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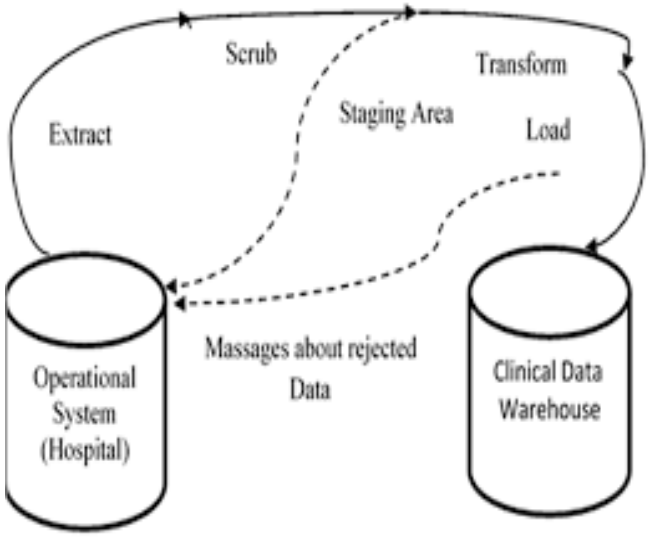
HEALTH CARE DATA WAREHOUSE SYSTEM ARCHITECTURE FOR CORONA DISEASE: A PROMINENT TOOL

Veerta Thakur*
Dr. Saurabh Charaya**

ABSTRACT

Data Warehousing methodologies share a common set of tasks, including requirements analysis, data design, architectural design, implementation and deployment. Clinical data warehouses are complex and time consuming to review a series of patient records however it is one of the efficient data repository existing to deliver quality patient care. Data integration tasks of medical data store are warehouse architecture. The presented data warehouse architectures are practicable solutions to tackle data integration issues and could be adopted by small to large clinical data warehouse applications.



Keywords: *Clinical Data Warehouse, Data Integration, Data Warehousing, Data Design, Data Warehouse Architecture.*

Introduction

There are relatively few institutions that have developed clinical data warehouses, containing patient data from the point of care. Because of the various care practices, data types and definitions, and the perceived incompleteness of clinical information systems, the development of a clinical data warehouse is a challenge. The world largest, fast growing and most information are available in the

* Ph.D. Scholar (192SET04010005), Department of Computer Science, OM Sterling Global University, Hisar, Haryana, India.
** Assistant Professor, Department of Computer Science & Engineering, Om Sterling Global University, Hisar, Haryana, India.

health care industry. In health care industry data may be recorded as doctor's name, patient's name, patient's record, individual patient report, physician order entry, doctor's decision support system, medicine. Most of the health care centres are still stand along, they are not communicating with other health care centre, and they don't share their documents with others.

I am going to store corona patient's data in data warehouse. At first the death rate was very high because no country was ready to avoid such a disaster, neither were there so many beds in the hospitals nor ventilators. As a result there is a huge loss of life and money. This design of mine has been made keeping in view this situation so that the data of corona patients can be stored in data warehouse. The treatment is being given to them is increasing the recovery rate and my design is going to be useful for the doctors so that in future they can do the treatment considering the past record. In this health care data warehouse, doctors can share patient record to others; they can take decision from others. Most of the health care centre design their patient record in individual group but in my design group are created based on disease i.e. same disease patients are in the same group. This work is based on the Corona disease, the cost of treatment, treatment using drug and vaccine, treatment at hospitals, isolation at home, death rate.

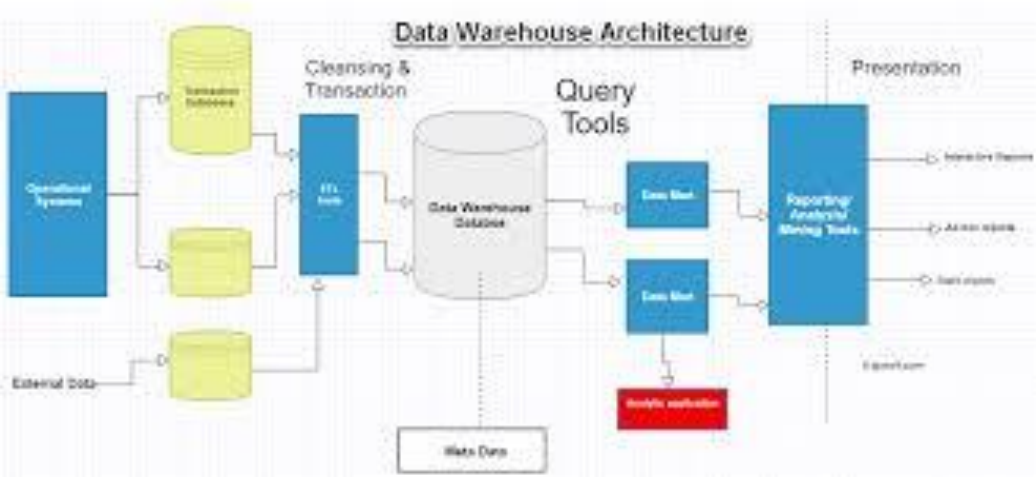
Corona, scientific name Covid-19, is an infection disease, spread from hand to hand. The most common symptoms are sore throat, fever and loss of smell and taste and after some time hard to breadth and lungs failure. In start of 2021, corona was less effective on children some places. Current evidence suggests that the virus spread mainly between people who are in close contact of each other. A person can be infected when aerosols or droplets containing the virus are inhaled or come directly into contact with the eyes, nose or mouth.

Sr. No.	Patients Condition	Treatment Adopted	Numbers of Hospitals	Successful Result in %
1	Extreme Serious Patients	Remdesivir, steroids, tocilizumab, favipiravir, Ivermectin & HFNC oxygen	20	80
2	Serious Patients	Aziromycin +Cetrizine+ Paracetamol & HFNC oxygen	12	60
3	Normal Covid Infection	Aziromycin +Cetrizine+ Paracetamol and Kadha	10	60
4	Mild illness	Cough Syrup + Paracetamol, Covid Stress Management	10	55
5	Covid Stress Management	Eat healthy meals, Get enough sleep, Get physical activity, deep breathing, stretching and meditation.	12	50
6	Precautions	Wear a mask, Clean your hands, Maintain safe distance, And Get vaccinated.	40	95

Data Warehouse

First of all we should study about Data warehouse. Data warehousing is the only viable solution for providing strategic information, it is a simple concept for information delivery. Data warehouse provides an integrated and total view of the enterprise to make the enterprise's current and historical information easily available for decision making. It also presents a flexible and interactive source of strategic information. It is an ideal environment for data analysis and decision support. It is fully user-driven, fluid, flexible, interactive, subject oriented, integrated, and non-volatile and time variant collection of data in support of management's decisions. Architecture is the proper arrangement of the all software and hardware components. As per requirements of organization arrange those building blocks in a certain way that gives maximum benefit. Just like any software development project, data warehouse also follow a set of steps to ensure that a working system is delivered on time and to ensure that all user requirement has been fully captures by the design.

Data warehousing is a process requiring a set of hardware and software components that can be used to better analyse the massive amounts of data that organisations, companies and research disciplines are accumulating to make better operational and/or strategic decisions. The data warehousing process does not consist of just adding data to the DW, but also requires the architecture and tools to collect, query, analyse and present information. "Data warehousing is a process, not a product, for assembling and managing data from various sources for the purpose of gaining a single, detailed view of part or all of a business".



The Approach

Although there are several technical issues as indicated above that challenge building a data warehouse solution and designing data warehouse architecture. Our approach was to experiment with the known and available **BKR** (e.g., Oncology and Mental Care). This approach had been taken by the mutual understanding of a Queensland base industry partner who provide Information Technology solutions to health care providers. Due to the confidentiality of healthcare data, and the privacy policy of the participating health care organisation, the proposed experimental data and information is not augmented physically. The data structure and alias names is used instead. Most of the data design and attributes in this experiment is an abstract only. We maintain such status of the data in order to preserve the privacy and protect intellectual properties as agreed with the collaborating industry partner.

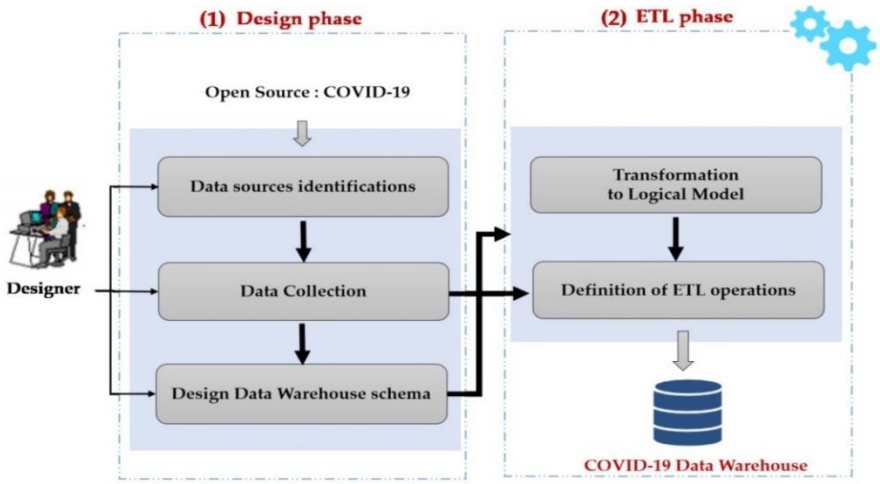


Figure: Overview of Our Approach

Review of Literature

A literature review surveys books, scholarly articles, and any other sources relevant to a particular issue, area of research, or theory, and by so doing, provides a description, summary, and critical evaluation of these works in relation to the research problem being investigated. Literature reviews are designed to provide an overview of sources you have explored while researching a particular topic and to demonstrate to your readers how your research fits within a larger field of study.

Literature reviews aim to answer focused questions to: inform professionals and patients of the best available evidence when making healthcare decisions; influence policy; and identify future research priorities.

The Purpose of a Literature Review

The purpose of a literature review is to collect relevant, timely research on your chosen topic, and synthesize it into a cohesive summary of existing knowledge in the field. This then prepares you for making your own argument on that topic, or for conducting your own original research.

- ***Osmar R.Z. (1999)*** The Author define here that the main principals of knowledge discovery from databases. Our main purpose is to find the *decision-making data*.
- ***Suknovic M. et.al (2005)-***This paper shows design and implementation of data warehouse as well as the use of data mining algorithms for the purpose of knowledge discovery as the basic resource of adequate business decision making purpose.
- ***Perej J.M. (2008)*** This paper surveys the most relevant research on combining Data Warehouse (DW) and Web data.
- **Qwaider W.Q. (2012)** This paper presents a model for clinical decisions support system which combines the strength of both OLAP and Data Mining.

Questions about the system strong for the following reasons:

- It discover hidden patterns in data.
- It enhances the real-time indicators and discover bottlenecks.
- It improves the visualization of information.
- Combining OLAP and data mining provides a potentially powerful tool to solve a real problem the world.

Objectives

- To design a module for treatment which have higher recovery.
- To develop a module to determine the cost of the treatment.
- To analyse the treatment type according to patient health.
- To design a platform for user past health details.

To enhance the Medical knowledge and to study the pattern of disease in local perspective. The hospital provides the general medical care encompassing all the departments like Medicine, Surgery, Gynecology, Pediatrics, Burn and plastics and others etc.

Objectives of health systems are:

- Improving the health of the population
- they serve.
- Responding to people's expectations.

Providing financial protection against the costs of ill-health.

Need of the Study

Pursuing a hospital administration degree can lead to advancement into higher healthcare management roles. Diverse career paths within health services administration, such as director of managed care, pharmaceutical project manager, clinical manager, and nursing home administrator, are open to exploration.

The IT department of a hospital is not only responsible for managing clinical software and the other processes that help administrative staff to keep patient records and admissions systems ticking along, they also have an important role to play in ensuring medical wards, operating rooms, labor and delivery suites and emergency departments run smoothly.

With the help of this study doctors can share their data with each other and with the help of data warehouse they will be able to take particular decision.

The need of this study was needed so that in future if the pandemic like corona comes again, then we know in advance that which treatment can reduce the death rate.

It should be also in the record of the doctors which type of patient is to be given which treatment. For example, which treatment is to be given to the patients of diabetes, heart patients and normal patients.

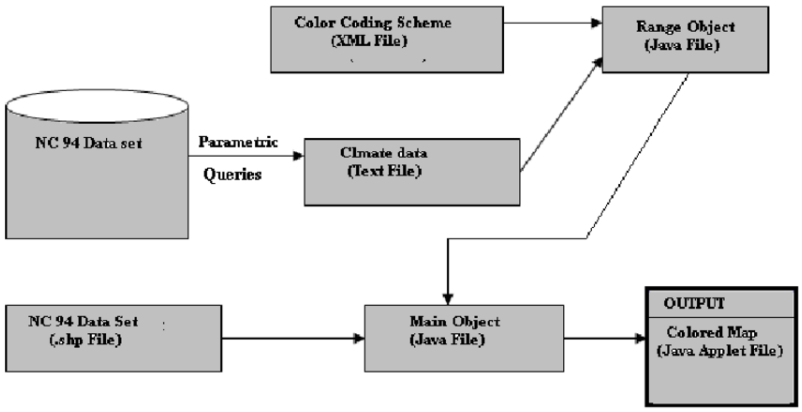
Queries become Faster

Research Methodology

Methodology discusses the research framework for this study. The various datasets were taken through primary data as well as secondary data. The primary data were taken from PHCs of district Hisar, Haryana, India and Secondary data to be collected from various sources such as:

- The research papers published by experts.
- Government of Haryana publications.
- Website of Ministry of Health. Data collected from these databases consist of diagnosis data with patient's medical and personal information of last 2 years.

Multiple Structured Query Language (SQL) queries were run to create these datasets. For purposes of this study, a sample of 2-year dataset was created in order to mine for knowledge discovery. Attributes that describe each entity with appropriate relationship are then fed into a data warehouse, which is designed using star schema.



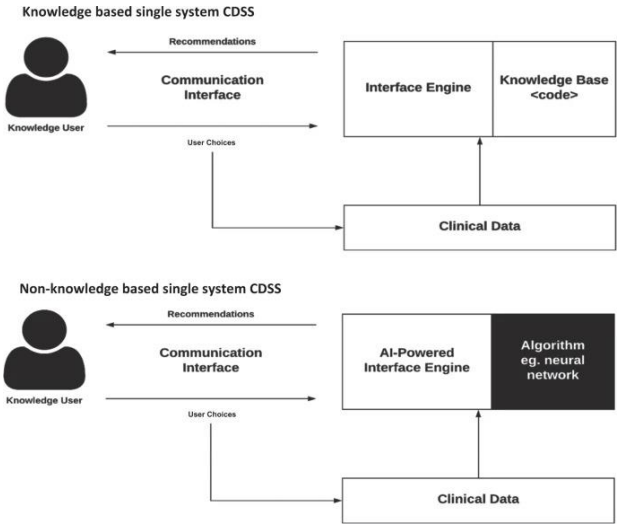
Decision Support System (DSS)

The result we get, used for making decisions. DSS provides a systematic method for decision-making that enables users to examine multiple views of the data that are generated using knowledge about the environment and decision problem.

Clinical decision Support System

A clinical decision support system (CDSS) is intended to improve healthcare delivery by enhancing medical decisions with targeted clinical knowledge, patient information, and other health information.

Fig. 1: Diagram of Key Interactions in Knowledge-based and Non-Knowledge based CDSS



Purposed Work Plan

A WORK PLAN is a schedule, chart or graph that summarizes the different components of a research project and how they will be implemented in a coherent way within a specific time-span.

Year I

In this year the following work has been done:

- Fulfil the coursework for all four subjects.
- Detailed assignments of different subjects related to the study problems and subjects of the coursework.
- Complete the exam for coursework.
- Doing the introductory study of the literature related to the healthcare data warehouse system for different diseases.
- Detailed analysis and preparation of the literature review related to the subject.

Year II

In this year the following work has been done:

- Submit a research synopsis.
- Presentation of synopsis in front of Doctoral Research Committee.
- Creating a data warehouse.
- Collecting data of Corona patients from various PHCs.

Year III

In this year the following work has been done:

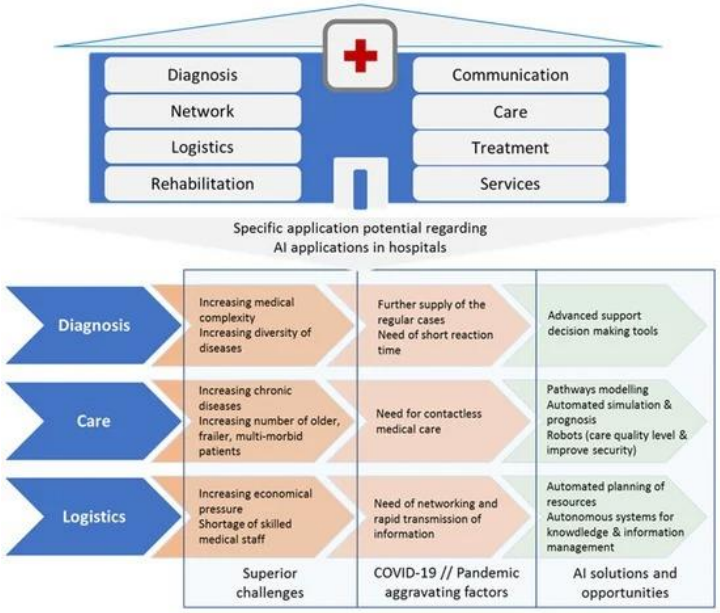
- Exploration and the analyses of the result to finalise the conclusion.
- Preparing the final documentation.
- In the form of the thesis, apply the research work and verify the plagiarism.
- Deliver pre-thesis viva and, if any, add modifications.

Final viva in order to protect the research work conducted.

Enable timely and quality management of COVID-19 patients at district and sub district levels by increased bed capacities at the Sub Health Centres (SHCs).

Another major step towards COVID control:

- 1000 bed hospitals ready.
- 500 bed field hospital and 300 bed COVID Care Centre ready in Gurugram as well.



Limitations of the Study

Interventions may be unavailable, their harms may exceed benefits, or evidence may incorrectly suggest more benefit than harm because study results reflect biases and are not trustworthy.

Such problems include: Heavy software development, implementation and upgrade costs. Difficulty switching from manual processes because both the staff and patients are accustomed to manual processes and are therefore unable to deal with the new method quickly.

- The study can only be viewed as a preliminary study and more follow up tracing investigations at different stages need to be conducted in order to monitor the continuing impact of the pandemic and the effectiveness of public policies and firms' responses.
- This study focuses on Haryana (India), which was among one of the countries to recover from this pandemic.
- The outcome of research based on data provided by the respondents/ secondary resources may not be true representation of the population.
- The study is limited to only Covid-19 patients and hence the results may not be generalised for all disease.
- The quality and authenticity of data provided by secondary resources/ respondents may not be true.

No study is perfect, no matter how elegant its design may be, and many journals require authors to write a section at the end of the discussion about the limitations of their study. For some studies, these limitations will be obvious: small sample size, multiple comparisons without corrections, observational design and risk for confounding. For other designs, the limitations may be less obvious, but you'll still need to list them. The usual practice is to place the strengths of a study ahead of the limitations. Most authors will list the strengths, beginning with a phrase such as, "Our study had several strengths," and then briefly describing what those are.

Scope of the Study

We can only work in hospitals after completing this course. But it's not 100% true. The healthcare field is such a vast field in growth at present. You can find various opportunities. One main area is hospital where you can work in administration department. Again, there are many fields in hospital. You can work as a floor administrator, or in hospital departments heading or supporting operations, quality, marketing, finance, purchase, HR and logistics. Actually, you learn all major management subjects in this course. This knowledge helps to enhance the efficiency of the hospital and increasing the productivity.

Healthcare consultancy is one of the fields which involves in playing an advisory role to the hospital to improvise the care and service. It is one of the booming fields. The role will be helping the hospitals to expand, stay updated with technology and helping them to grow. If someone is interested to set up a hospital a healthcare consultant can help from scratch like financial planning, feasibility analysis, architectural planning, branding, equipment planning, operation and human resource planning.

There are huge opportunities in IT sectors also. The role will be a business consultant, playing a mediator role between the software developers and the hospital.

Likewise, we can support any healthcare company like biomedical companies, pharma company in managerial perspective. The managerial skills help to set everything right. So, opportunities for healthcare management is huge.

Data warehouse is the most reliable technology used by the company for planning, forecasting and management. This work could be used by data administrators, executive managers, doctors, Covid testing team and the other staff of medical. Developing health care data warehouses, places data quality high on the agenda. Queries are becoming faster. Now with this design health care data warehouse, doctors can also share patients record to others, they can take decision from others.

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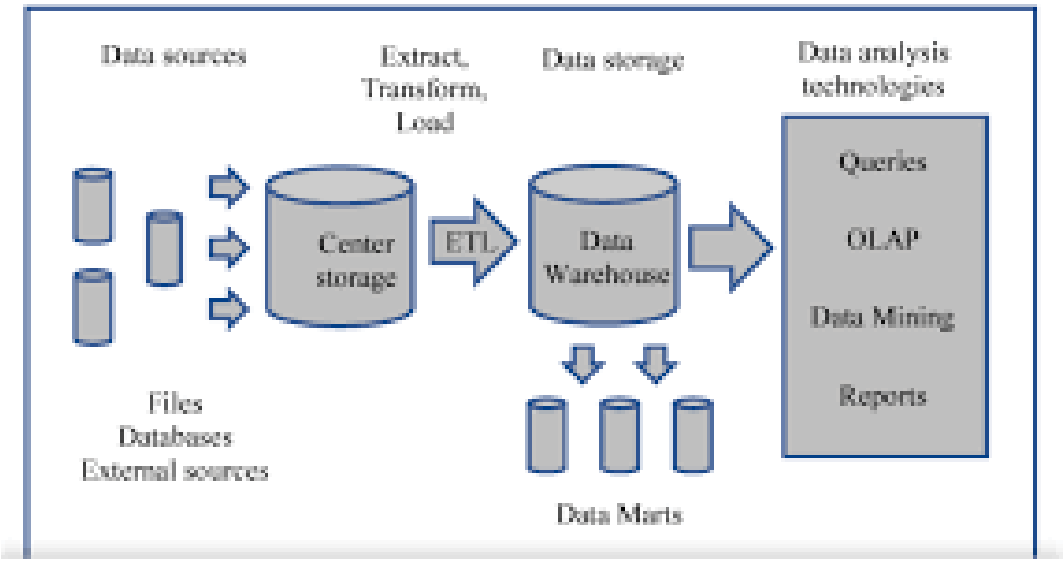
Conclusion

The COVID-19 pandemic demonstrates that the world remains vulnerable to public health emergencies with significant health and other socio-economic impacts. The pandemic takes variable shapes and forms across regions and countries around the world. The pandemic has impacted countries with inadequate governance of the epidemic, fragmentation of their health systems and higher socio-economic inequities more than others. We argue that adequate response to public health emergencies requires that countries develop and implement a context-specific national strategy, enhance governance of public health emergency, build the capacity of their health systems, minimize fragmentation, and tackle socio-economic inequities. This is possible through a PHC approach that provides universal access to good-quality health services through empowered communities and multi-sectoral policy and action for health development. The pandemic has affected every corner of the world; it has demonstrated that “no country is safe unless other countries are safe”. This should be a call for a strong global health system based on the values of justice and capabilities for health.

We conclude that health information technology improves patient's safety by reducing medication errors, reducing adverse drug reactions, and improving compliance to practice guidelines. There should be no doubt that health information technology is an important tool for improving healthcare quality and safety.



Healthcare technology refers to any IT tools or software designed to boost hospital and administrative productivity, give new insights into medicines and treatments, or improve the overall quality of healthcare provided.

Everyone needs to be well informed and concerned about the quality of care. Everyone means patients and their families, consumer agents and advocates, health professionals, administrators of health plans and facilities, purchasers of health care services, and policymakers at all levels.

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