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ABSTRACT
The factors like demography, economy and technology have greatly influenced the educational landscape. Librarianship is also impacted deeply with the new market trends such as open source concepts, social media, and digitization and knowledge management initiatives. The purpose of this review was to understand how new or recast job roles have changed visible work activities, tasks and responsibilities. Studies have shown that Medical and Health Sciences programs have begun to take initiatives in order to introduce health information literacy skills into the curriculum; therefore, the role of librarians has moved from beyond routine orientation sessions to curriculum-integrated literacy sessions throughout the academic year. Search for Literature was done in LISTA, Academic Search Complete, Medline, Emerald and Scopus. After systematic review of literature, it was concluded that the profession continue to emerge as the practices changed to satisfy the requirements of our clientele.

Keywords: Emerging Roles, Health Sciences Librarians
INTRODUCTION
Libraries in the past operated as repository for knowledge and as guardians of printed volumes of information. The digital culture and the way that information is being consumed in the present era have significantly challenged the role of health sciences librarians. Library professionals have to adapt themselves to the redefined job roles and need to acquire new skills as knowledge creators to provide services that satisfies the new generation. One of the functions of the library has been to guide users to access information and to enable users to identify search tools required for thoughtful enquiry.

The aim of this paper was to do a literature review on new roles and activities for librarians in the discipline of health sciences. The search was categorized over a period from 2004 to 2014. This study shows how this profession has evolved to overcome new market trends and how systematically it has undertook the blended roles to capture a new niche in the current market.

METHODS
Search strategy
A systematic literature search was conducted in September–October 2015 using five databases, namely Academic Search Complete, Medline, Emerald, Scopus, and Library and Information Science Abstracts. The search was limited to those studies published from 2004 to 2014. Initially, the search was conducted on the broad field of health sciences librarianship and then on the second concept, namely roles. The key search terms used are presented in Table 1.

The job titles and roles that were not described in the literature were obtained from the email discussion list of the Medical Library Association (MEDLIB-L). The archive discussion list for job postings in 2013 and 2014 was examined. The job titles identified from the job announcements were again used as search items in order to conduct a search in the databases.

Inclusion and exclusion criteria
Articles were included in the review if they (1) described new roles of health sciences librarians, (2) were published from 2004 to 2014 in the English language, for which full text was available, (3) had adequate information about new roles, and (4) described roles or activities taking place in a library setting.

Articles were excluded from the review if they did not describe (1) new roles of health sciences librarians and (2) subsidiary roles or activities.

RESULTS
Overview
Of the 343 studies retrieved from the databases and 97 from other sources, 62 duplicates were excluded. Of the remaining studies, 280 were excluded after abstract screening and 63 were excluded after full-text screening. Finally, a total of 35 studies met the inclusion criteria. A flow diagram of the article selection process is shown in Figure 1.

I. Roles and activities identified from the literature
The literature discloses a dynamic work environment for health sciences librarians. For example, earlier studies mainly focused on the reference librarian or the acquisition librarian. Many examples of new and emerging roles have been cited in the literature, including both functional and liaison models.1–6 Table 2 lists some of the new roles identified from the literature. Not all articles that described a role(s) or activity were included for review. Additional studies or citations were used in some cases to include the full description of the roles.
1. Research data librarian

The growth of data-intensive research and the move towards protocols for data management have encouraged librarians to develop research data services. The roles of research data librarians are to manage research data, use research data as a resource, and assist researchers with data management activities.\(^3\) Data librarians need to acquire collaborative skills as they have to work in groups. A data librarian needs to be expertise in areas such as copyright, intellectual property, licensing, research privacy, and project management skills.\(^3\)

Work routines of a research data librarian include assisting faculty and students with investigation, evaluation, and supporting researchers with data practices, data processes, technologies, data management, data storage and retrieval strategies including the requirements of funding agencies. Reilly\(^7\) indicated that libraries can provide data management only if they have a close collaboration with researchers. Collaborations have come along with relevant institutional departments, IT services, and institutional and national data centers.

### Table 2. New roles identified from the literature.

<table>
<thead>
<tr>
<th>Activity/role</th>
<th>Citations</th>
</tr>
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<tbody>
<tr>
<td>Research data librarian</td>
<td>7–9</td>
</tr>
<tr>
<td>Research informationist</td>
<td>3,10,11</td>
</tr>
<tr>
<td>Disaster information specialist</td>
<td>12,13</td>
</tr>
<tr>
<td>Data curator</td>
<td>14 – 17</td>
</tr>
<tr>
<td>Emerging technologies librarian</td>
<td>18 – 20</td>
</tr>
<tr>
<td>Systematic review librarian</td>
<td>21 – 24</td>
</tr>
<tr>
<td>Embedded roles:</td>
<td>25,26,27,28</td>
</tr>
<tr>
<td>a. Liaison</td>
<td>25,26</td>
</tr>
<tr>
<td>b. Informationist</td>
<td>27,28</td>
</tr>
<tr>
<td>c. Clinical informationist</td>
<td>29</td>
</tr>
<tr>
<td>d. Bio-informationist</td>
<td>30</td>
</tr>
</tbody>
</table>

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![Flow diagram of the article selection process.](image)
The literature has shown that librarians who work in academic research libraries feel that although they have adequate subject knowledge to help users with research data services, they need the opportunity to upgrade themselves through continuing education. It has also been shown that librarians who are interested in this specialized role can develop it through consultative or hands-on services. Furthermore, it has been indicated that librarians who are eager to learn more about these services can enroll in workshops or professional conferences focused on research data librarianship.33

The amount of enthusiasm about research data management that exists among librarians and information professionals may itself become a driver for change. According to Cox and Pinfield8,34 this will motivate librarians “to implement change in line with current trends in the profession. However, at some point, this positive perception will turn into a negative one when the scale and complexity of the challenge, its implications, and constraints become more apparent. While this is likely to happen, it is also probable that the current powerful drivers for research data management will not change”.

2. Research Informationist

Being a research informationist provides library professionals an opportunity to be efficient members of research teams. The term “informationist” was first coined in the year 2000 to describe a new profession which combines expertise in librarianship and the subject. Federer3 suggests that the Informationist roles are embedded at the venues like hospitals, clinics or research labs where patrons do their research or need access to information and the Informationist are specialized or have academic training in the fields of practice or research their patrons are involved in. Research informationists work alongside the research team from the inception of the research process to provide guidance to manage data and bibliometric analysis, and to assist with compliance to funder policies well into the publication stage.

The Library at the National Institutes of Health (NIH) in Bethesda, MD, USA established an informationist program in 2001. The NIH informationist program was designed to augment the scope of library services. Leadership formalized the services by recruiting librarians with dual knowledge streams and supporting the role in various clinical settings. In some settings, job responsibilities gradually evolved from the traditional roles to a varied range of activities in knowledge management.10 Research informationists now serve in various ways in different organizations. Many of these roles are embedded in different healthcare settings which include clinical, biomedical and public health.11

3. Disaster information specialist

Featherstone12 described “the role of a disaster information (DI) specialist as to continue beyond preserving collections and ensuring the continuity of library operations following a flood or other natural disaster.” The DI specialist is a community outreach role where information services is provided to emergency managers and members of disaster management teams. This new role of medical librarians and DI specialists has been pioneered and is being evaluated. The DI specialist acts as an information advisor for locating, accessing, organizing, and managing disaster health information. The National Library of Medicine (NLM) implemented a special program to promote the role of the DI specialist in providing disaster-related information.13 The DI specialization provides training to librarians and other interested professionals in order to support their institutions and communities throughout the disaster or emergency cycle.

4. Data curator

The role of a Data Curator is to actively manage data throughout its life cycles to be used in research, science, scholarship, and other educational activities across disciplines.14 It has been stated that “data is the new oil” of the information-rich world. Data curation includes data representation, data archiving, data authentication, data management & preservation, data retrieval and use. Although the responsibility of data curation rests on a number of professional roles within the library, it is now being associated with specific job roles such as data curator or data curation specialist. Data curation requires different skills from that of a librarian. Curation of the data is now included within the libraries’ mission and only libraries have the capacity to curate the different data types.15

Data curation is one of the emerging roles for librarians; which has more unresolved issues than resolved ones. An effective & best practice for managing research data remains still a learning process for librarians and researchers.16 The hybrid role of data curator requires the skills of a researcher,
librarian, early technology adopter and policy maker. There is no existing training programs, neither information science curricula nor extra-academic certification programs to prepare librarians to perform the role. Kouper\(^\text{17}\) in his review discuss about the Data Curation Fellowship Program which was created by CLIR as an attempt to bridge the gap and to increase awareness of the significance of the work of such hybrid professionals. The two-year postdoctoral fellowship help interested information professionals to acquire the diverse skills required to become a professional data curator.

5. Emerging technologies librarian
A new role that is actively advertised as follows: libraries strive to avail new technologies to upgrade service models in various service departments and to satisfy patron’s point of preference needs. Emerging technologies librarians fill different roles depending on the need of the library.\(^\text{18}\) The librarian focuses on the methods that can be used by libraries to provide services and information with new technologies.\(^\text{19}\) Their main responsibilities include trend spotting and implementation, website management, reference activities, technology assessment and evaluation, social media, web 2.0 outreach, systems, and electronic resource management. Furthermore, they use their skills to design, develop, and manage library website and integrate web applications, social media, and mobile technologies. A good example of this role was reported in a case study conducted at the Mayo Clinic, showing that librarians develop customized courses for library staff, health sciences faculty, and nurse educators using web 2.0, social media tools such as blogs, RSS, wikis, and other networking tools.\(^\text{20}\)

6. Systematic review librarian
The Institute of Medicine in 2011 released guidelines for researchers who were interested in conducting systematic reviews. When conducting comprehensive systematic searches for evidence, standard 3.1.1 states that “work with a librarian or other information specialist trained in performing systematic reviews to plan the search strategy” and standard 3.1.3 states that “use an independent librarian or other information specialist to peer review the search strategy”.\(^\text{35}\) A team of information professionals at the Centre for Health Information Management Research at the University of Sheffield conducted a systematic review and identified 10 librarians’ roles that supported systematic reviews, such as project leader, project manager, literature searcher, reference manager, document supplier, critical appraiser, data extractor, and data synthesizer.\(^\text{24}\)

The knowledge and expertise of a librarian is contributed to develop a treatment intervention or a practice guideline when they are involved in systematic review process or evidence based research.\(^\text{21}\) Dudden and Protzko\(^\text{22}\) reviewed “the contributions of librarians to systematic reviews, including communicating methods of the review process, collaboratively formulating the research question and exclusion criteria, formulating the search strategy on a variety of databases, documenting the searches, record keeping, and writing the search methodology.”

Recently, the future Knowledge Centre at the Augustus C. Long, Health Sciences Library announced the senior informationist, systematic review position.\(^\text{36}\) The role of this position is to (1) “lead and shape innovative information management programs with emphasis on retrieval, organization, and filtering information associated with research, patient care, teaching, and learning” and (2) expand the current role of consulting and instruction to a multi-faceted systematic review advisory service.

7. Embedded roles
Embedded roles takes the librarian out of the traditional library setting and places him/her in an “on-site” setting or situation where the librarian coordinate & collaborate with researchers more closely. This model enables the librarian to move from a supporting role in the partnerships with their clientele to a strong connecting role with stakeholders.\(^\text{37}\) In the research context, embedded librarianship is still an emerging model. Efforts are being made to define the criteria for success and the different pathways to engage. Embedded librarianship paves the way to reveal the potentials of a librarian beyond traditional library functions to satisfy the increasing demand.\(^\text{19}\) The most prominent embedded type introduced in 1991 is the liaison role that continues to emerge with new responsibilities.\(^\text{25,39}\) The next prominent role is the informationist.

A. Informationist role: informationist is best known as a medical health sciences librarian, who also has a subject-specific background in a biomedical discipline that serves as part of a clinical or
The informationist role can include searching for literature, building information literature through teaching, providing data management services, and assisting in the overall research process. This new role also includes answering clinical questions by reading the full text of important peer-reviewed articles, identifying and extracting relevant information, writing synopses of findings, and sharing the synopses or results with users.27 “An embedded informationist is more likely to achieve credibility, acceptance, and sustainability than an impersonal information service provided at a distance.”28 Recently, the NLM has supported the role of the informationist by providing grant opportunities to health sciences librarians who may be suited for this particular role.40

Informationist specialists started their position as clinical informationist, as reported previously,29 and their new roles include bio-informationists30, public health information specialists, and DI specialists.12,13

II. Roles and activities identified from job announcements

Job announcements on the MEDLIB-L during the period 2012 – 2014 were reviewed to identify new roles and activities that were not identified in the literature (Table 3). We identified five roles for which no published literature were found.

Table 3. New roles identified from job announcements during 2012 – 2014.

<table>
<thead>
<tr>
<th>Role</th>
<th>Institution/year of announcement</th>
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<tbody>
<tr>
<td>Metadata and digitization</td>
<td>LSU Health Shreveport/2013</td>
</tr>
<tr>
<td>Instructional design librarian</td>
<td>University of Vermont/2014</td>
</tr>
<tr>
<td>Innovation librarian</td>
<td>University of Utah/2014</td>
</tr>
<tr>
<td>Online education and outreach librarian</td>
<td>Loyola University Chicago/2014</td>
</tr>
<tr>
<td>Patient-centered care librarian</td>
<td>University of Utah/2014</td>
</tr>
</tbody>
</table>

1. Metadata and digitization

The main responsibilities of this role include knowledge of classification systems, subject thesaurus, and cataloging rules for electronic and print resources. In addition to establishing policies and procedures, the librarian is responsible for other roles such as digital initiatives and development and maintenance of the archives and historical collections. This position was posted six times from November 2013 to August 2014 by the same employer.

2. Instructional design librarian

Instructional design librarian is a new emerging position that share the responsibility of an academic librarian, an instructional designer and an instructional technologist.41

This job posting appeared on the MEDLIB-L in September 2014. Its main responsibilities include creating innovative and effective approaches to strengthen the skills of library faculty in order to design curriculum, tools, and learning experiences that enhance critical thinking and information literacy skills. In addition, other responsibilities include application of learning theory, pedagogical methods, and learning outcome assessment. This position was posted four times in 2014, with a total posting of 11 during 2004 – 2014.

3. Innovation librarian

The main responsibility of the innovation librarian is to support student faculty and staff working on medical gaming, innovation, and medical entrepreneurism. In addition, the librarian shares the responsibility of planning events for innovation and gaming. Promoting the library’s value through social media is yet another responsibility. This position was posted in July 2014.

4. Online education and outreach librarian

The position of online education and outreach librarian supports the design, development, teaching, and assessment of online and onsite curriculum by applying learning theories to instructional design. The other responsibilities include knowledge of web design, proficiency in instructional technology, developing online tutorials and other learning objects with Adobe Creative Suite, Audacity, and
Camtasia. This position was posted three times in March and May 2014 on the MEDLIB-L by the same employer.

5. Patient-centered care librarian
Organizing and maintaining patient education materials is the primary responsibility of a patient-centered librarian. The librarian works with hospital and patient education staff. Another major responsibility is Health literacy education and outreach. This position was posted in August 2014.

III. Embedded responsibilities of existing roles
1. Distance support librarian
Distance education is a developing global industry in today’s world. The roles and responsibilities of libraries and librarians have changed with the growth of online education. Groeling and Boyd indicated that in academic libraries, it is not only the type of available resources that is changing, but also the role of the librarian. Nearly 20 years ago, the work of a librarian was generally centered on a specific task (e.g., cataloging, reference, circulation). The ACRL's “Standards for Distance Learning Library Services” made it necessary to formalize the function, roles, and duties of academic librarians who support distance education students, which led to the creation of the job title distance education librarian.

2. Biomedical and translational research librarian
The quality of healthcare depends fundamentally on the achievements of biomedical research. Translational research involves the application of findings from basic sciences to improve human health and well-being. In a medical research context, translational research aims to “translate” findings from basic science research into medical and nursing practice to influence significant health outcomes. “Translational research implements a “bench-to-bedside”, from laboratory experiments through clinical trials to point-of-care patient applications and harnessing knowledge from basic sciences in order to produce new drugs, devices, and therapy for patients.” The responsibility of the translational research librarian is to develop educational and research-related aids for researchers in specialized areas such as Biomedical Engineering, Bioinformatics, Neurobiology, Cancer, Molecular Medicine, Cardiology, and Medical Translational Sciences. In addition, the librarian has the responsibility of providing research support through consultation, training, current awareness, and service development. Specific examples of librarians working in Biomedical and Translational Research can be found at Stony Brook University and the Washington University School of Medicine.

3. Medical literature analyst
Medical literature analysts are medical librarians responsible for identifying appropriate sources of medical research, industry news, and competitive intelligence. This position can be found at the AIM Specialty Health Centre. Its main responsibilities involve aggregating and publishing information to internal stakeholders via tailored-made knowledge products. Other responsibilities include management of data and information, conducting accurate and timely in-depth literature search, and conducting service evaluation and process improvement for guideline development.

4. Consumer health librarian
The responsibility of the consumer health librarian is to enable patients, families, caregivers, and the general public to find current, reliable, and accessible health information. Consumer health librarians can be instrumental in helping patients and their families to navigate the maze of medical decision-making through ethical reference transactions, enabling these consumers to become active participants in their own medical care. Consumer health services extend their scope to reach out to the community. Skills and knowledge need to be developed to make the librarian aware of the current trends in consumer health. The Medical Library Association offers a Consumer Health Information Specialization to assist librarians to keep their knowledge up-to-date with by providing access to new ideas and resources in the field. The National Network of Libraries of Medicine offers free training opportunities on consumer health.
5. Instruction librarian

The librarian’s role as a teacher is not a new one. Librarians have always been a part of the curriculum. They consider collaboration to be a critical component for the successful implementation and delivery of information literacy programs. Librarians teach or co-teach full courses, and conduct single lectures, workshops, and trainings. Moreover, librarians teach users how to use library catalog for electronic and print resources in order to access relevant information. They also teach non-library services such as reference managers. Eldredge described the tutor role as a non-traditional one. This role provides a profound understanding of the curriculum, as it relates to library and informatics services, earns respect from non-librarians, and prompts one to rethink the integrated model of instruction.

Medical Library Association brochures on “Deciphering Medspeak” that include plain language are ideal for assisting new clinicians to talk to patients without resorting to medical jargons. Some brochures focus on specific diseases while others translates the frequently used abbreviations on prescriptions. A special issue of the Journal of the Medical Library Association on instruction in health sciences libraries has stated that librarians teach credit courses in medical schools. This involves going beyond library instruction and becoming more embedded.

DISCUSSION

The finding from this literature review based on the analysis of published articles during 2004–2014 is that new roles have emerged for health sciences librarians. The review of the published literature and job announcements indicated 16 new roles or activities; of which, seven were identified each from the literature and job announcements and five were major additions to the existing roles. This list is in no wise conclusive as the roles continue to evolve with demand and user needs.

There is insufficient documentation in the literature regarding the details of each of these roles. The emerging roles are displacing traditional medical librarianship as librarianship becomes evolutionary to accommodate changing demands of users. Some studies have described new activities; however, evidence of these activities cannot be found in job advertisements.

Many of the roles discussed in the literature require collaboration with clinicians, researchers, and faculty. The roles provide opportunities to function as true partners rather than as assistants or support staff.

Several studies have highlighted the importance of information literacy and health information literacy, which has helped to bring health sciences librarians to the forefront. It is evident from the literature that librarians not only continue to engage themselves in routine orientations and training sessions, but also contribute to teaching information literacy in most medical programs. Research support is yet another area of strength. Bioinformatics and interdisciplinary research are identified as key areas of integration for health sciences librarians who are interested in research. Librarians possess skills including analysis, research, needs assessment, and objective data gathering that can help alleviate the challenges faced by researchers.

Librarians seem adept at exploring new and exciting ways to support the clientele. Although traditional services should continue, librarians add value to the core services by embracing these new and emerging roles.

LIMITATIONS

The limitations of the study are as follows. First, the study included the roles and activities of health sciences libraries and librarians from studies published only during the period 2004–2014. Second, published literature and job announcements on the MEDLIB-L alone were used as sources to identify the roles and activities of health sciences librarians. Third, the study did not use any unpublished data. Lastly, the review was limited to studies published in English.

CONCLUSION

As active collaborators, instead of fading into obscurity, librarians have learned new skills, explored new frontiers, and shifted from library spaces to become hybrid professionals. Among the many new roles identified, six were selected: five from job announcements and five from embedded responsibilities of existing roles. The roles of health sciences librarians continue to emerge as our practices change to support the needs of the clientele. However, two years of postgraduate education
is not enough for librarians to undertake the emerging roles. Graduates with health sciences degrees and experience would benefit by enrolling into a library sciences program, or librarians can pursue additional subject-related continuing education courses to acquire the necessary skills.

According to Brodman, “the fundamental role of the medical librarian has not changed in the half-century we are examining. The medical librarian has always been, and continues to be, the mediator between the physician and the medical literature. What has changed over the years, however, is the emphasis placed on one or another phase of this mediation, and, to some extent, the concept of how each phase should be carried out.”

REFERENCES


