
38th GABRIEL A. BERNARDO MEMORIAL LECTURE SERIES

**THE LIBRARIAN RELOADED: EVOLVING ROLES
IN HEALTH INFORMATICS**

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Introduction

I would like to thank the UP School of Library and Information Studies for the honor of speaking today in remembrance of Prof. Gabriel A. Bernardo, the doyen of Philippine librarianship. He died more than a decade before I was born and perhaps the only affinity to him that I can claim is that I have always loved books and libraries. I believe now is the only occasion out of all the other times I have delivered lectures that when asked for a short biography, I included President, Junior Librarians Club, Siena College Grade School.

While preparing for this lecture, I had an interesting Facebook conversation with Dr. Cito Maramba, one of my professors when I took graduate studies in health informatics. He recalled how as a research assistant in 1994 at in a project funded by the FRG-GTZ at the College of Public Health, he helped establish the first local area network (LAN) in UP Manila to make the MEDLINE-CDROM library available for searching within the college. PUBMED started in 1997 which made use of LAN for this purpose unnecessary. But when UP Manila got its internet connection, this LAN became the backbone for email and internet access. So Dr. Maramba told me, you can say that my informatics career started because of a health sciences library.

Mr. Eric Pareja who worked with Dr. Maramba recalls that then University Librarian Ms. Rosvida R. Rosal, was also the medical librarian. She was instrumental in getting UP Manila connected to the fledgling Philippine Internet by helping convince Dr. Perla Santos-Ocampo, UP Manila Chancellor, to get UP Manila on board. The UP Manila Library became part of the DOST-ESEP Library network (David, 1996).

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My mentor in health informatics Dr. Alvin Marcelo, delivered the Gabriel A. Bernardo memorial lecture fifteen years ago in 2002. Ten years later in 2012, I succeeded him as Chief of the UP Medical Informatics Unit. From him I learned the interdisciplinary nature of health informatics and how many other disciplines contribute to this relatively new field.

There are several multifaceted definitions that capture the interdisciplinary essence of health informatics. This one from Fenton and Biedermann (2014) clearly establishes the link between health informatics and information science: “A field of information science concerned with the management of all aspects of health data and information through the application of computers and computer technology.”

Certainly, the practice of medicine is information-intensive. In medical school, much time is spent in learning to take a good history from the patient. William Osler, the Father of Modern Medicine has said, “Listen to your patient, he is telling you the diagnosis.”

Getting a good history is vital as the doctor weaves the data gathered into a presumptive diagnosis. When the history is inaccurate or incomplete, to borrow a phrase from computer science - garbage in, garbage out. Dr. Michael DeBakey a pioneer cardiovascular surgeon, phrased it more elegantly when he said, “Good information is the best medicine.”

Wrong information spawns medical errors, such as the wrong medicine given to the right patient, the wrong dose of the right medicine, the right medicine given to the wrong patient or the wrong body part of the right patient operated on. In the Institute of Medicine report *To Err is Human: Building a Safer Health System*, Kohn, Corrigan and Donaldson (2000) estimate that at least 44,000 people and perhaps as many as 98,000 people, die in hospitals each year as a result of medical errors that could have been prevented. Preventable medical errors in hospitals exceed attributable deaths to such feared threats as motor-vehicle wrecks, breast cancer, and AIDS (Kohn, Corrigan & Donaldson, 2000).

The Institute of Medicine report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, recognized the potential of information technology to redesign the healthcare system and make it safer. According to the report, “Central to many information technology applications is the automation of patient-specific clinical information” (Committee on Quality Health Care in America, 2001, p. 16). Such information typically is dispersed in a collection of paper records, which often are poorly organized, illegible, and not easy to retrieve, making it nearly impossible to manage various illnesses, especially chronic conditions, that require frequent monitoring and ongoing patient support (Committee on Quality Health Care in America, 2001).

If health informatics were to be defined very simply, then it would be about getting the right information to the right person at the right time. And since I am at the UP School of Library and

INFORMATION studies, I believe I've come to the right place to seek an alliance.

My lecture is divided into three parts. First, I examine the convergence of biomedical informatics and library and information science. Secondly, I discuss the evolving roles of the health sciences librarian in health informatics. And lastly, I will discuss the current state of the field of health informatics in the Philippines and offer examples for potential collaboration.

Biomedical Informatics and Library and Information Science

The American Medical Informatics Association defines *biomedical informatics* as “the interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving, and decision making, driven by efforts to improve human health” (Kulikowski et al., 2012, p. 933).

Biomedical informatics is the core scientific discipline and under it are bioinformatics and structural (imaging) informatics, health informatics (composed of clinical informatics and public health informatics) and informatics in the translational science (see Figure 1) (Kulikowski et al., 2012).

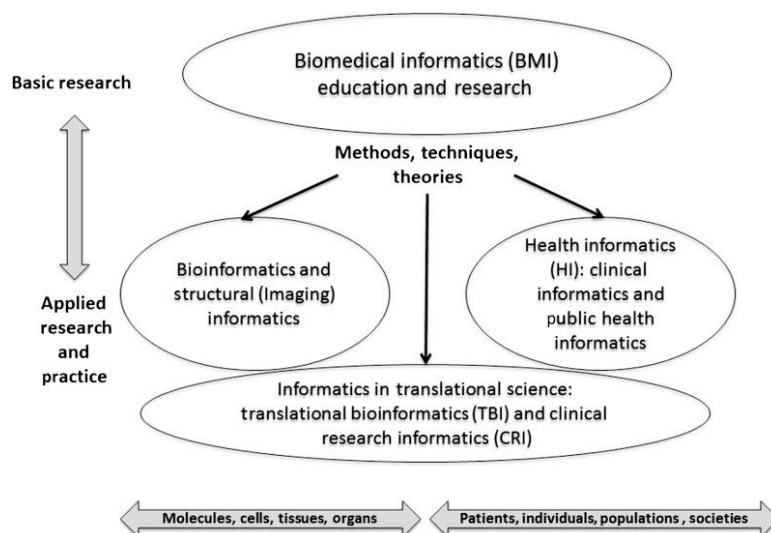


Figure 1. Biomedical informatics and its areas of application and practice (Kulikowski et al., 2012).

Kulikowski et al. (2012) recognized information science (see Figure 2) as one of the disciplines closely allied with biomedical informatics. According to them, “... it is fair to say that the most influential application of BMI methods has been in the library or information sciences, where the

MEDLINE (and PubMed) systems for biomedical literature indexing and retrieval have revolutionized the science of biomedicine ...” (p. 937).

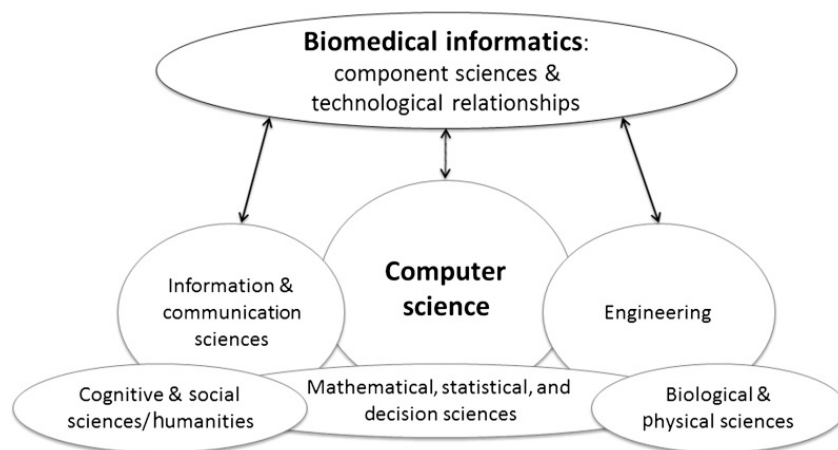


Figure 2. Component sciences and disciplines upon which biomedical informatics depends and to which it contributes (Kulikowski et al., 2012).

Perry, Roderer and Assar (2005) have noted the expansion of the biomedical informatics domain, overlapping with the already established domains of library and information science. Murphy (2010) observes that though librarians were recognized as professionals in the late 19th century, the medical library dates as far back as 2000 B.C. and that “it was librarians who initially dealt with the challenge of information explosion” (p. 75). Furthermore, Murphy (2010) enumerates the legacy of health science librarianship to health informatics in the following areas:

1. Medical librarianship included clinical records administration at the start of the 20th century.
2. Health science librarians led the first user studies on information needs and information-seeking behavior.
3. By providing information to the healthcare team and improving their library skills, health science librarians helped advance evidence-based medicine.
4. Health science librarians initiated training courses in information retrieval, critical appraisal and systematic reviews, making a significant contribution to the health informatics curriculum such as at the National Library of Medicine.

King and MacDonald (2004) opine that as a librarian’s information skills are not technology dependent and therefore enduring, then, “The ‘heart’ of informatics training is the librarian” (p. 213).

Cleveland and Cleveland (2009) agree as they wrote in the introduction of their book, *Health*

Informatics for Medical Librarians, that medical librarians are positioned by both training and professional mission to be an integral part of the health informatics environment.

UP Manila first offered the Master of Science in Health Informatics (MSHI) program in 2005. It is a two-track program jointly administered by the College of Medicine and the College of Arts and Sciences. The two tracks are medical informatics which accepts students with a medical or paramedical background and bioinformatics which admits students with a background in either computer science or biochemistry. Because of these admission requirements, the program produces hybrid professionals. Sadly, the current program does not accept those with a background in library and information studies.

With the Sheffield model (Figure 3), Corrall (2010) presents an interesting case study for educating the academic librarian as a blended professional.

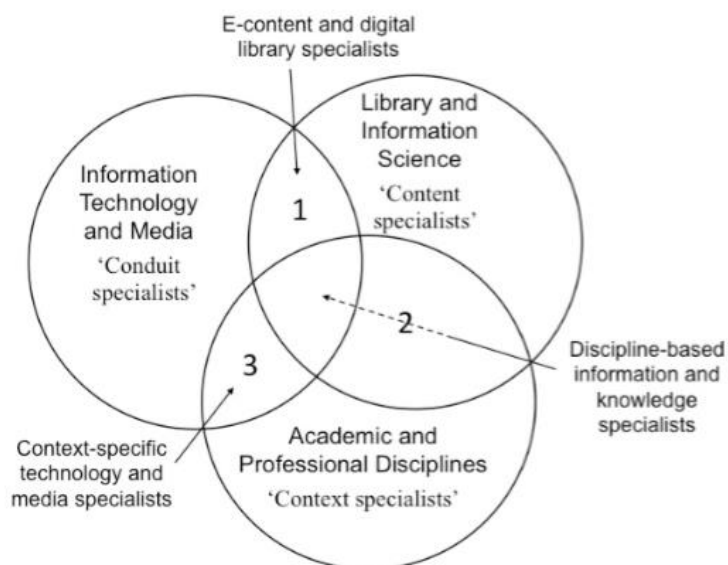


Figure 3. The Sheffield model of blended information professionals.

Using this model, the MSHI medical informatics graduate is a hybrid of context and conduit and is therefore a healthcare technology and media specialist. Following that line of reasoning, a librarian who takes health informatics training becomes a discipline-based information and knowledge specialist. Such an individual is a master of all three: conduit, content and context. A geographic information systems specialist is another example of such an individual (Corrall, 2010).

Evolving Roles of the Health Sciences Librarian in Health Informatics

“I believe that I am a medical librarian, an information specialist, a health information specialist, and perhaps in some cases, a biomedical information specialist. At any rate, no matter what the world calls me, my domain is information. In everything that I do, I work from that premise.”

- Ana D. Cleveland (2011, p. 63)

In this second part, I review the literature to look for examples of roles that librarians can play in an increasingly digital healthcare environment. By enumerating these not necessarily new, but evolving roles, I hope to inspire more librarians to embrace their potential.

Big Data Manager

Big data exhibit three V's: Volume, Variety and Velocity. According to Peters and Buntrock (2014):

In health care, volume can be massive both in the number of data artifacts (eg, clinical documents) and in terms of the size of a particular artifact (eg, the whole genome of a patient). Velocity refers to the rate of change of data, often connected with analysis of streaming information, typically in real-time (eg, bedside monitoring). Variety suggests the complexity of diverse data sources (eg, video, wireless remote monitor, digital genomic information). (p. 207)

Big data should be of great interest to librarians, as Murdoch and Detsky (2013) believe that analysis of big data from electronic medical records can “greatly expand the capacity to generate new knowledge” (p. 1351) and “help with knowledge dissemination” (p. 1351). In addition, according to Bieraugel (n.d.), “Librarians also need to embrace a role in making big datasets more useful, visible and accessible by creating taxonomies, designing metadata schemes, and systematizing retrieval methods” (para. 5).

Corbett, Deardorff, and Kovar-Gough (2014) agree that electronic medical records provide an opportunity for librarians to educate researchers about the data life cycle, “from inception to management, curation, preservation, and sharing” (p. 57). Librarians are uniquely suited to guide users in collection development and preservation of data sets (Hoy, 2014). With institutional support, librarians may even be able to provide the technical infrastructure to support data management and curation (Corbett, Deardorff & Kovar-Gough, 2014).

Research Data Manager

Librarians can assist researchers in complying with data retention guidelines of the funding agency (Hoy, 2014). Librarians can work with researchers in creating metadata to aid in searching

archived data sets (Brandt, as cited in Kesselman & Watstein, 2009). If data sets are preserved in this way, not only can the validity of the findings be tested but also, new analyses can be done (Surkis & Read, 2015).

Literature Search Expert

Medical schools teach evidence-based medicine so most physicians know how to do literature search. Or at least, they think they do. According to Dudden and Protzko (2011):

Most biomedical searchers do not have time for this kind of analysis nor do they tend to read the scope notes on a subject heading to see how it is to be used or when it was introduced. ... Many nonlibrarian searchers are impatient and want to find information fast. They are more intent on finding than on searching. (p. 304)

An interesting paper by Whipple, McGowan, Dixon, and Zafar (2009) showed that when comparing searches for high-impact health informatics literature by a librarian vs. content experts, the librarian found articles with a greater number of citations. Content experts selected more current articles. The authors conclude that the best practice would be a collaboration between the librarian and content expert.

McGowan et al. (2009) described a rapid evidence-based service where librarians provide information to answer primary care clinical questions in less than 20 minutes, via a web-based platform that supports both handheld devices and laptops with web access. This was called the “Just-in-Time Information” Librarian Consultation Service. The service was well-received by the clinicians. Challenges identified by the librarians included “new or unfamiliar medical jargon and questions that could not be efficiently or effectively answered” (p. 19). The authors also suggest keeping a database of questions asked and answers given.

Electronic Health Record Implementer

“Although we should always expect a medical record to be populated with data about a specific patient, in the electronic implementation of records we also expect to find data regarding populations of patients, integrated access to the biomedical literature, and interactive environments for offering clinical guidelines or frank consultative advice.”

- Blois and Shortliffe (1990)

There are several ways that librarians can be involved in the implementation of electronic health records.

Albert (2008) notes that librarians had traditionally served the clinician’s information needs

even prior to the electronic health record via LATCH (Literature Attached to the Chart). Much of the clinical librarian's time is spent researching and retrieving articles to send to hospital staff. Bushhausen (2013) thinks that this information can be delivered directly via the electronic health record software and suggests that the librarian work closely with the IT department.

Recently it has become possible to create infobuttons, which are defined as "clinical decision support tools that use information about the clinical context in which an information need arises to provide direct access to relevant information from knowledge resources" (Cimino, Jing, & Del Fiol, 2012, p. 112). Librarians are greatly involved in this process (Cimino et al., 2013) as it is their job to determine the clinical task mapped to a particular EHR function where the need for information is likely to occur and to then supply a resource that matches the need. Garrity (2010) wisely observes that with all the activities at the bedside, physicians do not have the leisure of time to do literature searches at the point of care and may not even click an infobutton. He asks instead, "How can evidence be logically integrated into the EHR so it is part of the treatment-and-care process?" (p. 210).

Jones, Shipman, Plaut, and Selden (2010) suggest including an information statement in the electronic medical record, to provide patients with access to reliable health websites while admitted and after discharge. They can discuss these resources with their healthcare team.

Physicians can directly enter medical orders in the electronic health record via the computerized provider order entry (CPOE) application, replacing the need to write orders by hand or giving orders verbally or by phone ("Computerized Provider Order Entry," n.d.). Brandes, Wells, and Bandy (2013) has documented how librarians using their information skills, provided evidence to support development of order sets in a hospital setting. Librarians can also build a knowledge management system to track approvals and changes for all order sets (Miles, 2015).

Medical students need guidance on using the electronic health record when transitioning from pre-clinical years to clinical rotations. Gomes, Linton, and Abate (2013) has described the development of an electronic health record module where health sciences librarians provided invaluable support.

Informatics Educator

"Librarians regularly utilize skills that, although not technology dependent, are essential to conducting computer-based research. ... The teaching of medical informatics, an intersection of technology and knowledge, is also most relevant when it transcends the operation of databases and systems. Librarians can teach students to understand, research, and utilize information beyond specific technologies."

- King and MacDonald (2004, p. 209)

Health informatics is a fast-changing field. The librarian can provide the following information-

related services (Shumaker & Tyler, as cited in Kesselman & Watstein, 2009): current news alerting, capturing group knowledge and lessons learned in a project team and maintaining a virtual collaborative workspace by organizing useful information.

There are several ways in which librarians are involved in learning management systems used for distance learning: threaded discussions, creation of tip sheets and online tutorials, and an “ask a librarian” link for support (Stewart, as cited in Kesselman & Watstein, 2009).

A librarian was on the teaching team of an online graduate level health informatics course on research methodology, providing the following services (Kumar et al, 2014): providing training on locating, retrieving, and evaluating information for course assignments and/or research projects; providing help with using information management tools such as EndNote; answering questions related to using APA style for course papers; providing research assistance for course assignments; and linking library resources to support students learning by creating instructional materials in the format of screencasts, videos, or PowerPoint presentations. The librarian’s involvement in the course was well-received by both faculty and students.

Content Manager

Tan and Maggio (2013) surveyed librarians in the United States and Canada who served as content managers in various ways. These include maintaining and updating information in an online clinical care tool for the healthcare team; and using blogs, Twitter, Tumblr, intranets, etc. to share results of literature searches.

Patient Advocate

As early as 1996, librarians were at work to provide consumer health information to patients via a dial-up network server and a toll-free telephone number (Martin & Lanier, 1996). Nowadays, we have the internet and patients are looking for health information online on their own. Some hospitals have patient portals where they can access their lab results or medical records. Tarver et al (2013) describe the librarian’s role in linking patients to their personal health data and contextual information. In the MyChart portal, a search box for MedlinePlus and links to MedlinePlus Connect were made available.

Health Informatics in the Philippines and Opportunities for Collaboration

The Philippines has a national eHealth vision (Department of Health, 2014):

By 2020, eHealth will enable widespread access to health care services, health information and securely share and exchange patient information in support of safer, quality health care, more equitable and responsive health system for all the Filipino people by transforming the way information is used to plan, manage, deliver and monitor health services. (p. 9)

Central to this vision is the establishment of the Philippine Health Information Exchange, which is “a platform for secure electronic access and efficient exchange of health data and/or information among health facilities, health care providers, health information organizations, and government agencies in accordance with set national standards in the interest of public health” (“Overview,” n.d. para. 3).

As the Department of Health and Department of Science and Technology work towards IT-enabled health services, UP Manila leads the way in capacity-building.

The Medical Informatics Unit was established in the UP College of Medicine in 1997. In 2004, the MS Health Informatics program was approved. The first batch of students was accepted in 2005. I was in that first batch and I was also the first graduate of the medical informatics track. According to Fernandez-Marcelo et al. (2012):

The program offers a unique approach to learning health informatics by putting emphasis on community-based and community-managed health information systems that are appropriate for resource constrained environments. It is also unique for its heavy adoption of the principles of primary health care in its curriculum design and implementation. (p. 147)

GIS Librarian

When I discussed the Sheffield model earlier, I mentioned that a geographic information system specialist is a discipline-based information and knowledge specialist. What’s a geographic information system (GIS)? It is defined as “a computer system for capturing, storing, checking and displaying data related to positions on Earth’s surface” (“GIS (geographic information system)”, n.d.)

Geographic information systems began in 1854 when British physician John Snow mapped cholera cases on the map of London. He found that the cases clustered along the water line (“Mapping the 1854 London cholera outbreak,” n.d.).

The Department of Health has ongoing GIS projects like the Philippine Health Atlas (accessible via <http://www.maps.doh.gov.ph>). Health facilities have already been mapped on this atlas. It is possible to start adding layers of information onto this map and do GIS analyses. According to Calogeras (2011), a good GIS librarian is needed in nearly all steps of such an analysis, as he/she “facilitates the acquisition of data via appropriate resources, assists with data organization, manipulation, project planning and implementation, and presentation within GIS software.”

Just-In-Time Librarian Consultation Service

“The disappointing reality, however, is that physicians still don’t regularly search the medical literature themselves, nor do they ask for professional help in searching nearly as often as they need to.”
- Davidoff and Florance (2000, p. 996)

There are several ways that the Just-In-Time Librarian Consultation Service described by McGowan et al. (2009) can be tweaked in our local setting.

I was involved in a research project called Email2MEDLINE (Gavino et al., 2012) where rural health physicians could email a query and expect to receive the results of a MEDLINE search. Only 70% or 21 of 33 doctors used the service in a two-month period, sending 83 unique queries. About half of the queries were on therapy. Limited access to the internet was the main reason for not using the service. Maybe we can try to solve this problem of bringing library services to our rural health physicians, but this time with librarians on the team.

In yet another research, our goal was to discover how resident trainees in the Philippine General Hospital would use an iPad at bedside rounds (Marcelo et al., 2012). Nearly half of the queries were about diagnosis. While the residents appreciated the convenience and mobility afforded by the iPads, slow internet speed and fear of losing the iPad were considered barriers to their use at bedside. Again, perhaps it is time to revisit the problem of access to evidence at the point of care with the help of librarians.

Perhaps closer to library science was a study (Marcelo et al., 2013) we did which sought to determine if there are differences in the accuracy of responses to simulated cases between resident physicians provided with an abstract only and those with full-text articles. The accuracy of decisions improved after the provision of evidence, whether in abstract form or full-text.

All these researches were in collaboration with Dr. Paul Fontelo of the National Library of Medicine in Bethesda, Maryland, USA. Perhaps now I needn’t look too far and seek a collaboration with the UP School of Library and Information Studies.

Informatics Education

Perhaps it is time to involve librarians in the MS Health Informatics program, either in teaching data literacy or literature search strategies in research methods. Or we can work on developing short courses on health informatics specifically for librarians who have interest in the field.

Patient Advocate

I have a Facebook page called Dok Bru where I post health information about common endocrine diseases like diabetes and goiter. Anyone can also post queries. Though this is not an online

consultation, I am able to answer queries in general terms. One problem I've encountered is sometimes there are too many comments and I find it hard to prioritize which ones I should read first. One of my informatics graduate students tried to run a sentiment analysis using R programming software. It proved difficult since the comments were not limited to English but were also in Filipino, Bisaya. There were colloquial expressions and abbreviated words typical of "text speak." I am wondering if librarians can help me by way of developing an ontology-based approach to data mining.

Epilogue

"As medical librarians, we know the path to knowledge and wisdom is not always a quick Google search, although the powerful search engine will definitely help in the journey to the truth."
- Homan (2010, p. 50)

I say, thank God for librarians! Thank you for the privilege of addressing you today. I learned so much in preparing for this lecture. For a kid who was once the President of the Junior Librarians Club in grade school, this is an amazing opportunity to revisit my love of books and libraries. I look forward to future collaborations.

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