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"Social Transformations in the Algerian Healthcare Sector: The Impact of Digitalizing the Electronic Medical Record (DEM.DZ) on the Quality of Health Services – A Case Study of Youssef Yalaoui Hospital in Ain Azel, Sétif.Algeria"

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Abstract

The digitalisation of the healthcare sector in Algeria is an imperative aimed at promoting public health and achieving quality healthcare services. The Ministry of Health has worked diligently to accomplish this by establishing a range of digital platforms that vary according to the directorates that make up healthcare institutions. Given that the patient is a key focus within the healthcare sector, the ministry introduced the electronic medical record system with the aim of improving healthcare services.

This study aims to explore the impact of the Digital Medical Record system (DEM.DZ) on the quality of healthcare services in Algeria. It also focuses on analysing the contributions of the electronic medical record system to enhancing the quality of services for both healthcare professionals and patients by addressing the main research question: How has the electronic medical record system affected the quality of healthcare services provided to both patients and healthcare professionals?

Keywords: Digitalisation, quality of healthcare services, electronic medical record system, public health, health technology.

Introduction

As part of its efforts to enhance public health and improve the quality of healthcare services, and believing that the health of its citizens is the foundation of its development and economic growth, the Algerian state has placed great emphasis on the healthcare sector. This focus extends beyond merely providing material and human resources to the digitalization of healthcare services, with a particular emphasis on the patient. In an effort to enhance the services provided and facilitate access to them, the government introduced a digital medical record system (DEM.DZ), enabling the continuous monitoring of patient records. This initiative aims to simplify access to healthcare services and ensure greater comfort for patients.

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1-Research Problem

Algeria is striving to keep pace with global technological advancements by prioritizing information and communication technologies (ICTs). This commitment is evident in its efforts to implement e-governance and digitize public sector services across all fields, as digital transformation has become a modern necessity.

The healthcare sector, being one of the

most sensitive and vital sectors, remains a top priority for the state. Efforts to modernize and enhance its services are aimed at improving public health, which is one of the country's most significant objectives. Ensuring high-quality healthcare services requires moving away from traditional methods and embracing modernization through digital transformation. To achieve this, the healthcare system has integrated various digital platforms to streamline operations and communication. Additionally, it has placed the patient at the center of its strategy, ensuring that medical care is delivered in an organized and technologically advanced manner through the introduction of the electronic medical record platform (DEM.DZ).

This study seeks to examine this initiative by addressing the following research question: How has the electronic medical record service affected the quality of healthcare services provided to both patients and healthcare professionals?

To further explore this issue, the study investigates the following sub-questions:

- What contributions has the electronic medical record service made to the quality of healthcare services for healthcare professionals?
- What contributions has the electronic medical record service made to the quality of healthcare services for patients?

2-The Conceptual Framework of the Study:

2-1The Concept of Digitalization

There are numerous definitions of digitalization. According to Terry Kunny, digitalization is: "The process of converting various types of information sources (books, periodicals, images, audio recordings, etc.) into a machine-readable format by using computers, transforming information into a set of binary numbers, which is referred to as digitalization." (Aknouch, 2010, p. 148).

Doug Hodges presents another perspective, adopted by the National Library of Canada, defining digitalization as:

"A process or procedure that converts intellectual content stored in traditional physical formats (such as books, articles, periodicals, manuscripts, etc.) into a digital format." (Mahi, 2020, p. 178).

Saleh Al-Dalhoumi defines digitalization as:

"A sophisticated reproduction process that allows for the conversion of a document, regardless of its type and format, into a digital sequence. This technical work is accompanied by intellectual and bibliographic efforts to organize the metadata, facilitating its indexing, cataloging, and representation of the digitized text's content." (Aknouch, 2010, p. 149).

Digitalization, or digital transformation, refers to the conversion of data into a digital format for processing through electronic computers. In the context of information systems, digitalization generally refers to converting printed texts or images into binary signals using scanning devices that allow the results to be displayed on a computer screen. (Mehri, 2006, p. 82).

The Encyclopedic Dictionary of Information and Documentation defines digitalization as: "An electronic process for producing electronic or digital codes, either from a document or any physical object, or through analog electronic signals." (Aknouch, 2010, p. 149).

Based on the aforementioned definitions, digitalization can be understood as the process of transforming information from its physical form into electronic signals, which may include documents, images, maps, or even ideas.

2-2Definition of Healthcare Service:

Healthcare service is an essential necessity and a fundamental human right that ensures the preservation of life and the achievement of health security. Countries, regardless of their cultural, political, or economic differences, strive to provide the necessary material and human resources within their healthcare institutions to ensure the delivery of these services and the advancement of public health.

Healthcare services are defined as:

"All services provided by the healthcare sector at the national level, whether curative, directed at individuals; preventive, aimed at society and the environment; or related to the production of medicines, medical supplies, prosthetic devices, and other resources to enhance citizens' health, treat them, and protect them from infectious diseases." (Ouchen, 2018, p. 56).

Another definition states that healthcare services refer to:

"Medical treatment provided to a patient, whether in the form of diagnosis, guidance, or medical intervention, resulting in patient satisfaction, acceptance, and benefit, ultimately leading to an improved health condition." (Dridi, 2014, p. 17).

Additionally, healthcare services are considered "an intangible economic commodity, similar to other service-based goods." (Merizek, 2012, p. 35).

Healthcare services can also be described as:

"A set of activities or healthcare benefits provided by hospitals to patients in exchange for a certain fee. These services utilize supporting materials, but ownership of these materials does not transfer to the recipient of the service." (Al-Maliki, 2018, p. 218).

2-3-Concept of Healthcare Service Quality:

The concept of healthcare service quality varies depending on the perspective of both service providers and recipients, as each evaluates quality based on their expertise and needs.

For patients, quality means:

"Being treated with respect, care, empathy, and understanding by all healthcare personnel they interact with—either directly or indirectly—during their stay at the hospital." (Nusairat, 2008, p. 231).

From the patient's perspective, the quality of healthcare services must align with their needs at the time, both psychologically (in terms of respectful treatment) and physically (in terms of appropriate nursing care). In this sense, quality is a subjective concept.

For healthcare providers, however, service quality refers to:

"Delivering the highest level of medical knowledge, skills, equipment, and technology for patient care." (Nusairat, 2008, p. 231).

Ensuring healthcare quality depends on the availability of essential resources. Healthcare services are not limited to verbal promises; they require adequate medical equipment and opportunities for professional development.

From a healthcare institution's perspective, quality is defined as:

"Achieving a high level of patient satisfaction at the lowest possible cost." (Ben Sheikh, 2018, p. 3).

In general, many researchers agree that service quality is determined by meeting customer expectations. However, since customer needs vary, the degree of quality is a relative measure, depending on the comparison between expected and actual service quality. (Al-Maliki, 2018, p. 218).

Based on the above, healthcare service quality is a collaborative effort between nursing staff and management. The latter ensures the availability of qualified human resources, proper training, and necessary facilities, while healthcare professionals focus on performing their duties diligently and continuously improving their skills to serve patients effectively. Additionally, government support and sufficient funding play a crucial role in enabling healthcare institutions to achieve high service quality.

2-4-The National Agency for Digitalization in the Health Sector:

The National Agency for Digitalization in Health was established by Executive Decree No. 22/251, dated 1st Dhul-Hijjah 1443, corresponding to June 30, 2022. The decree pertains to the restructuring of the previously named National Agency for Health Documents, which was initially created under Executive Decree No. 95/319, dated 19 Jumada Al-Awwal 1416, corresponding to October 14, 1995.

-Main Objectives and Responsibilities :

According to Article 6, the agency's primary mission is to implement a national health information system that ensures the digitalization of medical activities, promotes the sharing and exchange of health data, and guarantees data security and confidentiality among healthcare professionals, institutions, and users—while strictly maintaining medical and professional secrecy.

-Key Responsibilities of the Agency:

The agency is specifically tasked with:

- Developing the digital hospital system through a patient-centered platform, enabling healthcare professionals to monitor treatment pathways in real-time securely. This initiative aims to significantly enhance healthcare quality by integrating data related to:
  - Patient admissions,
  - Clinical information,
  - Treatment protocols,
  - Medical units and departments,
  - Intensive care management,
  - Hospital technical facilities (medical analysis laboratories, radiology units, hospital pharmacies),
  - Standardizing and maintaining medical equipment.
- Establishing a shared medical record (Dossier Médical Électronique - DEM.DZ) accessible to healthcare professionals through a unique patient identifier. This record consolidates all necessary personal medical data to facilitate patient care coordination.
- Implementing telemedicine, including:
  - Remote consultations and diagnostic imaging,
  - Teleconferencing for medical professionals,
  - Remote patient care—especially in underserved areas with limited healthcare access.
- Developing online medical training platforms in collaboration with relevant institutions, ensuring continuous medical and paramedical education for healthcare professionals and promoting distance learning.
- Creating interconnected healthcare networks at the local, regional, and national levels, to facilitate patient referrals to the most suitable healthcare facilities—particularly in emergency cases.

- Developing a digital classification system for diseases and medical procedures (both medical and paramedical) in coordination with healthcare professionals, social security institutions, and relevant sectors.
- Establishing a health monitoring and data platform to provide authorities, healthcare professionals, and users with reliable health information, including:
  - Emerging and re-emerging diseases,
  - Epidemics and pandemics,
  - Scientific, epidemiological, and demographic data,
  - Healthcare service availability.
- Developing a health incident reporting portal, enabling individuals to notify health authorities about adverse health events or unusual health risks, to help prevent epidemics, pandemics, and health crises.
- Digitalizing the management and archiving of medical records and other health-related documents.
- Contributing to the development of legislative and regulatory measures governing the use of information and communication technologies (ICT) in healthcare, with a focus on:
  - Medical practice regulations,
  - Medical data confidentiality,
  - Health data security and sharing.
- Providing scientific and technical information, as well as essential documentation for medical training and education.
- Designing, producing, acquiring, and publishing educational, medical, scientific, and technical materials across various media formats.

(Source: Official Gazette, Issue No. 47, 2022, pp. 13-14).

3-Theoretical Framework of the Study

3-1- Modernization Theory :

The modernization theory focuses on the transition from traditional systems to modern ones due to technological advancements, which applies to the digitization of the healthcare sector in Algeria.

-Application of the Theory to the Electronic Medical Record (EMR):

- Development of Healthcare Services:
  The electronic medical record (EMR) represents a shift from paper-based to digital systems, contributing to improving healthcare service quality and reducing medical errors caused by the loss or mismanagement of paper records.
- **Changing Roles and Relationships:**
  Digital transformation has reshaped the doctor-patient relationship, enabling faster and more accurate diagnoses and improving healthcare management through instant access to medical data.
- **Adapting to Technology:**
  Healthcare professionals and the broader community face challenges in adapting to new digital systems, which is a key aspect of modernization that requires continuous training and professional development.

3-2- Max Weber's Social Action Theory:

The social action theory focuses on how individuals respond to technological changes based on their beliefs and behaviors.

Application of the Theory to the Electronic Medical Record (EMR):

- Behavior of Doctors and Administrators:
  Doctors, nurses, and administrators respond differently to the digital system. Some perceive it as a positive development that facilitates work and enhances efficiency, while others struggle to adapt due to lack of training or resistance to change.
- Patients' Reactions:
  - Some patients believe that digitization improves healthcare services and reduces waiting time, leading to greater satisfaction with the healthcare system.
  - Others, however, fear privacy breaches or struggle to understand how to navigate digital records, which may create distrust in the new system.
- **Interaction Between Doctors and Patients:**
  With the implementation of digital records, the nature of communication between doctors and patients is changing. Doctors now rely more on digital data than direct conversations, which may reduce the human aspect of medical interactions, affecting patients' acceptance of digitalization.

By applying these two theories, it becomes clear that healthcare digitization in Algeria is not just about enhancing service quality but also about transforming social interactions within the healthcare system. This highlights the need for adaptation strategies and continuous training to ensure the successful implementation of digital transformation in healthcare.

4- Applied Study – Youcef Yalaoui Hospital, Ain Azel – Sétif Province

4-1-Geographical Scope of the Study:

The study was conducted at Martyr Youcef Yalaoui Hospital in Ain Azel, located in the municipality of Ain Azel, in the southern part of Sétif Province, northeastern Algiers. This hospital provides various medical services to the local population and neighboring areas, including:

- General medical consultations
- Emergency services
- Specialized medical care in various disciplines
- Diagnosis and treatment services

Additionally, the hospital comprises departments such as surgery, internal medicine, pediatrics, and intensive care units, among others. It is equipped with operating rooms, medical analysis laboratories, and radiology departments (X-ray, etc.). The hospital plays a crucial role in delivering healthcare services to the local community and reducing pressure on major hospitals in Sétif Province.

4-2-Timeframe of the Study:

Given the research nature, which did not require a large sample size, the study was conducted within a short period from September 10 to September 23, 2023.

4-3-Data Collection Methods:

To address the research problem, the study relied on:

- Theoretical section: Various references, including books, journals, conference papers, and theses.
- Empirical section: The main data collection tool was interviews conducted with a random sample of doctors, nurses, department heads, and patients. Additionally, observation and participant observation were used by joining patient queues to receive medical treatment, providing further insights into the hospital experience.

5-The Electronic Medical Record for Patients (DEM.DZ) in Practice:

In response to the directives of the Minister of Health and Population in Algeria regarding the digitization of the healthcare sector and the activation of the DEM.DZ platform (the DEM stands for Multimedia Distance Education.)

Youssef Yalaoui Hospital in Ain Azel has mobilized all its resources to ensure the success of this initiative. The goal is to achieve the desired objectives, improve the quality of services provided to patients, and modernize the monitoring of their treatment process. This is implemented through the following steps:

1- Reception and Orientation:

The patient first goes to the medical consultation department, where they are received by a general practitioner in an office equipped with a computer running the DEM.DZ electronic medical record system. The doctor conducts an initial examination by asking a series of questions and filling out a medical assessment form to determine the urgency of the case. The patient's condition is classified as urgent or non-urgent, and they are then given a ticket with a unique identification number (not a queue number) before proceeding to the waiting room.

The waiting area at the hospital is equipped with chairs and two television screens:

- The first screen displays educational health videos and an informational video explaining the DEM.DZ process.
- The second screen shows the queue order, using a non-sequential numbering system (e.g., 31, then 29, then 35, then 19). Each number is displayed in a specific color, which determines the patient's priority based on the urgency of their condition:
    - Red: Emergency case – requires immediate attention.
    - Orange: Urgent case – can wait briefly.
    - Green: Non-urgent case – can wait longer.

Priority is given first to red cases, followed by orange, then green, while maintaining a sequential order within each category based on the severity of the condition. If multiple cases have the same urgency level and risk factor, patients are treated in the order of arrival.

However, the queue order displayed on the screen is dynamic and may change if a new patient with a more critical condition arrives, making it difficult to predict the exact waiting time.

To educate patients and familiarize them with the treatment process, posters explaining each step in detail have been put up. These posters provide clear answers to patient inquiries and help eliminate any confusion.

2- Initial Examination:

In the designated examination room, a general practitioner conducts the initial medical assessment using a computer equipped with the electronic medical record system. The doctor records the patient's information, performs a physical examination, and orders medical tests or X-rays if necessary. Once the tests are requested, the doctor sends an electronic message to the relevant department, which carries out the required procedures. The results (images, values, etc.) are then securely sent back to the referring doctor.

3- Treatment:

After reviewing the examination results, including medical tests and X-rays, the doctor proceeds with the treatment plan by:

- Sending an electronic prescription to the treatment room, where the patient receives necessary medical care (injections, IV fluids, artificial respiration, ECG, etc.).
- Issuing a prescription for medication to be obtained from a pharmacy.
- Referring the patient for surgical intervention if needed.

6-Interview Analysis Results:

Based on interviews with key stakeholders involved in the electronic medical record system—including administrators, department heads, doctors, nurses, and patients—as well as direct observations and patient interactions, the following results were obtained:

6-1- Findings from Interviews with Healthcare Professionals :

Interviews with doctors, nurses, and administrative staff highlighted several key advantages of the electronic medical record system:

- Standardized patient care through a unified model across all healthcare institutions, reducing negligence and inefficiencies while providing legal protection.
- Modernization of healthcare services, making them more efficient and digitally integrated.
- Reduced overcrowding in emergency departments.
- Better organization of patient flow, reinforcing a culture of orderly queuing.
- Improved prioritization, ensuring faster care for critical cases.
- Electronic communication between doctors and different departments reduced patient movement within the hospital, thereby minimizing the risk of infection.
- Decreased handling of physical documents, lowering cross-contamination risks and contributing to hospital cleanliness.
- Progress toward the "Zero Paper" goal of digitization, reducing administrative costs and effort by eliminating excessive paperwork.

According to modernization and social change theory, while digital transformation promises higher service quality, its adoption varies across health institutions. Challenges include:

- Lack of digital training for some healthcare professionals.
- Resistance from some patients who are hesitant to use the new system.

Despite these challenges, the electronic medical record system represents a significant technological advancement, paving the way for a more efficient and modern healthcare sector.

6-2- Findings from observations and interwiews with Patients:

Unlike hospital staff, patients had a completely different opinion regarding the digital system, which led to varying degrees of dissatisfaction, particularly among non-emergency cases. Although it appears to serve urgent cases, it has not gained sufficient approval and has resulted in several issues, including:

-Increased Time and Effort Instead of Reduction:

- Patients go through an initial triage assessment, where they are examined by a triage doctor before being directed to the attending physician, leading to an indefinite waiting time depending on the urgency of their condition and the number of incoming patients.
- The same questions asked by the triage doctor are repeated by the attending physician before directing the patient to the appropriate treatment.
- Even patients with emergency referral letters from external doctors are required to go through the triage system instead of being sent directly to the specialist, wasting valuable time that could be crucial for the patient's health.

-Indirect Exclusion of Most Patients:

- Long waiting times—which can exceed two hours—force some patients to leave the hospital without receiving treatment, depriving them of their right to healthcare.

-Threat to Healthcare Access for Middle-Income Patients:

- Patients believe that digitalization has reduced access to free healthcare, as priority is now given to emergency cases, pushing many to seek private healthcare services.

- However, given the economic situation of public hospital patients, many cannot afford private treatment, putting public health at risk.

-Issues with the Queue Display System:

- Queue numbers are displayed only on screens without any audio alerts, making it difficult for patients—especially elderly and illiterate individuals—to follow their turn.
- Since numbers are displayed in a non-sequential order, patients struggle to determine when their turn will come, leading to confusion and anxiety in the waiting area.

According **to Max Weber's social action theory**, digitalization is not merely a technical change but a social transformation that affects individual behaviors and practices within hospitals (Weber, 1922).

- The digital system has altered how patients interact with healthcare services, creating discomfort and confusion, particularly among vulnerable groups (elderly individuals, illiterate patients, and low-income populations).
- While digitalization aims to enhance the efficiency of healthcare services, the lack of consideration for social and cultural disparities among patients has made implementation less inclusive (Castells, 1996).
- Some patients' rejection of this system reflects social resistance to technological change, which can be explained by the lack of sufficient awareness regarding the importance of health technology (Foucault, 1973).

Conclusion:

The Electronic Medical File (EMF) program, which the Ministry of Health has insisted on implementing as part of the digitalization of Algeria's healthcare sector, aims to establish a modern healthcare system that aligns with technological advancements and enhances the quality of patient services, ultimately laying the foundation for a digital hospital.

To assess its real-world application, we selected Youssef Yalaoui Hospital in Ain Azel, Sétif as a case study and reached the following conclusions:

- The contribution of the EMF to healthcare quality is relative, varying between healthcare providers and patients.
- From the perspective of healthcare providers, the EMF improves service quality in terms of accuracy, organization, cost reduction, and modernization.
- However, for patients at Youssef Yalaoui Hospital, the EMF has not significantly improved healthcare quality, except for its prioritization of urgent cases that cannot wait. At the same time, it has led to a gradual reduction in free healthcare access, as reflected in patient interviews.
- Patients struggled to transition from the traditional to the modern digital system, and the lack of a gradual implementation process hindered their ability to adapt.

And finally ,we propose several strategies in this field based on sociological analysis and study findings, including:

- Revising medical training to incorporate skills for handling health technology, along with training programs on how to guide patients within the digital system.
- Raising patient awareness through educational campaigns about the benefits of the digital system, while providing clear instructions on how to use it.
- Enhancing the patient queue display system by adding audio alerts or assigning assistants to help illiterate patients and the elderly follow their turns.
- Finding a middle ground for urgent cases referred from outside the hospital, allowing external doctors to directly register critical cases into the system, to prevent delays.

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