Do disasters predict international pharmacy legislation?

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Abstract

Objective. The aim of this study was to explore whether a relationship exists between the number of disasters a jurisdiction has experienced and the presence of disaster-specific pharmacy legislation.

Methods. Pharmacy legislation specific to disasters was reviewed for five countries: Australia, Canada, UK, US and New Zealand. A binary logistic regression test using a generalised estimating equation was used to examine the association between the number of disasters experienced by a state, province, territory or country and whether they had disaster-specific pharmacy legislation.

Results. Three of six models were statistically significant, suggesting that the odds of a jurisdiction having disaster-specific pharmacy legislation increased as the number of disasters increased for the period 2007–17 and 2013–17. There was an association between the everyday emergency supply legislation and the presence of the extended disaster-specific emergency supply legislation ($\chi^2 = 7.16, P = 0.007$).

Conclusions. It is evident from this review that there are inconsistencies as to the level of assistance pharmacists can provide during times of crisis depending on their jurisdiction and location of practice. It is not a question of whether pharmacists have the skills and capabilities to assist, but rather what legislative barriers are preventing them from being able to contribute further to the disaster healthcare team.

What is known about the topic? The contributing factors to disaster-specific pharmacy legislation has not previously been explored in Australia. It can be postulated that the number of disasters experienced by a jurisdiction increases the likelihood of governments introducing disaster-specific pharmacy legislation based on other countries.

What does this paper add? This study compared five countries and their pharmacy legislation specific to disasters. It identified that as the number of disasters increases, the odds of a jurisdiction having disaster-specific emergency supply or disaster relocation or mobile pharmacy legislation increases. However, this is likely to be only one of many factors affecting the political decisions of when and what legislation is passed in relation to pharmacists’ roles in disasters.

What are the implications for practitioners? Pharmacists are well situated in the community to be of assistance during disasters. However, their ability to help patients with chronic disease management or providing necessary vaccinations in disasters is limited by the legislation in their jurisdiction. Releasing pharmacists’ full potential in disasters could alleviate the burden of low-acuity patients on other healthcare services. This could subsequently free up other healthcare professionals to treat high-acuity patients and emergencies.

Introduction

Health care during disasters is often provided by hospitals and emergency services. However, access to these healthcare services can become overwhelmed or compromised, and hospitals can be overcrowded. The most common adverse health outcome as a result of a disaster is shifting from acute injuries to chronic disease exacerbations. In a disaster, disaster-affected individuals can often become displaced from their medications, prescriptions or their regular pharmacy. Other healthcare services may already be overburdened, affecting their capacity to handle the increase in medical needs from disaster-affected individuals. Pharmacists are regarded as the most easily accessible...
The ability of a pharmacist to contribute in disasters by providing vaccinations to the public varies substantially depending on the jurisdiction in which the pharmacist is registered to practise. There is a large difference between the limitations applying to vaccinations performed by Australian pharmacists and those in other countries. This is due to the different roles and responsibilities granted to pharmacists by their respective pharmacy legislation. In many countries, pharmacists are able to provide vaccinations to the public during both normal operations and in times of crisis. However, in some countries, pharmacists are only able to provide vaccinations to patients who have a valid prescription. This difference in legislation can have a significant impact on the ability of pharmacists to contribute to disaster response efforts.
and their counterparts in Canada or the US, who are able to administer intramuscular vaccines, subcutaneous vaccines and vaccinations to children.21–23 In most Australian states, pharmacists are allowed to vaccinate adults (depending on the state or territory) and only a limited number of intramuscular vaccines depending on the specific state legislation (e.g. pertussis, influenza and the measles, mumps and rubella vaccines).21,22 At the time of writing, Western Australia had just allowed pharmacists to vaccinate children as young as 10 years of age.24 In Canada, depending on the province, pharmacists can administer intramuscular and subcutaneous vaccinations.23 In the US, some states allow for any vaccine to be administered by pharmacists, and some states allow pharmacists to vaccinate children as young as 3 years of age.

Currently the legislation is ambiguous on the translation of a pharmacist’s ability to vaccinate in a disaster setting. This raises the question as to whether the legislation that allows a pharmacist to administer a seasonal influenza vaccine extends to allow pharmacists to administer a specific influenza vaccine during a pandemic.23

Temporary relocation legislation

The third area of pharmacy legislation reviewed was the ability for pharmacies to temporarily relocate or operate mobile pharmacies during a declared state of emergency or disaster. In a disaster, a pharmacy’s premises may be damaged and not be safe for operations. However, this does not mean the pharmacist and pharmacy staff cannot assist their communities. There are two legislation options that can be enacted during a declared state of emergency or disaster for pharmacists to continue operating their pharmacy: (1) take mobile pharmacies into a disaster zone operating under the licence of an existing premises; or (2) suspend their licence and temporarily relocate their premises to a new facility (usually for no longer than 6 months). It depends on the country as to which legislative option is preferred. In Australia, pharmacies are approved by both state and federal government legislation. They are able to apply for temporary relocation to continue providing services until their original premises are operational again under Federal government National Health Act 1953. In the US, pharmacies typically operate mobile pharmacies from their existing premises into disaster zones.26

Recent studies have found that the disaster health community is accepting of pharmacists undertaking more clinical roles in disasters, but a significant barrier of legislation was identified.27 Most of the published research to date exploring disaster-specific pharmacy legislation has been conducted in the US. There is currently no research in Australia reviewing pharmacy legislation relevant to disasters or literature that compares the disaster-specific pharmacy legislation across multiple countries. This review was conducted to determine where advances in utilising pharmacists’ full scope of practice in a disaster have occurred and which countries lag in preparing their pharmacy workforce for disasters in terms of legislative power. In addition, no literature has been published on the potential relationship between the number of disasters a jurisdiction has previously experienced and their level of preparedness in terms of pharmacy legislation (i.e. if a state in a country experiences more disasters than another state, are they more likely to have disaster-specific pharmacy legislation?).

The aim of this study was to update and expand previous research on current disaster-specific pharmacy legislation. The first research objective was to compare pharmacy legislation in five countries, namely Australia, Canada, UK, New Zealand (NZ) and the US. The second research objective was to investigate whether there was a relationship between the number of disasters a state, territory, province or country has experienced in the past 5 and 10 years and the presence of disaster-specific pharmacy legislation.

Methods

Context

Pharmacy legislation is regulated by governments within every country. However, the level of government at which the legislation is regulated differs depending on the country. Only Western countries were included in the present disaster pharmacy legislation review because their legislation was obtainable online (see Table S1, available as Supplementary Material to this paper) and written in English. Australia, UK, NZ and Canada all have similar healthcare systems for easy comparisons of pharmacy services. The US was included because it is one of the leading countries in disaster-specific pharmacy legislation. Table 1 outlines the countries involved in the present disaster pharmacy legislation review and the level of government at which the pharmacy legislation is regulated.

<table>
<thead>
<tr>
<th>Country</th>
<th>Level of government pharmacy legislation is regulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>States (n = 51)</td>
</tr>
<tr>
<td>Canada</td>
<td>Provinces and territories (n = 13)</td>
</tr>
<tr>
<td>Australia</td>
<td>States and territories (n = 8)</td>
</tr>
<tr>
<td>UK</td>
<td>National level (n = 1)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>National level (n = 1)</td>
</tr>
</tbody>
</table>

Table 1. Countries included in the disaster pharmacy legislation review and the level of government at which regulation arises

Data collection

The legal documents pertaining to pharmacy were reviewed in May 2018 for 51 states of the US (including the District of Columbia), 13 provinces and territories of Canada, eight states and territories of Australia, the UK and NZ. Four specific pieces of pharmacy legislation were reviewed within each of the legislative documents: (1) everyday emergency supply rule (commonly known as the ‘3-day supply’ rule); (2) disaster-specific emergency supply rule (quantity ≥3 days); (3) disaster-specific vaccination rule; and (4) temporary relocation or mobile pharmacy rule.

The number of disasters for each state, territory, province and country was collected for the periods 2007–17 (10 years) and 2013–17 (5 years). The 10-year period was originally chosen as the reference to account for the fluctuations in partisan attention, spanning multiple political terms in each country and the length of time it takes to get legislation passed in the different parliamentary systems within the countries of interest. As a comparison, data for the more recent 5-year period (2013–17) was also collected to see whether there was a difference in a single political cycle (or two depending on the country) and the
increased uptake of pharmacists into public health roles including disasters in the past few years.

The disaster data for the UK and NZ were obtained from the Centre for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT; http://www.emdat.be/disaster_trends/index.html, accessed 28 May 2018). However, the CRED EM-DAT database could not be used for comparisons across all the countries because it does not provide data for disasters at the state level. Therefore, those countries with state-based legislation required a different disaster database source. The Canadian government’s Canadian Disaster Database (http://cdd.publicsafety.gc.ca/srchpg-eng.aspx?dynamic=false, accessed 28 May 2018) was used to obtain the number of disasters experienced by each province and territory for the two time periods of interest. Information on US state-declared disasters was obtained from a US database provided by the Federal Emergency Management Agency (FEMA) website (https://www.fema.gov/disasters, accessed 28 May 2018). The Australian Institute for Disaster Resilience Knowledge Hub DisasterMapper (https://knowledge.aidr.org.au/disasters/, accessed 28 May 2018) was used to determine the number of disasters experienced by each province and territory in Australia for the time periods of interest. Because there is no universal definition of a disaster, each database uses a slightly different definition.28–31 The major difference in the disaster definitions used was that the Australian and Canadian databases provided a disaster definition similar to that of the CRED database used for the UK and NZ. Whereas, the FEMA database only recorded major declared states of emergencies or disasters and did not provide a specific disaster definition. This involved a government representative or governor declaring the local area a state of emergency or disaster. Each jurisdiction included an all-hazard approach to its disaster definition. Disaster-specific pharmacy legislation often uses the terminology ‘declared state of emergency’ to describe emergencies and disasters that have significantly disrupted a community or region.

Data analysis

The data obtained from the pharmacy legislation documents and disaster databases were entered into the IBM SPSS Statistics software version 25 (IBM Corp., Armonk, NY, USA). Pearson Chi-squared tests of independence were performed to determine whether there was a relationship between the four individual pharmacy legislations reviewed, specifically the relationship between the disaster-specific emergency supply rule and the other pieces of disaster pharmacy legislation. Where the expected cell count was below five, Fisher’s exact test was used. A binary logistic regression test using a generalised estimating equation (GEE) was used to test the association between the number of disasters experienced by a jurisdiction and whether they had disaster-specific emergency supply legislation, vaccination legislation or temporary relocation and mobile pharmacy legislation. To account for possible within-variable correlation due to the different levels of government that regulate pharmacy legislation in a country, a GEE model was used to cluster data for the states, provinces and territories within countries. These GEE models were simulated in IBM SPSS Statistics software version 25 for the disaster variables ‘10 years’ and ‘5 years’, producing six different models.

Results

International legislation comparison

There were 74 data points. Table 2 depicts the frequency of disaster-specific pharmacy legislation within each of the country profiles.

<table>
<thead>
<tr>
<th></th>
<th>US (n = 51)</th>
<th>Australia (n = 8)</th>
<th>NZ (n = 1)</th>
<th>UK (n = 1)</th>
<th>Canada (n = 13)</th>
<th>Total (n = 74)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Everyday emergency supply</td>
<td>17</td>
<td>34</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Disaster-specific emergency supply</td>
<td>34</td>
<td>17</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Disaster-specific vaccination legislation</td>
<td>46</td>
<td>5</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Temporary relocation or mobile pharmacies</td>
<td>44</td>
<td>7</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

A binary logistic regression test using a generalised estimating equation (GEE) was used to test the association between the number of disasters experienced by a jurisdiction and whether they had disaster-specific emergency supply legislation, vaccination legislation or temporary relocation and mobile pharmacy legislation. To account for possible within-variable correlation due to the different levels of government that regulate pharmacy legislation in a country, a GEE model was used to cluster data for the states, provinces and territories within countries. These GEE models were simulated in IBM SPSS Statistics software version 25 for the disaster variables ‘10 years’ and ‘5 years’, producing six different models.

Effects of disasters on pharmacy legislation

Each disaster-specific pharmacy legislation was tested for an association with the number of disasters experienced by the jurisdictions over a 5- (2013–17) and 10-year (2007–17) period.
using a GEE binary logistic regression (Table 3). There were six models in total.

Models 1 and 2 propose there was a significant association between disaster-specific emergency supply (quantity >3 days) in both the 5- and 10-year periods. Model 1 suggests the odds of a country with a higher number of disasters in the 10-year period is 1.58-fold more likely to have disaster specific emergency supply legislation (odds ratio (OR) 1.58; 95% confidence interval (CI) 1.14–2.19; P < 0.01). Model 2 proposes that, based on the more recent 5-year period, these odds increase to 1.78-fold more likely (OR 1.78; 95% CI 1.58–2.01; P < 0.01). Model 6 predicts there is a significant association between the number of disasters a jurisdiction has experienced in the more recent 5-year period (2013–17) and the presence of disaster-specific pharmacy relocation or mobile pharmacy legislation. This advocates that as the number of disasters increases, the odds of having disaster-specific pharmacy relocation or mobile pharmacy legislation increases 1.05-fold (95% CI 1.01–1.09; P = 0.01).

### Discussion

Before this study, disaster pharmacy disaster legislation had only been reviewed in the US. In 2014, <50% of US states had developed disaster-specific emergency supply legislation.21,22 In the present study, 4 years later, this is still the case, with 66.67% of US states still not having disaster-specific legislation. Ford et al.23 performed a content analysis on the uptake by US State Board of Pharmacies of pharmacy emergency preparedness and response guidelines into legislation as was suggested by the US National Association of Boards of Pharmacy.24 The two most common guidelines adopted by states were: (1) allowing out-of-state pharmacists and pharmacy personnel to practise in the affected state during the disaster; and (2) if affected by a disaster, the pharmacy should have a reporting procedure to the board.24 A survey of the uptake of these US National Association of Boards of Pharmacy guidelines by US State Board of Pharmacies was conducted in 2014.25 Of the 18 boards surveyed, 16 allowed for the temporary establishment of mobile pharmacies and nine allowed for emergency refill supplies to be dispensed more than once by a pharmacist.25

The present study compared five countries and their pharmacy legislation specific to disasters. It identified that as the number of disasters increases, the odds of a state, province, territory or country having disaster-specific emergency supply or disaster relocation or mobile pharmacy legislation increase. This provides a possible explanation for the variation in disaster-specific pharmacy legislation across the different jurisdictions. However, this is likely to be only one of many factors affecting the political decisions of when and what legislation is passed in relation to pharmacists’ roles in disasters.

Pharmacists need to be aware of the different legislation supporting their roles in disasters, which can differ significantly depending on the location of their practice. Supportive legislation (e.g. emergency supply, vaccination and relocation or mobile pharmacies) has the ability to empower pharmacists in disasters to better serve disaster-affected communities and increases the overall healthcare resources available. Hurricane Katrina highlighted the impact pharmacists could have in reducing the burden on the healthcare system, emergency departments and evacuation centres by providing continuity of medication care through increased quantity of emergency supplies.26–28 The Anthrax crisis in 2001 in the US illustrates how dissemination of prophylactic medications to the general public required pharmacists at the different stages of the triage process.29,30

### Limitations

This research project was limited to the five countries included in the analysis because their legislation was available publicly online and was written in the English language. Although only Western countries were included in this study, this allows for easy comparison because these countries have similar pharmacy services and pharmacist roles in disasters. Another limitation of the present study was that a single disaster database could not be used due to the varying levels of government that regulate pharmacy legislation. Having a single disaster database (like CRED EM-DAT; http://www.emdat.be/disaster_trends/index.html, accessed 28 May 2018) would have reduced the variability in disaster definitions used by each database. However, due to the need for state-level disaster information, this was not feasible. There were only three areas of legislation that were explored within this study; further research needs to explore the barriers and enablers of other legislation regarding pharmacists working in disasters (i.e. compulsory licensing of essential medicines, emergency supplies of controlled drugs).

### Conclusion

It is evident from this review of international disaster pharmacy legislation that there are inconsistencies as to the level of assistance pharmacists can provide during times of crisis...
depending on their jurisdiction and location of practice. It is not a question of whether pharmacists have the skills and capabilities to assist, but rather what legislative barriers are preventing them from contributing further to the disaster healthcare team.

Competing interests
The authors declare no competing interests.

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