



"DIGITALIZATION OF HOSPITAL"-A STEP TOWARDS "DIGITAL INDIA"

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ABSTRACT

Background: Due to the high patient load at the Regional Cancer Centre, the majority of the Cancer care involves Information and Communication Technology (ICT), modernization by implementing various e-Hospital software. A new technological era has opened up for newer kinds of innovation. "Digital Health care visits" is the service to look forward to better patient care and putting a step towards Digital India. The aim of the study is to gain a better understanding of the innovation "Digital health Cancer Care Center" with the objective to evaluate whether Digitalization provides Health services that are efficient, accurate, and timely for cancer patients and to improve the understanding of the health system in the general public.

Methodology: The above study was conducted at Kidwai Memorial Institute of Oncology, Bengaluru, by using a personal interview method. The samples were selected from the study population of Patients, Clinicians, Technicians, and Nursing staff in each specified type. 30 samples were selected from each category by adopting a cross-sectional study design. Descriptive statistical analysis was performed to analyze the data.

Results: About ¾ th of the patients were of the opinion that the waiting time from entry to diagnosis in the Institute is either satisfactory or highly satisfactory and about 1/4th of the patients were not satisfied. 70% of the Doctors expressed that Digitalization will definitely help in better patient care and about 53.3% of the Doctors expressed that Digitalization will definitely help in giving more time for patients examination and counseling them regarding the disease status, treatment modalities available, prognosis, and importance of follow up which helps in better patient compliance. About 93.3% of the Paramedical staff expressed that Digitalization will definitely help in reducing reporting time and in turn, helps in the early starting of treatment for patients. 93.3% of the Paramedical staff expressed that Digitalization will help in better communication with patients, as the reports can be sent through telemedicine services.

Conclusion: Digitalization reduces the waiting time from Hospital entry to diagnosing the disease and for the commencement of treatment. Digitalization is the way forward for the Health care system. Real-time data analysis helps in better management of Cancer patients by informing Clinicians about the intervention needed. Compiling large data sets from the general population, health care sector professionals will lead to a better understanding of the benefits of Digitalization in the healthcare outcomes of the population.

KEYWORDS : Digitalization, Information and Communication Technology, Cancer care, Artificial Intelligence, Survey.

INTRODUCTION

Digitalization is the way forward for giving better Patient care in the health care system. It reduces the waiting time from Hospital entry to diagnosing the disease and for the commencement of treatment¹. Cancer patients must be counseled and awareness to be spread regarding the new digital ways of communication to help them in speeding up diagnostic and therapeutic procedures. Digital data collection improves speed, reduces the manual handling of documents, improves quality assurance, and brings about transparency in the health care system.

Digital Healthcare comprises of e-Health, Telemedicine, Tele-monitoring, and Digital therapeutic aspects. It provides healthcare services supported by telecommunications, digital technology to improve and support healthcare services in day-to-day clinical practices. Patients receive individualized guidance from the Digital Health care facility².

In the e-Hospital of Regional Cancer Centre, the health care process includes prevention, diagnosis, planning the treatment and follow-up. Tele-Medicine provides remote

access to patients by the Health Care professionals (HCPs) using telecommunication. The need for in-patient consultation is very much limited.

Tele-monitoring is the application of digital technology to monitor patients and provide health care services³⁻⁴. The patient information is assessed remotely by Health Care Professionals to inform the patient and caregivers about the actions needed to be taken for appropriate symptom management and treatment advice through e-prescription⁵.

Digital therapeutics transforms Data collection and process into evidence-based clinical management. Future technological innovations of digitalized healthcare are Artificial Intelligence (A.I) with capabilities of machine learning, which uses predefined computer algorithms to make successful predictions about future events based on past experiences. Evidence-based supportive care guidelines must be developed and followed in routine clinical practice for best patient care⁶.

About 18.1 million new cancer cases, 9.6 million cancer deaths

and 43.8 million people were living with cancer (within 5 years of diagnosis) in 2018 worldwide ⁷. In India, the estimated number of people living with the disease is around 2.25 million every year, new cancer patients registered is around 12 lakhs and cancer-related deaths are 7,84,821 ⁸. During the period from 1984 – 2015, a total number of 4,19,052 new cases have been registered at Kidwai Memorial Institute of Oncology (KMIO), Bangalore out of which 2,45,797(58.7 %) cases were diagnosed as cancer cases. During the year 2017, a total number of 17,888 new cases were registered, out of which 9,295 cases were confirmed as cancer cases, with the male to female ratio as 1:1.3⁹. In Regional Cancer Centre about 80% of patients take cancer treatment under various government Health Schemes. Due to the high patient load at the Regional Cancer Centre majority of the Cancer center began its Information and Communication Technology (ICT) modernization by implementing various e-Hospital software. A new technological era has opened up for newer kinds of innovations. "Digital health care visits" is a service that has been introduced recently and which needs further investigation. It needs to be understood better to predict the future behavior of health care and innovative ways of better disease management.

In health care system the stakeholders are Hospital Management, Public health care sector, Private Health system and patients. The customers are one part of the stakeholders. In order for new innovative products and services to become successful, it is of high importance that consumers adopt the product or service. Patients are of prime importance in Health Institute and patient care is the most important issue to be taken care of in the Health Sector ¹⁰.

The aim of this study is to gain a better understanding of the innovation "Digital health Cancer Care Center" with the objective to evaluate whether Digitalization provides Health services that are efficient, accurate, timely for cancer patients and to improve the understanding of the health system in the general public.

METHODOLOGY

The above study was conducted at Kidwai Memorial Institute of Oncology, Bengaluru. The digitalization of hospitals is the best initiative and critical factor for the future. This is because a consistent implementation policy will create added value both for patients and the hospital's everyday operation. This includes retrospectively updating patient data in digital format and prospectively maintaining the patient's records. Digital communication and interaction improve the exchange of information between patients, health care personnel, and clinicians. One of the important parameters is fast analysis of data and taking initiatives to make necessary changes in health sectors.

The Samples were selected from the Study population of Patients, Clinicians, Technicians, and Nursing staff in each specified type. 30 samples are selected from each category by adopting a cross-sectional study design.

Collecting, organizing, and evaluating the data was done from each targeted group prospectively by using the core proforma developed by taking experts' opinions, each targeted group was interviewed personally. The core proforma for each group contained demographic information such as Age, Gender, Address, Occupation, Education, Contact phone number, and work experience.

After collecting the data, we performed quality checks for collected data for good quality of data i.e range checks, consistency checks, unknown values, and duplicate entries. Patient, Doctor, Paramedical staff's identical information was collected and followed by other variables to meet the objective of the study.

Statistical Analysis:

Descriptive statistical analysis was performed to analyze the data.

RESULTS:

Survey Of Patients Regarding Digitalization:

The Gender wise distribution of patients who participated in this study was, female patients comprised 63.3 % (19 out of 30) and males were 11 out of 30 which comprises 36.7%. The Educational distribution of patients who participated in this study was, about 50% of the patients were illiterates and the rest 50% of the patients were educated up to high school (Fig.1).

About 50% of the patients were either Agricultural laborers or from Agricultural backgrounds. The Patient's opinion regarding the communication system which is already existing in the Institute is satisfactory in about 3/4th of the patients. About 3/4th of the patients were of the opinion that the waiting time from entry to diagnosis in the Institute is either satisfactory or highly satisfactory and about 1/4th of the patients were not satisfied with the time taken for starting the treatment. Due to digitalization about 3/4th of the patients are of the opinion that the waiting time from diagnosis to starting treatment in the Institute is either satisfactory or highly satisfactory (Table no: 1).

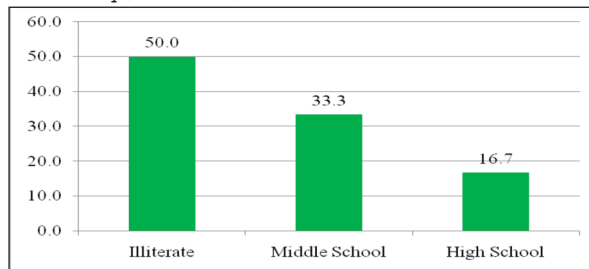


Fig no.1: Education Distribution of Patients in Percentage

Table No.1: Patient's Opinion On Existing System In The Institute

Group	Communication System Existing in Institute		Waiting time from Hospital entry to Diagnosis		Waiting time for commencement of Treatment	
	#	%	#	%	#	%
Highly Satisfactory	3	10	4	13.3	5	16.7
Satisfactory	23	76.7	19	63.3	20	66.7
Not satisfactory	3	10	7	23.3	5	16.7
Highly unsatisfactory	1	3.3	0	0	0	0
Total	30	100	30	100	30	100

Survey Of Doctors Regarding Digitalization:

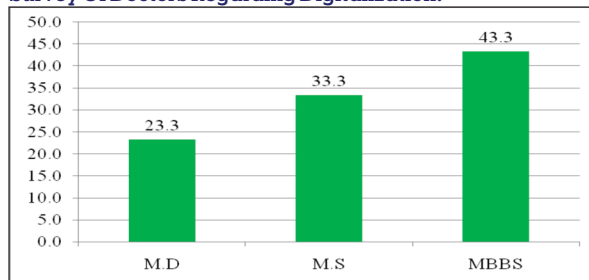


Fig no.2: Education Distribution of Doctors in Percentage

Table No.2: Doctors Opinion On Digitalization In Institute

Group	Does Digitalization Helps in better Patient care		Does Digitalization help in optimum OPD time utilization	
	#	%	#	%
Highly Satisfactory	21	70	16	53.3
Both methods are same	5	16.7	5	16.7
Difficult to work compared to previous methods	4	13.3	8	26.7
Not possible to implement digitalization	0	0	1	3.3
Total	30	100	30	100

The Educational distribution of Doctors who participated in this study is shown in fig no.7. About 43.3% of the doctors were M.B.B.S graduates pursuing a post-doctoral degree and the rest 56.7% of the doctors were Specialists (Fig.2). Table no.2 shows that 70% of the Doctors expressed that Digitalization will definitely help in better patient care and about 53.3% of the Doctors expressed that Digitalization will definitely help in giving more time for patient's examination and counseling them regarding the disease status, treatment modalities available, prognosis and importance of follow up which helps in better patient compliance.

Survey Of Paramedical Staff Regarding Digitalization:

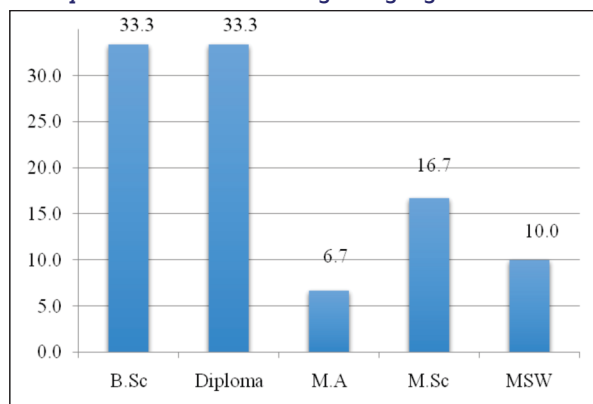


Fig no.3: Education Distribution Of Para Medical Staff In Percentage

Table no.3: Paramedical Staff Opinion On Digitalization In Institute

Opinion	Does digitalization help in reducing reporting time		Does digitalization help in better communication with patients		Does digitalization help in better Record maintenance and for Future Research	
	#	%	#	%	#	%
Yes	28	93.3	28	93.3	29	96.7
No	2	6.7	2	6.7	1	3.3
Total	30	100	30	100	30	100

The Educational distribution of Para Medical Staff who participated in this study is shown above. About 33.3% of the

Para Medical Staff were B.Sc Graduates and 33.3% were Diploma completed staff (Fig3). About 93.3% of the Paramedical staff expressed that Digitalization will definitely help in reducing reporting time and in turn, helps in the early starting of treatment for patients.

93.3% of the Paramedical staff expressed that Digitalization will definitely help in better communication with patients, as the reports can be sent through telemedicine services and there is no need for patients to stay away from their home town facing all the difficulties. An in-person visit to Regional Cancer Centre can be avoided in this COVID-19 crisis. The majority of the Paramedical staff who participated in the study were of the opinion that digitalization will definitely help in better medical record maintenance without the need for manual handling. Doctors can access the medical records at all places in the institute without the need for a hard copy of the file. This will also help in keeping regular contact with the patients or their attenders for better follow-up and update thereby helping in good research and publications (Table no.3).

DISCUSSION:

Digital culture is being imbibed in the Clinical practice. It transforms patient care by integrating health care data across the global healthcare landscape. Newer applications in smart phones, drug delivery system, personalized health gadgets and individualized telemedicine increasingly provide continuous data collection, treatment adjustment and active patient engagement in real-time. The Patient's opinion regarding the communication system which is already existing in the Institute is satisfactory but still, there is more scope to improve with better digitization of the patient appointment system on the institute website, it will definitely reduce the waiting time to contact the doctors.

Peng Zhao et al, the study also suggests a growing trend for the adoption of Web-based appointment systems. The findings of this review suggest that there are benefits to a variety of patient outcomes from Web-based scheduling interventions with the need for further studies¹¹⁻¹².

The majority of patients were of the opinion that the waiting time from entry to diagnosis in the Institute is satisfactory. There is an absolute need for digitalization in the diagnostic section which comprises biochemical, pathological, radiological investigations. The need for manual reporting, image printing will be reduced, thereby the financial burden on the institute for the printing of investigation forms and reports can be cut down drastically. Due to digitalization about ¾ th of the patients are of the opinion that the waiting time from diagnosis to treatment in the Institute will be reduced.

Peter E. Hilsenrath et al, the study also shows that Cost-effectiveness analysis is an accepted technique for evaluating the economics of new technologies. It identifies factors that are important in determining the cost of the Picture Archival Communication system (PACS) relative to film-based radiology. The maintenance costs will be drastically reduced and better human resource management can be done with minimum financial burden and with minimum time patient can avail discount rates in disease diagnosis and treatment. The effectiveness of PACS is also explored in terms of improvements in diagnostic accuracy and timely diagnosis¹³⁻¹⁴.

The majority of the Doctors expressed that Digitalization will definitely help in better patient care. They felt that the manual handling of the medical record consumes most of the consultation hours thereby reducing the time to be given for the patient's examination, diagnosis and planning the treatment. There will be better coordination with the other departments and planning the multidisciplinary treatment

approach, thereby giving the best and optimal patient care and they can give more time towards counseling for better patient compliance.

Caroline J Huxley et al, study suggests that Digital communication technology offers increased opportunities for marginalized groups to access health care. However, it cannot remove all barriers to care for these groups. It is likely that they will remain as a limitation relative to other population groups after their introduction¹⁵.

More than 90% of the Paramedical staff expressed that Digitalization will definitely help in reducing the reporting time and in turn, helps in the early starting of treatment for patients who are coming from faraway places as they are referred to the regional cancer centers. The accommodation problems and their livelihood will not be compromised if there is good digitalization and communication timely. An in-person visit to Regional Cancer Centre can be avoided in this COVID-19 pandemic crisis and also amidst the fear and anticipation of secondary and ripple waves of COVID-19 disease due to the emergence of newer variants of viral strains with high mutagenicity.

The majority of the Paramedical staff who participated in the study were of the opinion that digitalization will definitely help in better medical record maintenance without the need for manual handling. They expressed the risk of Upper Respiratory tract Infections and dust allergy frequently because of handling the old case files. Now in this, Covid-19 pandemic crisis, going, paperless may be one of the steps towards reducing the COVID - 19 burdens.

Doctors can access the medical records at all places in the institute without the need for a hard copy of the file. This will also help in regular contact with the patients or their attenders for better follow-up and updation thereby helping in research and publications. Telehealth service can be used in rural and remote areas to improve the accessibility of rural population to specialist care. Evidence to date has demonstrated the effectiveness and cost-effectiveness of telehealth in rural and remote populations by Christina Tsou et al study¹⁶⁻¹⁷.

Basch et al.¹⁸, has done groundbreaking work in Oncology and Denis et al.¹⁹ has demonstrated that electronic capture of Patient records results in superior outcomes compared to routine clinical care with regard to patient satisfaction, quality of life as well as patient outcome. This approach also seems to be cost-effective for the respective medical system. These results strongly suggest that we need to implement new digital technologies and thus modernize patient management.

Walter Ricciardi et al, the study also suggested that Government should play a more active role in the further optimization of both the process of decision making and treatment-related outcomes. Finding balance between centralized and decentralized activity can be achieved. Moreover, the broader preparation of the health care system to be able to deal with digitalization, education, financial and regulatory preconditions to implementation of monitoring systems to monitor its effects on health system performance remains important²⁰⁻²³.

Nichol, Peter B et al study suggests that Digitalization has made an isolated impact on each stage of this supply chain. However, the most profound impact has come in the form of increased ability to communicate transparent, real-time data between each stage and stakeholder. This is particularly powerful in the healthcare industry because it allows for ongoing monitoring and reporting of patient-centric data that enables providers to identify and respond to patient's needs more quickly. This data also helps providers effectively to

communicate with suppliers and payers to ensure that they have a low cost, but efficient inventory and drive preventative care as well as quality patient outcomes²⁴⁻²⁵.

CONCLUSION:

Digitalization of Medical records is the need of the hour in the Medical System as the maintenance of medical records manually are very tedious and cumbersome. By digitalization, the patient's information can be provided easily to the treating doctors. As the Nation is moving forward towards Digital India, Digital health provides good access for better Patient care. It is patient-friendly as it provides all the information regarding the appointment system including appointment alerts which can be informed to the patients/caregivers well in advance through modern ways of communication methods.

Digitalization reduces the waiting time from Hospital entry to diagnosing the disease and for the commencement of treatment. Digitalization is the way forward for the Health care system.

Real-time data analysis helps in better management of Cancer patients by informing clinicians about the intervention needed. Compiling large data sets from the general population, health care sector professionals will lead to a better understanding of the benefits of Digitalization in the healthcare outcomes of the population.

Cancer patients must be counseled and awareness to be spread regarding the new digital ways of communication to help them in speeding up diagnostic and therapeutic procedures. Digital data collection improves speed, reduces the manual handling of documents, improves quality assurance and brings about transparency in the health care system.

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