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Health Care Information Systems and Technologies

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Abstract

The health sector reconstruction amidst the industrial revolution is confronted with multiple challenges. The benefits are attributed to technology's critical role in realizing and constructing a robust health information system. Despite the healthcare system's digitalization, challenges exist with fragmentation and integration, influencing the Health Information System (HIS), thereby controlling resource allocation and decision-making. The paper provides a systematic review, thereby affording the proposition to develop sustainable information for Health Care applications. The impact of health information technology highlights the purpose of in-depth HIS research, thereby incorporating scientific methods. The study presents the evidence revealing the HIS inadequacies in tackling the transformative changes, thereby confronting the healthcare systems. Semantic Web technologies facilitate knowledge management and sharing, providing interoperability semantically among health information systems.

Keywords

Integrated information system; Health information system; bioinformatics; e-health; Ontology.

1. Introduction

HIS benefits the continuously changing society to attain sustainable health care and effective and efficient information management. Life expectancy increases and resource allocation are the known attributes fostering progress. (Epizitone. et al., 2022) The development path of HIS is geared towards the global information systems catering the health care universally and vital statistics. HIS is critical in integrating various departments and supports the information flow. (Epizitone. et al., 2022) The system is asymmetrical, resulting in the healthcare environment's distorted functions, highlighting the purpose of strategic management and development. The study necessitates scientific approaches like the integrated data science and machine learning techniques essential and indispensable for the framework development, enhancing the HIS to provide empirical findings for realigning the transformations of global healthcare. (Epizitone. et al., 2022) Information Technology through the HISs facilitates the modifications and benefits like eHealth and decision-making, attracting the nations to assimilate and invest in the systems. Semantic Web technologies are intelligent machine computing's universal space wherein the knowledge bases would be placed together in a meaningful fashion and possess the ability to understand conceptual facts for human consumption. (Karami; Rahimi. et al., 2019) They guide the researchers in identifying the quality websites to search for. As healthcare decision-making is a collaborative process, it allows clinicians to collect the correct information to avoid repeat experiences. In this regard, Health Level 7 (HL7) introduces the interoperability framework, which includes semantic interoperability (Karami; Rahimi. et al., 2019),

technical interoperability, and process interoperability. Attention is placed on two aspects categorized as ontologies for the consistent standards and terminology for interoperability.

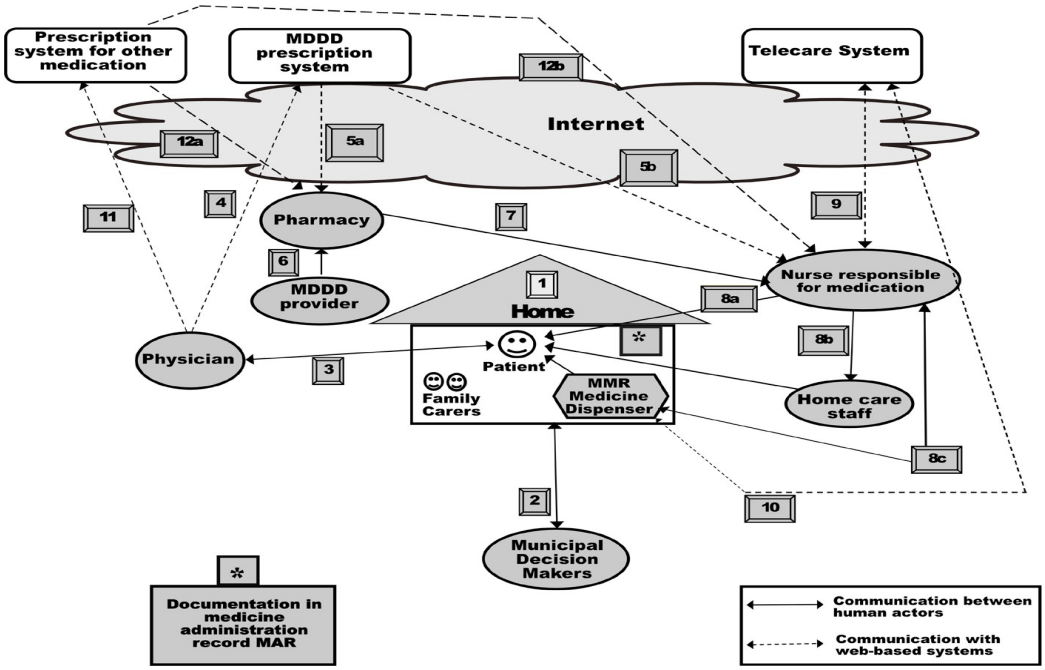
2. Medication Management

Under the process of medication management, information and communication technologies are used in several steps, like the health care ordering and prescribing, prescriptions storage, and electronic transfer, to process and dispense the pharmacies' prescriptions, to access the information on the current medicines on the patient's and supports the drug-related problem's decision making and detection. (Hammar; Iqbal; Jokela. et al., 2021) The medication prescription and the information handling had transitioned from paper to electronic. Clinical support systems are a powerful tool to reduce the potential inappropriate elderly medications used by healthcare physicians and pharmacists. Multi-dose drug dispensing (MDDD) is the service where the patients receive the medication as the machine is packed as the unit dose for administration. (Hammar; Iqbal; Jokela. et al., 2021) Patients receiving MDDD are old and possess several diseases and drugs. The service improves medication safety and adherence to reduce the healthcare workload. MDDD prescription is not automatically transferred to the regional electronic health record (HER) medication list (Hammar; Iqbal; Jokela. et al., 2021), which is the parallel prescription system. Under the MDDD patients, the medication list is transferred to the health care providers to improve drug treatment quality. In this regard, medicine dispensing robots are successfully used in pharmacy settings to re-engineer pharmacy services to improve the efficiency and safety of the medical management process. (Hammar; Iqbal; Jokela. et al., 2021)

Geriatrics care is gradually shifting from the traditional hospital-centered model for advanced ICT home-based solutions, utilizing telepresence with home telecare robotic systems. The recent study examines the usability and safety profile of the robotic device promoting medical adherence for home care patients, and the overall medication management system performance is satisfied. (Hammar; Iqbal; Jokela. et al., 2021) Digital medicine dispensers improve efficiency and enhance patient independence, empowering patients and safeguarding trust and service quality.

3. System Design

The system design for the MDDD is shown below.

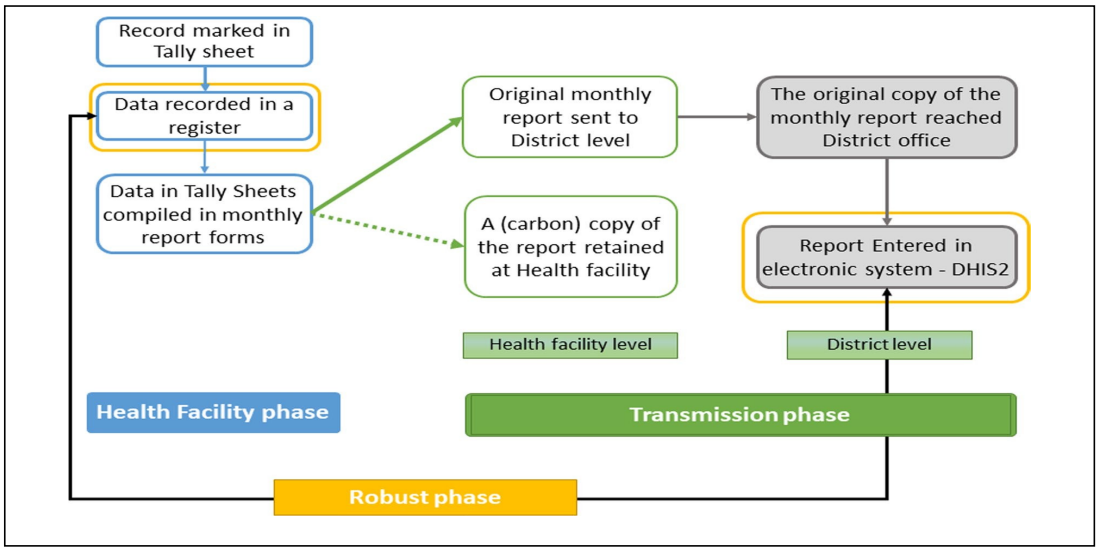


The MMR system involves the non-invasive medicine dispenser and telecare system for regular and continuous medicinal usage. The medicine dispenser administers the machine packet dose sachets. The medicine dispenser type is classified as a class 1 medical device having the lower perceived risk. (Hammar; Iqbal; Jokela. et al., 2021) The figure above picturizes the multi-dose drug dispensing service used for home care settings. The figure illustrates another system in parallel with the MDDD system used for the prescribed medications to the patient, which can't be included under the MDDD service. (Hammar; Iqbal; Jokela. et al., 2021) MDDD benefits could be enumerated as follows: Patients needing multi-dose medications at home with family careers, and the municipal authorities decide the help provided for the patient. After the consultations, the physician prescribes the medicines required for multi-dose drug dispensing; physicians enter the prescription information into a dedicated MDDD system separated from the regular prescriptions. (Hammar; Iqbal; Jokela. et al., 2021) The health care providers could access the national MDDD database and the patient's medication lists under the service. (Hammar; Iqbal; Jokela. et al., 2021) The above system can be used as the authorized pharmacy personnel for accessing information regarding MDDD prescriptions through the pharmacy information system.

4. Data Collection

The patient data is recorded in the registers, and the records are compiled during each month end done as duplicate and separately for every service area. Tally sheets which are designed for each service area, are used daily for tracking every record. (Ariff Adilah Mohamed; Iskandar Yulita Hanum P; Majid Mohamed Isa Abd. et al., Dec 2020) The monthly report is submitted to the district offices. Tally sheets used registers and carbon copies of the reports are kept at the facility

for usage and future reference. The words are filed and organized, and the data is entered into the district Health Information Systems electronic system for further use and analysis. (Ariff Adilah Mohamed; Iskandar Yulita Hanum P; Majid Mohamed Isa Abd. et al., Dec 2020) The indicator records are tracked across the sources like the register's physical counts, documents marked under the tally sheets, and the report form's compiled totals. The original copies of the monthly reports submitted from the facilities are reviewed. The filed records are compared with the report's carbon copies and the details entered under the DHIS2. (Ariff Adilah Mohamed; Iskandar Yulita Hanum P; Majid Mohamed Isa Abd. et al., Dec 2020) The data assessment period from Jan 2014 to Sept 2017 comprises a detailed review covering the twelve months. The pictorial data journey is shown below.



5. Research Methodology

The above research methodology adopts the non-probability sampling technique for the sample collection from the population. As the actual sampling frame is unknown, the sampling technique is adopted for the respondent's selection. (Ariff Adilah Mohamed; Iskandar Yulita Hanum P; Majid Mohamed Isa Abd. et al., Dec 2020) Power analysis calculates and determines the study's sample size. G*Power, in this regard, calculates the minimum size required for performing the data analysis with a confidence level of 95%. Survey research explains the predictors of the intention to use a Poison Information System (PIS), and the constructed relationships are analyzed. (Ariff Adilah Mohamed; Iskandar Yulita Hanum P; Majid Mohamed Isa Abd. et al., Dec 2020) The questionnaires would be sent through the online Google Forms to the healthcare professionals to manage the poison cases in public hospitals. The respondents slow down their responses after several reminders. To solve the response lack, the technique of paper survey is considered and implemented. The response time stipulated for the questionnaire completion is three weeks. A representative is selected to guide the data collection throughout the research. The questionnaire would be sent from every hospital to the healthcare professionals.

6. Conclusion

Investment in HMIS has resulted in tool utilization improvement and data accessibility. The routine data quality is low. The district level's DHIS2 reflects the inaccuracy of the existence of the primary data source. The study findings emphasize the importance of continuous data quality audition and strategies innovation with consideration for the process of underlying data management, dealing with human resource challenges, and indicator types. As there is a

requirement for universal healthcare advances, a practical model is developed to attain the objectives. The study findings prove that a strong evidence body highlights the HIS's unfitness for transformative changes, eliminating the challenges confronting integrated information deployment.

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This is Arvind Chandrasekaran from Texas, USA. Presently working for PPG Healthcare for the past six years. I have also been pursuing Doctorate in Computer Science (Big Data Analytics) from Colorado Technical University for the past two years, having completed 54 credits; I'm looking to achieve the same by this year.