigators using a constant comparison technique. Open coding was conducted on interview transcripts, followed by the clustering of coded items into categories. The two coders compared and agreed on the coding of data and emergent categories, with progressive refinement until all data was consistently subsumed. Categories were tabulated and illustrative quotes selected for the reporting of results and to use for the creation of the composite narrative.

The scripts were used to create an anonymous composite story. According to Moran (2000), this presents the lived experience of participants, to transport the reader into the world of the phenomena. The results and the composite story were presented to the full cohort group to ensure validity of the emergent themes and the reconstructed narrative.

Ethics

Ethical approval was granted by the Human Ethics Committee, at the University of Canterbury. This study was part of the Researching the Health Implications of Seismic Event group (RHISE). It was a *no-blame* project as it was designed to capture the lived experiences of the participants, and it was not intended to investigate the actions of individuals in any way. Informed consent processes were put in place for interviews and participants were offered support throughout, and following data collection. Anonymity and confidentiality was assured. The survey was anonymous and tapes were transcribed, anonymised, and then deleted. Consent for publication was undertaken twice, pre-data collection and when the themes were validated with the participants.

Results

Survey Results

There were 36 HOs employed at the CDHB at the time of the earthquake on 22nd February 2011 of which 26 (72%) responded to the survey. The survey contained both quantitative and qualitative questions. The results are as follows:

Experience on the Day of the Earthquake

Immediately following the earthquake, 46% reported staying on in their home wards and 23% went to help in the Emergency Department (ED) at Christchurch Hospital and then went back to their home wards. One participant stated: “I went to ED to help with incoming trauma but as more senior colleagues arrived, was re-stationed back to home ward”. Others worked in the outpatients department where they helped to evacuate patients

In the acute period, there was confusion about where to go and where the doctors were most needed. Seventy percent of the HO's surveyed reported that they received no clear instructions from senior medical staff on where they should go or what they should do immediately following the earthquake. Nineteen percent received clear immediate instructions from a senior colleague. A typical comment was, “No one really knew what to do. The intercom was very weird - what does come to a state of readiness mean? ” However as time went on, more structure emerged, as stated by one participant: “initially… at about 4-5pm one of the consultants gave us instructions on key things to do for patients arriving on the ward.”

During the first three days following the earthquake, 73% reported being directly involved in the care of earthquake victims. Open text responses from the survey described work being more acute based. Greater emphasis was placed on early discharge of stable non-trauma patients to free up beds for the incoming trauma cases. Greater direction was provided by senior medical staff. Constructive team work was seen across the specialties and the usual team structure changed. One House Officer stated “We initiated medical ward rounds of under 65 year olds run by house officers to

avoid medical diseases slipping through the gaps, renal function etc."

There were environmental limitations as well. One participant stated that: "Due to minimal electronic equipment availability, initially due to power outages, many tasks had to be done manually which took more time".

Professional and Personal Impact

Difficulties with work in the weeks following the earthquake were reported by 92% of the HOs. Fifteen percent reported that stress from aftershocks had caused lack of sleep, while others (23%) mentioned stress from the distress of the patients for whom they were caring. One HO wrote:

> *On the day of the earthquake, I saw (a disturbing event). This was extremely traumatising for me as I could not get that image out of my head. This recollection has reduced in frequency, but it is still happens and it bothers me a lot.*

Over half reported a significant impact on their living conditions through having to reside in damaged homes or homes that fell inside the cordoned zone. They felt the effects of this impacted on their ability to work and 23% reported significant travel problems getting to and from work. Examples of qualitative survey responses are:

> *I lived in a tent in the backyard for a few days after the earthquake as I was scared. I moved back in, but slept on the living room floor. Power and water was out for 2 weeks, but the hospital was good because I could shower and eat there.*

> *There was difficulty sleeping due to aftershocks and stress, people staying over, harder to get to work, increased workload, more patients, starting a new run, uncertainly about the future, and dealing with distressed patients…*

What Was Learnt from the Event?

New learning as a result of the earthquake was reported by 88% of HOs. Fifty four percent described learning more about the process of care in an emergency situation. Nineteen percent reported developing new emergency clinical skills, such as "rapid assessment/ triage of sick patients, better organisation of time, being more prepared for emergencies, learning hospital emergency procedures, evacuation techniques, more efficient communication skills.... you learn to act quickly!"

Eleven percent reported developing a new understanding of teamwork. Examples of comments are, "I was impressed by teamwork, team spirit, and altruism of the profession" and "Unity wins. Communication and communication! Even a simple hug comforts!"

Twenty three percent HOs reported that they had developed new personal skills including how to cope with the "unpredictability and stressfulness" of a crisis and grow from it as a person. One learnt to "Stay calm and do what I can" another said "Good experience at working in an unpredictable and stressful environment"

Education and training was reported as being significantly affected by 31% HOs and minimally affected by 58%. One participant stated that, "There was disruption to our formal and informal teaching. All the efforts were directed at purely looking after patients rather than teaching… damage to teaching facilities, increased workload." Others reported less self-directed learning due to decreased concentration, underlying stress, being tired and as one said, "with no electricity or internet at home, learning becomes impossible."

How the Experience has Influenced Participants' Careers

Levels of motivation across the cohort changed in the weeks following the earthquake with 57% reporting a change in motivation for their work. Open text replies from the survey indicated that there was both increased and decreased motivation across the cohort. Several people reported that their levels of interest in their work increased due to their drive to assist others. However, several people reported that they had become less enthusiastic and interested in their roles at the CDHB.

Twenty percent of HOs reported that the earthquake experience had influenced their thoughts about their career direction in both positive and negative ways. Two reported wanting to pursue a career in ED or orthopaedics as a result of the earthquake. However, some of the junior doctors reported wanting to leave Christchurch to pursue their careers in other centres.

In-depth Interview Results

The transcribed data from the seven interviews was read by two researchers who independently identified the key themes. They then compared coding, agreed on the themes. One researcher crafted a composite story from the analysis that protected the anonymity of participants.

Table 1
Key Themes from Interviews

Theme		Quotes to illustrate theme
1.	The hospital damage and the terror of the event	"It was pretty chaotic in the wards with all the stuff from the ceilings falling off and you know nurses and other multi discipline team guys pretty scared and crying everywhere and it was quite scary actually." (I3)
		"I looked up again and I saw, people that, ……there were cars coming in, I could see cars coming in, trucks coming in, people on roofs of cars, people on the trays of like flat deck utes and trucks and stuff. People, some of the people, were some of the people of the roof of the cars and others were out the windows of the car holding onto the people on the roofs of the cars ….. and I remember going 'what the hell have I, it just looks like a war, it literally was it felt to me like I had just walked into like a war triage centre" (I6)
2.	Moving between ward and the emergency department (ED)	"Like if we had a problem tomorrow I still wouldn't know whether to stay on the ward or go to ED" (I4)
		"It quietened down in ED after an hour and a half and no one was sort of coming in at quite the same rate which they were previously and I ran into a registrar and he said, 'What are you guys been doing? I am going back to the ward to start discharging patients, those I can, come with me." (I6)
		"So I went back up to the ward and discharged patients with him potentially probably 70% of the patients on Ward 23." (I6)
		"Like I was desperately trying to get an MRI for J (a patient) for his back so I went to an MRI scanner until someone turned up and it got turned on. I went and got the patient and wheeled him down there. It was all so different. It was a real place if you had to advocate." (I4)
		"This must have been about 3 or 4 o'clock I think, um, so people had stopped coming into ED. There were too many doctors in ED so I went back up to orthopaedics, um, and there were a lot of people coming up to the ward." (I7)
3.	Feeling out of depth in ED	"I saw, I looked across and I could sort of see the husband, well what I presumed, now her husband or partner was holding this girl who was quite heavily pregnant and I went over there and thought, I had my gynae attachment about six weeks ago, I am not sure what I was going to ask this lady or what, but it is probably better me than some, you know, I was, there is no one else here that is probably anymore better qualified than I am and I walked over there and said 'what happened?' (I3)
		It felt quite, ah, you know, over my level of doctoring to make a call like that, a patient on the streets like, you know, just making these decisions, um." (I3)
		"…at the time I wasn't entirely sure about how to, how best to suture it because there was a bleeding blood vessel and I had only ever sort of sutured skin (and superficial layers and didn't really know how I was meant to stop the bleeding because it was obvious that pressure for the last twenty minutes hadn't worked." (I7)
4.	Getting in touch with family, and getting home	"And I think especially towards the end of the night you, I think it just became, you kind of bottled it up, put it to the back of your mind but the longer you were in the hospital the harder and harder it was to do that." (I7)
		"I got really stressed out like, the immediate, after the immediate shock has passed the fact that I couldn't contact my family was really getting on top of me and I couldn't, I felt like I couldn't really do anything because the I live in Christchurch. So what I did was that I left the scene, left the hospital and, ah, and got into my car and drove home, yeah. I drove home which took like two hours because of all the traffic." (I3)
		Note this is a comment 3 or 4 hours post-quake
		"I talked to nana and said just make sure everyone knows I am fine but I am not going to be able to talk to anyone." (I4)
5.	Helping each other	Allocating a role on the ward – "I was the neck of femur guy" (I2) "I was dealing with spinal patients" (I7)
		"Quite a lot of doctors from the UK were kind enough to stay overnight, and therefore the registrars organised themselves into shifts, and managed both the wards and the triage centres." (I1)
		"Um, with the house surgeons who were rotating around doing a couple of days on, a day off, a couple of days on, doing long days and things in between that just to look after each other." (I5)
6.	Not knowing what to do	"I didn't know what to do" and I was "unsure of my role." (I4)
		"Well, I ah, well, I sort of felt like, you know, I wanted to get out of there initially but, you know, and I was panicking, well not really, I didn't know what to do but when, but ah, when my consultant said, you know, we should do the rounds and then let's get out and get some food first, yeah, no, I didn't have any clue." (I3)
7.	Emotional after affects	Comments about returning home
		"Sucked, yeah, really sucked, we actually felt like you are doing something you are doing something…. you might be getting swamped with work that you can do and there is nothing that you can do at home. We did have power on at that stage so we were just sitting there watching images and all the mess." (I3)
		"I thought I was a lot stronger than I actually thought I was, yeah. I kind of collapsed when I got home ….there were no tears at work … a lot when I got home. …..I think if it happened again I don't think we can do it again, basically, I don't think a lot of people would be able to….. I don't think I, I would be surprised if I could." (I4)

Themes in Taped Interviews

There were seven key themes that emerged from the interviews and these are presented in Table 1 with illustrative quotes.

Key themes have been integrated into the composite narrative shown in box 1. This illustrates these themes through the use of phenomenological text which allows us to present the lived quality and significance of the experiences as they are understood by the participants (Moran, 2000). We have used the language and words of the House Officers interviewed to evoke what van Manen (2007, p.23) describes as "felt meaning".

Will this Cohort Group Stay Long Term?

Responses from the qualitative interviews suggest that most of the HO's will stay in medicine but some may not stay in Christchurch in the short term. Some examples were:

> *I felt it was quite amazing, you know, the type of work and the work load that they were able to handle... and, yeah, it has definitely added to my passion in orthopaedics, but definitely not the location. (I6)*

> *I am a Christchurch girl and I love Christchurch so I am here till the end of the year at least but am going to leave and then come back one day. (I1)*

> *Um, and I mean we have previously been looking at houses and stuff in Christchurch but that is certainly not the go now … I think it has complicated it actually I think that..., oh, I have never been 100% sure of what I wanted to do and I am still actually feel like I would like to stay in Christchurch further down the track. (I3)*

Conclusion

New Zealand, as part of the Pacific Rim, is a very geologically active area. February 22nd was an event very few of us were emotionally prepared for, even after the warning events of September 4th, 2010. The current research focused on collecting and documenting the experience of a specific group of junior doctors who were working in the general service areas of the hospital at the time of the event. Like the participants in Richardson and Ardagh's (2013) study, junior doctors in the current research talked about the impact a lack of communication had on their own anxiety levels,

Box 1
Earthquake Stories – Composite Narrative

I walk up the stairs and yell to my registrar, "I'll see you at lunch what jobs do we have here?" he replies "Oh just some voltaren that needs charting". I make one step from the corridor into the room and all of a sudden I get whipped from below. A thundering, violent rattle rips through the very ground I'm walking on.

I grasp for the rail by the door. My trainee intern grabs for the rail too. She misses and grabs me. There are people screaming, things crashing. The shaking subsides, but the building continues to wobble. Opposite where I stand the remains of the drug cupboard are on the floor, broken bottles everywhere, pills scattered. I gather my composure, and head to my patient.

I hear a consultant calling my name. We run around the ward moving patients away from the windows and checking that they are ok. We head upstairs. The stairwell is dark. I register the lack of light as a lack of power. Half way up the stairs the ground rips again. Dust falls from the stairwell. "I hope this doesn't fall" I think. Then I say to myself, "forget about it, there are patients up there".

I grab my phone and try and ring my partner. It's engaged. I text her, and then my parents and pop my phone back in my pocket.

We know all the ward patients are ok so we head downstairs to ED, it's packed. I open the door and head outside. It's hazy, lots of dust. Where's that coming from? My concentration is whipped away. "Are you a doctor?" an ED nurse ask, "Yes, well kind of, a first year house officer" I reply. "Good" she says, "there is a triage being set up. Really sick patients go straight through into ED, cuts and bruises go round the back."

I walk towards the car park. A patient gets out of the boot of a Land Cruiser, stumbling, shaking. I grab her by the hand, "Hi, my name's Joe, what happened to you?" "A building collapsed on me" she replied. "Pardon?" I said. She carried on, "um, I was in the PGC building". The driver turns and yells "There will be heaps more coming this way mate, we are going back to pick more up." I look up, a chopper is circling. For about the next hour I triaged patients. Walking-wounded to outpatients, serious injuries into ED. At times I didn't know what to do and I was unsure of my role.

Once the rush dies down I walk over to a colleague. We head back inside and up to the ward. Nurses tell us that the director of medicine has been through and we need to discharge as many patients as possible. We work through the ward board discharging anyone who can be safely discharged. The aftershocks keep coming.

Just as we finish the discharging I get a phone call from my partner. Our house is a wreck. I hand over the remaining patients to my colleague. I need to get home. As I leave the hospital to walk home, I turn and look back at the hospital. Guilt grabs me, how can I be leaving the hospital, don't they need me? I turn and walk back towards the hospital and then turn again and walk home. They will need rested people tomorrow I decide.

Once I got home it sucked. At the hospital we actually felt like you are doing something, you might be getting swamped with work that you can do but there is nothing that you can do at home. I kind of collapsed when I got home, there were no tears at work but a lot when I got home.

particularly regarding communication with patients' family, children and elderly family members, as well as friends. The same themes of community, vulnerability and the long term emotional impact were also evident within this cohort group. Ardagh et al's (2012) paper on the initial health system response comments on the difficulties that arise when dealing with frightened patients. This was an additional stress reported by the junior doctors, especially with no way to communicate with the friends and relatives of patients admitted.

The results provide an insight into the experience of healthcare workers, in this case junior medical staff in their first year of practice. While stresses were well recognised and a debriefing was held within the doctors training programme, much of the wider debriefing was missed by this cohort group who were relatively mobile on the day. The CDHB responded positively to personal needs by providing pastoral care, for example arranging transport, showers for doctors without water at home, and finding alternative accommodation for doctors whose homes were uninhabitable. Interview data made it clear that this had been appreciated.

The participants in the study were working at the hospital on a structured learning programme, as new graduates. This meant that there were naturally impacts on learning, both positive and negative. The group learned much about patient care, team dynamics and about their personal responses to a crisis. While the learning content changed, learning did not stop. One of the key goals of this period of internship is to select a specialist career pathway and results show that this was significantly impacted. For some it defined the future, for others there was disruption.

This study reminds us of the personal impact of any disaster on the health workforce, the need to acknowledge the individual responses and to develop education, support and systems that will develop and sustain a resilient workforce. Recommendations that medical education units need to considered as part of disaster planning and teaching have also been reported elsewhere (Sheehan, Thwaites, York, & Lee, 2013).

It is hoped that this study will contribute to and generate interest in exploring this further within the Australasian health research community because, as noted by Mutch and Marlow (2013), the approach of collecting and viewing different communities' experiences of disasters is both novel and significant.

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