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Robin Featherstone

Gabriel Boldt

Nazi Torabi
UWO, ntorabi@uwo.ca

Shauna-Lee Konrad

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Provision of pandemic disease information by health sciences librarians: a multisite comparative case series*†‡§ 🕮 🄴🄲

Robin M. Featherstone, MLIS; R. Gabriel Boldt, MScEd, MLIS; Nazi Torabi, MSc, MLIS; Shauna-Lee Konrad, MLIS

See end of article for authors' affiliations.

Objective: The research provides an understanding of pandemic information needs and informs professional development initiatives for librarians in disaster medicine.

Methods: Utilizing a multisite, comparative case series design, the researchers conducted semi-structured interviews and examined supplementary materials in the form of organizational documents, correspondence, and websites to create a complete picture of each case. The rigor of the case series was ensured through data and investigator triangulation. Interview transcripts were coded using NVivo to identify common themes and points of comparison.

Results: Comparison of the four cases revealed a distinct difference between ''client-initiated'' and ''librarian-initiated'' provision of pandemic information. Librarian-initiated projects utilized social software to ''push'' information, whereas client-initiated projects operated within patron-determined parameters to deliver information. Health care administrators were identified as a key audience for pandemic information, and news agencies were utilized as essential information sources. Librarians' skills at evaluating available information proved crucial for selecting best-quality evidence to support administrative decision making.

Conclusions: Qualitative analysis resulted in increased understanding of pandemic information needs and identified best practices for disseminating information during periods of high organizational stress caused by an influx of new cases of an unknown infectious disease.

INTRODUCTION

In late April 2009, news spread of the latest infectious event to strike countries across the globe: influenza A virus subtype H1N1 (H1N1). As had been seen in 2003 with severe acute respiratory syndrome (SARS), a new virus or other infectious disease has the potential to wreak havoc on populations and, by proxy, on health care organizations. A lack of disaster and emergency preparedness in health care institutions may contribute to an increase in infectious cases, leading to an even more precarious situation [1].

🕮 This article has been approved for the Medical Library Association's Independent Reading Program <http://www.mlanet.org/education/irp/>.

🄴🄲 Supplemental Appendixes A, B, and C are available with the online version of this journal.

Highlights

- Pandemic information services benefited from prior planning. Librarians integrated themselves into organizational incident response teams but were better positioned to provide rapid and effective services when library involvement was outlined in a disaster plan.
- Alerting services from reputable sources proved invaluable for gathering accurate information during the peak period of an infectious outbreak, when information overload was a significant problem.
- The effectiveness of social software to ''push'' pandemic updates proved difficult to evaluate.
- Strategic communication methods for information delivery during an outbreak considered audience capacity and made use of appropriate technologies.
- Librarians' skills to summarize and deliver best available evidence efficiently supported health care administrators' decision making.

Implications

- Health care librarians can meet administrators' urgent need for high-quality evidence during the response phase of an infectious outbreak.
- Professional development opportunities will assist librarians in developing methods for gathering high-quality evidence, delivering concise summaries, and evaluating pandemic information services.

Effective hospital information communication systems—along with supplies, security, staff, utilities, and clinical activity—are among the vital responses necessary to prevent and contain infectious disease pandemics [2]. This comparative case series sought to examine the efforts of health sciences librarians to answer the information needs of health care organizations during the 2009 H1N1 pandemic.

Ample literature focuses on disaster and emergency planning for library operations, collection protection, technical services, and financial management [3, 4]. In addition, during emergency and disaster situations such as Hurricane Katrina, cases in which librarians provided services during the response and recovery phases have been analyzed [5]. A previous study identified roles for librarians in disasters as institutional supporters, collection managers, information disseminators, internal planners, community supporters, government partners, educators and trainers, and information community builders [5].

Disaster planning for library operations has been well studied, but the degree to which health care organizations have involved information professionals, such as hospital librarians, in their local surveillance networks is just beginning to be understood. In connection with the 2009 H1N1 pandemic, McKeown highlighted roles for clinical or hospital librarians as monitors and providers of H1N1 information to hospital incident management personnel [6], whereas Coats et al. described a new model for clinical librarians in emergency medicine to improve health outcomes for patients [7]. A clinical librarian can play a vital role on emergency teams by contributing "up-to-the-minute access" to information and improving staff knowledge and information retrieval skills [7]. Librarians' contributions to operational strategic knowledge through developing information systems, disaster planning, and transferring knowledge has been investigated, and a model for service provision is now supported by the National Health Service (NHS) Health Library [7].

Similar librarian contributions have been investigated in depth through a pilot project supported by the National Library of Medicine's (NLM's) Disaster Information Management Research Center (DIMRC). In an effort to help medical librarians plan for future emergency and disaster incidents, the project identified important professional functions:
■ actively participating in emergency preparedness meetings and listening carefully for unfilled needs and questions;
■ creating and maintaining email lists for specific groups and needs to distribute updated pertinent information quickly and efficiently;
■ maintaining a careful watch of PubMed, government agency reports, news reports, and NLM/DIMRC emails to provide updated information to the emergency management or preparedness committee members [2].

The project concluded that libraries should be an integral part of hospitals' emergency preparedness structure, and developing a protocol in coordination with emergency preparedness teams would allow for integrated librarian support [2].

A further topic investigated with respect to library services in a disaster is the role of social media, which has been identified as an effective tool for building knowledge and disseminating information in the Web 2.0 era [8]. H1N1 was the first global pandemic to occur in the age of social media and, thus, presented a unique opportunity to explore the role of social software in a pandemic [9]. In addition to providing broad examples of librarian involvement in emergency and disaster planning, Schmidt described a more specific role of communications technology infrastructure for library operations, the implementation of "cloud computing" (the movement of desktop applications and operating software to a web-based platform) and Web 2.0 applications in core communications channels at an educational institution during disaster events [10].

Building on the growing body of literature describing librarians' supporting roles in disasters, this qualitative case series sought to increase the current understanding of how health librarians can support the information needs of health care organizations during a pandemic. By examining four unique cases, the investigators aimed to identify the various methods, media, and communication channels used by librarians to disseminate information and to anticipate future roles for health sciences librarians in disaster and emergency planning.

METHODS

Exploratory survey

The investigators distributed an exploratory survey (Appendix A, online only) during the first wave of the pandemic, in April 2009, to a group of approximately thirty health librarians in the region of southwestern Ontario. The researchers intended that the survey would gather data about H1N1 information needs as quickly as possible during the first wave of the outbreak and asked librarians to share detailed accounts of any reference transactions related to the pandemic. The response rate was low—four completed surveys—but one respondent recounted a project to provide H1N1 information that far exceeded a typical reference transaction. That single case became the impetus for seeking similarly extended projects that provided H1N1 information and became the first case in the series reported here.

Multisite comparative case series design

Researchers selected a multisite comparative series study design as it allowed for an analytic induction approach, with a specific issue or problem as the focal point [11]. The emerging infectious disease, H1N1, served as focal point for the case series. Whereas a case study would analyze a single subject in a single setting, the multisite comparative case series allowed researchers to compare two or more cases of equal value [11].

Data collection and analysis occurred in tandem, as cases were compared and contrasted. Characteristics of the first case identified during the exploratory survey—specifically, that health care administrators were a key audience and that technology played a pivotal role in delivering pandemic information—were compared with subsequent cases in the series.

The Research Ethics Board of the University of Western Ontario approved the study in the spring of 2010.

Case selection

Participants were recruited through professional email discussion lists: MEDLIB-L, CANMEDLIB, and DISASTR-OUTREACH-LIB. Self-identified cases were subsequently screened against predetermined eligibility criteria: the project leader had to hold a master's of library or library and information science degree (MLS/MLIS), and the project had to extend through multiple pandemic phases. Seven cases were screened; five cases met the eligibility criteria and were selected; four cases proceeded through the data collection process and were subsequently analyzed. Regrettably, confidentiality concerns by the fifth case's institutional legal department resulted in the withdrawal of their case from the study. Cases included one US and three Canadian projects.

Data collection

The investigators collected data through two methods. First, a minimum of two coinvestigators conducted semi-structured interviews with project leaders from each case through face-to-face meetings, telephone conference calls, or web-facilitated conversations. The researchers divided questions (Appendix B, online only) into topic areas: initiation of the project, information gathering and dissemination, project evaluation, organization of personnel, and professional roles of individuals involved. Investigators digitally recorded each interview, and the MP3 files were transcribed by a professional transcription service. Second, investigators collected available supporting documentation from each case. Supporting documents included websites, internal communications, and evaluative tools, as well as clients' H1N1 questions.

Data analysis

The investigators followed popular coding strategies for qualitative research [12]. After a preliminary examination of the data, researchers agreed on eight recurring themes to guide further coding and analysis: information request, communication, personnel, organizational structure, time, information gathering, technology, and evaluation (Figure 1). Themes occurred with relatively equal distribution among the four cases; but, unsurprisingly, the amount of information on each varied as interviews were of different lengths and participants spoke in more detail about the particular aspects of their H1N1 information projects.

As the investigators began analyzing the data, they identified a natural division between "librarian-initiated" projects, where librarians began supplying information independent of a specific request, and "client-initiated" projects, where librarians participated in an organizational response to the pandemic. There were two cases of each type; equal division between the two case types happened entirely by chance.

Interview transcripts and supporting documents for each case were coded into themes by a minimum of two coinvestigators using NVivo qualitative analysis software. The NVivo program stored research documents and researchers' annotations. NVivo also allowed the investigators to reorganize coded sections for in-depth analysis of each theme. Using a model of interpretive thematic analysis [13], the researchers compared coded sections to reveal "repeated patterns of meaning."

RESULTS

Case descriptions

Table 1 provides brief descriptions of the four cases included in the series.

The following summaries describe key findings in each thematic category and are presented in a loosely chronological order, following the chain of events for each case of H1N1 information provision.

Information request

Email and in-person requests were the most popular methods by which librarians in all cases were initially contacted to provide H1N1 information. In one of the librarian-initiated cases, physicians and nurses requested information from their local academic health library. These requests resembled traditional reference questions, and, in response to a perceived need, the librarian began publishing information to an audience of health care providers through the use of social software.

In the other librarian-initiated case, the service did not arise out of an information request. The librarian, whose primary users were other health librarians, described the decision to start compiling and posting H1N1 information to the web as a "very natural and logical thing to do." The librarian anticipated a need from the community and decided to create an access point that the librarian felt would be helpful.

For one of the client-initiated cases, a hospital's pandemic planning document identified the library as being responsible for monitoring websites and information sources daily and for providing reports to the planning leaders during multiple phases of a pandemic. The information request was sent by administrators to the director of the hospital libraries and then forwarded to two librarians. The librarians were asked to "provide priority supports to the pandemic incident management team," as outlined in phases

Figure 1
Distribution of coded themes between the four cases in the series
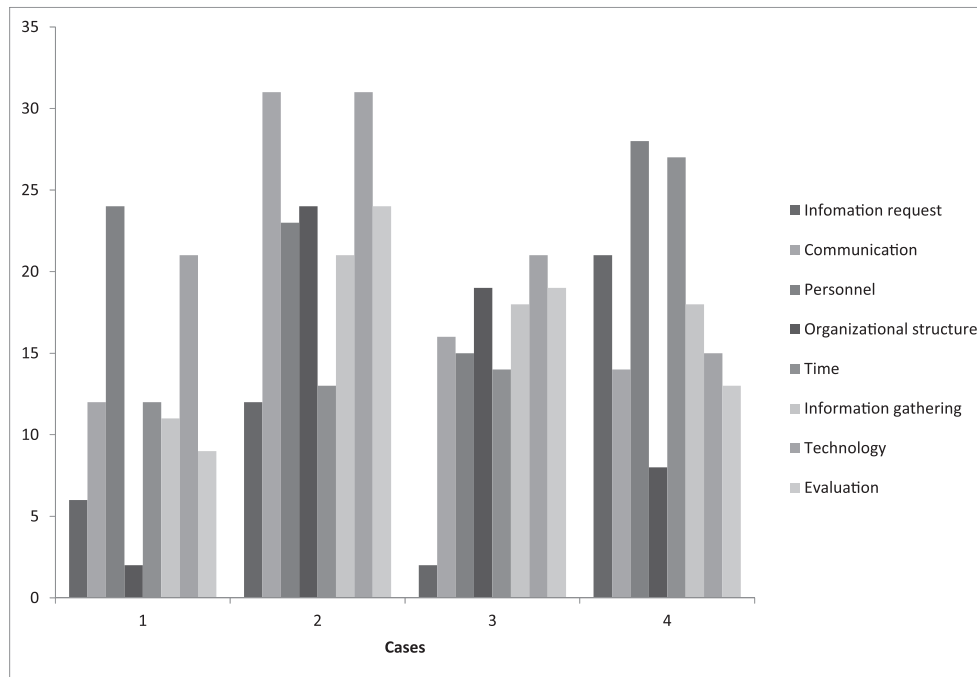
five and six of the hospital network's pandemic plan. The librarians' tasks were to monitor key websites and provide daily updates to the integrated vice president of information management, the pandemic incident manager (who was also an integrated vice president), and (later) the city-wide chief executive officer.

In the other client-initiated case, an outreach librarian to a government public health department was asked, in-person, by the pandemic-level planning team to find an "article here, article there," but literature searches led to the librarian being asked to join the reference group "that advised the chief public health officer and the top level planning committee for the pandemic response." The librarian performed weekly searches for published, peer-reviewed journal articles as part of the librarian's role in the group. Questions originated from "physicians out in the field" and were filtered through the public health

office. The librarian answered questions from the research group who advised the planning team, who, in turn, informed policy and distributed information to health professionals. In the early days of the pandemic, the planning team just wanted to know if there was anything "out there" on H1N1, but as the pandemic progressed and administrators learned what the librarian could do, clinical queries, high-level planning questions, and requests to support comparative reviews about "how public health planning had worked or hadn't worked" all required librarian-mediated searches. Further, advisers to the chief pubic health officer provided the librarian a list of known journals to review on a daily basis and asked the librarian to supply print and/or electronic full-text portable document format (PDF) articles of H1N1 information as soon as they were published, depending on availability. But only in some instances were the sources of information specified in the

Table 1
Brief descriptions of H1N1 provision of information projects analyzed for the case series

Case	Subject(s)	Project	Project audience
1	Academic health sciences librarian	■ Self-initiated ■ Monitored, selected, and shared H1N1 information sources via social software	Clinicians, nurses, and health sciences librarians
2	Team of hospital librarians	■ Client-initiated ■ Provided H1N1 statistics and relevant news items via daily email updates	Incident management team for an urban hospital system
3	Medical librarian	■ Self-initiated ■ Monitored, selected, and shared H1N1 information sources via social software	Health sciences librarians
4	Outreach librarian at an academic center	■ Client-initiated ■ Disseminated best-available evidence on H1N1	Government public health department

request: ''they mostly didn't know where the answers would come from.''

Communication

For the librarian-initiated cases, social media facilitated rapid information dissemination and sharing between librarian colleagues. Email discussion lists, Twitter, blogs, really simple syndication (RSS) feeds, Facebook, Friend Feed, Mendeley citation management software, and wikis were all described as communication tools that also assisted in generating ideas between colleagues. A collective knowledge community of librarians and other hospital staff members depending heavily on social software formed during the early days of the H1N1 outbreak. In both cases, independently maintained wikis were the final destination for gathered information and the tools by which information was communicated with audiences.

In the client-initiated case of the outreach librarian working with the government public health department, all information was communicated via email, telephone, or in-person. The other client-initiated case involved a narrowly prescribed communication method: After the librarians' managers received the initial information request, the line of communication ran almost entirely one way. Librarians emailed a small audience of 3 administrators an update of H1N1 news and statistics by 10:30 a.m. every morning, in time for a daily 11:00 a.m. meeting of the critical incident planning team. Because the administrators used BlackBerry mobile phones to receive their emails, the librarians needed to reformat information for these specific devices. The librarians also developed a standardized format (Appendix C, online only) for presenting their daily email updates so that they could be analyzed quickly. They were strictly limited to gathering text because graphs, charts, video clips, and so on could not be supported by the email program that the administrators used.

Personnel

In both librarian-initiated cases, collaboration with other information professionals was informal and organic in nature. Librarians indicated receiving resource suggestions from other librarians in their libraries and occasionally incorporating these sources into their wikis. With the exception of some minor help from another librarian in one case, the original project initiator completed most of the work needed to publish information online. Minimal involvement from the initiators' institutions was reported. Organizational administrators did not request the information, nor did they seem to be avid consumers of it. The librarians worked on the projects independently and outside of their regular duties.

In contrast, the client-initiated projects depended heavily on the support of library staff in their institutions. These relationships were viewed as essential to the success of the project. Other library staff assumed shifted responsibilities, provided H1N1 information during staff vacations, assisted with the development of the information platforms, and obtained and delivered full-text H1N1 information sources. These two cases reported that input from librarians at external institutions was either not sought or not found to be useful.

Organizational structure

Librarian involvement in an institutional response was formalized prior to the start of the H1N1 outbreak in only one of the cases. The other client-initiated case, however, as explained above, illustrates how a librarian can be quickly integrated into a response team, specifically a group of researchers using evidence to inform policy.

The librarian-initiated cases provided H1N1 information without an organizational infrastructure supporting them. Both projects fell outside of the librarians' regular work responsibilities, leaving little time for rigorous assessments of the information selected for inclusion on their wikis and limited resources to perform formal evaluations of the services.

Time

In all cases, librarians began collecting and disseminating H1N1 information in late April 2009. An intense period of high demand for H1N1 information lasted from April to June 2009, followed by a declining period of information requests from June until November 2009. After November 2009, as the pandemic subsided, the need for up-to-date information declined to the point where it was no longer necessary.

Librarians who gathered information during the ''early days'' of the outbreak reported an urgency to post sources. One librarian reported, ''[I] was pretty much just looking, compiling and adding as fast as I could since information and the information resources were changing so quickly.''

Information gathering

While all cases reported using social media to facilitate their information gathering, these tools were utilized in the librarian-initiated cases to a greater extent than the client-initiated cases. In the librarian-initiated cases, Twitter, blogs, wikis, and ''push'' technologies (RSS feeds and email alerts) were used to monitor information about H1N1 as it was being published to the web.

Librarians sought information from ''trusted'' sources, like PubMed, when information gathering was part of a more formal literature request or in response to a specified information need. However, once an information need was identified for an institution, librarians created alerts so they could monitor information as it was published.

One librarian-initiated and one client-initiated case reported gathering information exclusively from ''credible'' resources, such as recognized biomedical

databases, and known sources, like NLM. In contrast, the other cases reported including information from news sources and government agencies. These two cases included morbidity and mortality statistics and disease incidence rates. All four cases emphasized the need to assess the credibility of the information before disseminating it.

Analysis and evaluation of sources was involved, in varying degrees, with every project providing H1N1 information. One client-initiated case reported needing ''high evidence-based information'' and looking for research studies of any kind (because randomized controlled trials on H1N1 did not exist during the early days of the outbreak). But, like others cases, the librarian reported, ''[evaluation] criteria changed depending on the question.'' This librarian also witnessed the increase in scholarly publishing on H1N1:

At first there were lots of SARS articles…and Bird Flu articles that came up [in searches] that didn't apply…But then every week the PubMed alert would come back with more and more. That didn't mean it was all high quality literature, but it was definitely becoming pretty big.

Interestingly, this librarian was asked to search for historical as well as current information. Questions were asked about ''how [the H1N1 virus] mutates and so on and how it happened in 1918.'' Table 2 provides a list of H1N1 questions and topics received by the librarian.

Librarians also used their judgment to determine how much information to include in their summaries. In the case of providing daily updates to administrators, librarians reported trying ''to keep things consistent'' by providing a ''decent amount of news items, whether that was 5 to 10.'' When there were too many items to report, ''as there were 50,'' they reported ''selecting news items'':

There reached a point for example when they reported school closures or clinics for flushots things like that…I would refocus my attention on the fact that this has to be relevant or possibly impacting our own health care facilities here; so if they reported a school closure in St. Johns Newfoundland and it was just one school closure of many school closures that week then I would filter them out.

The process of selecting information, as they described it, ''evolved and got probably cleaner, better as we went along.''

Scholarly sources of information included databases: PubMed and Scopus; clinical tools: BMJ Clinical Evidence, UpToDate (epidemiology, clinical manifestations, diagnosis of swine H1N1 influenza A, and treatment and prevention of swine H1N1 influenza topic pages); journals: *American Journal of Public Health, Annals of Internal Medicine, BMJ, Canadian Medical Association Journal (CMAJ), JAMA, Nature*, and *New England Journal of Medicine (H1N1 Influenza Center)*; and a search engine: Google Scholar. ''Gray literature'' or non-indexed sources included Canadian governmental or nongovernmental organization (NGO) websites: Public Health Agency of Canada, Health

Table 2
H1N1 questions and information requests by health professionals as recorded and received by an outreach librarian working with a government health department

Clinical questions
■ What is the effect of H1N1 on immunosuppressed or immunocompromised patients?
■ What is the effect of H1N1 on pregnant patients, embryos, and fetuses?
■ What is the effectiveness of antiviral agents and drugs for H1N1?
■ What is possibility of relapse after taking antiviral agents or drugs?
■ What is the effectiveness or duration of H1N1 vaccine?
■ Can there be adverse reactions to taking the H1N1 vaccine after already having influenza in the last year?

Health care administrative questions
■ Is there any available information on: protective equipment for H1N1 for health care workers (i.e., masks, gloves, etc.)?
■ Is there any available information on household transmission of H1N1?
■ Is there any news of a third wave of H1N1?

Research questions
■ Is there any available information on H1N1 in aboriginal populations?
■ How are socioeconomic factors related to H1N1?
■ Are there epidemiological reviews of H1N1 and influenza?
■ Are there reviews on Tamiflu and H1N1?
■ Are there research studies on the usefulness or effectiveness of H1N1 public health surveillance?
■ Are there any pandemic modeling studies?
■ Are there research studies on resilience during pandemics?

Canada, Regional Centers for Disease Control, Ministry of Health and Long Term Care, and provincial health agencies; Canadian news sites: CBC, CTV, *The Globe and Mail, Calgary Herald,* and *Vancouver Sun;* a US governmental website: Centers for Disease Control and Prevention (CDC) (Morbidity and Mortality Weekly Report); a US news site: CNN; international governmental or NGO websites: World Health Organization (WHO), Pan American Health Organization (PAHO), and European Centre for Disease Prevention and Control (ECDC); and international news sites: BBC and *The Guardian.* Participants also reported consulting resource guides created by other librarians in the form of LibGuides, a web platform for publishing text, resource links, videos, and widgets (third-party web content). Study participants did not report consulting all sources in all cases.

The process of organizing information into categories began from the very beginning. One librarian reported that:

[A]t first it was just trying to organize everything and then we gradually self-organized in the categories of special databases, public health, multiple languages, international, NLM resources, CDC Resources, WHO Resources, and then LibGuides librarian[s] created, with news items bumped towards the top of it.

The client-initiated case of providing regular email updates to hospital administrators involved more systematic retrieval. In this case, references from medical literature databases were not sought, because ''that kind of information would not have been as time sensitive.'' The librarians located local, provincial, statewide, and international statistics on confirmed cases and deaths. They did not include statistics from their local hospitals, as the planning team to whom they were delivering the information ''would probably

be the best people to know it before we did.'' The first section of their daily report was statistics—number of cases reported and numbers of deaths—which were located primarily using three websites: Public Health Agency of Canada, CDC, and WHO. The second section included textual summaries from governmental organization and news sources.

It was a particular challenge for these librarians to stay abreast of the most recent statistics. Media sites often included more updated figures than government websites. The librarians also gained a sense of which sources were updated the fastest. They recounted that ''The ECDC tended to be ahead of WHO in terms of how regularly they reported, what time of day they reported.'' The sources of information also changed over the course of the pandemic, and regular monitoring of multiple sources was required to provide accurate reporting of cases. It was also a challenge to reconcile data sets, as figures differed for the same statistics.

Technology

The librarian-initiated cases were heavy users of social media technologies, such as wikis, Twitter, Facebook, and RSS feeds. Information was compiled and stored on wikis before being published on the web. One librarian described ''leveraging the network effect'' and managing a wiki that received more than 25,000 hits. Client-initiated cases made greater use of email than social software. As the pandemic escalated, Google Scholar and Google Alerts became an effective method for librarians to monitor information as it was being published on the web. Google Scholar was used to answer some ''direct questions'' because it searched full-text PDFs.

Evaluation

Informal evaluation was the most common method of assessment and took place in the form of brief emails, blog mentions, and anecdotal feedback commending the work of the various information providers. None of the projects reported negative feedback. Librarian-initiated projects gathered metrics, specifically, the number of visits to their wikis. In both librarian-initiated cases and one client-initiated case, librarians reported having only a general sense of the reception, use, and success of the projects. Study participants expressed their audiences' responses to the product in subjective terms: ''I do believe that it was valuable''; ''[m]y sense is that they must have been happy with it''; and ''I just felt that it was helpful.'' Barriers to more formal evaluation were reported as lack of time and difficulties defining the audience or the scope of projects. Both librarian-initiated cases expressed a need for more formal evaluation if the projects were to be replicated.

Assessment for one client-initiated case was more deliberate. Administrator clients identified a need to evaluate the project upon its completion, and librarians distributed an email survey to help inform and improve future implementations of the library's involvement in pandemic disease planning.

LIMITATIONS OF THE STUDY

Limitations of the research are the possibility of recall error, researcher or participant bias, and a lack of generalizability owing to the small number of cases. Interviews were conducted in a timely manner following the outbreak, and the exploratory survey was distributed during the first wave of the pandemic in April 2009. The process of obtaining academic ethics approval delayed recruiting participants in the case series and collecting data until the early months of 2010. Case series participants described events that occurred between three months and one year prior to the interviews, and the researchers acknowledge the potential for recall error owing to this unavoidable time lag.

Researcher bias was reduced through the use of triangulation: Multiple investigators independently coded and analyzed data. In instances where librarian participants were asked to describe the value of their services, bias was inherent, but, despite limited opportunities to evaluate service provision for some cases, the researchers made every effort to collect data from formal assessments. Findings were limited to comparisons between the four cases and cannot universally represent librarian involvement with projects to provide H1N1 information. However, the investigators hypothesize that similarities between the cases are typical of the experiences of librarians who conducted H1N1 information support.

DISCUSSION

The division between librarian-initiated and client-initiated cases of H1N1 information provision yielded significant findings with implications for future pandemic disease information projects. Intended audiences for the librarian-initiated projects were care providers and other medical librarians, but it was health care administrators serving on pandemic response and planning teams who requested H1N1 information services in the form of extended projects. The client-initiated cases illustrated how library services could be integrated into support infrastructure and tailored to support administrative decision making. In light of these findings, administrators should be recognized as a key audience for pandemic information and special consideration should be given to their preferences for receiving concise summaries during the response phase in the form of mortality and morbidity statistics, clinical guidelines from health agencies, and authoritative news updates from both national and international sources.

The librarian-initiated information projects delivered H1N1 information via social media to a potentially large community. Regrettably, these altruistic initiatives proved difficult to evaluate, whereas the clear lines of communication between administrator and librarian facilitated direct feedback in the client-initiated cases. Also, librarians providing H1N1 information via social media assumed the work of gathering, organizing, and sharing information

individually and in addition to their professional duties. The client-initiated projects received assistance from library staff to redistribute workloads and allow the time-consuming activity of gathering H1N1 information. Despite having a smaller audience, librarians may anticipate advantages when working in a formal organizational structure: equitably distributed workloads, assistance from colleagues, support from managers, and greater opportunities to adequately evaluate pandemic information services.

Given the urgent need for current information during the response phase of a pandemic, librarians can anticipate using news sources, government websites, and social media to answer information requests. In the case of emerging unknown infectious diseases, a traditional approach to gathering highest-quality evidence must be adapted given the unavailability of clinical trials and research studies. Vigilant monitoring of reputable health information sources will be required, and librarians can expect to gather, select, condense, and deliver information to audiences as soon as it is published.

As the phases of disaster management switch from response to recovery and (eventually) preparedness, audiences for pandemic information will likely change from administrators and health providers to researchers. Early monitoring of scholarly publications through the use of alerting services (email alerts and RSS feeds) will assist librarians in facilitating access to peer-reviewed literature for researchers and groups working to identify potential projects.

To prepare for future pandemics, librarians can familiarize themselves with alerting services and information sources from local health authorities, provincial and state-level emergency management groups, federal disease centers and agencies (CDC and Federal Emergency Management Agency), and international health organizations (WHO, ECDC, and PAHO). Educational opportunities—such as those being developed by the Medical Library Association's Disaster Information Specialization Program <http://www.mlanet.org/education/dis/>—will support librarians as they build capacity to provide pandemic information services. Further, public recognition of professional librarians' skills at managing pandemic information will assist the integration of librarians into formalized pandemic planning, response, and recovery teams.

CONCLUSION

The four cases of H1N1 projects by health librarians analyzed for this qualitative case series informed understanding of pandemic information needs and will support future professional development in disaster medicine. Best practices for librarians providing pandemic information, as identified by the case series, include: formalizing librarian inclusion on institutional disaster management teams, disseminating concise summaries of current and authoritative information to support administrative and clinical decision making, anticipating researcher interest in

scholarly articles on pandemic-related studies, utilizing alerting tools to monitor publications, developing familiarity with information sources from governmental and nongovernmental health agencies and organizations, and formally evaluating provision of pandemic information service.

As with all disasters, pandemic information needs are case-specific, but health librarians may anticipate utilizing professional skills to support administrative decision making in future infectious outbreaks. Integrating library services into organizational disaster plans, instructing and familiarizing librarians on the use of alerting tools and authoritative sources of disaster information, anticipating resource reallocations to allow dedicated service provision, and strategizing assessment methods will all optimize the capacity of health librarians to assist in future pandemic response efforts.

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AUTHORS' AFFILIATIONS

Robin M. Featherstone, MLIS, robin.featherstone@mcgill.ca, Liaison Librarian, Life Sciences Library, Third Floor, McIntyre Medical Building, McGill University, 3655 Promenade Sir William Osler, Montréal, QC H3G 1Y6, Canada; **R. Gabriel Boldt, MScEd, MLIS,** gabriel.boldt@lhsc.on.ca, Clinical Librarian, London Regional Cancer Program, London Health Sciences Centre, Room A4-912, 790 Commissioners Road East, London, ON N6A 4L6, Canada; **Nazi Torabi, MSc, MLIS,** ntorabi@uwo.ca, Research and Instructional Services Librarian, Allyn and Betty Taylor Library, Natural Sciences Centre, University of Western Ontario, Room 60E, London, ON N6A 5B7, Canada; **Shauna-Lee Konrad, MLIS,** shauna.konrad@lhsc.on.ca, Clinical Librarian, Children's Hospital, London Health Sciences Centre, Room B5-122H, 800 Commissioners Road East N6A 5W9, London, ON N6A 4L6, Canada