

Internship Training

At

mCURA Mobile Health Pvt. Ltd

Smart OPD Software: Functionality & User Satisfaction Evaluation

By

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PG/15/057

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Certificate of Approval

The following dissertation titled "**Smart OPD Software: Functionality & User Satisfaction Evaluation**" at "**mCURA Mobile Health Pvt. Ltd, Gurgaon**" is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

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This is to certify that **Preeti Yadav**, student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at “**mCURA Mobile Health Pvt. Ltd, Gurgaon**” from **02/01/2017 to 15/05/2017**.

The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.

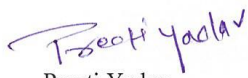
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This is to certify that the dissertation titled “**Smart OPD Software: Functionality & User Satisfaction Evaluation**” and submitted by **Preeti Yadav**, Enrollment No. **PG/15/057** under the supervision of **Dr. Nishikant Bele** for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from **02/01/2017** to **15/05/2017** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.



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PGDHM(2015-17)- Health IT

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PREETI YADAV

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List of Abbreviations

1. OPD- Out Patient Department
2. HCP- Health Care Professionals
3. E- Prescribing- Electronic Prescribing
4. HCQI- Health Care Quality Indicator
5. EMR- Electronic Medical Record
6. EHR- Electronic Health Record

ORGANIZATIONAL PROFILE

mCURA Mobile Health Private Limited was incorporated 4 years ago in June 2013 and it is registered at RoC-Delhi as Private Company limited.

mCURA, strongly believe that the healthcare organizations should have all the relevant clinical data available to them anytime/anywhere, to make the right decision. Built on this belief, "**Enterprise Clinic Management Suite**" presents the right data at your FINGERTIPS.

mCURA is a complete, scalable, and effective solution for the entire healthcare community with a flexible, open technology platform that can leverage and integrate with all modules and with external systems too.

It is our aspiration to initiate a high-performing healthcare system, where all those engaged in the care of the patient are linked together in secure and interoperable environments, and where the flow of clinical data directly enables the most comprehensive, patient-centered, safe, efficient, and effective delivery of care where and when it is needed most – at the point of care.

Key Features

1. Practice management
2. Electronic Prescribing
3. Medical advisory
4. Continuity of care management
5. Electronic Medical Records
6. tPOE System (Tablet based Physician Order entry)
7. Drug index reference
8. Referral management
9. Medication Management
10. Patient flow & Visitation broadcasting

CHAPTER- 1

(Introduction)

Smart OPD Software: Functionality & User Satisfaction Evaluation

Introduction

Smart OPD is an integrated mobile health platform that helps streamline the end-to-end patient lifecycle during his/her visit to the OPD. This is made possible by bringing the entire ecosystem - doctor, pharmacy, lab, front office, etc. - together digitally and connecting it with the patient. The underlying technology that brings together and integrates this entire ecosystem is mobility. Essentially, Smart OPD is a tool to connect doctors and patients over mobile devices.

The use of mobile devices by health care professionals (HCPs) has transformed many aspects of clinical practice. Mobile devices have become commonplace in health care settings, leading to rapid growth in the development of medical software applications (apps) for these platforms. Numerous apps are now available to assist HCPs with many important tasks, such as: information and time management; health record maintenance and access; communications and consulting; reference and information gathering; patient management and monitoring; clinical decision-making; and medical education and training.

fast and secured access to vital health information, lab results, queue management, access to the appointment scheduling of the consultants and various clinical services, patient dashboard at the consulting room is possible through smart OPD .

The system allows booking doctor's appointment through the mobile app, which also sends reminder, and assigns queue token number on the phone itself once at the hospital. This helps avoiding the long queues and waiting hours. There is also provision for cancelling and re-scheduling of the appointment.

On the other hand, the doctors are equipped with tablets loaded with the app that allows them to do everything, right from scheduling an appointment to writing a prescription. Once a patient appointment has been booked it is reflected in the mobile app on the tablet of the concerned doctor.

Further, notes from the consultation with the patient are captured on the tablet. Capturing of the data can be done by the doctor himself/herself or there is an option of having an IT

clinical assistant do that in case the doctor is not comfortable using the tablet simultaneously while consulting with the patient. This ensures that the human touch between the doctor and the patient is not compromised on during the consultation.

The diagnosis entry is made into the tablet along with any prescribed tests and medicine. In case of any tests involved, the diagnostic lab gets information in advance so that it is ready when the patient arrives, being an integrated system. The lab results, including diagnostic images, are also available on the mobile app and can be viewed by both the doctor and the patient.

Before prescribing the medicine, the doctor can go through the drug reference guide that has all the drugs with their generics and different brand names listed in the system. With a comprehensive view of the drugs in a single view, the doctor is able to prescribe the cheaper option in case of a patient with financial constraints. A printout of the prescription is taken directly from the tablet at the end of the session. Integration of pharmacy allows for auto delivery of order to the pharmacy once the doctor submits the prescription.

Chapter II

(Review of literature)

Review of Literature

Aghazadeh, et.al(2015) conducted a study on Evaluating the Effect of Software Quality Characteristics on Health Care Quality Indicators(HCQI). The aim of the study was assessing the effect of software quality on the performance quality of healthcare institutions. The finding of the study showed that software Maintainability was rated as the most effective factor on user satisfaction and Functionality as the most important and independent variable affecting patient care quality. Efficiency was considered as the most effective factor on workflow, and Maintainability as the most important factor that affects healthcare communication. Usability and Efficiency were rated as the most effectual factor affecting patient satisfaction. Reliability, Maintainability, and Efficiency were considered as the main factors affecting care costs .

Miguel, et. Al(2014) conducted a study on Review of Software Quality Models for the Evaluation of Software Products. The aim of the study was to describe the main models with their strengths and point out some deficiencies. The overall conclusion was that there are very general models for assessing software quality and hence they are difficult to apply to specific cases. Also there exist tailored quality models whose range is in small domain, using as starting model the ISO 9126. Models for Free/Open source emphasize the participation of community members.

Ventola, et.al(2014) conducted a study on Mobile Devices and Apps for Health Care Professionals: Uses and Benefits. The findings of the study suggests that Medical devices and apps are already invaluable tools for HCPs, and as their features and uses expand, they are expected to become even more widely incorporated into nearly every aspect of clinical practice. However, some HCPs remain reluctant to adopt their use in clinical practice. With the implementation of such measures, the main determinant of an app's value may ultimately be its ability to provide meaningful, accurate, and timely information and guidance to the end user in order to serve the vital purpose of improving patient outcomes.

Boudreaux, et.al(2014) conducted a study on Evaluating and selecting mobile health apps: strategies for healthcare providers and healthcare organizations. This paper summarized seven strategies for evaluating and selecting health-related apps: (1) Review the scientific literature, (2) Search app clearinghouse websites, (3) Search app stores, (4) Review app descriptions, user ratings, and reviews, (5) Conduct a social media query within professional

and, if available, patient networks, (6) Pilot the apps, and (7) Elicit feedback from patients. The paper concluded with an illustrative case example. Because of the enormous range of quality among apps, strategies for evaluating them will be necessary for adoption to occur in a way that aligns with core values in healthcare, such as the Hippocratic principles of non maleficence and beneficence.

Lowery, et.al(1990) conducted a study on Evaluation of healthcare software from a usability perspective. The aim of the study was to provide a framework for evaluating healthcare software from a usability perspective. The finding of the study identified framework arises from the proliferation of software packages in the healthcare field, and from an historical focus on the technical and functional aspects, rather than on the usability, of these packages. Healthcare managers are generally unfamiliar with usability concepts, even though usability differences among software can play a significant role in the acceptance and effectiveness of systems. Six major areas of usability are described, and specific criteria which can be used in the software evaluation process are also presented.

Ahmad, et.al(2014) conducted a study on Smart Phone Application Evaluation with Usability Testing Approach. The objective of the study was to provide testing novel techniques, the usability testing of most common used smart phones such as Android and Apple smart phone application. The findings of the study provided the guidelines for various corresponding features to compare or evaluate different features on the basis of modern smart phones' operating system, framework for hardware and software, battery life and many more features. Usability testing of smart phones' software application is a promising research context that nowadays faces a number of challenges because of sole features of mobile phones, narrow bandwidth, varying environmental factors and unreliability of wireless connection or networks. A number of questionings are applied to accumulate user's opinion about ongoing features. Users of Android and Apple smart phones reply by answering based on their routine life usage experience.

Chapter III

(METHODOLOGY)

Problem Statement

In last few years the patient load is keep on increasing due to continuous increase in volume of patient doctors are facing much problems in managing the load of the patient. Now a days medical error are increasing because of manual recording of the clinical data. To overcome these problems mCURA has started the Smart OPD project that will be helpful in changing the entire hospital approach and will allow the continuum of care. Software will allow the real quality care as well as avoid repeat prescription and repeat visits of the patient. This software helps the doctors in managing the patient queue in the hospital. Smart OPD will capture the additional patient information. Since it's been a long time of implementation of the software, so need arises to evaluate the functionalities and user satisfaction of the end user so that finding of the study can be applied to increase the effectiveness of the software in future.

Methodology

This chapter deals with the methodology selected by the investigator .It contains research design ,research variables ,the setting , the population , sample, the sampling technique, the sample size, the sample selection criteria that is the inclusion criteria and exclusion criteria development and description of tool ,the validation and reliability of the tool .

Aim of the Project

The aim of the project is to evaluate the smart OPD software.

Objective of the Project

The objectives of the project are –

- 1) To assess the performance of Smart OPD Software based on its functionalities.
- 2) To assess the user satisfaction level of Smart OPD.

Study Design and Location

Cross-sectional study design to examine the functionalities of the smart OPD software as well as the satisfaction level of the doctors who are using Smart OPD on the provision of patient care in a private hospital.

Data collection period

The period of data collection was 10/03/2017-30/05/2017.

Period of tool development

Time taken in development of tool was 15/02/2017-05/03/2017.

Study population

The study population includes 25 doctors presently working with the Smart OPD in a private hospital.

Sampling Technique

Non probability convenient sampling was used to select the participants. Non-probability sampling is a sampling technique where the samples are gathered in a process that does not give all the individuals in the population equal chances of being selected.

Sample Size

The sample consists of 18 doctors who were available in the hospital.

Tools of Data collection

The tool used to collect the data was a structured, closed ended questionnaire. The questionnaire was constructed with emphasis on the content, clarity and simple language. Questionnaire design was based on the prior scientific and relevant literatures. The questionnaire was reviewed by experts in the field of medical and health information management for content validity in terms of relevance, accuracy, and its relationship with the doctor's workflow in the OPD. The variables in the questionnaire were mainly adopted from the study of *Ventola et.al (2014)*. Then the questionnaire had revised and amended based on the experts' views. The data collection tool was a questionnaire designed based on the scientific and relevant literatures and library studies. The Questionnaires consisted of the 3 sections and a total of 33 statements. Each of the section directed towards one of the objectives. Responses on the statements of section B were collected on 5 point Likert scale ranging from strongly agree to strongly disagree. The scoring was 1 = Strongly disagree, 2 =

Disagree, 3 = Neutral ,4 = Agree and 5=Strongly agree. Responses on the statements of section C were collected on 5 point Likert scale ranging from very good to very poor. The scoring was 1 = Very poor, 2 = Poor, 3 = Average ,4 = Good and 5=Very good

Sample selection criteria

Following inclusion criteria was used to select the respondents

Inclusion criteria

1. All the doctors who were using the smart OPD software
2. Who were ready to participate in the study.

Chapter IV

(DATA ANALYSIS &INTERPRETATION)

Data Analysis and Interpretation: Data analysis was done with the help of SPSS software. The reliability of the questionnaire was assessed using Cronbach's Alpha, which was found to be 0.842 based on the 33 statements. Statistical tools such as descriptive statistics (frequencies, percent, mean and standard deviation) and one sample t-test was used to analyze the data depending on the requirement.

Sample Profile:

The below table provides a brief description of the sample profile of doctors of private Hospital, New Delhi.

Section-A Demographic Information

Variables	Categories	Percentage	Description
Department	Hematology	5	Majority of the respondents were from the ENT, Nephrology and MAS department
	Endocrinology	11	
	Medicine	6	
	Gynecology	5	
	Pediatrics	11	
	Ophthalmology	11	
	ENT	17	
	Nephrology	17	
	MAS	17	
Experience	0-10 years	6	Majority of the respondents were 11-20 years experienced.
	11-20 years	44	
	21-30 years	33	
	31-40 years	17	
Experience with Hospital	0-10 yrs	45	Majority of the respondents had 0-10 years experience with hospital
	11-20 yrs	44	
	21-30 yrs	11	

Source: Field Survey

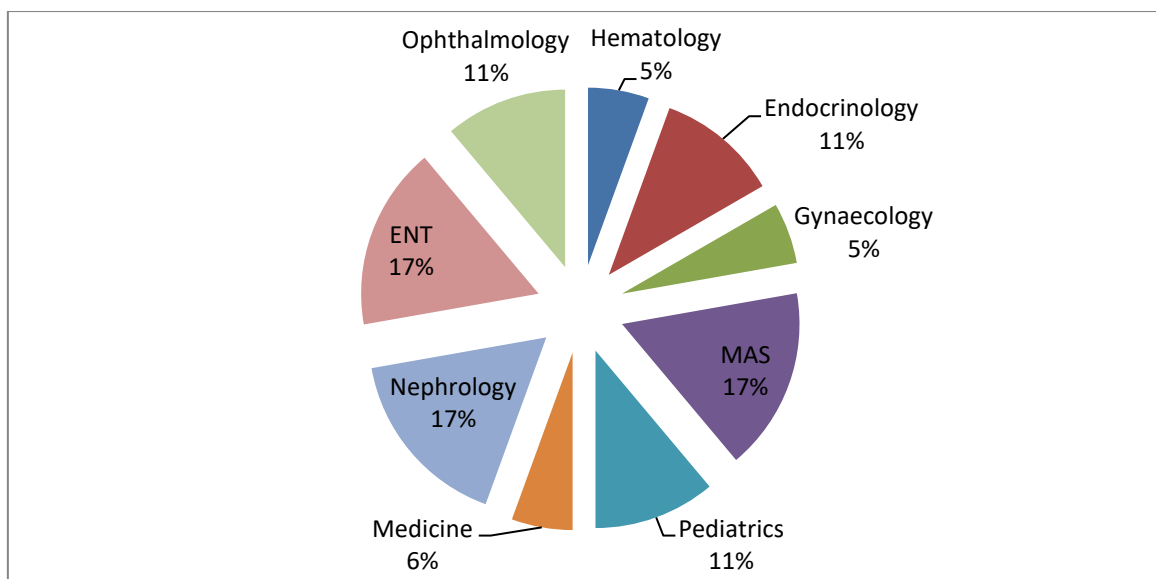


Fig 1: Department

Interpretation: Majority of the respondents belongs to the nephrology, MAS and ENT department followed by pediatrics, Ophthalmology and Endocrinology department

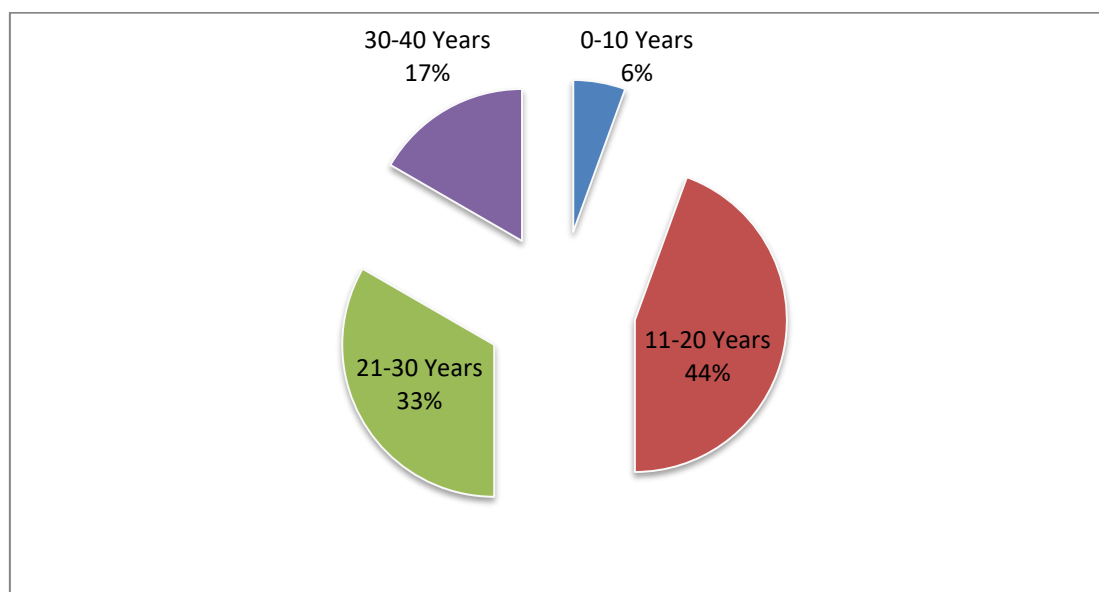


Fig 2: Experience

Interpretation: Majority of the respondents had 11-20 years(44 percent) of clinical experience followed by 21-30 years(33 percent), 30-40 years(17 percent) and 0-10 years (6 percent).

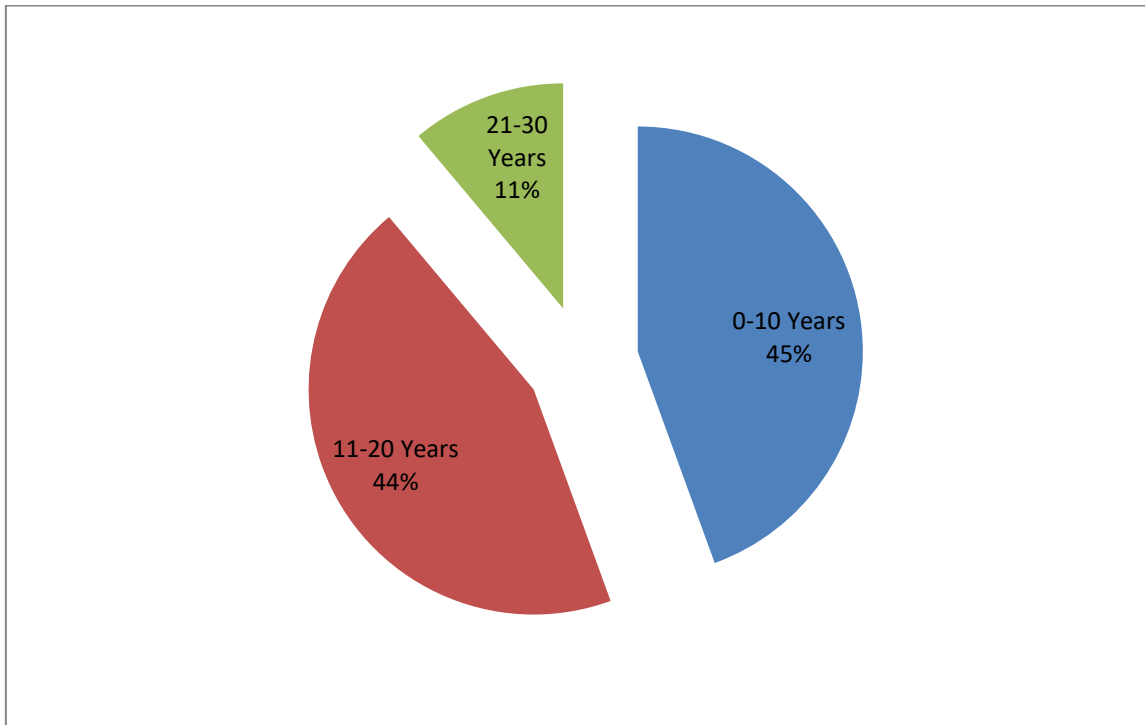


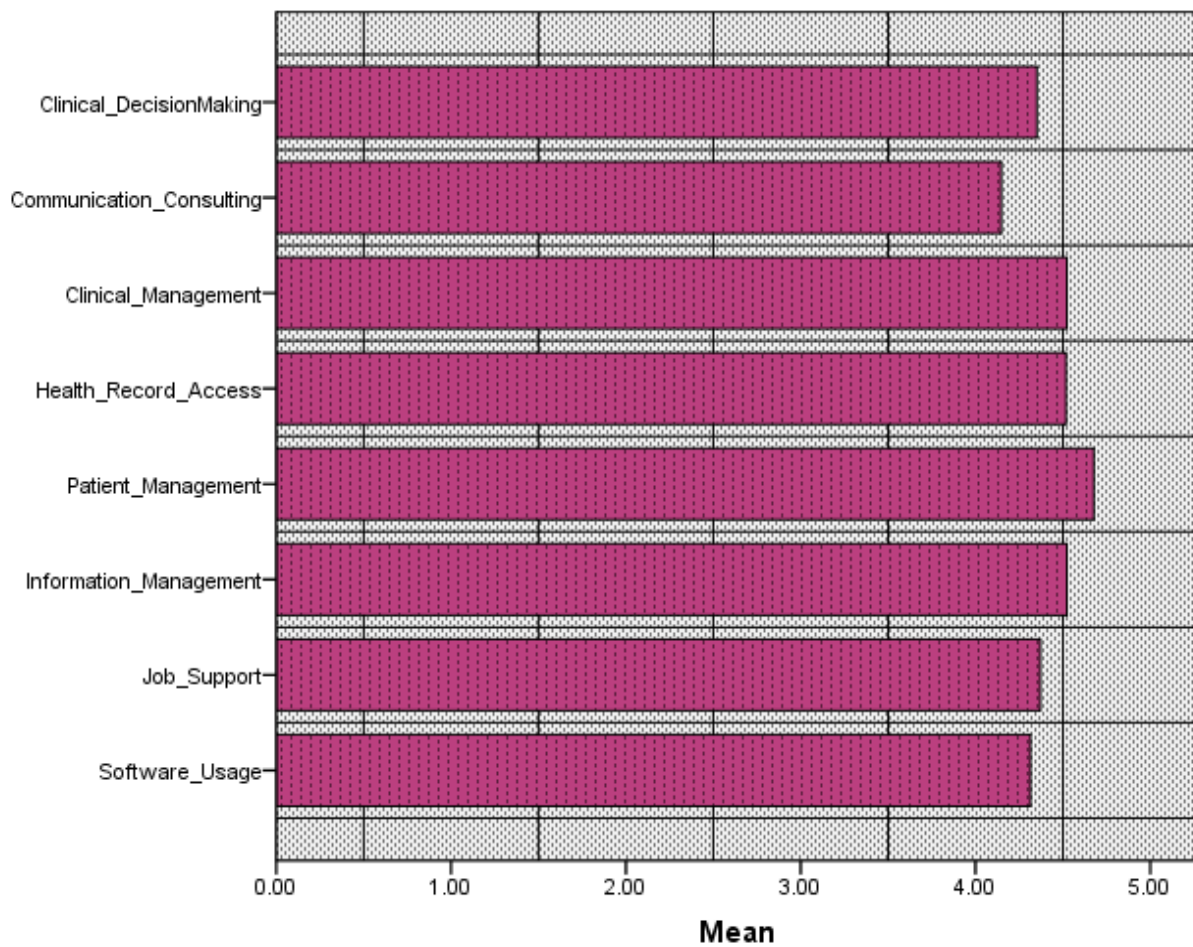
Fig 3: Experience with Hospital

Interpretation: Majority (45 percent) of the respondents had 0-10 years experience with hospital followed by 44 percent who had 11-20 years of experience and 11 percent of respondents had 21-30 years of experience with hospital.

Chapter V

(Result, Discussion, Conclusion & Recommendation)

Fig 4: Overall Mean



Section-B Functionalities

One Sample t-test Results (N= 18, df=17) , Test Value=3, Sig. Testing Done at 95% Confidence Interval

Table 1: Overall Information management

Variable	Mean	Std. Dev.	Mean Diff.	t value	Sign. (2 tailed)*	Significance of result
Information_Management	4.52	.275	1.52	23.43	.000	Significant

Table 2: Overall Patient management

Variable	Mean	Std. Dev.	Mean Diff.	t value	Sign. (2 tailed)*	Significance of result
Patient_Management	4.67	.257	1.67	27.59	.000	Significant

Table 3: Overall Health_Record_Access

Variable	Mean	Std. Dev.	Mean Diff.	t value	Sign. (2 tailed)*	Significance of result
Health_Record_Access	4.51	.383	1.51	16.82	.000	Significant

Table 4: Overall Clinical_Management

Variable	Mean	Std. Dev.	Mean Diff.	t value	Sign. (2 tailed)*	Significance of result
Clinical_Management	4.52	.248	1.52	25.97	.000	Significant

Table 5: Overall Communication_Consulting

Variable	Mean	Std. Dev.	Mean Diff.	t value	Sign. (2 tailed)*	Significance of result
Communication_Consulting	4.14	.365	1.14	13.32	.000	Significant

Table 6: Overall Clinical_DecisionMaking

Variable	Mean	Std. Dev.	Mean Diff.	t value	Sign. (2 tailed)*	Significance of result
Clinical_Decision Making	4.35	.332	1.35	17.23	.000	Significant

Source: Field Survey

Section-C User Satisfaction

One Sample t-test Results (N= 18, df=17) , Test Value=3, Sig. Testing Done at 95% Confidence Interval

Table 7: Overall Software Usage

Variable	Mean	Std. Dev.	Mean Diff.	t value	Sign. (2 tailed)*	Significance of result
Software_Usage	4.31	.419	1.31	13.29	.000	Significant

Table 8: Overall Job Support

Variable	Mean	Std. Dev.	Mean Diff.	t value	Sign. (2 tailed)*	Significance of result
Job_Support	4.37	.321	1.37	18.1	.000	Significant

Source: Field Survey

Information Management: The value of information management mean (4.52) indicates that the smart OPD software helps in writing the notes, recording audio, recording video, helps the doctors taking picture and also helps in organizing all the information and images (mean>3) and, the results of one sample t-test indicates that this result is significant at 95% confidence interval ($p < 0.05$).

Patient Management: The value of patient management mean (4.67) indicates that the smart OPD software helps in scheduling patient appointment their registration in the hospital also helps in generating bill of the patient along with the queue management when patient goes for the consultation and also facilitates to view patient dashboard by the doctor(mean>3) the results of one sample t-test indicates that this result is not significant at 95% confidence interval ($p > 0.05$).

Health Record Maintenance And Access: The mean value of mean is 4.51 indicates that Smart OPD helping the doctors in accessing the patient health information in terms of EHR and EMR .It also helps in accessing the patient lab reports images and radiological scans as well as facilitates in electronic prescribing of the medicines. The value of mean (4.51) is higher than the test value (3) the results of one sample t-test indicate that this result is also significant.

Clinical Management: The value of the clinical management mean is 4.52 which is greater than the test value ($4.52 > 3$) indicates that the smart OPD software helps in collecting the clinical data of the Patient, monitoring of the patient health .It helps the patient by avoiding their repeat visits and prescriptions by reducing the medical error and also saves the physician time so that he can easily gives his quality time for the patient rather than writing manually on the prescription. The results of one sample t-test indicate that this result is also significant ($p > 0.05$).

Communication & Consulting: Mean value of communication and consulting variable is 4.14 which indicates that the Smart OPD software helps the doctor in consulting the patient through voice calling, video calling, texting , E-Mail through multimedia message or through video conferencing(mean>3). The results of one sample t-test indicates that this result is significant at 95% confidence interval ($p < 0.05$).

Clinical Decision Making: The value of Clinical decision making variable is 4.35 which is greater than the test value. The result indicates that the Smart OPD also helps the physician in diagnosing the disease and laboratory test ordering. The results of one sample t-test indicates that this result is significant at 95% confidence interval ($p < 0.05$).

Use Of Software: The mean value of software usage variable is 4.31(Mean>3) . It indicates that the software is interactive for the doctors to work with and they found it easy to learn and work on it . The results of one sample t-test indicates that this result is significant at 95% confidence interval ($p < 0.05$).

Job Support: The value of the Job Support mean is 4.37(Mean>3). It indicates that the software is saving the users time for a particular task in a given situation; it increases their productivity and also found to be effective in their job. The results of one sample t-test indicates that this result is significant at 95% confidence interval ($p < 0.05$).

Discussion:

The overall result of the study highlights that, doctors find the smart OPD software helpful in the information management of the patient in terms of writing notes, recording audio, recording video and taking pictures as well. It is also helpful in patient management by scheduling the patient appointment, registration and generating bill.

Smart OPD software helpful in accessing the EHR and EMR of the patient in terms of instant access of lab reports and radiological scans. Doctors have agreed that the software also helps in clinical management by monitoring the patient health, avoiding the repeat visits and prescriptions and in electronic prescribing. Software provides assistance in communication and consulting of the patient by facilitating text message, voice calling, video calling and sending E-Mail. It also helps clinical decision making process by providing diagnostic facilities and lab test ordering.

As per the doctors Smart OPD software is easy to learn and is pretty easier to work with it .

This also increases the effectiveness of the doctors in their job and increases their productivity by enabling them to see more patients in less time.

Conclusion:

Today, in healthcare systems, use of information technology has become an integral part for achieving better patient care. Medical devices and apps are already invaluable tools for HCPs, and as their features and uses expand, they are expected to become even more widely incorporated into nearly every aspect of clinical practice. The present research study was carried out in a private Hospital in New Delhi to capture the functionalities and user satisfaction level of the doctors who is using Smart OPD software. Overall the study results highlight that the Smart OPD helping the doctors in information management, patient management, health record access, clinical management as well as in their clinical decision making. They also find that using Smart OPD help them to do their job effectively and the software is also easy to learn and use in their clinical practice. However, some HCPs remain reluctant to adopt their use in clinical practice. Although medical devices and apps inarguably provide the HCP with many advantages, they are currently being used without a thorough understanding of their associated risks and benefits. Rigorous evaluation, validation, and the development of best-practice standards for medical apps are greatly needed to ensure a fundamental level of quality and safety when these tools are used. With the implementation of such measures, the main determinant of an app's value may ultimately be its ability to provide meaningful, accurate, and timely information and guidance to the end user in order to serve the vital purpose of improving patient outcomes.

Recommendation:

Based on the findings of the study following recommendation can be given-

1. Supervision and Training could be the better platform to make the software more user friendly.
2. Since the findings of the study are good so it can be expanded with more doctors in the hospital.
3. Needs to improve the teleconsultation services and training on it.

Based on observation following recommendation can be given:

1. User manual should be provided to the doctors.
2. Data duplication needs to be removed.
3. It should be flexible enough to incorporate any changes in the software.
4. End user feedback needs to address within time frame.

Limitation of the Study:

The limitation of the smart OPD software evaluation was as follows-

1. The study has been done only in single hospital because software is implemented in one hospital only.
2. Time constraints.
3. Fewer doctors are using the software so samples were taken among that available doctors who were using the smart OPD.
4. The result of the study cannot be generalized in all the available doctors in the hospital.

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Annexure-I

Smart OPD Software: Functionality & User Satisfaction Evaluation Questionnaire

Section A - Demographic Information

1.	Department	
2.	Total year of experience	
3.	Total year of experience with Hospital	

Section B - Functionalities rating scale

Please rate the following features/functions of Smart OPD software on the basis of its performance on the given rating scale –

Very Poor	Poor	Average	Good	Very Good
1	2	3	4	5

S.No	Functionalities	1	2	3	4	5
A.	Information Management					
1	Write notes					
2	Record audio					
3	Record Video					
4	Take photographs					
5	Organize information and images					
B.	Patient Management					
1	Schedule appointments					
2	Registration					
3	Billing					

4	Queue Management					
5	Patient Dashboard					
C.	Health Record Maintenance and Access					
1	Access EHRs and EMRs					
2	Access Images and Scans					
3	Electronic prescribing					
D.	Clinical Management					
1	Collect clinical data					
2	Monitor patient health					
3	Repeat visits and prescription					
4	Reduction in medical error					
5	Saves quality time					
E.	Communication and Consulting					
1	Voice calling					
2	Video calling					
3	Texting					
4	E-Mail					
5	Multimedia messaging					
6	Video conferencing					
F.	Clinical Decision making					
1	Disease diagnosis aids					
2	Differential diagnosis aids					
3	Laboratory test ordering					

Section C - User Satisfaction Scale

-For the following statement please provide your Agreement/Disagreement on the given scale

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

S.No	User Satisfaction	1	2	3	4	5
A.	Use of Software					
1.	Software is interactive to work with					
2.	Software is easy to use					
3.	Learning to operate the software is easy for me					
B.	Job Support					
1.	Software saves my time while completing a particular task in a scenario is satisfactory					
2.	Software increases productivity in my job					
3.	It increases my effectiveness on the job					