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Review Article

INFORMATION TECHNOLOGY IN HEALTHCARE SECTOR: A COMPARATIVE REVIEW OF THE EXISTING TECHNOLOGIES AND PRACTICES

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ABSTRACT

In the current era of technological advancements, software applications provide a very handy and user friendly environment to perform a particular task. A hospital information system (HIS) is an element of health informatics that focuses mainly on the administration needs of hospitals. It is a comprehensive, integrated information system designed to manage all the aspects of a hospital's operation, including medical, financial, and legal issues and the corresponding processing of services. Its purpose is to manage the information that health professionals need to perform their jobs effectively and efficiently. This paper aims to compare and contrast the different technologies and systems developed over time that aim to serve this purpose.

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INTRODUCTION

In the late 19th century the use of computers became increasingly common in healthcare environments. The use of computers has drastically changed the science and practice of health or medical informatics. Improvements in the efficiency of computers, internet and computer networks have helped the healthcare professionals to support their decision-making processes by increasing the accessibility of crucial information [1].

A hospital information system (HIS) is designed to manage the administrative, financial, technical and clinical aspects of a hospital. They help in the evaluation of Hospital Performance, overall cost, and projection of the long term forecast. Every hospital undergoes the process of vigorous decision making, which require health professionals to apply their knowledge acquired with time and that derived from data describing the patient, or the hospital in order to make decisions related to treatment plan, administrative jobs, maintenance services etc. HIS takes on the tasks of collecting, storing, analysing, manipulating, and presenting the data which helps to generate the information needed to make the decisions in a hospital [2]. An efficient and future-proof HIS is therefore, a key component of a viable health system as Healthcare business models are evolving rapidly. Therefore, it is the need of the hour to control processes that govern the healthcare sector as costs rise and there is a requirement to manage information needed by the health professionals [3].

HIS in Indian Hospitals

In India, basic healthcare facilities still poses a threatening challenge of proper implementation. There are numerous government hospitals that satisfy the needs of the Indian citizens but they are devoid of the basic infrastructure and amenities. The government has introduced a relatively new term called "E-health" that stands for healthcare practice which are supported by electronic processes and communication. According to EU ICTs for Health: "e-Health describes the application of information and communications technologies across the whole range of functions that affect the health sector, from the doctor to the hospital manager, data processing specialists, social security administrators and the patients"[4].

Current Scenario and Need to Adopt HIS

Corporate healthcare companies are gearing into fast track growth using latest technology for providing best quality service to face competition. Government hospitals are often overburdened and collapsed public health care systems in India. They have also begun to take ICT (Information communication and technology) route in various parts of the country, changing the dynamics of healthcare being the prime objective. HIS provides web-based information sharing platforms for developing countries. Information systems for healthcare help in increasing productivity, patient satisfaction, maintenance of quality care and abolishment of outdated procedures. It also reduces the chaos encountered in big Government hospitals. Web services are therefore essential for

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healthcare professionals, administrative members and patients in order to share, organise and access medical services.[5]

Challenges in Implementation

There are several barriers, ranging from technical to financing to political issues. One of the biggest challenges is scalability: while pilot projects have generally been successful, when taken to scale, they resulted in costly and inefficient programmes due to the proliferation of discrete and independent systems. Success in the future will depend on achieving much more interoperability and cooperation than is today the case, between all the major stakeholders [6].

Safety and Privacy Considerations

Safety of personal data and other sensitive information represents one of the most pressing challenges in design practice of digital health solutions and has implications on aspects relevant to both developers and medical experts alike [7].

One of the most promising application areas for information technology is digital healthcare, an area that is currently undergoing fundamental evolution due to unprecedented demographic and socio-economic changes of the modern society, which together call for a transition towards more affordable, pervasive, and patient-centred forms of care.

IT has the potential to give rise to many areas of digital healthcare, including remote real-time health monitoring, elderly care, chronic disease management, and fitness programs, by introducing a concept of a continuous treatment process requiring seamless information sharing across multiple healthcare professionals and various healthcare institutions in order to improve healthcare services and containment of related costs[8]. This is a massive opportunity for a next generation of better and more sustainable healthcare but raises considerable concerns and challenges with respect to data protection and safeguarding of patient safety, privacy, and transparency of information.[9]

HIS DEVELOPED OVER TIME AND THEIR SPECIFICATIONS

Medicaid (Wipro)

Wipro Medicaid solution and services provide operations such as– IT Applications, Infrastructure and Business process services. IT Application and Infrastructure and Security Services include maintenance, enhancements, Conversions, upgrades, Application hosting and service desk. Medicaid Medical Management provides features such as Health Risk Assessment (HRA), complex case management and Medicaid Care Management platform for integrated behavioural and clinical programs.

Table1 Pre-existing HIS and Their Features

Developer	Software	Features
Wipro	Medicaid	<ul style="list-style-type: none"> Advanced Data Analytics and back end operations Membership and enrolment Billing Applications and Business process services.
TCS (Tata Consultancy Services).	Med Mantra-Hospital Management and Information System	<ul style="list-style-type: none"> Patient registration Demographic details Doctors' appointment scheduling Lab Result Reporting
Quintegra solutions	Quintegra	<ul style="list-style-type: none"> Customizable modules according to hospital needs.
InterSystem's TrakCare	TrakCare	<ul style="list-style-type: none"> Focuses on patient clinical data Different modules of the software share the same repository and have a common interface. Multi-language Multi-currency Focuses on local requirements based on geographical conditions
Caisis Team	Caisis	<ul style="list-style-type: none"> web-based information system storage and analysis of cancer patient data
ProEmTechInfosystems	ProMed Application suite (MIRepo, ProLIS, ProMedLite, ProAppS)	<ul style="list-style-type: none"> Customisable according to hospital requirements Accounting Appointment Billing Patient record Bed management
ACG Infotech Ltd.	Electra	<ul style="list-style-type: none"> Web based Variety of predefined modules Supports DICOM technology and tele-radiology Mobile friendly
MentisSoft Solutions Pvt. Ltd.	Medinous	<ul style="list-style-type: none"> Focuses on administrative and management processes provides information on patient care, administration, finance and accounting for decision making.
DNVGL	Synergi Life	<ul style="list-style-type: none"> QHSE (quality, health, safety and environment) management Guides on possible non-conformances, risk factors, incidents and improvement suggestions etc. Multi industry application

It also offers functions like advanced Data Analytics and back end operations that include membership and enrolment, billing and reconciliation, member and provider service, membership scanning and fulfilment and printing[10].

Med Mantra-Hospital Management and Information System

It is a hospital management service provided by TCS (Tata Consultancy Services). This HIS has 28 modules meeting the hospital needs, like Patient registration, demographic details, outpatient visits, doctors' appointment, Lab, Radiology and Cardiology Result Reporting, Operation Theatre Management, Admission, Discharge, Transfer, Pharmacy etc[11].

HMIS by Quintegra Solutions

The HMIS modules have been designed according to three categories – core modules, supporting modules and enterprise-enabling modules. These modules can further be customized according to hospital needs. These are mainly divided into three namely, core module, enterprise-enabling module and supporting module. It offers a patient centred approach and is powered by SAP Net Weaver® [12].

Inter System's Trak Care

It is a unified hospital information system mainly focusing on patient clinical data for improving safety and patient outcomes. The different modules of the software namely, clinical, administrative, and departmental modules share a single data repository and have a common user interface. Additional features include multi-language and multi-currency system that are equipped to meet the local requirements of different geographic regions [13].

Caisis

Caisis is a web-based information system for the storage of patient data and analysis of that data. This software is specific to cancer patients and is intended to bridge the gap between clinics and cancer research [14].

ProMed

ProMed is a management based software for multi-speciality hospitals, laboratories and clinics. The main feature of this software is that it can be customised according to the requirements of the hospital. ProMed Application Suite consists of the following applications - ProMed, MIREPO, ProLIS, ProMedLite and ProAppS. They have options for accounting management, appointment management, billing, patient record storage, bed management etc. [15].

Electra

Electra covers a wide range of departments in a hospital in the form of modules that can be selected by the user according to their requirement. It also supports DICOM technology and tele-radiology for obtaining opinion of distant consultants. It is web based and mobile friendly for the purpose of achieving paperless transactions within the institution [16].

Medinous

Medinous is developed by MentiSoft solutions and it focuses mainly on administrative and management processes. It also provides information on patient care, administration, finance and accounting in order to aid effective decision making [17].

Synergi Life

This software mainly focuses on QHSE (quality, health, safety and environment) management for non-conformances, risk factors, incidents and improvement suggestions etc. Apart from healthcare the technology is also used in a number of other industries and businesses, such as energy, transport, government, construction and more [18].

CONCLUSION

Numerous MNC's have developed a wide range of hospital information systems which offer a comprehensive spectrum of features. Some of them have been reviewed in this paper. With such high levels of technological advancements, hospital information systems have seen an increase in availability. However, the main concern lies within its proper implementation. The Indian healthcare system is still lacking behind in transitioning from conventional practices to modern technologies such as this. The main factor responsible for such scenario is the cost of the product and lack of infrastructure. More focus on regional modifications coupled with feasible cost can be of great value in incorporating information technology in Indian healthcare systems.

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