REVIEW

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Health information literacy and health informatics: imperatives for medical librarians and healthcare practitioners

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ABSTRACT

Health informatics, also known as healthcare informatics or biomedical informatics, is a multidisciplinary field that focuses on the scientific study and practice of managing health data. In this paper authors have conceptualized health information literacy and health informatics. Discourses include: the role of medical libraries and medical librarians, Electronic Health Systems including Health Information Systems, Electronic Medical Record (EMR). Also, Medical Data Management, its benefits and challenges were also highlighted. Health information literature is also reviewed. The authors concluded by reiterating the importance of health information literacy, health informatics and its technological applications and the need for librarians and medical practitioners in the healthcare environments to acquire the requisite knowledge, skills and technologies that could enhance health information services delivery on the part of the librarians and healthcare services delivery on the part of the health practitioners.

Keywords: Health information literacy, health informatics, medical librarians, healthcare practitioners, medical data management, health information literature

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Introduction

The term information literacy connotes the ability to search and use information effectively. This is a very broad meaning of information literacy. Many experts have explained the meaning of information literacy in various ways. Information literacy enables people to identify the value of information and use it to make knowledgeable choices in their personal, professional and academic lives. The United Nations Educational, Scientific and Cultural Organization UNESCO, (2013), defined information literacy as "a set of competencies that empowers citizens to access, retrieve, understand, evaluate and use, to create as well as share information and media content in all formats, using various tools, in a critical, ethical and effective way, in order to participate and engage in personal, professional and societal activities". Again, the Chartered Institute of Library and Information Professional (CILIP) 2012 notes that "information literacy is the ability to access, evaluate, organize and use information in order to learn, problem solve, make decisions – formal and informal learning contexts at work, at home and in educational settings. Information literacy is knowing when and why you need information, where to find it, how to evaluate, use and communicate it in an ethical manner."

Health is no longer the sole responsibility of Doctors, Nurses and other medical personnel, but now also the responsibility of individuals, households, communities, governments and librarians including multinational agencies. The medical librarian is the custodian of knowledge regarding healthy living. He or she is cable affecting the health living standard of the people through health informatics. Consequently, when people understand the context of health into the different

approaches/health strategies, they are bound to make better decisions for themselves and others.

Health literacy is defined by the institute of medicine as the degree to which individuals have capacity to obtain process and understand basic health information and services needed to make appropriate health decisions. The Medical Library Association (2003) in the United States defines health information literacy as the "set of abilities needed to recognize a health need, identify likely information sources and use them to retrieve relevant information; assess the quality of the information and its applicability to a specific situation as well as analyze, understand and use the information to make good health decisions." This implies that to be health literate, one must be able to access health information using available media.

According to Prytherch (2016), the term "informatics'' is defined from three perspectives as: 1."the process, methods and laws relating to the recording, analytical-synthetical processing, storage, retrieval and dissemination of scholarly information, but not the scholarly information as such which is the attribute of the respective science or discipline. 2. the study of the structure of knowledge and of its embodiment in information-handling systems. 3. the study of the handling and communication of information, particularly by automated and electronic methods." It is consequent upon the above backdrop that this paper seeks to find out the role medical libraries and librarians should play in health in order to enhance healthy living of the people through information literacy and informatics theories and practice.

Objectives of the Study

The objectives of this study are to:

1. conceptualize health information literacy and health informatics
2. identify the importance of health information literacy
3. explore the branches of health informatics
4. examine the types of information used by public health workforce
5. review the roles of medical libraries and librarians play in health information literacy

Method

This paper employed ex post facto and content analysis research approach by consulting existing literature from books, including encyclopedias and journals. The information gathered were critically analyzed and authenticated to ensure their conformity with current trends in health information literacy and health informatics.

Findings

Health Literacy

Health literacy is essential to successful access to care and use of health services, one aspect is self-care information on chronic conditions and maintenance of health and wellness. Health literacy is important in diverse ways; it requires individuals to play a more active role in the decision and management of their health and as well follow the trends in health policy of their nation. For instance, a health literate person helps a diabetic patient to know information about his or her cholesterol level, body pressure and body mass index (BMI); best practices for his or her diet and exercise, what medicines he needs to take and their safety and effective use, how he or she plans her health in consultation with the Doctor, Ophthalmologist and Pharmacist as well is being informed of over the counter medicines (Nongo & Ode, 2018).

Health Information Literacy

The Medical Library Association (2014), provided an exhaustive review of health information literacy as the set of abilities needed to: recognize a health information need; identify likely information sources and use them to retrieve relevant information; assess the quality of the information and its applicability to a specific situation; analyze, understand and use the information to make good health decisions.

Similarly, the office of Disease Prevention and Health Promotion of Nigeria as reported by Egunjobi and Akerele (2014), stated that health information literacy is the ability to obtain, process and understand basic health information and services to make appropriate health decisions. According to them, studies have shown that as

much as half of all adults in all socio-economic level struggle with health literacy and also lack the ability to understand and use the information needed to make good health decisions. Therefore possessing high health information literacy skills will enable people to make appropriate health care decisions, use community information centres more frequently and thus see public libraries and branches of National libraries as partners in their overall wellbeing.

Health Informatics

Health informatics is the field of science and engineering that is aimed at developing methods and technologies for the acquisition, processing, and study of patient data (Imhoff, 2002), which can come from different sources and modalities, such as electronic health records, diagnostic test results, and medical scans. The health domain provides an extremely wide variety of problems that can be tackled using computational techniques (Sami and Reynolds, 2021). Health informatics is synonymous with medical informatics which introduces information processing concepts and machinery to the domain of medicine.

Health informatics is a spectrum of multidisciplinary fields that includes study of the design, development and application of computational innovations to improve health care (Nadri et al., 2017). The disciplines involved combines medicine fields with computing fields, in particular computer engineering, software engineering, information engineering, bioinformatics, bio-inspired computing, theoretical computer science, information systems, data science, information technology, autonomic computing, and behaviour informatics (Shortliffe and Cimino, 2014). In academic institutions, medical informatics research focus on applications of artificial intelligence in healthcare and designing medical devices based on embedded systems (Sami and Reynolds, 2021). In some countries the term informatics is also used in the context of applying library science to data management in hospitals.

Table 1: Health Informatics Strategies

Application	**Nursing Informatics** Nurses interact with health IT systems during patient care and documentation	**Clinical Informatics** Information is provided to caregivers during the care process to make a patient care plan
Career	**Chief Nursing Informatics Officer (CMIO)** CNIOs often have many of the same duties of the CMIO, though CNIOs typically interact more with nurses.	**Chief Medical Informatics Officer (CMIO)** CMIOs work in both the technological and medical areas of medicine and are the go-betweens for the IT department and physicians
Goals	Evaluating health IT products that nurses use, such as EHRs, and creating effective workflows that involve technology	Integrating healthcare technology into day-today patient care

Branches of Heath Informatics

Health Informatics according to Nwaneri and Nzekwe-Excel (2021) consists of the following sub-specialties: bioinformatics, clinical informatics, nursing informatics, consumer health informatics, public health informatics, dental informatics, pharmacy informatics and imaging informatics. These various branches of health informatics are further discussed in the following sub-sections.

Bioinformatics: Bioinformatics is a multidisciplinary field that combines biology, computer science, information science, mathematics, engineering and statistics. The major divisions of bioinformatics are (1) the development of software tools and algorithms, and (2) the analysis and interpretation of biological data (Zhang and Liu, 2013). Also, it deals with a large volume of data generated from medical experimentation or obtained from various biological data sources. Essentially, computers with high-speed memory and high storages sizes are always used in the practice of Bioinformatics. The main purpose of Bioinformatics is data management and knowledge discovery.

Clinical Informatics: This is a multidisciplinary field drawn from disciplines such as computer science, information science and clinical science that focus on the development and use of computer applications to address medical data. The practice of Clinical Informatics covers a wide range of areas such as medical data mining, electronic medical records, decision support systems, and hospital information systems. The major aim of clinical informatics is the use of modern information and communication technology tools to develop effective interventions for healthcare delivery.

Nursing Informatics: This specializes in the support of nursing by information systems in the delivery, documentation, administration and evaluation of patient care and prevention of disease, it incorporates nursing, computer and information sciences with the main objective of the use of information systems to support the practice of nursing (Darvish et al., 2014). Nursing informatics is a fast growing field with informatics Nurse Specialist now recognized by some nursing associations.

Consumer Health Informatics: Healthcare consumers are often inquisitive and desire basic health information or education that will help improve their condition. Consumer health informatics emerged as a discipline to address this gap using ICT mostly the Internet to educate users. With the aid of several technological innovations, consumer health informatics has improved the standard of living and quality of care of consumers of health services (Lewis et al., 2005).

Public Health Informatics: This is an emerging discipline that refers to the systematic application of information system and computer science and technology to public health practice, research and learning (Yasnoff et al., 2000). It focuses on the application of information science and technology to promote the health of populations especially in the area of disease prevention. It also utilizes appropriate technologies to provide timely delivery of quality data in order to deliver the required interventions and prevent disease spread. Active national surveillance is a key aspect of public health informatics which is often implemented during periods of epidemic or pandemic outbreaks such as Ebla or Corona Virus Disease (COVID-19).

Dental Informatics: It is an emerging discipline concerned with the use of computers and health information systems in improving dental practice (Sparllek et al., 2007). This combination of dentistry with information technology is aimed at improving dental care. There are a number of applications of ICT and AI in dental practice and research. According to Singaraju et al., (2012), in the diagnosis of oral cancer, OralCDx® neural network is used to search for cancerous cells. Similarly, genomic and proteomic technologies have found valuable applications in personalized dental care (Eng et al., 2011). Dental disease diagnosis, prevention and treatment can be enhanced with the deployment of these technologies.

Pharmacy Informatics: The American Society of Health Systems Pharmacy (ASHP) (2007) defined pharmacy informatics as "the use and integration of data, information, knowledge, technology, and automation in the medication-use process for the purpose of improving health outcomes". It includes various approaches of medication management, during utilization review, use of barcoding technology during product dispensing, and the development of alert systems for drug prescription and dispensing. Technologies used in the practice of pharmacy informatics include: e-prescribing, tele-pharmacy, automated dispensing cabinets, bedside bar-coding, smart pumps and e-medication administration records, computerized provider order entry, etc.

Imaging Informatics: This emanated from the need to deploy information systems in the processing and management of medical imaging information in a healthcare enterprise. The use of digitized images in medical diagnosis has led to significant improvement in the accuracy and reliability of diagnosis by providing radiologists with the needed support in the interpretation of medical images.

Health Information Systems

Health Information Systems are integrated software systems designed for collecting, processing, storing, retrieving, and transferring the required healthcare information (Yazdhi-Feyzabadi et al., 2015). There is

increased need for healthcare organisations to have an efficient system of internal and external communication. Hospital information systems are essential to the efficient management of hospitals. The vast operations and activities of hospitals need to be effectively coordinated in a manner that will minimize cost and risk while maximizing profit. Consequently, health information systems provide a useful platform that is able to enhance data handling processes to aid quality clinical and managerial decision making in hospitals.

Health information systems usually consists of autonomous and heterogeneous information systems such as electronic health records, medical practice management software, laboratory information systems, e-prescribing software, etc. which have been integrated into a single system. For this to be achieved interoperability of the various systems is necessary.

i. Electronic Health Systems

Electronic health (e-health) refers to the delivery of health services using the Internet and related technologies. Many hospitals across the globe have embraced e-health and continued to deploy it in their operations. The deployment of ICT technologies in healthcare has increased efficiency, reduced costs and improved the quality of care. Nwaneri and Nzekwe-Excel, (2022), identified and highlighted the major e-health solutions to include the followings: health information systems, electronic medical records, medical practice management software, e-prescribing software, laboratory information management software.

ii. Electronic Medical Record (EMR)

The concept of electronic medical records evolved based on the need to manage patients' records in electronic form and develop a system that enables the communication of such information to the various specialists that manage the patient. Obviously, the deployment of EMRs has immensely improved the timely delivery of medical services. Some common EMRs in the market include GE Centricity, Epic, CareCloud, NextGen, Cerner and many others.

public health informatics

Public health is distinct from other medical fields in that its focus is on the population as a whole, rather than on the individual patient. Information requirements are therefore quite different but nonetheless critical. According to Health People 2010 (2000), ready access to the public health knowledge base is fundamental to achieving the nation's goals established decennially to improve health, including finding the best solutions to community health needs, promoting healthful lifestyles and disease prevention, and providing informed responses to public health issues. And in public health emergencies, public trust requires rapid, well-informed responses to health threats, often of unknown origin and continually unfolding over hours and days.

As observed by Dee and Rankin (2018), while there is general consensus on the critical need to make information accessible to the public health community, there have been few formal studies of information needs. These studies can be confounded by the public health workforce's diversity, worker-role variation and overlap, and the fuzzy boundaries of the field. In addition to the journal literature, influential white papers, government information sources in public health. This gray literature can be discovered at the Web sites of federal and state government health agencies and public health organizations. Providing information services to the public health workforce has fallen outside the mainstream of library services. Federal and state governments have little or no formal arrangements for library and information services for their public health workers. But there is need to advocate for a better supporting to the information needs of the public health community.

The role of medical libraries and medical librarians

Medical libraries and librarians have played significant roles in health information literacy. According to Anyaoku (2016), medical libraries are institutions for health information dissemination. They provide information for well being which are accessible in a health, hospital setting. They support medical doctors, nurses, pharmacists,

other allied health professionals and students in learning, knowledge acquisition and reason through provision of information resources that cover all areas of medical specialties. Medical libraries are established to provide services and information resources to support and advance the mission to patient care, research and biomedical education for health institutions. Medical libraries generate, organize and provide access to information. The primary objective is to promote health, wellbeing, reduce mortality and morbidity in populations.

The emerging solution to customized services at the point of need appears to employ both technological and human interventions. As Bakken (2001), pointed out, an informatics infrastructure is essential for evidence based practice. This infrastructure must include standard terminologies and structures, electronic information resources, data exchange stands to enable transfer of information across heterogeneous systems, processes that enable evidence appropriate to specific patient cases, and informatics competencies. Among the challenges to achieving these goals are building a persuasive business case; achieving consensus in describing, organizing, accessing, and archiving information resources; designing clinically relevant information retrieval strategies, and integrating evidence-based processes into the organizational structure.

Davidoff and Florance (2000) have argued that in addition to informatics tools, a new informationist specialist is need as a full member of the clinical team: a professional who specializes in information, who possesses information science, informatics and domain knowledge, and who works outside the library in the health care setting. The dynamics between health care professionals and health information access forms the basis for bridging the gap between the biomedical knowledge base and the use of it in daily medical practice and clinical decision-making. Health care professionals' information needs typically require responses within a short time frame. They need credible, current, and relevant information to the specific case at hand. While the knowledge base of the health sciences is the biomedical literature, primarily journals, additional sources such as collegial expertise, continuing education programs drug information resources, and various online knowledge services augment published literature. Library services and technologies that connect the health care professional with this knowledge base in a meaning full and efficient way must be grounded in information seeking and information-use studies (Dee & Rankin, 2018).

Conclusion

In this paper, we undertook a review on the health information literacy and health informatics and all health and information professionals who are involved. It is hoped that this paper will be found educative and instructive by medical, nursing and laboratory science students, medical and other health practitioners as well as librarians and information scientist who are working in the hospitals or healthcare institutions. Again, the students would found it a veritable tool in their information literacy and health information courses. The stakeholders in the health sector are encouraged to get acquainted with technologies associated with health information and health service delivery.

Recommendations

Health workers, librarians and information scientists, medical and library schools, library and information science students and students of the health related faculties are challenged to acquire health information literacy skills, health informatics applications and medical data management. It is hoped that stakeholders in the health field would find the issues discussed very useful in their academic and professional careers. Essentially, a basic understanding of healthcare informatics is necessary for various stakeholders in the healthcare environment.

References

American Society of Health Systems Pharmacy (ASHP) (2007). Statement on the pharmacist's role in informatics. American Journal of Health Systems Pharmacy, vol. 64, 200 – 203.

Anyaoku, E.N. (2016). Empowering patients for chronic disease self-management through access to health

information in Nigeria: overview of strategies. Journal of Health Information and Librarianship. 2(1), 1&2), 22-29.

Bakken, S. (2007). An informatics infrastructure is essential for evidence-based practice. J. Am. Med. Inform. Association, 8 (3), 199-201.

Darvish, A.; Bahramnezhad, F.; Keyhanian, S. &Navidhamidi, (M. 2014). The role of nursing informatics on promoting quality of healthcare and the need for Appropriate Education. Global Journal of Health Sciences, 6 (6), 11 – 18.

Davidoff, F.; France V. (2000). The informationist, A new health profession? Am. Intern. Med. 132, (12), 996 – 998.

Dee, C. &Ranklin, J. (2018). Health Science Professional Literatures and their users. In John, D.M. & Michael L-Clark (eds.). In: Encyclopedia of Library & Information Sciences, 4th ed. CRC Press, Taylor & Francis

Egunjobi, R. A. &Akerele, J. A. (2014). Health information literacy as a predictor of community information services utilization among citizens in public and national libraries in southwestern Nigeria. Library Philosophy and Practice. Retrieved from http://digitalcommons.unl.edu/libphilprac/1148/

Eng, G. Chen, A. Vess, T. and Ginsburg, G.S. (2011). Genome Technologies and Personalised Dental Medicine. Oral Diseases, 18, 223 – 235.

Healthy People 2010 (2000). Department of Health and Human Services: Washington, DC,

Imhoff, M. (2002). "Health Informatics". Evaluating Critical Care: 255 – 256. https://doi.org/10.1007/978-3-642-56719-3-18

Lewis, B.; Chang, B.L. and Friedman, C.P. (2005). Consumer Health Informatics, In: Lewis, D. Eyesenbach, G. Kukafka, R. Stavri, Z. and Jamison, H. (ed.) Consumer Health Informatics. New York: Springer Science Business Media Inc.

Medical Library Association (2003). Health Information literacy. http://www.mlanet.org/resources/heathlit/define.html

Medical Library Association (2014). What is health information literacy? https://www.mlanet.org/resources/healthlit./define.html

Nongo, C & Ode (2018). Information Literacy for Sustainable Development Goals in Nigeria: Implication for Healthy Living. In: Nwokocha, U & Nwachukwu, V.N. (eds.). Information Literacy, Sustainable Development Goals & Library & Information Sc. Education Proceedings of the 20th NALISE conference. Sept 17 – 21, 2018, Benue State University, Makurdi. Umuahia: Veno Café Ventures.

Nwaneri, S. C. and Nzekwe-Excel, C. (2021). Information and Communication Technology in Healthcare. Lagos: Adelove Ventures.

Prytherch, R. J. (2016).Harrod's Librarians' Glossary and Reference Book, 10th edition. London: Routledge, Taylor and Francis Group.

Sami, H.R., Reynolds, N.C. (7 May 2021). Talaver F., Busis N.A. Lorenzo N. (eds.). Medical Informatics in neurology: What is Medical Informatics? Signal Processing, Image Processing. EMedicine: Medscape's Continually Updated Clinical Reference.

Shi-Nash, A.&Hardoon, D.R.(2016).Data Analytics and Predictive Analytics in the Era of Big Data. New Jersey: John Wiley and Sons Inc.

Shortliffe & Cimino (2014) (eds.) Biomedical Informatics: Computer Applications in Health Care and Biomedicine (4thed). London: Springer-Verlag.

Singaraju, S.; Prasad, H. and Singaraju, M. (2012). Evolution of Dental Pathology as an Oral Tool in Oral Pathology. Journal of Oral Maxillofacial Pathology, 16 (1), 83 – 87.

Sparllek, H.; Irvin, J.Y. Schleyer, T. Butler, B.S.; Weiss, P.M. (2007). Supporting the emergence of dental informatics with an online community. International Journal of Computerized Dentistry, 10, (3), 247 – 264.

Yasnoff, W.A.; O'Carrol, P.W.; Koo, D.; Linkins, R.W.; Kilbourne, E.M. (2000). Public Health Informatics: Improving and Transforming Public Health in the Information age. Journal of Public Health Management and Practice, 6 (6), 67 – 75.

Yazdi-Feyzabadi, V.; Emami, M.; &Mehrolhassani, M.H. (2015). Health Information System in Primary Care. The Challenges and Barriers from Local Providers' Perspective of an Area in Iran. International Journal of Preventive Medicine, 6, p.65.

Zhang, S.Y. &Liu, S.L. (2013). Bioinformatics. In: Stanley M. and Kelly T. H. (eds.)Brenner's Encyclopedia of Genetics 2nd Edition. U.S.A: Academic Press