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**PROMOTING DATA LITERACY FOR
SOCIETAL DEVELOPMENT: ROLE OF
INFORMATION PROFESSIONALS**

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A SURVEY OF DATA LITERACY SKILLS OF HEALTH INFORMATION MANAGERS IN NIGERIA

By

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Abstract

Health Information Managers (HIMs) work almost exclusively with data, they collect, manage and protect health care data, ensuring the accuracy, access, security and quality of such data. Health Information Management is the practice of acquiring, analyzing and protecting patient's information vital to providing efficient and quality health care. Traditionally, health records were paper-based, however, technological development laid the foundation for e-records, leading to volumes of more complex data that require efficient management. The adoption of e-records though greatly improved health data management, created new challenges of data literacy skills for HIMs. Evidence abound that Nigerian health information system is weak and do not provide needed information. The study is focused on the level of HIMs data literacy skills and ability to manage data in the era of e-records. Respondents were drawn from a cross section of HIMs in Nigeria. A self-developed questionnaire was used to collect data for the study, copies were administered through HIMs National Professional Association platform using google drive, 392 copies were completed and returned. Data analyses were done using descriptive statistics and inferential statistics. Findings show a high level of HIMs data literacy skills, however, there is need for HIMs to improve their e-data literacy skills.

Keywords: *Data literacy skills, health Information managers, health data, e-records*

Introduction

Healthcare is one very important part of our society and it is imperative for healthcare providers to access quality data for effective and efficient patient care. Quality data support efficient and quality health care service delivery, thus, good data management practices are important component of health care management (Hess, 2021). Each day, hundreds of patient's access healthcare facilities leading to volumes of data being generated that must be properly managed. Patient care management are data driven, a process that

accumulate large volumes of patients demographic, clinical and administrative data, to create 'external memory' for current and future uses (Berg and Toussaint, 2003).

There had been claims that the Health Information System (HIS) in Nigerian is currently weak and unable to provide the much-needed quality health data required for decision-making (Adeloye et al, 2017). According to the Federal Ministry of Health (2016), the system is said to be characterized with many structural and governance barriers, low data analytics, fragmented and disorganized manner of data collection, despite the fact that trained health information managers are responsible for the collection and management of health data in healthcare facilities. This paper, therefore, aims at finding out the root cause of poor data management in Nigeria despite the presence of trained health information managers in healthcare facilities. Health information management is defined as the collection and analysis of healthcare data to provide information for health care decisions involving patient care, institutional management, health care policies, planning and research (OpenText, 2017; Oweghoro, 2019).

The management of data from patient care as medical records dates back to as far as Egyptian times (1600 BC), when documentations on patient care were written on papyrus describing the arts of medical care by physicians. Historically, health care data were only available on paper and are filed, stored and shredded, as there were defined processes for dealing with paper. As part of their functions, the health information managers, analyse, extract, store and convert health care data into information while the remainder stay within the patient health record.

According to Oweghoro and Oluwole, (2021) in clinical coding, a method of collecting hospital morbidity and mortality, health information managers go through large number of documents about a patient's episode of care, identify and interpret diagnostic statements; with the understanding of a current health data classification system, select the most appropriate code(s) from the international classification of diseases. (World Health Organisation, 2022). The data generated forms a database for hospital based morbidity and mortality. If morbidity and mortality data are to be of high quality, reliable and valuable, health information managers must be proficient in data management, particularly in data literacy skills (O'Malley, et al. 2005; Oweghoro, 2019; Oweghoro and Oluwole, 2021).

Technological advancement in health information management had witnessed the migration from paper-based to electronic patient information management. With this advancement in technology the functions of health information managers changed from medical records

management to health information management, thereby expanding the responsibilities from managing paper records to managing full scale process of capturing, managing and sharing health care data electronically (Luthuli and Kalusopa, 2017; Ngoepe and Marutha, 2021). This growing technological advancement in health care practice, the demand for more complex and quality health care data and the emerging revolution in health information management, continue to create serious challenges in data management practices for the health information managers. For example, technological revolution gave birth to the concept of Electronic Medical Records (EMR) and later Electronic Health Records (EHR) that can be described as a systematic collection of health data about individual patients and the populations in digital format that is capable of being shared (Gunter and Terry, 2005).

An EMR is a digital version of the paper health records, it contains the patient's medical and treatment history from one health organization. In contrast, an EHR contains the patient's records from multiple health organizations and provides a more holistic, longitudinal view of a patient's health profile (Mcelhone, Hannell, and James, n.d.; eHealth Ontario, n.d.; Gunter and Terry, 2005). According to Bonderud (2021), EHRs are multifunctional and are used for everything from clinical documentation and medication management to clinical decision support, reporting and analytics, and outcome results management.

The main purpose behind setting up an electronic health records system was to be able to analyze voluminous, varied, unstructured health data and acquire meaningful insights through analytic and decision-making tools (Cano et al., 2017; Wang, and Hajli, 2017). A new dimension to health care is the datafication of health, digital phenotyping, and Internet of Health, with the accompanying use of electronic devices such as smart watch, e-health, online and mobile device usage that has led to more complex data collection (Peppin and Thomas, 2020). Though, health information managers' traditional job roles made them experts in managing health care data and processes in an information system, the digitalisation of health information and datafication of health, have further expanded the roles of health information managers into information technology (IT) and user support (Zeng, Reynolds and Sharp, 2009). While these emerging concepts have myriad advantages on health care, they create new challenges and complexity to health information managers (Sutherland et al., 2016) in data management, thereby establishing the need for advance data literacy skills.

Data literacy is the individual's ability to read, understand, work with, analyse, argue and utilize data in different ways, (Forbes 2019; Eastern Michigan University, 2021; Morrow, 2021; Stobierski, 2021; Gartner, 2021; Panetta, 2021). Kirk Borne a data scientist, opined that data literacy has several components, which together add up to someone becoming skilled in data literacy. This means acquiring the skill of understanding what data is and its characteristics (sources, types, formats, and data features), data applications (analysis, data science, decision support, artificial intelligence, automation, and analytics), data techniques (such as pattern discovery, pattern recognition, and prediction), and data communication (telling story with data, evidence-based action, decision support, and visualization) (Wigmore, 2015).

Data literacy skills can be regarded as an underlying component of digital dexterity, the ability and desire to generate or use existing data and emerging technology to drive better business outcomes. This requires the ability to collect, explore, analysis, understand, and communicate with data in a meaningful way. Gartner, (2017) summarized data literacy skills into four components as data collection, data analysis, data management and data visualization. According to Gartner (2021) health information managers have to be proficient in data collection, data analysis, data management and data visualisation.

Health data may be sourced through health care providers one on one interaction with patients, health surveys by researchers, preventive health services such as mass immunisation clinic, civil registration system and data from datafication of health (Agency for Healthcare Research and Quality (2018). According to Wigmore, (2015), data literacy skills will enable the health information managers to know and collect what data is appropriate to use for a particular purpose; understanding data analytics tools and methods and when and where to use them, interpreting data visualisations, such as graphs and charts. In addition, they will be thinking critically about information yielded by data analysis, recognizing when data is being misrepresented or used misleadingly and communicating information about data to people lacking data literacy, an ability sometimes referred to as data storytelling.

The healthcare industry is now more data dependent than ever before and data collection, data sharing, analysis and use foster growth in health care delivery (Pentland, 2013). Innovations in health care science and health information technology often lead to new developments in data literacy skills with the day. Innovations such as datafication, data phenotyping, big data and Open data bring with them different ways of managing and utilizing data to make judgments, understand

situations and making more informed decisions. In a knowledge-based patient care era, where information is power, quality health care data now occupy a central role as the currency of health care age (Chinien and Boutin, 2011; Cowan, Alencar, & McGarry, 2014; Mitrovic, 2015; Ikemoto & Marsh, 2008; Mandinach, Parton, Gummer, and Anderson, 2015; Oguguo et al. 2020). If the health information managers are to remain current and relevant they have to improve on their data literacy skills. In a study in New South Wales to identified information skills possess by health information managers, Robertson & Callen (2004) observed that the most frequently cited areas for further education were electronic health records, health data collections, database applications and health informatics, reflecting the rapid advances in information technologies.

Nigerian hospitals are increasingly keying into electronic health information systems and the roles of the health information managers will expand and the demand for data literacy skills increased. Health information managers' expertise in data literacy skills will be important to ease the transition from paper-based to electronic health records, and their roles will range from managers of health information systems to clinical coders system analysts, clinical information systems support specialists and information system managers in information services departments, data managers, data analytic experts and research assistants. (Callen and Craig 2000; Robertson and Callen 2004).

Healthcare will continue to change dramatically as a result of technological development and future technological innovation is going to keep transforming healthcare (Thimbleby, 2013). Technology is applying Artificial Intelligence and other devices in health care delivery and the use of statistics in observing broader patterns in health; data is already informing many critical decisions that influence peoples' wellbeing and this stands to go further (Kumar et al, 2022). While there is no crystal ball to predict the future, it will be safe to say that as health systems grow and expand and as the volume of data grows with expansion, the need to integrate and harmonise data to make it available to all users is critical (OpenText, 2017). Therefore, data will be one of the greatest drivers of innovation in the health industry, and the health information manager's skill in data literacy will continue to expand.

Aim of the study

The study aims at examining the level of data literacy skills of Health Information Managers in Nigeria in view of emerging technological development in the health care and health

information management and suggest possible improvement towards improving the quality and integrity of health care data for efficient and effective patient care, control costs and enhance the efficiency of the healthcare delivery.

Specifically, the study is to determine:

1. data literacy skills possessed by health information managers;
2. level of data literacy skills of health information managers;
3. data literacy skills by gender;
4. data literacy skills of health information managers by hospital types;
5. data literacy skills of health information managers and cadre; and
6. data literacy skills by years of experience;
7. examine the proficiency level of health information managers with e-data management.

Research Questions

The following research question were developed to guide the study;

1. What are the data literacy skills possessed by Health Information Managers?
2. What is the level of data literacy skills of health information managers?
3. What is the health information managers' proficiency with e-data management?

Hypotheses

The following hypotheses were tested at $\alpha 0.05$ level of significance.

Ho 1: There is no significant relationship between HIMs data literacy skills and gender

Ho 2: There is no significant difference among HIMs data literacy skills and hospital types.

Ho 3: There is no significant difference among HIMs data literacy skills and cadre

Ho 4: There is no significant difference among HIMs data literacy skills and years of experience.

Methodology

The descriptive cross-sectional survey method was used for the study. The population for the study consist of health information managers in Nigeria. A structured questionnaire was developed by the Researcher and used for data collection. Copies of the instrument was administered on respondents through a National Professional Association WhatsApp platform

using Google form. There were 392 responses to the questionnaire and data was analyzed using descriptive and inferential statistic with the aid of Statistical Package for Social Sciences.

Results

4.1: Demographic characteristics

Table 1 Personal Factors of the respondents

SN	Item		Percentage
1	Gender responses=367	Male	30.4
		Female	69.6%
2	Age (last birthday)		
		< 30	13.1
		30 - 39	35.9
		40 - 49	32.2
		50 - 59	18.2
		>60	0.5
3	Highest Professional Qualification 366 responses	PD/ND	30.4
		HND/BSc/BHIM	53.2
		Masters	14.2
		PhD	2.2
4	Years of experience 366 responses	< 2	16.9
		2 - 4	12.0
		5 - 7	12.3
		8 - 10	13.4
		>10	45.4
5	Hospital Status: 367 responses	Primary	56.1
		Secondary	6.3
		Tertiary	36.5
		Private	1.1

Results from Table 1 shows that females constitute 69.6% of the respondents and majority (68.1%) are within the age group of 30 to 49 years, while 53.2% had either HND or first degree in Health Information Management. Majority of the health information managers that responded are experienced in the practice with 13% having practiced for between 8 to 10 years and 45.4% for over 10 years. Most of the respondents work in the primary health care level (56.1%) followed by tertiary with 36.5%, while only 1.1% indicated they work in private health care facilities.

Research Question One: What are the data literacy skills possessed by HIMs?

Table 2: Data Usage and Data Visualisation by HIMs

Item	Percent
Which of these do you consider as the responsibility of a Health n=372	
Data Collection	58.3
Data Analysis	65.7
Data Visualisation	34
Data Management	58.3
How comfortable are you working with data in your current role n=371	
Very Uncomfortable	1.1
Uncomfortable	2.8
Comfortable	43.7
Very Comfortable	52.1
How often do you use data to make decisions n=372	
Daily	44.9
Weekly	8.6
Monthly	45.2
Rarely	5.4
Never	0
Which of these data type(s) are you familiar with? (Select all that apply) n=370	
Numeric	88.6
Categorical	40.3
Binary	17.6
Ordinal	22.4
Time Series	20.3
Visualising data is important for seeing meaningful relationship n=368	
No	1.9
Yes	97.8%
Data visualisation tools mostly used by HIMS n=365	
Microsoft Excel	88.5
Google chart	32.3
Tableau	14.2
SPSS	0.3
Stata	0.3
Which of these communicating tools are you familiar with	
Google Sheets	14.5
Microsoft Teams	5.6

Skype	8.8
Slack	0.8
Microsoft Excel	36.7
Zoom	41.3

The findings in Table 2 show that of the 372 Health Records Managers that responded, 65.7% consider Data Analysis as their responsibility, 58.3% indicated Data Collection, 58.3% Data Management and 34% Data Visualisation. Majority of the respondents, (95.8%) indicated they are comfortable working with data. When asked how often they use data when making decisions as health records managers, all 372 respondents indicated they use data in decision making, 44.9% use data daily, 45.2 monthly and only 5.4% indicated they rarely use data in decision making. As to the type of data respondents were familiar with, 88.6% of the 370 responses indicated numeric while 40.3% indicated categorical, and only 20.3% indicated time series. Nearly all the respondents (97.8%) were of the view that visualisation is important for seeing meaningful relationships in a dataset. The respondents mostly use Microsoft Excel (88.5%) as data visualisation tools, followed by google chart 32.3%. Majority of the respondents claim they are familiar with Zoom (41.3%) and Microsoft Excel (36.7%) as communicating tools.

Research Question Two: What is the level of data literacy skills of HIMs?

The data literacy skills of the Health Information Managers was examined against data collection, data analysis, data visualisation and data management skills to determine the level of their skills. Respondents rated each statement on a scale, with different levels of agreement or proficiency, represented as NTM (Not True of Me), RTM (Rarely True of Me), TM (True of Me), and VTM (Very True of Me).

Table 3 presents the self-assessed data literacy skills of Health Information Managers on data collection. The findings reveals that the HIMs are of the view that data is significant for structuring, recording and easy analysis of information, ($\bar{x} = 3.68, \sigma = 0.52$). The results show that the HIMs exhibited a high level of confidence in their ability to: clearly decide architectural terms before engaging in information; ($\bar{x} = 3.5, \sigma = 0.61$) synthesize information relevant to their research ($\bar{x} = 3.42, \sigma = 0.68$); and in their skills for downloading information from the net ($\bar{x} = 3.36, \sigma = 0.73$). Respondents believe they have capacity to create graphs and tables using

computer programs, ($\bar{x} = 3.15$, $\sigma = 0.89$) and understanding of the concept of a dataset ($\bar{x} = 3.30$, $\sigma = 0.72$). These results in Table 3 suggest that health information managers possess high level data collection skills.

Table 3: Data Collection skills of Health Information Managers

Item	NTM	RTM	TM	VTM	Mean	SD	Remark
I clearly decide these arch terms before engaging in information	5	10	150	198	3.5	0.61	True of Me
I apply professional skills for downloading information from the net	9	28	145	176	3.36	0.73	True of Me
I have the ability to synthesize information relevant to my research	4	27	142	185	3.42	0.68	True of Me
I can convert data from one format or file type to another	7	43	146	162	3.29	0.75	True of Me
I can critically evaluate quality of datasets for error or pro	3	60	145	150	3.23	0.75	True of Me
I can state a correct hypothesis	11	54	159	134	3.16	0.79	True of Me
I can use digital platforms	2	19	107	230	3.58	0.62	True of Me
I have created graphics and tables using a computer program	18	65	121	154	3.15	0.891	True of Me
I know the concept of dataset	8	31	166	153	3.3	0.719	True of Me
Data is necessary for the structuring recording and easy analysis of information	2	6	97	253	3.68	0.535	True of Me

Data Analysis skill of Health Information Managers

Table 4 presents the result on the self-assessed data analysis skills of health information managers, categorised as NTM (Not true of me), RTM (Rarely true of me), TM (True of me), and VTM (Very true of me). The result (Table 4) indicate that majority of the respondents can: code data in statistical packages ($\bar{x} = 3.42$ $\sigma = 0.68$); identify best method of data analysis for data from different health sources, ($\bar{x} = 3.32$ $\sigma = 0.75$); interpret results of analysis ($\bar{x} = 3.28$ $\sigma = 0.73$); and can test a statistical hypothesis ($\bar{x} = 3.27$, $\sigma = 0.78$). The findings also reveal that the respondents are familiar with statistical concepts, such as correlation, regression, or hypothesis testing, ($\bar{x} = 3.31$ $\sigma = 0.70$) while close to 50% are not comfortable with SQL for querying databases, ($\bar{x} = 3.29$ $\sigma = 0.77$), though they indicated being familiar with at least one data analysis programme (Table

4). These may suggest that health information managers possess moderately high level of literacy skills in data analysis.

Table 4: Data Analysis skill of Health Information Managers

Item	NTM	RTM	TM	VTM	Mean	SD	Remark
I can test a statistical hypothesis	17	61	151	125	3.27	0.78	True of Me
I can sort my data	3	14	153	190	3.21	0.75	True of Me
I can label my variables properly on SPSS	30	75	142	102	3.21	0.75	True of Me
I can code data into software and statistical packages	39	99	129	87	3.42	0.68	True of Me
I can run analysis using different software such as Excel, Stata	17	73	151	115	3.18	0.90	True of Me
I know the best method of analyzing data from different health sources	18	61	159	119	3.32	0.75	True of Me
I am confident in interpreting the results of data analysis and recommendations based on the findings	11	45	170	131	3.28	0.72	True of Me
I am familiar with statistical concepts, such as correlation, regression, or hypothesis testing	17	76	146	115	3.31	0.70	True of Me
I am comfortable with using SQL for querying databases	50	117	126	56	3.29	0.77	True of Me
I am familiar with at least one data analysis software (such as Excel, SPSS, Stata, Python or R, and so on)	9	53	138	156	3.23	0.77	True of Me

Data Visualisation and Interpretation skills of health information managers

Table 5 reveals insights into visualization and interpretation skills of health information managers in Nigeria. The findings show that the respondents have the ability to create meaningful tables to present, organise and visualise data ($\bar{x} = 3.27$ $\sigma = 0.78$); handle data in an ethical manner and can compare results of analysis ($\bar{x} = 3.21$ $\sigma = 0.75$), signifying a high level of visualisation skill. The result also indicated that respondents have the ability to represent information on tables,

charts, bars, and graphs ($\bar{x} = 3.42$ $\sigma = 0.68$), and also competent at visualising data on graphs, charts and tables ($\bar{x} = 3.23$ $\sigma = 0.77$). These findings suggest a relatively high level of proficiency in data visualisation.

Table 5: Data Visualisation and Interpretation skills of health information managers

Item	NTM	RTM	TM	VTM	Mean	SD	Remark
I can create meaningful tables to organise and visually present data	9	47	139	163	3.27	0.78	True of Me
I can apply and work with data in ethical manner	7	51	159	141	3.21	0.75	True of Me
I can compare results of analysis with other findings	7	50	163	138	3.21	0.75	True of Me
I can represent information in tables charts bars and graphs	2	34	135	187	3.42	0.68	True of Me
I can design slides for PowerPoint presentation	21	56	117	164	3.18	0.90	True of Me
I can interpret result of data analysis	9	34	147	168	3.32	0.75	True of Me
I used data to solve problem or make a decision in my role	4	46	155	153	3.28	0.73	True of Me
I can discuss any of my findings adequately	4	36	164	154	3.31	0.70	True of Me
I can Interpret and draw conclusions from graphs charts and	7	49	135	167	3.29	0.77	True of Me
I am competent at visualising data with graphs charts and tab	8	49	155	146	3.23	0.77	True of Me

Data Management skills of health information managers

The result of Data Management skills of health information managers is presented in Table 6. Table 6 shows that the respondents: are capable of organising data into meaningful table, ($\bar{x} = 3.35$ $\sigma = 0.69$), understand the concept of data cleaning and data preprocessing with almost all the respondents indicating knowledge ($\bar{x} = 3.26$ $\sigma = 0.74$); and indicated ability to determine the quality of data, ($\bar{x} = 3.23$ $\sigma = 0.72$). However, slightly over 50% of the respondents can model data

($\bar{x} = 2.94$ $\sigma = 0.83$). Though majority of the respondents indicated that they can use data from multiple sources to promote business intelligence ($\bar{x} = 3.01$ $\sigma = 0.82$), quite a number cannot determine the distribution pattern of a dataset. Few of the respondents indicated that they can determine the veracity of statements with data, ($\bar{x} = 2.97$ $\sigma = 0.83$) and also understand the concept of data warehousing ($\bar{x} = 2.95$ $\sigma = 0.85$). These findings suggest relatively high level of data management skills of health information managers.

Table 6: Data Management skills of health information managers

Items	NTM	RTM	TM	VTM	Mean	SD	Remark
I understand the concept of data cleaning and data preprocessing	5	49	152	152	3.26	0.74	True of Me
I can determine the patterns in raw data	12	65	167	114	3.07	0.79	True of Me
I can create a model with data	16	88	157	97	2.94	0.83	True of Me
I can use data from multiple sources to promote business intelligence	14	74	163	107	3.01	0.82	True of Me
I can determine the distribution pattern of a dataset	12	85	164	97	2.97	0.80	True of Me
I can determine the quality of data	6	43	173	136	3.23	0.72	True of Me
I can distinguish between structured and unstructured data	12	62	152	132	3.13	0.81	True of Me
I can organize data into meaningful table	3	36	152	167	3.35	0.69	True of Me
I can determine the veracity of statements with data	15	83	157	103	2.97	0.83	True of Me
I understand the concept of data warehousing	17	87	150	104	2.95	0.85	True of Me

Research Question Three: What is the health information managers' proficiency with e-data management?

The proficiency level of Health Information Managers' competence with computer skills and knowledge with various computer-related tasks and concepts were examined. Table 7 revealed that the majority: have basic understanding of computer operations, ($\bar{x} = 3.52$ $\sigma = 0.62$); can use

computer effectively, store and process data using applications like Excel ($\bar{x} = 3.46$ $\sigma = 0.68$); can access the Internet or browse the web freely ($\bar{x} = 3.44$ $\sigma = 0.72$). The findings reveal that a large no of the respondents can use computer spreadsheets effectively ($\bar{x} = 3.33$ $\sigma = 0.75$). Virtually all the respondents indicated they are familiar with Electronic Health Record software, and have the ability to generate reports from Electronic Health Record, ($\bar{x} = 3.29$ $\sigma = 0.79$).

Table 7: Health information managers’ knowledge of e-Data Management

Items	NTM	RTM	TM	VTM	Mean	SD	Remark
I have a basic understanding of how to operate the computer	3	14	132	211	3.52	0.62	True of Me
I can use computer spreadsheets effectively	9	36	141	171	3.33	0.75	True of Me
I am familiar with Electronic Health Record application software	12	32	122	192	3.38	0.78	True of Me
I can generate reports from Electronic Health Record	14	34	145	165	3.29	0.79	True of Me
I can access the Internet or browse the Web freely	7	28	125	198	3.44	0.72	True of Me
I can create a database for hospital morbidity and mortality	20	72	139	127	3.04	0.88	True of Me
I am able to operate computer effectively	6	21	133	198	3.46	0.68	True of Me
I can store and process data using application such as Excel	5	28	149	176	3.39	0.69	True of Me
I know the concept of digitalization	10	41	163	144	3.23	0.75	True of Me
I understand the concept of datafication of health	7	51	161	139	3.21	0.75	True of Me

Results of Hypotheses tested

The *p*-value for all the four hypotheses tested are significant (Tables 8, 9, 10 and 11) having a value less than or equal to the designated alpha level of 0.05. Therefore, the null hypothesis that asserts that gender, hospital types, cadre and years of experience of health information managers are independent of data literacy skills were rejected. The results

are therefore significant and the study suggests that the level of health information manager's data literacy skills are associated with gender, hospital types, cadre and years of experience.

Table 8: Cross-tabulation and Chi-square test between gender and data literacy skills of Health Information Managers

Gender	Questions Related to Data Literacy Skills				Chi-Square
	NTM	RTM	TM	VTM	P-Value
Male	0	0	14	102	0.05
Female	0	0	50	192	

Table 9: Cross-tabulation and Chi-square test between hospital type and data literacy skills of Health Information Managers

Hospital Status	Questions Related to Data Literacy Skills Questions				Chi-Square
	NTM	RTM	TM	VTM	P-Value
Tertiary	0	0	15	133	0.03
Secondary	0	0	35	158	
Primary	0	0	13	59	
Private	0	0	1	2	

Table 10: Cross-tabulation and Chi-square test for Health Information Managers data literacy skills and cadre

Cadre	Questions Related to Data Literacy Skills Questions					Chi-Square
	NTM	RTM	NTM	RTM	NTM	RTM
Level	Top	0	0	14	133	0.02
	Middle	0	0	45	158	
	Low	0	0	8	33	

Table 11: Cross-tabulation and Chi-square test for Health Information Managers data literacy skills based on years of experience.

		Questions Related to Data Literacy Skills Questions				Chi-Square
		NTM	RTM	TM	VTM	P-Value
Years of experience	< 5	0	0	18	70	0.01
	5-15	0	0	28	83	
	>15	0	0	18	141	

Discussion of the findings

The study has shown that there are more females in health information management practice than male, who are well qualified, with moderate years of practicing experience and majority practice in primary and tertiary levels of health care. The findings show that health information managers collect, analyse, and manage data, and this is in line with the assertion of Gartner (2021) that health information managers are proficient in data collection, data analysis, data management and data visualisation. This finding also agreed with those of World Health Organisation (2022) that health information managers collect hospital morbidity and mortality data, analyse it to identify and interpret diagnostic statements.

The results also show that health information managers are familiar with various types of health care data, are comfortable with working with data and often use data to take decisions on daily and monthly bases, which is in agreement with the findings of Zeng, Reynolds and Sharp, (2009) that health information managers have the expertise in data literacy skills. Health information managers were found to be aware of the importance of data visualisation and the use of the tools such as tables, charts, tableau, google chat and uses them, including data communicating tools such as google sheets, Microsoft teams, Microsoft excel, zoom and the likes. These findings support those of O'Malley, et al. (2005); Oweghoro, (2019); Oweghoro and Oluwole (2021) claim that health information managers are proficient in data literacy skills, particularly in data management and data visualisation. The findings from the study also suggest that the level of health information managers' data literacy skills is relatively high as reflected by the high level of their skills in data collection, analytical skills, data visualisation and interpretation skills and data management skills which support the findings of Zeng, Reynolds and Sharp, (2009) that health information managers' traditional job roles made them experts in managing health care data and processes, in digitalisation and datafication of health care data.

Health information managers have basic understanding of how to operate the computer, they are found to be familiar with Electronic Health Record application software and are capable of generating reports from Electronic Health Records. They have the ability to access the Internet or browse the Web freely, create database for hospital morbidity and mortality, can store and process data using application such as Excel. This agrees with the findings of Luthuli and Kalusopa, (2017) and Marutha, (2021) that technologies have expanded the responsibilities of health information managers from managing paper records to managing full scale process of

capturing, managing and sharing health care data electronically. Health information managers are found to know the concept of digitalisation, datafication of health and Internet of things. The study also reveals that there is a significant relationship between health information manager's data literacy skills and gender, hospital types, cadre and years of experience.

Conclusion and Recommendation

The mission of every health care institutions is to restore patient's health and this demands quality health care data for evidence-based intervention. Health information managers are responsible for developing and maintaining protocols for collecting, maintaining and managing health care data. Without quality data, it would be impossible to make informed decisions about the safety and efficacy of therapies. Efficient health care data management is critical to the success of any health care delivery system. The global wave of digitisation has brought significant transformations to health care industry, leading to the growth of data in volume, velocity, veracity, variety and value.

Health care has become highly data-intensive and the fundamental focus is on how to automate, simplify and optimize the use of data. Managing, integrating and harnessing huge piles of health care data help to enhance operational performance. Healthcare data management is now critically important. In all of these, the services of health information managers have been found to be indispensable, particularly when there is a huge amount of data to process and manage. Thus, health information managers require a high level of data literacy skills to remain current and relevant in today's health care industry. With the growing number of technological innovations in health data management, HIMs must acquire new skills in data, statistics and information literacy to meet the challenges of information needs of health care in an e-health environment.

References

- Adeloye, D., David, R.A., Olaogun, A. A., Auta, A., Adesokam, A. Gadanya, M., Opele, J. K., Owagbemi, O. and Iseolorunkanmi, A. (2017). Health workforce and governance: The crisis in Nigeria. *Human Resource Health* 15(1): 32. <https://doi.org/10.1186/s12960-017-0205-4>
- Agency for Healthcare Research and Quality (2018). Data Sources for Health Care Quality Measures
- Berg, M. and Toussaint, P. (2003). The mantra of modeling and the forgotten powers of paper: A sociotechnical view on the development of process-oriented ICT in health care. *International Journal of Medical Informatics*, 69(2-3): 223-234.

- Bonderud, D. (2021). EMRs vs. EHRs: What's the difference? Health Tech.
[https://healthtechmagazine.net/article/2021/07/emrs -vs-ehrs-whats-difference-perfcon](https://healthtechmagazine.net/article/2021/07/emrs-vs-ehrs-whats-difference-perfcon)
- Callen, J. (2001). Which competencies do health information managers working in public hospitals perceive to be important for effective performance? *Health Information Management*, 30(1). Retrieved from WWW 18/06/04 <<http://www.himaa.org.au>>.
- Callen, J. L, and Craig J. A (2000). A profile of the health information manager: a comparison between two states in Australia. *Health Information Management*, 29(4): 162-167.
- Cano, I., Tenyi, A., Vela, E., Miralles, F. and Roca, J. (2017). Perspectives on Big Data applications of health information. *Current Opinion in Systems Biology*, 3: 36-42.
- Chinien, C., and Boutin, F. (2011). Defining essential digital skills in the Canadian workplace: Final Report. Retrieved from http://www.nald.ca/library/research/digi_es_can_wor
- Cowan, D., Alencar, P., and McGarry, F. (2014). Perspectives on open data: Issues and opportunities. IEEE Conference on Software Science, Technology and Engineering. IEEE. doi:10.1109/SWSTE.2014.18
- Dimick, C. (2012). Health Information Management 2025: Current Health IT Revolution Drastically Changes HIM in The Near Future. *Journal of AHIMA*, 83(8): 24-31.
- Eastern Michigan University (2021). Data Literacy (<https://guides.emich.edu/dataliteracy>)
- Evans, R.S. (2016). Electronic Health Records: Then, Now, and in the Future. *15Yearbook of Medical Informatics*, (Suppl 1): S48-61. Doi:10.15265/IYS-2016-s006. PMID:27199197;PMCID:PMC5171496
- Federal Ministry of Health (2016). National health Policy.
<http://ngfrepository.org.ng:8080/jspui/handle/123456789/3155>
- Forbes (2019). Why Data Management and Data Literacy Need To Go Together (<https://www.forbes.com/sites/forbestechcouncil/2019/06/05/why-data-management-and-data-literacy-need-to-go-together/?sh=31cddfa97021>)
- Gartner (2017). Information as a second language: enabling Data Literacy for Digital Society (<https://www.gartner.com/doc/3602517/information-second-language-enabling-data>)
- Gartner. (2021). Data Literacy (<https://www.gartner.com/en/information-technology/glossary/data-literacy>)
- Gunter, T. D., Terry, N. P. (March 2005). The emergence of national electronic health record architectures in the United States and Australia: models, costs, and questions". *Journal of Medical Internet Research*, 7 (1):e3
 doi:10.2196/jmir.7.1.e3. PMC 1550638. PMID 15829475.

- Hess, S. (2021). Five Practical Steps Towards Healthcare Data Governance. <https://www.healthcatalyst.com/insights/healthcare-data-governance-5-step-strategy>
- Ikemoto, G., and Marsh, J. (2008). Chapter 5: Cutting through the data-driven mantra. Different conceptions of data-driven decision making (Vol. 106). RAND Corporation. Retrieved from: http://www.rand.org/content/dam/rand/pubs/reprints/2009/RAND_RP1372.pdf
- Khennou, F., Khamlichi, Y. I., and Chaoui, N. El. (2018). Improving the Use of Big Data Analytics within Electronic Health Records: A Case Study based OpenEHR. *Procedia Computer Science*, 127:60-68
- Kirkland, L.R.; Bryan, C.S. (2007). Osler's service: A view of the charts. *Journal of Medical Biography*, 15 (Suppl. S1), 50–54. doi:10.1258/j.jmb.2007.s-1-06-10. PMID: 17356743.
- Luthuli, L. P. and Kalusopa, T. (2017). The management of medical records in the context of public service delivery in the public sector in KwaZulu-Natal: The case of Ngwelezana hospital. *South African Journal of Libraries and Information Science*, 83(2). Doi:10.7553/83-2-1679
- Lorkowski, J. and Pokorski, M. (2022) Medical Records: A Historical Narrative. *Biomedicines*, 10(10): 2594. Doi:10.3390/biomedicines10102594.PMID:36289856; PMCID: PMC9599146
- Mandinach, E. B., Parton, B. M., Gummer, E., and Anderson, R. (2015). Ethical and appropriate data use requires data literacy. *Phi Delta Kappan*, 96(5): 25-28. Doi:10.1177/0031721715569465
- Robertson, M. and Callen J. (2004). The educational needs of health information managers in an electronic environment: What information technology and health informatics skills and knowledge are required? *Health Information Management*, 32(3-4): 95-101.
- Mitrovic, Z. (2015). Strengthening the Evidence-Base for Open Government in Developing Countries: Building Open Data Capacity through e-Skills Acquisition. Mitrovic Development and Research. Retrieved from <http://www.opendataresearch.org/dl/symposium2015/odrs2015-paper3.pdf>
- Montinari, M.R.; Minelli, S.; de Caterina, R. (2019). The first 3500 years of aspirin history from its roots?—A concise summary. *Vascul. Pharmacology*, 113, 1–8.
- Morrow, J. (2021). Be Data Literate: The Data Literacy Skills Everyone Needs To Succeed. Kogan page, 215. Amazon e-book.
- Ngoepe M. and Marutha N. (2021). A Framework to Integrate Healthcare Records in the South African Public Hospitals Using Blockchain Technology. *African Journal of Library, Archives and Information Science*, 31(1): 29-38

- O'Malley, Kimberly J., Cook Karon F, Price, Matt D, Wildes Kimberly Raiford, Hurdle John F, Ashton Carol M, (2005). Measuring diagnoses: ICD code accuracy. Health Research and Educational Trust 10.1111/j.1475-6773.2005.00444.x.
- Oguguo B. C. E., Nannim F. A., Okeke, A. O., Ezechukwu, R. I., Christopher, G. A., and Ugorji, C. O. (2020). Assessment of Students' Data Literacy Skills in Southern Nigerian Universities. *Universal Journal of Educational Research*, 8(6): 2717-2726, DOI:10.13189/ujer.2020.080657. <http://www.hrpub.org>
- OpenText (2017). The History of Health Information Management – From Then to Now. Retrieved from [Blogs.opentext.com/history-health-information-management-now/](https://blogs.opentext.com/history-health-information-management-now/).
- Oweghoro B. M. (2019). Health information Management: Evolution, Development and Technology. Research on Contemporary Issues in Media Resources and Information and Communication Technology Use: A Festschrift in Honour of Professor Iyabo Mabawonku. In. W. Olatokun, A. O. Aremu and A. Adetimirin. Ibadan: Department of Library, Archival and Information Studies, University of Ibadan, Nigeria. 454-464 pp.
- Oweghoro B. M. and Oluwole E. T. (2021) A review of Clinical Coding Accuracy in a Nigerian Tertiary Institution: A case study of University College Hospital, Ibadan, Nigeria. *International Journal of Health Records and Information Management*, 5(1): 10-14
- Pearson, D. 2001. Medical history for tomorrow preserving the record of today. *Health Information and Libraries Journal*, 18(3): 139–143.
- Pentland, A., Reid, T., and Heibeck, T. (2013). Big data and health: Revolutionizing medicine and public health. Report of the Big Data and Health Working Group 2013. Retrieved from <http://www.wish-qatar.org/summits/wish-2013/forums-researchchairs/big-data-healthcare/>
- Peppin, A. and Thomas, C. (2020). Health datafication, digital phenotyping and the Internet of Health. <https://www.adalovelaceinstitute.org/blog/health-datafication-digital-phenotyping-and-the-internet-of-health>
- Salem, M. E.; Eknayan, G. (1999). The kidney in ancient Egyptian medicine: Where does it stand? *American Journal of Nephrology*, 19(2): 140–147.
- Robertson, M.; Callen, J. (2004). The educational needs of health information managers in an electronic environment: What information technology and health informatics skills and knowledge are required? *Health Information Management*, 32(3-4): 95-101.
- Stobierski, T. (2021). A Beginner's Guide to Data & Analytics (e-book). Harvard Business School Online. <https://info.email.online.hbs.edu/data-analytics-e-book?>
- Sutherland, S. M., Kaelber, D. C., Downing, N. L., Goel, V. V. and Longhurst, C. A. (2016). Electronic Health Record–Enabled Research in Children Using the Electronic Health Record for Clinical Discovery. *Pediatric Clinics of North America*, 63(2): 251-268.

Thimbleby, H. (2013). Technology and the future of healthcare. *Journal of Public Health Research*, 2(3): e28. Doi:10.4081/jphr.2013.e28

Wang, Y. and Hajli, N. (2017). Exploring the path to big data analytics success in healthcare. *Journal of Business Research*, 70: 287-299.

Wanga, Elijah Oling 2022. Applications of Big Data and EHR Data Analytics

Wigmore, I. (2015). Definition of data literacy. <https://www.techtarget.com/>

Zeng, X., Reynolds, R. and Sharp, M. (2009). Redefining the Roles of Health Information Management Professionals in Health Information Technology. *Perspectives in Health Information Management*, 6(Summer). PMID: PMC2781729