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DEPARTMENT OF BIO MEDICAL ENGINEERING

CBM351: HOSPITAL PLANNING AND MANAGEMENT NOTES

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UNIT I

OVERVIEW OF HOSPITAL ADMINISTRATION

Distinction between Hospital and Industry, Challenges in Hospital Administration -Hospital Planning – Equipment Planning- AMC – Functional Planning – Current Issues in Hospital Management – Telemedicine – Bio-Medical Waste Management

MANAGEMENT

Management is an activity which is necessary for a group of people working in an organization.

The task of management incorporates:

1. Determining the goals and objectives of the organization.
2. Acquiring and utilizing resources.
3. Installing communication system.
4. Determining controlling procedures.
5. Evaluating the performance of the organization.

Management is a purposive activity. It is something that directs group efforts towards the attainment of certain pre - determined goals.

According to *F.W. Taylor*, “Management is an art of knowing what to do, when to do and see that it is done in the best and cheapest way”.

1.1 Functions of management

Management as a function performs the following five functions:

1. Planning
2. Organizing
3. Staffing
4. Directing
5. Controlling



1.1.1 Planning

A plan is a future course of actions. It is an exercise in problem solving and decision- making.

Planning is determination of courses of action to achieve desired goals.

1.1.2 Organizing

It is the process of bringing together physical, financial and human resources and developing productive relationship amongst them for achievement of organizational goals.

To organize a business involves determining & providing human and non-human resources to the

organizational structure.

Organizing as a process involves:

- Identification of activities.
- Classification of grouping of activities.
- Assignment of duties.

1.1.3 Staffing

Staffing has assumed greater importance in the recent years due to advancement of technology, increase in size of business, complexity of human behavior etc.

The main purpose of staffing is to put right man on right job i.e. square pegs in square holes and round pegs in round holes.

Staffing involves:

Recruitment, Selection & Placement. Training & Development.
Remuneration. Performance Appraisal. Promotions & Transfer.

1.1.4 Directing

Direction is that inert-personnel aspect of management which deals directly with influencing, guiding, supervising, motivating sub-ordinate for the achievement of organizational goals.

Direction has following elements:

Supervision
Motivation Leadership
Communication

1.1.5 Controlling

The purpose of controlling is to ensure that everything occurs in conformities with the standards.

Controlling has following steps: Establishment of standard performance. Measurement of actual performance.
Corrective action.

2. MANAGEMENT IN HOSPITAL

Hospital is an institution for the care, cure and treatment of the sick and wounded, for the study of diseases and for the training of doctors and nurses.

It mainly relates to management of all aspects of a hospital; a coordination of all elements of a hospital. This may range from patient care to record keeping to inventory of medicines and cleanliness.

The functions of the management in all types of the organization remains the same and revolves round the following management functions.

3. DISTINCTION BETWEEN HOSPITAL AND INDUSTRY

Hospitals has some difference from industries.

- Hospital gives **service to people** provided by variety of skills.
- Hospitals exist because people need care, and nursing homes exist because of the need for long-term health care.
- The nature of the demand for hospital services is also different. The patient made decision that he is ill.

and requires **services which cannot be provided at home.**

- The patient leaves home, family, friends, his work-place, his way of life for a **new environment**, i.e. the hospital.
- In this new environment, he becomes one of the many. In his home, he has a definite role.
- In the hospital, his role is similar to 30 or 40 others in the ward or unit in which he is a patient. He is subjected to a new set of values and a new way of life.
- A hospital **deals daily with the life, suffering, recovery and death** of human beings.

Hospital is different in many aspects:

1. Complexity

- Hospitals tend to have very complex organizational structures compared to their overall size.
- A 400-bed hospital might have over 1,000 different job titles.

2. Highly trained professionals

- A large portion of the workforce- physicians, nurses, allied health and many technical positions, are highly trained and have a high level of autonomy.

3. A fragmented organization structure

- An auto manufacturer designs the entire workforce around production of the car.
- Hospitals have begun to take a service line or patient-centered approach to organizational structure, built around the patient experience.

4. Customer Service is no longer a 'nice to have'

- Every company wants to improve customer service.
- But with the new HCAHPS (Hospital Consumer Assessment of Health care Providers and Systems) requirements, patient satisfaction scores are a critical success metric for hospitals.

5. The nature of the Services

- Poor quality in a manufacturing plant means a poor product and a weakened competitive advantage.
- Poor quality in a hospital means harm to patients and the hospital's ability to fulfill its mission.

4. CHALLENGES IN HOSPITAL ADMINISTRATION

Challenges to administrative abilities have come from within the health field as well as from the public:

1. Business and professional leaders who were initiated into the hospital scene as trustees of voluntary hospitals;
2. The large number of physicians who are especially worry about the facilities and services available for the care of their patients;
3. Professional organizations which prescribe various standards of hospital operation while granting approval to the hospitals;
4. Academicians who are concerned about matching what they teach with the requirements of the patients and hospital administration;
5. Labour demanding standards of employment and working conditions.
6. Trustees of the Trust Hospitals, members of Registered Society Hospitals, shareholders of Corporate

Hospitals, and other who have been their own masters and have been operating with no restraints so far will have to face increasing professionalism threatening their power and existence.

The hospital CEO has to collect sufficient funds from patients rather than from trustees, society members, shareholders, etc. to run his hospital.

A new challenge is that of being environment friendly. Hospitals do not focus on safe environment.

The CEO of a hospital must be able to provide latest technology and vision. He should push for change when it is required in the interest of the patients, employees and the community.

The Chief Executive Officer of a hospital; will have to serve as a catalyst for relationship building between patients and employees, government agencies and his hospital and between hospitals and his own hospital;

It is also important for the hospital CEO to be a business practitioner first and then a technologist. His responsibilities include executive communication, budgeting, building relationships, management, problem solving etc.

CEO is primarily responsible to facilitate and communicate the hospital's philosophy and vision.

The administrators of earlier hospitals usually were nurses who combined their nursing tasks with the performance of supervision of supply of cloth, feeding of patients and housekeeping. As the medical aspects of hospital service became more complex, physicians became administrators.

There's no doubt a hospital administrator's job is difficult and demanding, and it's only getting tougher. Here are four challenges they must overcome in order to successfully improve patient care.

1. Compete for healthcare professionals

There is a real shortage of healthcare professionals, and it's hurting the profitability of hospitals as they pay more for every employee they hire.

From 2008 and 2018, healthcare employment will grow by 23 percent, compared to only 9 percent in all other employment sectors, according to the Bureau of Labor Statistics. During that time, hospitals will be forced to compete for:

- Registered nurses (expected to grow 22.2 percent)
- Licensed practice and licensed vocational nurses (expected to grow by 20.7 percent)
- Home health aides (expected to grow by 50 percent)
- Nursing aids, orderlies and attendants (expected to grow by 18.8 percent)
- Physicians and surgeons (expected to grow by 21.8 percent)

With this in mind, hospital administrators must put a plan in place to address the shortage and compete for the best employees. As they compete, they must be skilled at recruiting, hiring and retaining qualified healthcare professionals.

Hospital administrators need to build strong relationships with schools that offer healthcare-related degrees in their local communities and across the nation.

Additionally, they must make working at their hospital attractive, which means thinking beyond competitive pay and benefits to ensuring each individual employee feels connected to the hospital and has a passion for working for the organization.

2. Specialize for growth

With the rapid growth of specialty hospitals, physician-run outpatient surgery centers and diagnostic centers, traditional hospitals are facing increased competition.

To compete for patients, hospital administrators must be prepared to set their hospitals apart through a

specialized care strategy.

Benchmarking best practices is essential; hospital administrators must take time to investigate other specialty healthcare providers in their local communities, identify areas of opportunity and put a strategic plan in place for building renowned specialty practices. During this process, they typically take numerous factors into consideration, including local demographics and competitors' areas of specialization.

With a specialization strategy solidified, hospital administrators must focus their efforts on recruiting specialized personnel and building a local reputation for excellence for the practice area.

3. Prepare for the future

As America's 78 million baby boomers come of age, hospitals are feeling the pressure to expand to meet growing demand. At the same time, hospitals are facing changes in the way they are paid. Reimbursements are shifting from a fee-for-service model to a model that is based on outcomes and overall quality of care.

When patient satisfaction plays a role in the way hospitals are paid, you can bet hospital administrators are making it a priority.

Therefore, hospitals are conducting extensive market research to ensure their expansion efforts are aligned with what consumers expect.

For example, with the knowledge that women make most healthcare decisions in a family, one hospital decided to build an 18,000-square-foot imaging center for women with a spa-like atmosphere and robes. One children's rehabilitation hospital built a massive facility that comes complete with therapeutic gardens, play areas and even an all-grades school for inpatients. Other hospitals are converting semi-private rooms into private rooms, and there is a great deal of emphasis on making them safe, comfortable and cozy.

Having modern facilities with up-to-date medical equipment is crucial for hospitals that are competing for patients. With this in mind, hospital administrators must be prepared to balance current financial strain while positioning for the future.

4. Improve patient care through technology

There's not a corner or crevice of healthcare that is not being affected somehow by technology. Medical providers throughout the country, for instance, are spending millions of dollars on electronic medical record systems that allow physicians and hospitals to seamlessly share patient information.

Ensuring that EMRs are effectively implemented within the healthcare organization is a critical role of healthcare administrators.

Healthcare administrators need broad-based skills to integrate information and make evidence-based decisions. From electronic communication to order entry systems to the most advanced imaging technology, even the best technology is no good unless it's applied to improving organizational and patient outcomes.

Hospital administrators are responsible for making sure hospitals operate efficiently and provide quality medical care to patients.

As a result, they must keep up with advances in medicine, technology and government regulations and policy changes.

5. HOSPITAL PLANNING

The general public is now more alert to its health and in accepting the role of the hospital in its daily life.

Today's Patients are Better Informed

Today's patients are better informed and know more about health care services.

This is why they make their own decisions- they shop for and select the best hospital; they choose their doctor or

change him.

Having become cost conscious, they demand quality care at a reasonable price.

Hospitals of Yesteryear

Health care has come a long way since Florence Nightingale tended the harmed soldiers in the Crimean War. Back then, it was largely weak loving care. There wasn't enough of treatment and health care.

The institution that we know today as the hospital is phenomenon of the last century.

Technological Advances

With the rapid development and advances in technological, medical and administrative sciences and innovative techniques and therapies, today's hospitals will become disappearing within a short time.

One cannot even guess at the future miracles of medicine.

That is why one planning design expert said, "We have got to design 'smart' hospitals that respond to present needs while anticipating future changes."

In the early days, we talked of only general hospitals. Then came specialties in hospitals and now we are planning and designing superspecialty hospitals operated and managed by superspecialists.

When our health is at stake, we want quality, whatever it takes. We demand the best and are willing to pay for it.

Why Health Care Costs are High?

Today, health care costs are rising dramatically. That is largely because of the tremendous advances that have come about in treatment, technology and equipment.

For example, equipment such as the MRI, CT Scan, ultrasound, mammography, simulator and linear accelerator are so common and so necessary in today's health care treatment requires huge investment.

On the treatment side, a cardiac patient who once would have been treated with drugs can now have a bypass operation or a pacemaker implant that would cost him a great deal of money. He recovers in the technologically advanced and sophisticated Coronary Care Unit (CCU) that would cost him Rs. 1,000 or more per day.

A person who at one time would have died of kidney failure now receives dialysis at considerable cost; alternatively he can have a new kidney – a transplant that would cost upward of a lakh of rupees.

Many hospitals fit the bill as "hospitals of people's choice." They are operated efficiently and furnish a high standard of patient care.

And yet, there are a vast number of hospitals in India in which standards of care are low. These standards must be improved if those hospitals have to meet people's growing expectations.

Today's patients recognize the distinction between good and commonplace hospitals.

5.1 Planning for a New Hospital

In the establishment of a hospital, the first step is always a dream or an idea born in the mind of an individual. If the idea is appealing, the originator is able to gather support of other people.

A committee is then formed and is given the authority to undertake preliminary work such as a feasibility study and to raise funds to meet the expenses involved in the survey and study.

All successful hospitals, are built on a triad of good planning, good design and construction, and good administration. The success of a hospital is generally measured by the quality of patient care it provides and the efficiency with which it operates. It must be noted that a strong management is essential for the daily functioning of a facility and this must be included in the plans for a new hospital.

To be successful, a hospital requires a great deal of preliminary study and planning. It must be designed to meet the needs of the people it is going to serve. It must be staffed with adequate number of efficient doctors, nurses and other professionals.

The promoters must be made aware of and assume responsibility for the creation of well planned and well designed hospitals that are efficient, functional and economical so that they will render quality and adequate care to the community they serve.

5.1.1 Planning involves six question

- What we expect to do?
- Why it will be done?
- Where will it be done?
- When we expect to do it?
- Who all are going to do it?
- How will it be done?

5.1.2 Planning Team

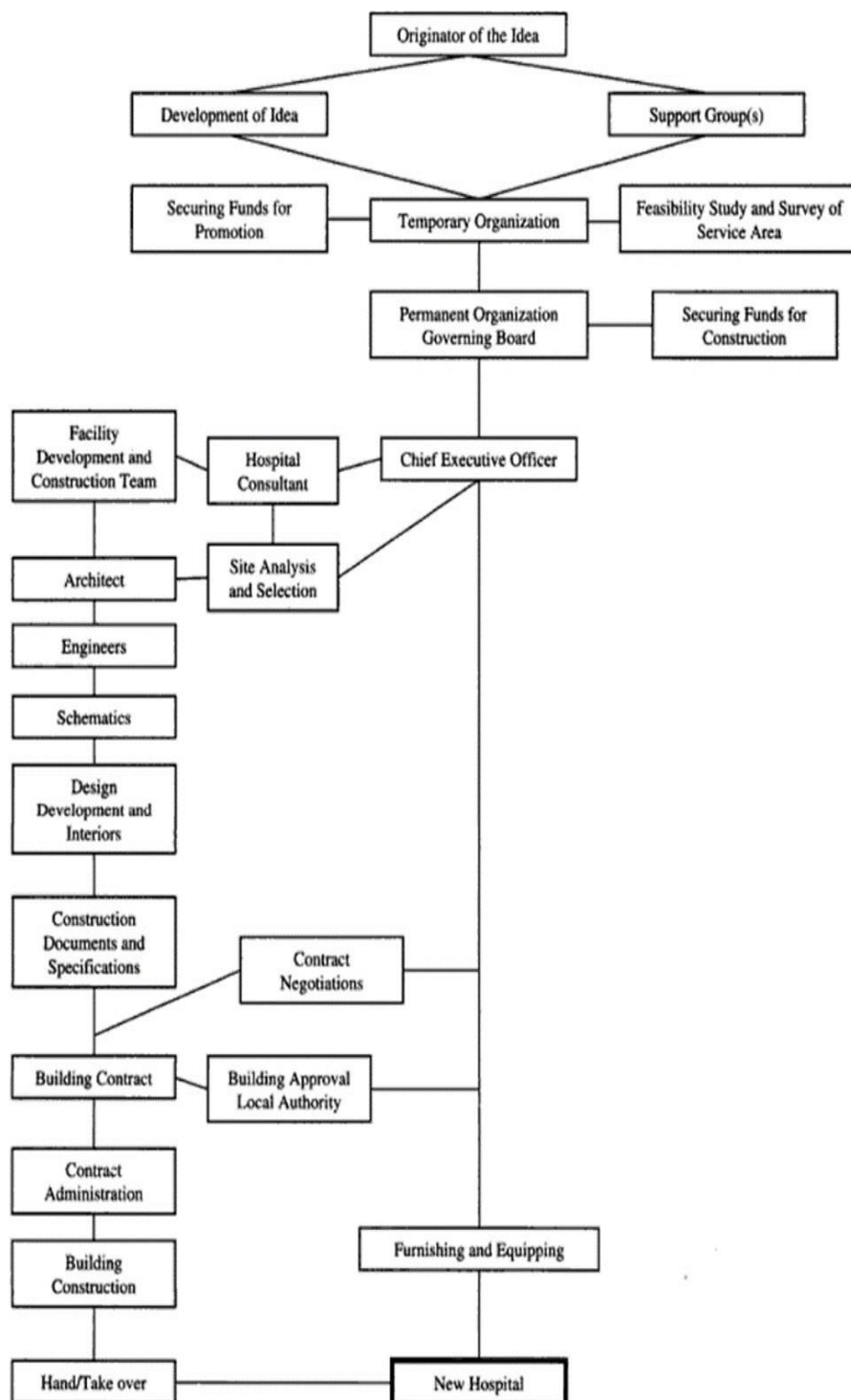
- Hospital administrator
- Specialists from various clinical branches
- Nursing advisor
- HR manager
- Civil and electrical engineers
- Representative of local body
- Senior architect
- The graphic presentation of the different stages in promoting and building a new hospital is as follows:

6. EQUIPMENT PLANNING

Hospital planning is not complete if careful attention is not given to the fixed and movable equipment needed for the hospital. With the exception of items of current operating expense such as food, fuel, drugs, dressings, paper, printed forms, soap, etc.,

The term “equipment” means all items necessary for the functioning of all services of the hospital including accounting and records, maintenance of buildings and grounds, laundry, public waiting rooms, public health and related services.

Medical equipment is a vital component in healthcare delivery. Equipping health facilities need detail planning and coordination, clinical needs and the equipment requirements are met with the design and function.



The ultimate objective is to ensure all products selected are fit for purpose, within budget and, procured, delivered and commissioned in accordance with projects build programme.

Healthcare Equipment Planning is a specialised process and requires not only a clear understanding of the clinical need but also a knowledge of budgeting, architectural design and building process.

Effective project planning can only be achieved by a successful team process. This cohesive team generally

consists of user groups, project managers, architects and other associated healthcare planners such as equipment planners, whose responsibility is to balance the requirements of the clinical users and the clients against available healthcare technology, budgetary targets and the realities of the design and construction process.

A series of meetings are arranged with the medical staff and other personnel to discuss the equipment needed. A room by room equipment list is then compiled and reviewed by the administrative, medical and departmental staff.

In an existing hospital, purchasing new equipment presents no particular problem except perhaps securing finances. Besides a purchasing department, there is usually a well-established procedure and mechanism to authenticate the need for new equipment or to replace an old one. There are trained people who can write specifications. The hospital administrator, generally an experienced man, and his purchasing officer will easily accomplish these tasks. It is not so in a new hospital.

The timing of delivery, warehousing, unpacking, assembling and installing of equipment compound the problem. These are as important as selection and purchase.

If the equipment is to be imported, the procedure will be even more complex. There are approvals and licences to be obtained and economical hurdles to be crossed. The lead time will be longer. Lakhs of lakhs of rupees may be wasted, operating efficiency impaired and standards of patient care severely affected by not planning and executing any one of these tasks properly.

It devolves on the hospital consultant or the hospital administrator who will have been engaged early in the planning stage to determine all the items of equipment necessary for the hospital, to write or secure specifications, to call for and receive amounts and to purchase or recommend purchase with regard to depreciation.

Equipment for a new hospital may be classified into the following three groups based on the usual methods of acquisition and on suggested accounting practices with regard to depreciation.

1. Built-in Equipment:

- This is usually included in the construction contracts.
- Examples are cabinets and counters in the pharmacy, laboratory and other parts of the hospital, fixed kitchen equipment, laundry chutes, elevators, dumb waiters, boilers, cold rooms/walk-in coolers, deep freezers, fixed sterilizing equipment and surgical lighting.
- The planning and design of fixed equipment built into the hospital facility is the architect's responsibility.

2. Depreciable Equipment:

- Equipment that has a life of five years or more is not normally purchased through construction contracts.
- These large items of furniture and equipment have reasonable fixed location in the hospital building but are capable of being moved.
- Examples are surgical apparatus, diagnostic and therapeutic equipment, laboratory and pharmacy equipment, office equipment, etc.
- Equipment that is not included in the construction contract but which require mechanical or electrical service connections or construction modifications shall, as far as is practical, be identified on the design development drawings to ensure its coordination with the architectural, mechanical and electrical phases of construction.

3. Non- depreciable Equipment:

- Equipment having less than five years' life span is purchased through ways other than construction contracts.

- These are generally small items of low unit cost under the control of the storeroom.
- Examples are kitchen utensils, chinaware, tableware, surgical instruments, catheters, linen, sheets, blankets, lamps, wastebaskets, etc.

The consultant must prepare a list of all the items under groups 2 and 3 given above.

The first step in preparing this list is to consider each room as a separate entity and prepare a comprehensive room-by-room equipment list, which should include additional items that may be required for the hospital. Detailed specifications must be given.

This task must be undertaken at the stage of design development itself. Working closely with the architect, the consultant should test the space needed for each item of equipment on the list.

The selection of technical, scientific and medical equipment requires careful analysis of each department's needs and conscientious study that will result in selecting equipment that will best meet the needs.

Department heads and staff members should be fully satisfied with the type and quality of the equipment. They should therefore be consulted before purchase.

It is necessary to consult with the architect designing the building early so that the facilities planned will be of sufficient size to accommodate the equipment and render the necessary service.

7. FUNCTIONAL PLANNING

Functional planning in hospitals is important, and the key to this is the understanding that travel and adjacencies affect the operational cost over the life of the building.

The main function of a hospital is to provide the population with complete health care; it also functions as the center for the training of health workers.

Following are some of the broad categories of Hospital functions:

Medical care - which involves the treatment and management of patients through the staff of physicians.

Patient Support - which relates directly to patient care and includes nursing, dietary diagnostic, therapy, pharmacy and laboratory services.

Administrative - which concerns the execution of policies and directions of the hospital governing discharge of support services in the area of finance, personnel, materials and property, housekeeping, laundry, security, transport, engineering and board and other maintenance.

7.1. Functional planning covers the following activities.

1. Determining approximate section wise workload.

2. Determining services to be provided (for inpatients/ outpatients, for other departments, smaller hospitals and private practitioners).

3. Determining area and space requirement to accommodate equipment, furniture and personnel in technical, administrative and auxiliary functions.

4. Dividing the area into functional units, biochemistry, microbiology, histopathology, urinalysis, etc.

5. Determining the number of workstations in each functional unit/division and deciding the linear bench space allotted for each work station.

6. Determining the major equipment and appliances in each unit. This is generally classified into:

i. Technical equipment peculiar to certain workstations

ii. Other equipment and appliances e.g. (refrigerators, hot air ovens, centrifuges) that can be jointly

used by different workstations or units.

7. Determining the functional location of each section in relation to one another, from the point of view of flow of work and technical work considerations.

8. Identifying the electrical and plumbing requirements for each area/work station. Independent electric circuits are required for electronic equipment items. Location of sinks and wash areas are vital for efficient performance of workstations.

9. Considering utilities, lighting, ventilation (forced or normal exhaust, air-conditioning and air hygiene) and isolation of equipment or workstations.

10. Working out the most suitable laboratory space unit, which is a standard module for work areas. A standard module facilitates rearrangement of work units with least disruption and minimal structural changes.

Current Issues in Hospital Management

Hospital management system is being used for decades. Most of the hospitals in India make use of HMS but they face certain challenges in implementing it. Among them, technical and human challenges are considered to be the complicated factors while implementing HMS.

How can you face the challenges while implementing HMS?

The HMS system helps to manage every information about the patients like their personal data, comprehensive medical data, and previous medical histories along with their diagnoses, treatments, investigations, and other medical decisions. Apart from that, HMS help in improving safety, and quality as well as one of the most affordable options available in the healthcare industry.

Despite their benefits, the healthcare industry faces many challenges. Implementation of HMS still fails in some hospitals due to barriers.

Few Challenging problems that you face while implementing HMS

Human Challenges

While considering human factors, including

- Awareness of HMS's advantages & importance.
- In general, Experience, and knowledge of using computer applications.
- Impressions and Beliefs regarding HMS and making use of them efficiently.

The researchers in a study have identified three main human challenges that are a barrier to adopting the HMS in healthcare industries namely.

- Shortage of professional healthcare faculty who have in-depth knowledge of HMS and other similar technologies.
- Poor acceptance of HMS Software.
- Shortage of health informatics professionals who are well capable of establishing and implementing the techniques.

Another few significant problems for unsuccessful HMS implementation include.

- Healthcare specialists nature,
- the lack of time allowed for training and learning on making use of the HMS,
- the lack of healthcare professional support, motivation, and more.

Many studies illustrate that HMS needs more effort, and time, and adds more work. There are high chances of HMS to get slow down and causing a decrease in productivity.

Technical Challenges:

Other technical challenges that fail the implementation of HMS in the healthcare industry includes Networks and computer having different maintenance problems, lack of no standards for Data entry and data retrieval, and difficulties in

training users technically to use HMS.

Few tips to overcome Human Challenges

- Proceed below to check out a few things you can follow to overcome the human challenges that make HMS implementation tough.
- One can improve the awareness of the advantages and benefits of making use of the HMS by a focused multi-phase approach on any topic. The approach can be made used from the starting level of healthcare industry schools, and colleges, then with the undergraduate degree, and through various aspects of postgraduate medical education. All Medical education programs should include the significance of HMS, its applications, and its advantages.
- Formal training while taking various levels of medical practice and education is capable of improving the knowledge in using a Hospital management system correctly. Many types of research suggest HMS training and teaching needs to be developed and also implemented as a subject or course of the postgraduate and undergraduate medical education programs.
- Every health information management should include subjects of HMS short courses for medical education programs and healthcare professionals. These programs should be initiated by the health ministry and its formal channels for every healthcare specialist at any healthcare organization and hospital. Apart from that, developing and enhancing self-taught computer science courses in nursing education, medical schools, and postgraduate training is also essential.
- It's a good idea to develop both postgraduate and undergraduate specialized programs in Health Information Management, Health Informatics, and Health Information Technology, which increases the number of health informatics specialists and technicians.
- Overcoming the negative impressions of HMS's new and experienced staff can be neglected through the development of HMS training programs and in-house hospital orientation programs.
- You can make the healthcare professional participate and involve in various stages of system implementation, development, and deployment to improve the healthcare specialist's support.
- You can offer the healthcare professional overtime payment, direct and indirect incentives, rewards, bonuses, and more for the hospital departments and sections that implement HMS successfully in a healthcare organization.
- Offering healthcare professionals enough time convenient and suitable for them to learn and get trained on HMS.
- Another good idea is to conduct different interesting training programs for healthcare professionals so that they get to know about HMS implementation in depth and gain a better understanding.

Few tips to overcome the Technical Challenges

- You need to make sure that the HMS commercial providers and vendors are offering the right user manuals, documentation, troubleshooting, and guidelines for using HMS to the hospitals in a proper way.
- Ensuring the working conditions of computers and networks is more important for the software to work better and have fewer maintenance problems. Technical support and hardware maintenance are also significant.
- Upgrading your old communication networks and computers to a new one for enhanced performance.
- Make sure you perform every analysis required in depth before the start of the design phase and the implementation phase.
- Implementing newer innovations in both hardware and software is required to overcome data entry difficulties.

- While considering the software innovations, the system needs to be designed to support structured data entry instead of unstructured one. In the case of hardware innovations, implementing hand-held devices, touch screens, and tablets helps in minimizing the gap between the recording and data acquisition process and this leads to easier accessibility.
- Elimination of health information technology and management staff overload can be through outsourcing a few electronic processing tasks namely medical transcription of dictating the voice files.
- Make sure about the system interface design, and check whether they are understandable and user-friendly.
- Data standards usage is one of the crucial steps for source accuracy, quality, and reliability as well as to validate system data.
- Make sure you increase the computer terminal numbers at the point of care.

Telemedicine

Telemedicine is the use of telecommunication, satellite communication and information technology to provide clinical health care from a distance. It has been used to overcome distance barriers and to improve access to medical services that would often not be consistently available in distant rural communities. It is also used to save lives in critical care and emergency situations.

Although there were distant precursors to telemedicine, it is essentially a product of 20th century telecommunication and information technologies. These technologies permit communications between patient and medical staff with both convenience and fidelity, as well as the transmission of medical, imaging and health informatics data from one site to another.

Early forms of telemedicine achieved with telephone and radio have been supplemented with videotelephony, advanced diagnostic methods supported by distributed client/server applications, and additionally with telemedical devices to support in-home care.

Types of Telemedicine

Telemedicine can be broken into three main categories:

- store-and-forward,
- remote patient monitoring and
- (real-time) interactive services.
- **Store and forward**
 - Store-and-forward telemedicine involves acquiring medical data (like medical images, biosignals etc.) and then transmitting this data to a doctor or medical specialist at a convenient time for assessment offline.
 - It does not require the presence of both parties at the same time.
 - Dermatology (cf: teledermatology), radiology, and pathology are common specialties that are conducive to asynchronous telemedicine.
 - A properly structured medical record preferably in electronic form should be a component of this transfer.
 - A key difference between traditional in-person patient meetings and telemedicine encounters is the omission of an actual physical examination and history.
 - The 'store-and-forward' process requires the clinician to rely on a history report and audio/video information in lieu of a physical examination.

Remote monitoring

Remote monitoring, also known as self-monitoring or testing, enables medical professionals to monitor a patient

remotely using various technological devices. This method is primarily used for managing chronic diseases or specific conditions, such as heart disease, diabetes mellitus, or asthma. These services can provide comparable health outcomes to traditional in-person patient encounters, supply greater satisfaction to patients, and may be cost-effective. Examples include home-based nocturnal dialysis and improved joint management.

Real-time interactive

Electronic consultations are possible through interactive telemedicine services which provide real-time interactions between patient and provider. Videoconferencing has been used in a wide range of clinical disciplines and settings for various purposes including management, diagnosis, counselling and monitoring of patients.

Emergency

U.S. Navy medical staff being trained in the use of handheld telemedical devices (2006).

Common daily emergency telemedicine is performed by SAMU Regulator Physicians in France, Spain, Chile and Brazil.

Aircraft and maritime emergencies are also handled by SAMU centres in Paris, Lisbon and Toulouse.

A recent study identified three major barriers to adoption of telemedicine in emergency and critical care units. They include:

- **regulatory** challenges related to the difficulty and cost of obtaining licensure across multiple states, malpractice protection and privileges at multiple facilities
- Lack of acceptance and reimbursement by government payers and some commercial insurance carriers creating a major **financial** barrier, which places the investment burden squarely upon the hospital or healthcare system.
- **Cultural** barriers occurring from the lack of desire, or unwillingness, of some physicians to adapt clinical paradigms for telemedicine applications.

Telemedicine system. *Federal Center of Neurosurgery in Tyumen, 2013*

Telenursing

Telenursing refers to the use of telecommunications and information technology in order to provide nursing services in health care whenever a large physical distance exists between patient and nurse, or between any number of nurses. As a field it is part of telehealth, and has many points of contacts with other medical and non-medical applications, such as telediagnosis, teleconsultation, telemonitoring, etc.

Telenursing is achieving significant growth rates in many countries due to several factors: the preoccupation in reducing the costs of health care, an increase in the number of aging and chronically ill population, and the increase in coverage of health care to distant, rural, small or sparsely populated regions. Among its benefits, telenursing may help solve increasing shortages of nurses; to reduce distances and save travel time, and to keep patients out of hospital. A greater degree of job satisfaction has been registered among telenurses.

Baby Eve with Georgia for the Breastfeeding Support Project

In Australia, during January 2014, Melbourne tech startup Small World Social collaborated with the Australian Breastfeeding Association to create the first hands-free breastfeeding Google Glass application for new mothers. The application, named Google Glass Breastfeeding app trial, allows mothers to nurse their baby while viewing instructions about common breastfeeding issues (latching on, posture etc.) or call a lactation consultant via a secure Google Hangout, who can view the issue through the mother's Google Glass camera. The trial was successfully concluded in Melbourne in April 2014, and 100% of participants were breastfeeding confidently. Small World Social Breastfeeding Support Project.

Telepharmacy

Pharmacy personnel deliver medical prescriptions electronically; remote delivery of pharmaceutical care is an example of **telemedicine**.

Telepharmacy is the delivery of pharmaceutical care via telecommunications to patients in locations where they may not have direct contact with a pharmacist. It is an instance of the wider phenomenon of telemedicine, as implemented in the field of pharmacy. Telepharmacy services include drug therapy monitoring, patient counseling, prior authorization and refill authorization for prescription drugs, and monitoring of formulary compliance with the aid of teleconferencing or videoconferencing. Remote dispensing of medications by automated packaging and labeling systems can also be thought of as an instance of telepharmacy. Telepharmacy services can be delivered at retail pharmacy sites or through hospitals, nursing homes, or other medical care facilities.

The term can also refer to the use of videoconferencing in pharmacy for other purposes, such as providing education, training, and management services to pharmacists and pharmacy staff remotely.

Teleneuropsychology

Teleneuropsychology (Cullum et al., 2014) is the use of telehealth/videoconference technology for the remote administration of neuropsychological tests. Neuropsychological tests are used to evaluate the cognitive status of individuals with known or suspected brain disorders and provide a profile of cognitive strengths and weaknesses. Through a series of studies, there is growing support in the literature showing that remote videoconference-based administration of many standard neuropsychological tests results in test findings that are similar to traditional in-person evaluations, thereby establishing the basis for the reliability and validity of teleneuropsychological assessment.

Telerehabilitation

Telerehabilitation (or *e-rehabilitation*) is the delivery of rehabilitation services over telecommunication networks and the Internet. Most types of services fall into two categories: clinical assessment (the patient's functional abilities in his or her environment), and clinical therapy. Some fields of rehabilitation practice that have explored telerehabilitation are: neuropsychology, speech-language pathology, audiology, occupational therapy, and physical therapy. Telerehabilitation can deliver therapy to people who cannot travel to a clinic because the patient has a disability or because of travel time. Telerehabilitation also allows experts in rehabilitation to engage in a clinical consultation at a distance.

Most telerehabilitation is highly visual. As of 2014, the most commonly used mediums are webcams, videoconferencing, phone lines, videophones and webpages containing rich Internet applications. The visual nature of telerehabilitation technology limits the types of rehabilitation services that can be provided. It is most widely used for neuropsychological rehabilitation; fitting of rehabilitation equipment such as wheelchairs, braces or artificial limbs; and in speech-language pathology. Rich internet applications for neuropsychological rehabilitation (aka cognitive rehabilitation) of cognitive impairment (from many etiologies) were first introduced in 2001. This endeavor has expanded as a teletherapy application for cognitive skills enhancement programs for school children. Tele-audiology (hearing assessments) is a growing application. Currently, telerehabilitation in the practice of occupational therapy and physical therapy is limited, perhaps because these two disciplines are more "hands on".

Two important areas of telerehabilitation research are (1) demonstrating equivalence of assessment and therapy to in-person assessment and therapy, and (2) building new data collection systems to digitize information that a therapist can use in practice. Ground-breaking research in telehaptics (the sense of touch) and virtual reality may broaden the scope of telerehabilitation practice, in the future.

In the United States, the National Institute on Disability and Rehabilitation Research's (NIDRR) supports research and the development of telerehabilitation. NIDRR's grantees include the "Rehabilitation Engineering and Research Center" (RERC) at the University of Pittsburgh, the Rehabilitation Institute of Chicago, the State University of New York at Buffalo, and the National Rehabilitation Hospital in Washington DC. Other federal funders of research are the Veterans Health Administration, the Health Services Research Administration in the US Department of Health and Human Services,

and the Department of Defense. Outside the United States, excellent research is conducted in Australia and Europe. Only a few health insurers in the United States, and about half of Medicaid programs, reimburse for telerehabilitation services. If the research shows that teleassessments and teletherapy are equivalent to clinical encounters, it is more likely that insurers and Medicare will cover telerehabilitation services.

Teletrauma care

Telemedicine can be utilized to improve the efficiency and effectiveness of the delivery of care in a trauma environment. Examples include:

Telemedicine for trauma triage: using telemedicine, trauma specialists can interact with personnel on the scene of a mass casualty or disaster situation, via the internet using mobile devices, to determine the severity of injuries. They can provide clinical assessments and determine whether those injured must be evacuated for necessary care. Remote trauma specialists can provide the same quality of clinical assessment and plan of care as a trauma specialist located physically with the patient.

Telemedicine for intensive care unit (ICU) rounds: Telemedicine is also being used in some trauma ICUs to reduce the spread of infections. Rounds are usually conducted at hospitals across the country by a team of approximately ten or more people to include attending physicians, fellows, residents and other clinicians. This group usually moves from bed to bed in a unit discussing each patient. This aids in the transition of care for patients from the night shift to the morning shift, but also serves as an educational experience for new residents to the team. A new approach features the team conducting rounds from a conference room using a video-conferencing system. The trauma attending, residents, fellows, nurses, nurse practitioners, and pharmacists are able to watch a live video stream from the patient's bedside. They can see the vital signs on the monitor, view the settings on the respiratory ventilator, and/or view the patient's wounds. Video-conferencing allows the remote viewers two-way communication with clinicians at the bedside.

Telemedicine for trauma education: some trauma centers are delivering trauma education lectures to hospitals and health care providers worldwide using video conferencing technology. Each lecture provides fundamental principles, firsthand knowledge and evidenced-based methods for critical analysis of established clinical practice standards, and comparisons to newer advanced alternatives. The various sites collaborate and share their perspective based on location, available staff, and available resources.

Telemedicine in the trauma operating room: trauma surgeons are able to observe and consult on cases from a remote location using video conferencing. This capability allows the attending to view the residents in real time. The remote surgeon has the capability to control the camera (pan, tilt and zoom) to get the best angle of the procedure while at the same time providing expertise in order to provide the best possible care to the patient.