



Hawke's Bay pharmacists' activities during a campylobacter contamination of public water supply in Havelock North during 2016

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J PRIM HEALTH CARE

2020;12(2):122–128.

doi:10.1071/HC19110

Received 7 December 2019

Accepted 1 May 2020

Published 4 June 2020

ABSTRACT

INTRODUCTION: In August 2016 contamination of the local water supply resulted in a significant gastroenteritis outbreak in Hawke's Bay. The significance of the initial test result was recognised early, partly as a result of information provided by a Havelock North pharmacist to health authorities about an unusual number of requests for anti-diarrhoeal medication.

AIM: To describe the breadth of activities undertaken by pharmacists working in Hawke's Bay in August 2016, following *Campylobacter jejuni* contamination of the public water supply in Havelock North, New Zealand.

METHODS: All pharmacists and hospital pharmacy management staff working in Hawke's Bay in 2017 were eligible to complete the qualitative online questionnaire. Additionally, information was requested from stakeholders with known relevant experiences. Free-text responses were thematically analysed using a general inductive approach.

RESULTS: Thirteen pharmacists and two ancillary staff from community pharmacy, hospital pharmacy, general practice, management, emergency response and dispensary management responded to the survey. Analysis of responses revealed three overarching themes and six sub-themes. The first was public wellbeing, with sub-themes of community information, local emergency response and pharmacy operational management. The second was pharmaceutical distribution, with a sub-theme of stock management. The third theme was clinical medicine management, with sub-themes of acute symptom management and medicine management.

DISCUSSION: The pharmacy profession appears to have played an important role in public wellbeing, pharmaceutical distribution and medicine therapy management during the outbreak. It is likely that through their actions, responding pharmacists reduced demand on other primary care services and prevented hospitalisations. Further research directions include exploring the effectiveness of community pharmacists in public health surveillance and the use of endorsed public health information to ensure consistent delivery of health messages.

KEYWORDS: Public Health; Health communication; Disaster planning; Pharmacists; Primary Health Care (all MeSH terms)

Introduction

On the morning of Friday 12 August 2016, the Hawke's Bay District Health Board (DHB) became aware of a likely contamination event in the Havelock North water supply when *Escherichia coli* (*E. coli*) was detected in a water sample. The significance of the initial test result was recognised early, partly as a result of information provided by a Havelock North pharmacist to health authorities about an unusual number of requests for anti-diarrhoeal medication.

The gastroenteritis outbreak (referred to as 'the Gastro outbreak'), due to contamination of a secure untreated water supply with *E. coli* and *Campylobacter jejuni* (*C. jejuni*), resulted in over one-third of the Havelock North population being affected, ~5500 individuals. More than 1000 additional cases occurred outside of Havelock North. The resulting illness contributed to four deaths and three cases of Guillain-Barré Syndrome.¹ This was the most significant recorded gastroenteritis outbreak experienced in New Zealand, and of similar gravity to international events such as the *E. coli* outbreak in Walkerton, Canada, in 2000.^{1,2}

Internationally, there is attention on the expansion of pharmacists' roles in public health and emergency care.^{3,4} During a *Clostridium difficile* outbreak in the Royal Victoria Hospital in Barrie, Ontario (2007) hospital, pharmacists demonstrated competence in antibiotic stewardship, clinical decision-making, tool development and clinician education.⁵

The study aims to describe the breadth of activities undertaken by pharmacists working in Hawke's Bay in August 2016 following the *C. jejuni* contamination of the public water supply in Havelock North.

Methods

In April 2017, variations of a six-item online questionnaire, developed in SurveyMonkey (SurveyMonkey, San Mateo, CA, USA), were emailed to 95 pharmacists via the Hawke's Bay DHB email distribution lists for community pharmacy owners and pharmacists, hospital pharmacy staff and clinical pharmacist facilitators working in general practice. The questionnaire sought feedback on activities undertaken by pharmacists or staff

WHAT GAP THIS FILLS

What is already known: Microbial contamination of public water supply is a serious public health concern that has major consequences for the health and wellbeing of the community. Pharmacists have valuable quality use of medicine knowledge and skills providing patient care across the health system, including public health and emergency care.

What this study adds: Pharmacists working in the community and in hospitals provide key coordination and communication roles during a wide-spread public health emergency, including medicine advice, supply continuity and harm-reduction activities. Community pharmacy is well-placed to support syndromic surveillance to predict infectious outbreaks in the community. The value added by the Chief Pharmacist, being part of the high-level emergency response, enabled timely responses to community queries, as well as wider understanding of the scope and capabilities of pharmacists in their varied roles. Community pharmacists are key members of the wider primary health-care system providing patient-centred care and public health messages. Furthermore, standardised protocols are useful to enable pharmacists to provide consistent advice.

around care management of patients with vomiting, diarrhoea, dehydration, other symptoms of *C. jejuni*; at-risk patients; provision of advice and education; and additional activities. There were prompts for key areas within each of these for consideration (eg symptom management, triage and referral, stock issues, education and advice). Question wording was modified to reflect different pharmacist workplaces (community pharmacy, general practice, hospital). These surveys closed in July 2017. In June 2017, supplementary information was sought from the Hawke's Bay DHB Emergency Response Adviser to clarify actions during 'the Gastro outbreak'.

Responses were collated and general inductive coding undertaken by researchers (D. Vicary, S. Salman) was undertaken independently.⁶ Where responses lacked sufficient information, or were ambiguous, respondents were contacted and asked for clarification. Themes were decided upon using a semantic theming approach, to identify the explicit surface meanings of the responses.⁷ Initiation occurred independently by both researchers, with collaborative construction of categories and overarching explicit themes.⁸ Rectification and

Box 1. *Response themes and sub-themes*

- Public wellbeing, encompassing:
 - Local emergency response;
 - Community information; and
 - Pharmacy operational management.
- Pharmaceutical distribution, including stock management; and
- Clinical medicine management, encompassing:
 - Acute symptom management; and
 - Medicine management.

finalisation was performed by the lead researcher (D. Vicary). This process produced explicit themes broadly describing pharmacists' actions during this time. Illustrative quotes were selected and labelled with the respondent code derived from their response order, workplace and location.⁸

Health and Disability Ethics Committees (HDEC) defined this study as a resource utilisation review, and that of a minimal-risk observational study, which therefore did not require submission to HDEC.⁹ Furthermore, HDEC noted that as this study was an audit or related activity, it did not require HDEC review as it did not involve the use, collection, or storage of human tissue without consent.

Results

Responses were received from 13 pharmacists working in community ($n = 7$), hospital ($n = 4$) and general practice ($n = 2$). The hospital respondents included the Clinical Pharmacy Team Leader and on-call pharmacist and two non-pharmacist respondents (ancillary staff); a pharmacy technician (Hospital Pharmacy Dispensary Coordinator) and an Emergency Response Adviser. Two respondents had a district-wide role, whereas others worked in Hastings ($n = 6$), Napier ($n = 4$) and Havelock North ($n = 3$). Two of the three pharmacist owners from Havelock North responded. Responses from pharmacists working outside of Havelock North reflect the wide distribution of those affected beyond the Havelock North area.

Response analysis identified the three themes and six sub-themes, as shown in Box 1.

Theme 1: public wellbeing

Local emergency response

Two respondents opened their Havelock North businesses for additional hours, including Sunday when they are usually closed. One opened after viewing information on public media and the other after receiving a telephone call from a local general practitioner asking if the pharmacy could be opened on Sunday.

Connecting with patients of concern and providing additional medicine deliveries were tasks carried out by community and general practice pharmacists, augmented with assistance from volunteers, while also responding to customer needs and information requests from the DHB and media.

'Far more deliveries to homes of patients usually independent.... [Emergency staff training and education] 2 – 3 x daily as new advice issued.....' [Respondent 1: Community, Havelock North]

Community information

Pharmacists reported providing the public with a large volume and variety of information, including: hand hygiene and infection control; duration of boiling water; signs of dehydration and how to safely rehydrate; self-management of acute illness; information on the campylobacter infection; and when to seek medical attention. The advice was not always consistent, with pharmacists reporting recommending boiling water for times between 3 and 10 min to render it safe to drink.

Provision of written material to the public included the distribution of the 'Diarrhoea and Vomiting' self care cards produced by the Pharmaceutical Society of New Zealand.

Pharmacy operational management

Pharmacy activities included additional staff communication, occupational health and safety education, roster optimisation and designating on-call staff.

'We had a reshuffle of the clinical pharmacist work load. Prioritising medical wards over surgical wards.' [Respondent 9: Hospital, Hastings]

Theme 2: pharmaceutical distribution, including stock management

Pharmaceutical distribution and supply included sourcing and distributing prescription and non-prescription medicines. Community pharmacies in Havelock North distributed donated electrolyte solutions and one responding Havelock North pharmacist provided non-contaminated bottled drinking water to the public at no cost. The hospital pharmacy supplied water suitable for extemporaneous compounding to affected pharmacies. During ‘the Gastro outbreak’, azithromycin was dispensed from the hospital pharmacy on discharge to ensure patient access, as government restrictions meant azithromycin was not funded for this condition in the community. On a few occasions, ciprofloxacin was used when azithromycin was deemed unsuitable for treatment.

Stock management

Pharmacists in all three locations noted running out of medicines (oral rehydration electrolytes, loperamide, metronidazole, azithromycin and anti-emetics), although the exact medicines differed in each place. The support of wholesalers to source stock from outside the region and expedite deliveries was appreciated and valuable.

‘Community ran out of oral rehydration, shifted hospital stock. I was able to liaise with a supplier who had some close to date ...’ [Respondent 8: Hospital, Hastings]

‘Huge stock issues - loads of time spent liaising with wholesalers and patients to ensure [medicines] sourced. The wholesalers had to source product from other centres ...’ [Respondent 1: Community, Havelock North]

Theme 3: clinical medicine management

Pharmacists’ medicine management activities included providing medicine advice, including subsidy rules. Pharmacists supported good clinical practice by reinforcing the guidance on recommended antibiotic treatments, as well as patient-specific recommendations. There was active communication with general practices about pertinent medicine issues to enable practices to

consider activities to mitigate these risk areas, dependent on workforce availability.

Harm-reduction activities included medicine advice to reduce the risk of acute kidney injury, increased monitoring, such as blood glucose levels, interaction management (e.g. antibiotics and warfarin), and the appropriate use of medicines such as loperamide, non-steroidal anti-inflammatory medicines and prescribed antibiotics. Medicines such as sulfonylureas, angiotensin enzyme inhibitors, diuretics, metformin, angiotensin receptor blockers, and non-steroidal anti-inflammatories (referred to as SADMAN¹⁰) put some patients at risk of increased adverse effects in times of dehydration or other acute illness. Both community and general practice pharmacists actively contacted ‘at-risk’ patients. These included elderly people, people reliant on pharmacy delivery of medicines, patients with specific conditions, patients for whom medicines were dispensed in adherence packaging and people taking specific medicines (e.g. SADMAN medicines, warfarin or lithium).

Acute symptom management

Pharmacists reported playing a vital triaging role by referring more at-risk patients to other health providers and advising on acute symptom management without further medical input, where it was deemed safe to do so. The advice on acute symptom management varied between respondents, but covered a wide range of acute symptoms, including providing advice on, or products for, hydration, vomiting, diarrhoea, nausea, abdominal cramps, headache, fever, exhaustion, skin irritations from the chlorine added to the water, and reactive arthritis.

‘Triaged walk-in patients and provided advice, sales or referred as necessary.’ [Respondent 6: Community, Napier]

Community Pharmacy-based respondents also noted an increase in volume of telephone calls related to ‘the Gastro outbreak’ where triage and symptom management advice was also given. Two respondents noted that the legal classification of cyclizine requires sales by pharmacists to be in the manufacturer’s approved packaging only. These were not available at the time, meaning

there were limited pharmacological treatment options available to pharmacists for managing vomiting.

Responding community and general practice-based pharmacists described undertaking symptom severity assessment, which took into account the person's co-morbidities, polypharmacy and other risk factors.

Pharmacist respondents working in Hastings and Havelock North community pharmacies provided information on the numbers of people seeking advice and the over-the-counter (OTC) products purchased due to illness. Two-way communication between pharmacists and the Chief Pharmacist, a member of the emergency response team, enabled targeted public health messages to be generated based on questions the public asked community pharmacists. These included information about appropriate rehydration fluids; oral rehydration fluid formulae; foods to eat and avoid during acute gastrointestinal illness; and oral contraceptive advice. This supported a consistent message from health professionals across the DHB. Messages were actively distributed by pharmacists via social media and during their professional encounters with the public. The Chief Pharmacist role was essential in facilitating communication between the local emergency response team and the pharmacy workforce.

Discussion

This study captures information about the role of pharmacists during the 2016 Havelock North waterborne outbreak of *C. jejuni*. Responses demonstrated that pharmacists are a key link between the public and emergency management, focusing on both public needs and pharmaceutical considerations. Respondents demonstrated an attitude of rising to meet the needs of the occasion, in some cases going above and beyond, using their expert skills, knowledge and local connections to benefit individuals and the community.

Our findings provide baseline information to inform the strengthening of community pharmacy integration into the existing Hawke's Bay public health capacity. This integration will improve the effectiveness and efficiency of responses to future

disease outbreaks by increased utilisation of pharmacists' skills and pharmacy services. Health planners included community pharmacists in emergency plans, but respondents in this study highlighted that pharmacists have a larger role to play in managing public health outbreaks.

The themes reported in this study are similar to themes outlined in the American Society of Health-System Pharmacists' Statement on the role of Health-System Pharmacists in Emergency Preparedness, which describes four general principles related to medicine: (1) therapy management; (2) pharmaceutical distribution; (3) triage and public advice; and (4) collaboration with prescribers.¹¹ In their review of the 1999 West Nile Viral Encephalitis outbreak in New York City, Fine and Layton noted the need for public and clinician education.¹² This study found that pharmacists undertook educational roles during 'the Gastro outbreak' to assist customers, staff and prescribers. New York City pharmacies mass distributed mosquito repellent; Havelock North pharmacies distributed free water and oral rehydration solution.

Bower et al. described the key roles undertaken by hospital pharmacists during a *Clostridium difficile* outbreak in the Royal Victoria Hospital in Barrie, Ontario.⁵ The key roles were education of prescribers, clinicians and pharmacists, antibiotic stewardship and the development of clinical decision support tools. During 'the Gastro outbreak', pharmacists provided education to customers, their staff and prescribers, on appropriate antibiotic usage in general and for specific patients.

By providing triage and symptom management and medication, the pharmacist response may have reduced demand on general practitioners, who in turn were focused on managing more severe illness in the community. As a result of the combined community response, the hospital remained open and functioned as usual during 'the Gastro outbreak'.

Our study found evidence of community pharmacist awareness of a higher-than-usual level of acute gastrointestinal symptoms among their customers, before official information was circulated by the DHB. The role that community pharmacists played in public health surveillance and in particular with

monitoring care-seeking behaviour (“health indicators”) contributed to the management of ‘the Gastro outbreak’.¹³

Non-diagnosis-based data are being increasingly used for routine disease surveillance and early outbreak detection. Data automatically acquired and assessed is described as syndromic surveillance.¹⁴ Syndromic surveillance based on pharmacy OTC sales has been shown to have potential for acute respiratory and gastrointestinal disease outbreak detection.^{15–17} At the time of ‘the Gastro outbreak’, there were no formal or informal links between community pharmacies and the DHB Public Health team. In 2018 and 2019, community pharmacists were invited to voluntarily inform the DHB Medical Officer of Health of unexpected or unexplained increases in certain acute symptom management requests. Acknowledging that voluntarily providing information is less sensitive than automated ‘see-all’ data analysis, this is a step in the right direction. There is further opportunity to explore the role of community pharmacy in health indicator surveillance.

In this study, respondent guidance to the public on the duration of time to boil water varied, as did advice around management of acute diarrhoea with OTC anti-diarrhoeal or probiotic products. To increase the timeliness and consistency of responses, pharmacists could be given a protocol to follow. There is value in further exploring the development of public health information and prescribing guidance as part of the planning of public health events to ensure correct and consistent messages are provided.

The respondents’ responses suggested the value of the Chief Pharmacist as part of the high-level emergency response team. Policy documents note that pharmacists offer an important health professional viewpoint in any planning, and the Chief Pharmacist can ensure that pharmacists are included in communications much earlier when a potential outbreak is identified.¹¹

Fine and Layton discussed the use of a public hotline for obtaining information.¹² Pharmacist respondents noted the high volume of outbreak-related telephone calls they managed. In future, the use, and promotion, of a public hotline during an

outbreak could be considered. One pharmacist engaged volunteers from a non-government agency, Age Concern, to check on vulnerable members of the community. Further investigation into the value of volunteers as part of emergency planning would be worthwhile.

This study has provided insights into important considerations for future public health emergency event planning. Due to its topography, the Hawke’s Bay region can be isolated, particularly due to road closures in the winter months, and this study highlighted the role of pharmaceutical wholesalers and pharmaceutical companies in these situations.

The Health and Disability System Review currently underway is undertaking a system-wide approach to ensure more equitable health and wellbeing outcomes for all New Zealanders. The interim report acknowledges the increasing need for the provision of robust emergency preparedness capacity that is able to react immediately at the local level.¹⁷ Also recognised is the changing role of community pharmacist due to technological advancements and changing consumer habits, acknowledging that a pharmacist’s time is best spent using their clinical skills to establish and have wider integration into the health-care system.¹⁷ Our study recognises the value of pharmacists integrating into general practice and suggests wider integration of pharmacists’ roles in emergency preparedness should be considered and valued.

Limitations of this study include information being requested 5 months after the event, which could result in recall bias. Although the survey response rate was poor (13/95; 13.7%), pharmacists who did respond were representative of the varied roles in Hawke’s Bay. It is possible that pharmacists who responded did so on behalf of their team or staff; this was not specifically explored. Some key informants had changed jobs during this time and were unavailable to participate. We acknowledge that data saturation may not have been reached with this number of respondents from a heterogeneous sample.⁸ Non-responder bias may also be present in our sample. A strength of the study was that respondents worked in a range of settings and roles, providing a breadth of viewpoints.

Conclusion

This study explored the variety of roles and harm-reduction and management activities undertaken by pharmacists working in Hawke's Bay in August 2016 during a major gastroenteritis outbreak. Responses indicated that as a health professional group, pharmacists played important roles in public wellbeing, pharmaceutical distribution and clinical medicines management. Opportunities for Hawke's Bay Emergency Response planners and public health services to harness pharmacists' skills include increasing pharmacists' contribution to emergency planning and management; prevention and early detection of events; and mass medicine distribution and management.

Further research directions include determining the effectiveness of community pharmacy as a source of information for public health surveillance and distribution of pre-prepared regionally approved public health information to ensure consistent and accurate health messages are provided during potential future outbreaks.

Competing interests

Dianne Vicary currently works as a Planning and Commissioning Manager for Pharmacy Services for Hawke's Bay District Health Board and Nick Jones as a HBDHB Medical Officer of Health. On behalf of other authors, the corresponding author states that there are no conflicts of interest.

Funding

This research did not receive any specific funding.

Acknowledgements

The authors wish to acknowledge the Hawke's Bay pharmacists who participated in this research.

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