Health Informatics and Data Migration Integrity Nexus: Implications, Challenges and Solutions

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Abstract: The rapid changes occurring in the healthcare sector, which call for the migration of data from many points and locations, have the potential to have a significant impact on human lives. As a result, there are more and more reports concerning error rates that have varied degrees of detrimental effects on healthcare delivery. Although there are many contributing elements, a large percentage of those unfavorable results can also be attributed to the data migration process. Data migration between various platforms is becoming more and more necessary as a result of the growing use of technology in the health sector, which forces health practitioners to share information across platforms. One of the main concerns during the migration process is minimizing errors that may arise. According to the study's findings, there are a number of reasons why data migration is necessary, such as when moving data to the cloud, switching to a new technology, cutting operating costs, replacing an outdated system with one that better meets organizational goals, or developing a backup plan. Data migration has various advantages, such as enhancing flexibility, lowering overhead costs, improving security, resolving licensing concerns, reducing redundant data, and promoting cooperation. Lack of personnel with experience in data transfer, inadequate infrastructure, technology, and human resource training, as well as a lack of data governance and data alteration during data movement, are some of the difficulties related to data migration. A backup system should be installed, proper testing should be conducted, communication should be acceptable, and planning and preparation are key components of an efficient data migration process. The study concluded that data migration offers organizations technological flexibility and multiple answers to a wide variety of problems. To ensure data integrity, security, and compliance during migration, it is essential to establish a clear data governance framework that defines roles, responsibilities, and accountability for data handling.

Keywords: Data Migration, Informatics, Care, Medicine, Error Rates, Technology.

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I. INTRODUCTION

Medical record credit reported that "oil's value as a resource cannot be understated in context of industrial revolution. If data is the new oil, how valuable would medical data be? Indeed, it is considered highly valuable and priced higher than financial data" (Medical record credit card, undated). The above statement shows how critical data is to the age we live in. For instance, it has been said that the science of healthcare is now an information-based one. This branch of study now significantly deals with the collection of data, processing, and the deployment of such data to the field of medicine (health informatics). The discipline of health informatics is concerned with the use and usage of data in biomedicine and health (Hersh, 2002; Lawanson et al., 2025a). It is worth noting that decision support systems, already used in health facilities worldwide, depend on clinical data analysis to support decision-making functions critical to both healthcare research and these systems. (Castaneda *et al.,* 2015, Landi, 2017; Lawanson et al., 2025b). In order to enhance patient`s care and secondary use of data, the healthcare sector is in greater need of clinical data. Secondary use is crucial to raising the standard, effectiveness, and safety of healthcare delivery (Barton *et al.,* 2011; Lawanson et al., 2025c). Information systems must uphold quality, encourage safety, increase productivity constantly, and serve as a foundation for information sharing (Wheatley, 2017).

In the modern era, Information and Communication Technology (ICT) is playing an increasingly vital role in the health sector, with health informatics experiencing particularly rapid growth. Medical records are increasingly being kept electronically by health organizations, which have historically kept them on paper. Health care providers, patients, and the general public stand to gain greatly from the implementation of an electronic health record (Grimson et al., 2000; Waegemann, 2003). However, there are also increased risks to the confidentiality and privacy of personal health information such as data breaches, hacking and cyber-attacks, cloud storage risks etc (Chhanabhai *et al.,* 2006; Mulligan, 2001; Kerr, 2004; Anderson, 2001). Inappropriate access to paper records is often limited to a small number of documents; but, because of the volume of data involved, improper access to electronic records carries potentially disastrous consequences (Flanagan, 2006). The United States is a very important country in terms of ICT usage; however, the country is mostly a private health system with numerous disparate systems. The adoption of electronic health data systems had been reported to be more successful in Scandinavian, Dutch, and Belgian nations (Flanagan, 2006). Due to the volume of data that is available in the health sector, practitioners and pertinent stakeholders need to be prepared to interact with these new technologies in order to guarantee the highest level of patient safety and effective service delivery.

Data is described as a strategic asset since their volume and variety have an impact on all facets of organizations (Xiong *et al.,* 2022). To support an organization's data management strategy, data quality, standards, governance, security and operations, platform and architecture, and sustainability, data management integrates a wide range of data volume, diversity, and velocity perspectives (Fleckenstein & Fellows, 2018). In the dynamic world of contemporary business and organizational expansion with the health sector, effective data management is essential for seizing opportunities and tackling obstacles. Data migration is the process of transferring digital data. Data migration is the process of moving information to a new location, file format, environment, storage system, database, datacenter, or application. As organizations transform digitally, the speed of such transformation introduces significant cybersecurity vulnerabilities that must be addressed in tandem (Olayinka, 2025).

A company or business may collapse or stop providing services as a result of the complexity and difficulties of data migration (Hussein, 2021). The most difficult task in data management is data migration (Opara-Martins et al., 2016). Data migration is therefore a very important IT activity. When moving on-site IT equipment and data to a cloud computing environment, data migration is a crucial component of cloud migrations. For data transfer efforts to be successful, preparation, execution, and validation are therefore necessary. Data migration projects vary depending on the systems and data involved as well as the goals of the organization. Data migration can be divided into several categories, such as database migration, application migration, cloud migration, storage migration, and business process

migration. It is also the most difficult task when it comes to consolidation, upgrades, revisions, and data-driven system deployment (Cao & Iansiti, 2022). Yet, the complexity and technical difficulty of the procedure may have an impact on how much data migration is done.

II. WHY IS DATA MIGRATION SO IMPORTANT?

The reason data migration is considered crucial is that organizations require them anytime they need to migrate their data in any way. For example, data migrations are required when an organization has to upgrade a system or server, combine storage hardware, switch databases or data centers, or even modify data formats. The need for organizations to migrate from an outdated system to a new one is because every system has a different function and is built on a different architecture. There are numerous reasons why a company would decide to go through these migrations. As organizations grow and expand, their needs may change over time, to the point where the current system is no longer able to fulfill those needs and no modification can be made to meet them. The organization's financial status may also change as a result of new technology that can provide more and better services at the same or lower cost is needed, a loss in funding, a nose-dive in business, or just a change in the value proposition. Any or all of these reasons necessitates` data migration. Furthermore, obsolescence, which is an indication that an outdated system can no longer communicate with more recent versions needed for other organization activities. For whatever reason, the end consequence is a migration process (Shumate, 2019).

Transferring data from one place to another is constantly required to enhance the effectiveness of data management. To be more precise, there are many other reasons why data might need to be migrated, such as changing formats to prevent technology obsolescence, upgrading accessibility, security, or governance, or moving to a new application. Data migrations guard against corruption or loss caused by incompatible devices or inadequate data execution, and they guarantee the data is transferred correctly and securely. When a company implements a new data system or location, frequently as a result of having to move or combine older systems with more advanced ones that can make greater use of the data. A new enterprise application migration has several advantages, such as enhanced competitiveness, scalability, enhanced performance, reduced costs, and maximized value. Data migration reduces the cost of information technology operations in businesses and organizations by facilitating the transfer of data from one or more storage spaces to the same or different computer system platforms or locations. This allows for improved data scalability, accessibility, and portability. (Banimfreg,2023; Azeroual & Jha,2021).

III. EFFECTIVE DATA MIGRATION STRATEGIES

According to Hussung (2016), basic configuration should be completed, depending on the system. As outlined

by Bilal (2014), the data migration process entails a few fundamental tasks, including data extraction, test site installation, data loading, data testing, and error or problem identification in data mapping. Once these tasks are completed, the data is retested. Data is then imported to the new system upon its implementation. Numerous studies have shown important issues with data migration strategies, including heterogeneous data transfer (Latha & Kumar, 2021), integrity checks, effective migration methodologies

(Prasanna et al., 2021), and data validation Sibgatullina & Yakupov, 2022). Completing each phase will help improve user approval of the system (when it is made available, thus it is crucial to ensure a smooth roll out (Hussung, 2016). Nonetheless, NetApp Global Services, (2006), reported that there are strategies for carrying out a data migration process. From the literature reviewed, Figure 1 shows important steps to effective data migration process;
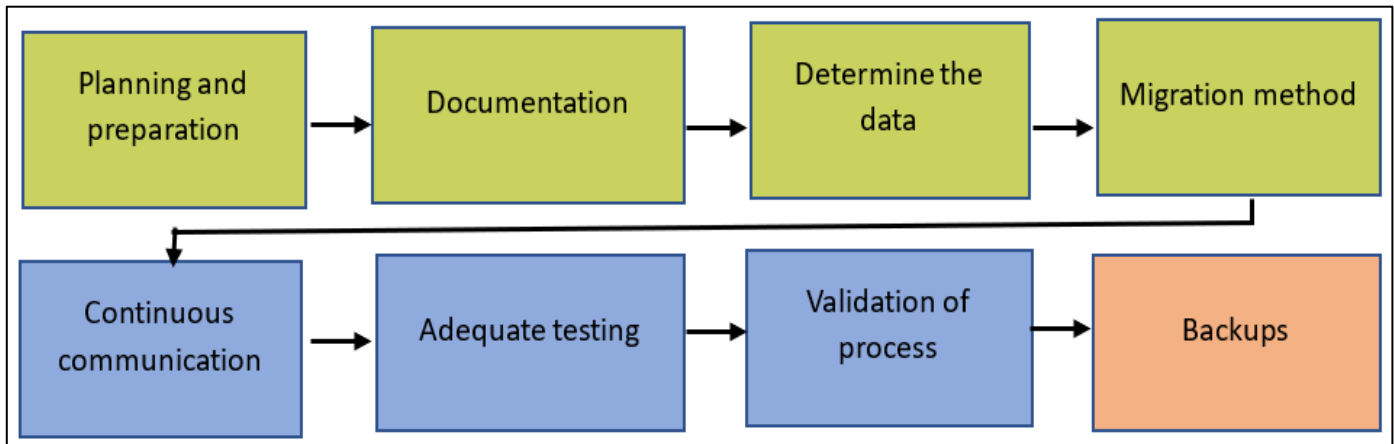

Fig 1 Data Migration Steps

> *Planning and Preparation*

Data migration lacks a well-defined technique due to the intricacy of the typical migration process and the divergence of modern information systems (Bisbal *et al.,*1999). Planning and preparation are the first steps in any data migration process. It might be difficult to transfer current data to a new application, which increases the risk to a firm as a whole by introducing errors, duplications, and security vulnerabilities. Planning and preparation include locating the source and destination systems, transferring data fields between them, and putting together a strategy for testing. Planning and preparation are essential when it comes to data migration in order to reduce these risks and guarantee a good result (Rintamäki, 2010).

> *Documentation*

All facets of the migration process, including preparation, execution, and post-migration assistance, should be documented. This will guarantee that all parties concerned are informed of the situation and can assist in resolving any potential problems that should arise. This is also considered as a critical step in any data migration process.

> *Determine Data Migration Method*

The strategy for data movement is established in the data migration plan. There are various approaches to data migration, and each project should assess which approach is best suited for it. It is important to consider the systems in question, the financial constraints, the volume of data, the schedule, the allowable downtime, the data format, and other relevant aspects (Federal Student Aid 2019).

> *Communication*

During any data migration process, effective and continuous communication is considered necessary. Any

potential obstacles should be communicated as soon as they arise, and the team involved should be kept informed of the migration's progress.

> *Adequate Testing*

When the system is implemented and ready for go-live, system testing will need to happen (Alwan, 2009, Hussung, 2016, Rouse, 2016). When the system is prepared, a testing strategy is crucial for identifying any bugs or difficulties prior to the migration going live. Testing should be done on every facet of the migration, including the data transfer, the new system configuration, and any reports or other features that depend on the moved data.

> *Validation Exercise*

Patient safety is at stake when it comes to the management of healthcare data, hence care is needed as well as legal mandates and national standards must be followed when dealing with and managing data (Data Protection Commissioner 2007; HIQA 2012).
It is crucial to check and confirm the outcomes following the migration process. It is always important to confirm if the anticipated outcomes were achieved and what was not.

> *Backups*

Having backups of the source and destination data is always a smart idea when migrating data. This can guarantee that the migration can be resumed, and the data can be restored in the event of an issue.

IV. BENEFITS OF DATA MIGRATION

The provision of safe and efficient patient care is heavily dependent on having prompt access to accurate information, the value of which is determined by the caliber

of data that is captured and saved for later use in patient records (Lalor *et al.,* 2018). Healthcare workers are often provided with information in confidence which is used by them on a daily basis. Patients who supply the information anticipate that it will be kept private and confidential (Flanagan, 2006). The benefits of data migration include some of the following;

➤ *Enhanced Security*

Data and health records need to be properly stored, safeguarded, and subjected to the appropriate rights restrictions (Beglaryan *et al.,* 2017, Kruse *et al.,* 2016, Djalai *et al.,* 2015) so that only the appropriate parties can access the information. To accomplish this, systems needs to be sophisticated enough to control appropriate limitations and secure access. Users have occasionally chosen cloud-based solutions because, according to Heart *et al.* (2016), the service provider is in charge of protecting the data stored on the cloud. Yet safe interactions with users and other systems are also necessary for data sharing, which is a crucial component of contemporary healthcare systems. Companies that fail to maintain their databases often leave gaps in security that allow hackers to get in and take critical information, making it available over networks. For businesses to safeguard themselves against the financial and operational dangers of a cyber-attack, they need to migrate to the most secured patches.

➤ *Reduces Overhead Costs*

Health organizations or businesses generally can cut numerous overhead expenses by implementing data migration. If a company keeps using an archaic database, they risk incurring significant overhead costs. If they have insufficient infrastructure, they can find it difficult to grow. Overtime, the time, money, and effort required to maintain an outdated database can result in missed opportunities, income, and productivity. A company's database may be transferred to an open-source system that will fulfill its objectives more successfully and profitably in many ways. You can get assistance with cross-database migration from on-premises systems to open-source systems, from a seasoned data migration provider.

➤ *Cut Back on Redundant Data*

Data redundancy in an organization can be caused by a variety of sources. Organizations that have merged following an acquisition or those that use segmented systems may occasionally experience data redundancy. It can be difficult to draw inferences from various datasets that are used by different organizational divisions that are not in sync with one other. You can consolidate all of your organizational data into a single system with the aid of data migration.

One of data migration's primary goals is to move all organizations` data to a single, centralized location. By making this adjustment, the quantity of redundant data that arises from storing data from different corporate divisions on several systems can be decreased.

➤ *Encourages Cooperation*

Improved access to patients' medical histories is made possible by migration, which encourages more sharing of health information. By doing this, the challenges of having data in silos are lessened, including the inability to retrieve and integrate the data and the physical challenge of putting a lot of data into a chart that could break under strain (Rouf *et al,* 2008). The potential exists for it to offer a unified source of historical and present health data from various sources, which can be analyzed to identify successful solutions. Enhancing healthcare services or workflow efficiency was one of the main factors requiring the deployment of data transfer (Houser *et al.,* 2008).

Effective communication among team members is facilitated by implementing cross-database migration across open-source systems where employees can access and share data. Thus, using adaptable solutions for data migration can promote improved worker cooperation within a company. Due to their ability to connect data from disparate sources within the healthcare context, data migration can enhance collaboration and boost findings' availability at the point of care.This benefit is especially important now that patient health care is being delivered through collaborative care models (Institute of Medicine (IOM), 1997).

➤ *Challenges Associated with Data Migration*

Maillet *et al.* (2015), reported that a complicated transformation that takes place over time is necessary for the successful execution of data migration. Therefore, projects involving data migration have often encountered some challenges as a result (Paasela, 2022). The following are a few major obstacles to successful data migration:

● *Inadequate Personnel with Data Migration Expertise*

When implementing healthcare IT solutions, human resources play a significant role. During this stage, the human element may prove to be the most difficult obstacle. Implementing data migration can be hampered by lack of technological competence, ineffective tools, low educational attainment, and a shortage of support staff (Blair & Smith, 2012). Hardware and software inefficiencies can cause problems with technology. Adoption and deployment of technology may suffer from poorly organized instruction (Al Masslawi *et al.,* 2016).

● *Inadequate Technology*

Inadequate technology for point-of-care data collection is one of the three primary obstacles that Vollmer *et al.* (2014) identified for the implementation of data migration. Technological hurdles and inadequate technical understanding are among the challenges associated with data migration. Hardware and software inefficiencies can cause problems with technology. Adoption and deployment of technology may suffer from ill-structured instruction (Al Masslawi et al., 2016). Frustration due to delays in workflow caused by device or software malfunctions or other technical concerns is a challenge. Despite ongoing advancements, Chavis (2012) contends that technology will never be 100% accurate. According to Nielsen (1992), it is imperative to involve users in the pre-design phase in order to understand

their needs. Engaging with users to learn their characteristics and have a grasp of workflow and current practices.

- *Lack of Necessary Standards for Migration*

Not all of the standards needed to exchange information have been defined, which is one of the primary obstacles to data migration. An additional obstacle is the abundance of standards covering various facets of health data interchange. Bringing the various standards together to achieve complete interoperability and satisfy the stakeholders' technical and clinical needs is challenging (Hayrinen *et al,* 2008). International efforts to this effect is on-going on standards creation. There are organizational, financial, and policy issues with data migration. Social, workflow, technological, and professional impediments are among the other challenges that have been noted (Linders *et al.,* 2007).

- *Inadequate Fund Necessary for Migration*

One of the main obstacles to the adoption of data migration is a lack of financing (Simon *et al.,* 2008). Furthermore, Houser *et al.,* (2008) also discovered that a hindrance to implementation was the absence of funds and resources. Because of the growing use of technology and the increased sharing of health information across many organizations, HISO has observed that health information is vulnerable to a wide range of risks and vulnerabilities in the modern world (HISO, 2008).

- *Inadequate Infrastructure*

In addition, limitations or limited capabilities (Gagnon *et al.,* 2014) or non-availability of hardware or software (Blumenthal, 2010) may further restrict the infrastructure. Another issue with current infrastructures is scalability (Agbakoba *et al.,* 2016). In addition, it is possible for organizations to require additional IT resources and to improve their infrastructure through retrofitting (Bain, 2015) in order to accommodate the new system.

According to Beglaryan et al. (2017), Wang and Biedermann (2012), the systems need hardware, additional software, and network availability. According to Kruse *et al.,* (2016) and Sligo *et al.,* (2017), the deployment of the healthcare IT solution will be delayed if these structures are not in existence or are not completely capable of supporting the systems.

The infrastructure available to support healthcare IT has been identified as a challenge throughout research. In order to guide and instruct users in the capabilities and functionalities of the system, training may also be conducted. This will lessen the effort while going live and enable customers to begin using the system with confidence. It will also guarantee that the duties they need the system to perform are fulfilled (Hussung, 2016, Alwan, 2009, Rouse, 2016).

- *Poor and Inadequate Training in Human Resources*

One of the main obstacles to implementation has been identified as training. According to Kruse *et al.,* (2016), this indicates that users are either not well trained or not trained at all to use and operate the system. Misuse of the system and user unhappiness may result from this. For users to operate

the system with confidence, it is crucial that they receive the appropriate technical training (Qiao *et al.,* 2015). While the system is being implemented, a lack of training may make some of the other barriers more difficult to overcome. Time is another element that affects training; it takes time to teach users and for them to pick up the system while working (Kruse et al., 2015). A problem could also arise if the training is not appropriate for the users, wasting staff and organizational time while failing to give the users the confidence they need to operate the system.

Staff members must thus be taught and comfortable using the technology for it to be implemented successfully (Johnson et al., 2014). It is acknowledged that in order to utilize a new system to its fullest extent, some new users may feel that it is not appropriate for their workload or the organization (Beglaryan *et al.,* 2017).

- *Lack of Data Governance*

We might not think much about the problems and ramifications with our medical data, however that does not mean that we are immune to consequences (Kesan, Jay et al., undated). The medical services and systems we currently have are data mines. More data is being gathered and processed than ever before by employing a range of intricate electronic technologies. Although these advancements give access to improved healthcare, they also put us at risk for new dangers (Aggarwal, 2018). Any problems affecting the system's implementation that are not directed by the organization or system supplier are considered external factors (Kruse et al., 2015).

Examples of this include the inability to hire the right people, the absence of industry standards that make it difficult to compare the advancement of a business, and the failure to establish standards for system requirements. Moreover, the outside variables that may influence the execution of the system include the population of the organization and its impact (Barrows & Clayton, 1996).

- *Possible Solutions to the Challenges of Data Migration*

According to The Nursing and Midwifery Board of Ireland (2015), the standard of care medical professionals give their patients is reflected in the quality of the records they keep. When evaluating data quality, three dimensions are measured: completeness, accuracy, and consistency (Cai & Zhu, 2015, Thoroddsen *et al.,* 2013; Zozus *et al.,* 2014). Data migration is typically required for significant reasons, such as some of the previously mentioned ones. However, data migration might produce "inaccurate, incomplete, untimely, fragmented, duplicative, and poorly documented" information, care and caution must be exercised during the process (Pierre, 2004). Some of the solutions to the challenges of data migration include the following;

- *Provide Reliable Data Backup Strategy*

A solid data backup plan should be in place before moving data. Should an issue arise during migration, you will always have the option to use the backup source to recover the data. Your data transfer partner will also carry out data migration testing to verify that all of the data has been moved

to the new location. This will enable you to maintain the preservation of all of your previous data and continue to use it for data analysis and reporting. Putting in place an extensive data backup strategy is a quick and effective way to overcome this obstacle. Have this plan in place before beginning the relocation process. Software for data migration with integrity checks is preferred since it guarantees that all data is transferred without alteration. With this solution, you can reduce the challenge of data loss and corruption.

- *Proper Training of Personnel Involved in Data Migration*

There may be some data semantics errors even if all of your data was properly moved to the new location. The data from this field gets moved to another field or column once it has been migrated to the target location. This may lead to incomplete data, incorrect reporting, and incorrect interpretations. The use of well-trained personnel and very competent companies will help to reduce this risk.

- *The Use of Proper Technology*

It is strongly advised to use appropriate technology and to carry out several testing sessions, especially when large amounts of current data are being migrated. This problem can be readily resolved by automating the procedure using appropriate technologies, lowering the expected errors, and using effective data migration software with sophisticated transformation capabilities.

- *Audit of the Data Types and Source*

Before starting the actual data migration project, the data migration company you hire should conduct an audit of the data types and sources your company uses. Data corruption is one of the data migration risks that can occur if unwanted data types are migrated to the new system. As a result, you can face a system crash or damage the data organization.

- *Proper Data Planning*

The number of data silos will only rise if you don't plan your data migration properly and lose track of the data points you use. In that case, the data migration project won't be finished. Furthermore, when technical and functional teams are making extensive use of data, ensure the process is well-planned to avoid this data migration risk. Pay attention to your business processes first, then the migration itself. Examine every procedure in your company that deals with data and compile a list of all the data sources that should be combined into a single, central solution.

- *Create A Backup Plan*

Create a backup plan that details the possibility, potential dangers, and mitigating techniques. Determine backup and rollback strategies to promptly recover from any unforeseen issues. Before the whole migration, carry out pilot or small-scale tests to find and fix any possible problems. Maintain constant vigilance over the migration's progress, and make sure a dedicated support staff is on hand to handle any last-minute worries or problems.

V. CONCLUSION AND RECOMMENDATIONS

Data migration has been working in the background to create electronic health records in the US for decades. This represents a substantial shift in how data and technology are used to provide effective and safe care for the next generations. Data migration is something that organizations perform for a number of reasons. Data migration is required, for instance, when a company replaces a server, switches out storage, or even moves data centers. Transferring data from one system to another, or from one location, format, or application to another, is a crucial process known as data migration. Data migration process help businesses reduce data migration risks and prevent data loss.It is recognized that there are some obvious challenges with the process of data migration, which make data migration from one form or platform to another inevitable. Health information technology (HIT) should be a major component of any health care system redesign, as the Institute of Medicine (IOM) report "Crossing the Quality Chasm" identified safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity as the main goals for improved patient care, each of which could be supported by HIT. Failure to apply an appropriate data migration technique can result in unreliable data, service interruptions, financial losses, and brand damage. It is recommended that a clear data governance framework is established to ensure data integrity, security, and compliance during migration. This includes defining roles, responsibilities, and accountability for data handling. Provision of specialized training for IT personnel and healthcare staff involved in data migration to reduce human errors and improve efficiency is also recommended.

REFERENCES

[1]. Agbakoba, R., Mcgee-Lennon, M., Bouamrane, M.-M., Watson, N. & Mair, F. S. (2016). Implementation factors affecting the large-scale deployment of digital health and well-being technologies: A qualitative study of the initial phases of the 'Living. *Health Informatics journal,* 22**,** 867-877.

[2]. Aggarwal, M., (2018). Towards Medical Data Ownership by Patients: Implications, Challenges and Solutions, A MSc in Health Informatics, Trinity College.

[3]. Al-Masslawi, D., Block, L. and Ronquillo, C. (2016) Adoption of Speech Recognition Technology in Community Healthcare Nursing. *Studies in Health Technology and Informatics,* 225, pp.649–653.

[4]. Anderson, J. G. (2001) Undermining data privacy in health information. *British Medical Journal*, 332 (7284): 442-443.

[5]. Anzhelika D. (2023). Top 10 Data Migration Challenges and Ways to overcome them, https://forbytes.com/blog/common-data-migration-challenges/

[6]. Azeroual, O.; Jha, M. (2021). Without data quality, there is no data migration. *Big Data Cognitive Computing*, 5*(24)*.

[7]. Banimfreg, B.H. (2023). A comprehensive review and conceptual framework for cloud computing adoption in bioinformatics. *Healthcare Analytics. 3*, 100190.

[8]. Barrows, R. C., Clayton, P. D. (1996). Privacy, Confidentiality, and Electronic Medical Records. *Journal of the American Medical Informatics Association*, 3(2):139-148.

[9]. Barton, C., Kallem, C., Van Dyke, P., Mon, D. & Richesson, R. (2011). Demonstrating "collect once, use many"-assimilating public health secondary data use requirements into an existing Domain Analysis Model. *AMIA Annu Symp Proc,* 2011**,** 98-107.

[10]. Beglaryan, M., Petrosyan, V. & Bunker, E. (2017). Development of a tripolar model of technology acceptance: hospital-based physician's perspective on EHR. *International journal of Medical informatics,* 102**,** 50-61.

[11]. Bilal, D. (2014). Library automation: Core concepts and practical systems analysis (Third edition). Santa Barbara, CA: Libraries Unlimited.

[12]. Bisbal, Jesús, et al. Legacy Information Systems: Issues and Directions. Software, IEEE. 1999, Vol. 16, 5.

[13]. Blair, W. and Smith, B. (2012). Nursing documentation: Frameworks and barriers.

[14]. Blumenthal, D. 2010. Launching HITECH. *New England Journal of Medicine,* 362**,** 382-385.

[15]. Cai, L. & Zhu, Y. (2015), 'The Challenges of Data Quality and Data Quality Assessment in the Big Data Era', *Data Science Journal*, vol. 14, no. 0, p. 2, viewed 8 April 2018, <http://datascience.codata.org/article/10.5334/dsj-2015-002/>.

[16]. Cao, R.; Iansiti, M. Digital transformation, data architecture, and legacy systems. *J. Digit. Econ.*, *1*, 1–19.

[17]. Castañeda H, Holmes S. M, Madrigal D. S, Young M. E, Beyeler N, Quesada J. (2015). Immigration as a social determinant of health. *Annual Review of Public Health*, 36:375-92.

[18]. Cavalcanti, D.R.; Oliveira, T.; Santini, F.O. Drivers of digital transformation: A weight and meta-analysis. *Heliyon*, 8, e08911.

[19]. Chavis, S. (2012) Documentation in Motion, For the Record. November 2012. pp 18 – 21.

[20]. Chhanabhai, P., Holt, A. & Hunter, I. (2006). Health Care Consumers, Security and Electronic Health Records. Health Care & Informatics Review Online.

[21]. Contemporary Nurse (2008): *A Journal for the Australian Nursing Profession*, 41(2):160–168.

[22]. Education, Mar 31;8:13. PMID, 18373880.

[23]. Ellison, M.; Calinescu, R.; Paige, R.F. Evaluating cloud database migration options using workload models. *Journal of Cloud Computing, 7*(6): 12 Essentials and Recommendations: Committee 10029.

[24]. Federal Student Aid (2019). Data Migration Roadmap Guidance. https://studentaid.gov/sites/default/files/fsawg/static/gw/docs/ciolibrary/Data_Migration_Roadmap_Guidance.pdf

[25]. Fleckenstein, M.; Fellows, L. (2018). Overview of data management frameworks. In *Modern Data Strategy*; Springer International Publishing: Cham, Switzerland, 2018; pp. 55–59.

[26]. Gagnon, M. P., Nsangou, E. R., Payne Gagnon, J., Grenier, S. & Sicotte, C. (2014). Barrier and facilitators to implement electronic prescription: a systematic review of user groups perceptions. *Journal of the American Medical Informatics Association,* vol. 21**:**535-541.

[27]. Grimson, J., Grimson. W and Hasselbring, W. (2000). "The SI Challenge in Health Care," Communications of the ACM, Vol. 43, No. 6, June 2000. doi:10.1145/3364Health Care (Revised Edition). eds. R. S. Dick, E. B. Steen, and D. E. Detmer.

[28]. Heart, T., Ben-Assuli, O. & Shabtai, I. (2016). A review of PHR, EMR and EHR integration: A more personalized healthcare and public health policy. *Health Policy and Technology*, 20-25.

[29]. Hersh W, Helfand M, Wallace J, Kraemer D, Patterson P, Shapiro S, Greenlick M. (2002). A systematic review of the efficacy of telemedicine for making diagnostic and management decisions. *Journal of Telemedicine and Telecare*, 8(4):197-209.

[30]. HIQA (2012), *Guidance on information governance for health and social care services in Ireland*, Dublin, viewed 6 May 2018, <https://www.hiqa.ie/system/files/Guidance-on-information-governance.pdf>.

[31]. HISO (2008) Health Information Standards Organisation (HISO), Draft No.

[32]. Houser et al (2008) Houser SH, Johnson LA. Perceptions regarding electronic health record implementation among health information management professionals in Alabama: a statewide survey and analysis. Perspectives in health information management / AHIMA. 2008 May 16; PMID 18504505. Pages 5-6.

[33]. Hussein, A.A. (2021). Data migration needs, strategy, challenges, methodology, categories, risks, uses with cloud computing, and improvements in its using with cloud using suggested proposed model (DMig 1). *International Journal of Information Security, 12*:17–103.

[34]. Hussung, T. (2016). What Is the Software Development Life Cycle? *Husson Universities* [Online]. Available: http://online.husson.edu/software-development-cycle/

[35]. Institute of Medicine (1997). The Computer-Based Patient Record: An Essential Technology for Modern Healthcare

[36]. Johnson, M., Lapkin, S., Long, V., Sanchez, P., Suominen, H., Basilakis, J. and Dawson, L. (2014). A systematic review of speech recognition technology in health care. *BMC Medical Informatics and Decision Making,* 14(1).

[37]. Kerr, K., (2004) The Electronic Health record in New Zealand. Health Care & Informatics Review Online. [Internet], March. Available from <http://hcro.enigma.co.nz/>

[38]. Kruse, C. S., Kristof, C., Jones, B., Mitchell, E. & Martinez, A. (2016). Barriers to Electronic Health

Record Adoption: a Systematic Literature Review. *Journal of Medical Systems,* 40**,** 1-7.

[39]. Kruse, C. S., Mileski, M., Alaytsev, V., Carol, E. & Williams, A. (2015). Adoption factors associated with electronic health record among long-term care facilities: a systematic review. *BMJ Open,* 5**,** 1-9.

[40]. Lalor, L., (2018). *Documentation of nursing practice: A closer look at care plans in semi-electronic and conventional paper-based records during a time of change,* A dissertation submitted to Trinity College Dublin in partial fulfilment of the requirements for the degree of Master of Science in Health Informatics.

[41]. Latha, M.; Kumar, P. (2021). Analysis on data migration strategies in heterogeneous databases. *International Journal of Advanced Research in Science, Communication and Technology*, 6: 210–214.

[42]. Lawanson, O. M., Berleant, D., & Ajiferuke, O. (2025a). Effect of information communication technology and immunization on infant mortality in Nigeria. *World Journal of Advanced Research and Reviews,* 25(3), 1359–1368. https://doi.org/10.30574/wjarr.2025.25.3.0783

[43]. Lawanson, O. M., Abu-Halimeh, A., & Ajiferuke, O. (2025b). Leveraging advanced technologies to improve telemedicine delivery in Nigeria. *World Journal of Advanced Research and Reviews,* 25(3), 1698–1707. https://doi.org/10.30574/wjarr.2025.25.3.0902

[44]. Lawanson, O. M., Berleant, D., & Ajiferuke, O. (2025c). Review and recommendations for health informatics in sub-Saharan African countries: Between opportunities and challenges. *Medical Research Archives,* 13(5). https://doi.org/10.18103/mra.v13i5.6554

[45]. McGill, M.M.; Sexton, S., Peterfreund, A., Praetzellis, M. (2021). Efficient, effective, and ethical education research data management and sustainability. In Proceedings of the 52nd ACM Technical Symposium on Computer Science Education, Virtual Event, USA, 13–20 March 2021.

[46]. Mulligans, E. A., Braunack-Mayer, A. (2004) Why protect confidentiality in health records? A review of research evidence. *Australian Health Review*, 28 (1): 48-55.

[47]. NetApp Global Services (2006). Data migration best practices.

[48]. Nielsen, J. (1992). The usability engineering life cycle. *Computer*, 25(3): 12–22.

[49]. Olayinka, O. T. (2025). *Built for speed, breached by threats: The cybersecurity dilemma of digital transformation. International Journal of Innovative Science and Research Technology*, 10(4), 1963–1967. https://doi.org/10.38124/ijisrt/25apr984

[50]. Opara-Martins, J., Sahandi, R., Tian, F. (2016). Critical analysis of vendor lock-in and its impact on cloud computing migration: A business perspective. *Journal of Cloud Computing*, 5(4).

[51]. Outpatient clinics: perspectives of third year medical students. BMC Medical

[52]. Prasanna, C., Subha, R., Sreemathy, J., Aravindh Ramanathan, P., Jainaveen, M. (2021). Data validation and migration-a theoretical perspective. In Proceedings of the 7th International Conference on Advanced Computing and Communication Systems, Coimbatore, India, 19–20 March 2021.

[53]. Qiao, Y., Asan, O. & Montague, E. (2015). Factors associated with patient trust in electronic health records used in primary care. *Health Policy and Technology,* 4**,** 357-363.

[54]. Rouf, E., Chumley H. S., Dobbie, A.E., Rouse, M. (2016). Electronic health records in

[55]. Systems development life cycle *(SDLC)* [Online]. Available: http://searchsoftwarequality.techtarget. com/definition/systems-development-life-cycle.

[56]. Shumate, Scott Eugene, "A Study of Database Migration: Understanding the User Experience." Master's Thesis, University of Tennessee, 2019. https://trace.tennessee.edu/utk_gradthes/5550

[57]. Sibgatullina, A.I., and Yakupov, A.S. (2022). Development, a data validation module to satisfy the retention policy metric. *Russian Digital Libraries Journal,* 25: 159–178.

[58]. The Nursing and Midwifery Board of Ireland (2015). Recording clinical practice, professional guidance. The Nursing and Midwifery Board of Ireland.

[59]. Thoroddsen, A., Sigurjónsdóttir, G., Ehnfors, M. & Ehrenberg, A. (2013). 'Accuracy, completeness and comprehensiveness of information on pressure ulcers recorded in the patient record', *Scandinavian Journal of Caring Sciences*, vol. 27: 84–91.

[60]. Vollmer, A.M., Prokosch, H.U. and Burkle, T. (2014). Identifying Barriers for Implementation of Computer Based Nursing Documentation. *Studies in Health Technology & Informatics*, 201: 94–101.

[61]. Waegemann, C. P (2003). EHR vs. CRP vs. EMR. Healthcare Informatics Online [Internet] May, pp.1-4.

[62]. Wang, T. & Biedermann, S. (2012). Adoption and Utilization of Electronic Health record systems by Long-Term care facilities in Texas. *Perspectives in Health Information Management,* 9**:** 1-14. Washington, D.C: National Academy Press.

[63]. Wheatley, C. (2017). Hands-free charting... As good as it sounds? Nursing Management (Springhouse), 48(11): 25–28.

[64]. Xiong, F., Xie, M., Zhao, L.; Li, C., Fan, X. (2022). Recognition and evaluation of data as intangible assets. *SAGE Open*, 12, 21582440221094600.

[65]. Yang, C.; Zhao, F.; Tao, X.; Wang, Y. (2021). Publicly verifiable outsourced data migration scheme supporting efficient integrity checking. *Journal of Network and Computer Applications*, 192: 103-184.

[66]. Zozus, M.N., Hammond, W.E., Green, B.B., Kahn, M.G., Richesson, R.L., Rusincovitch, S.A., Simon, G.E. & Smerek, M.M. (2014). Assessing Data Quality, viewed 7 May 2018.