ORIGINAL ARTICLE

Effect of digitization of medical case files on doctor patient relationship in an Out Patient Department setting of Northern India: A comparative study

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Abstract

Background: Digitization of health records and health delivery processes in health care settings may have an impact on the Patient-Physician communication, wait times, that affect the overall patient satisfaction with the health care services. **Aim & Objective**: We ascertained the effect of digitization of medical case files on the doctor patient relationship (DPR) domain of patient satisfaction at an urban primary health center in India. **Settings and Design**: Comparative, cross-sectional study in primary health centres. **Methods and Material**: The patient satisfaction was compared between the patients attending the Public Health Dispensary (PHD) that uses digitized medical case file system and a Civil Dispensary (CD) which follows the conventional paper based medical records, using a Patient Satisfaction Questionnaire (PSQ). **Statistical analysis used**: Univariate analysis was done by chi-square test and adjusted analysis was done by multiple linear regression. **Results**: Patient satisfaction in DPR was found to be same between the digitized medical case files based and conventional OPD (p=0.453). Significantly higher overall patient satisfaction was reported in the conventional paper based OPD than the digitized OPD (p<0.001). **Conclusions**: Patient satisfaction towards the doctor-patient relationship (DPR) was same between paper based OPD and the digitized medical case files based OPD.

Keywords

Electronic Health Records; Primary Healthcare; Physician Patient Relationship; Patient Satisfaction; India

Introduction

Electronic Medical Records (EMR) have been widely used whenever patients encounter the health systems.(1) However, the digitization of health delivery processes may have an impact on the doctor patient relationship (DPR) which in turn might affect the overall patient satisfaction with the health care services.(2–6) While studies on satisfaction between various patient groups and levels of health care has been done in India,(7,8) the impact of digitized medical case files service provision on patient satisfaction has not been studied. Outpatient (OP) services form the major proportion of healthcare. Hence, the following study was conducted in primary healthcare OP settings in Northern India.

Aims & Objectives

To assess the effect of OP care digitization of medical case files on the patient satisfaction levels towards the DPR in Chandigarh, India.

Material & Methods

A comparative, cross-sectional, observational study on the patient satisfaction levels was conducted during May-June 2020, among the patients attending the OPDs of Public Health Dispensary (PHD) at Sector X, Civil

Dispensary (CD) at Sector Y in Chandigarh. PHD at Sector X, the study group, is fully digitized: registration, physician consultation, investigations and drug dispensation. (Figure 1) The daily OPD census in each of the health center is in the range of 50-60 patients. The health care workers handling the digitized medical case files in PHD, Sector X had been trained by the software firm who established it, and are maintaining the systems. The digitized medical case files settings in the PHD are in place for about 3 years. It includes registration where the identification details of the patient are entered, a unique patient identity (ID) number is generated and patient is added to the line list of the triage room by the registration desk. After registration, the patient moves to the triage room, wherein the multi-purpose worker (MPW) identifies the patient from the line list and after confirming the identity with the patient, the anthropometry, blood pressure and blood glucose are assessed and the details are entered in the digital file of the patient. From the triage room, the patient' case file is moved to the Medical officer' portal by the MPW. The medical officer (MO) calls the patient from the line list to MO room, and conducts the consultation. The symptom pattern, comorbidities and provisional diagnosis are typed into the patient digital file. The MO explains the diagnosis and prescription to be followed to the patient. Once the prescription is done, a printed copy of the prescription sheet with diagnosis is given to the patient, for their records. After the MO consultation is completed, the patient' digital file with the prescription will automatically move to the pharmacy. The pharmacist will dispense the drugs to the patients accordingly, when they reach the pharmacy. Any old patient can be identified based on the patient ID or patient name. So when they come for follow-up visit, the patient' digital file can be retrieved, past treatment accessed and consultation can be done in the same file. Sector Y CD, the comparator group, follows the conventional system wherein the OPD was managed with paper-based system. (Figure 2) These two centers were chosen deliberately, to include a paperless and paper based OPD that have similar patient load, staffing pattern, battery of services provided and managed by the same administration.

Patients aged less than 18 years, patients approaching for any emergency care, patient who had already completed the interview in previous visit and those who did not give consent were excluded. A pre-validated, structured, interviewer administered, Hindi Patient Satisfaction Questionnaire (PSQ) for OPD services, was used to determine the patient satisfaction levels, which has DPR as one of the domains.(8) The PSQ used in our study was the Hindi version that was developed by Mohd et al.,(8) by adopting items from the PSQ tool developed and validated by Grogan et al.(9) The Hindi PSQ has a high internal consistency. (Cronbachs' alpha-0.96).(8)

Global PSQ scale was used since factors such as general cleanliness, registration que, seating arrangements etc., are among the attributes of patient satisfaction.(9) Hence in order to rule out any confounding bias of these factors from other domains/aspects of the clinic on the doctor-patient relationship(DPR), they were also assessed. The questionnaire was developed based on patient expectations, and the guidance being taken from study tools adopted in previous studies which were conducted in India and other countries.(8) It is a 30 item questionnaire that includes sub-domains such as DPR, General aspect of the clinic, Registration & Reception, and Pharmacy. Each item was scored on a likert scale between 1 and 4. The total score can range from 30 to 111. Higher the score, greater the patient satisfaction. Total patient satisfaction and domain specific scores for each patient were obtained by sum of the individual items. Apart from this, we also collected information on the socio-demography of the participants, such as age, sex, occupation etc. Since we could not find a pre-existing similar study, to calculate the required sample size, we conducted a pilot study by including 30 patients from each center. Using G*power software, based on the effect size of 0.8 obtained from the pilot study, with an alpha error of 5% and power of 95%, minimum sample size in each group was calculated to be 39 patients. Adding a non-response/attrition rate of 10%, the sample size was finalized to be 43 patients per center. The samples were distributed over a period of 6 days, so as to include all days, including the specific days for special clinics such as Ante natal care clinics and non-communicable disease clinics, in the week. During the first six days, 7 patients per day and on the last day 8 patients were recruited by consecutive sampling, with equal distribution over the OPD hours. After obtaining the written informed consent from the participants, the interview was conducted by the staff who were not the employees at the respective centers. Two staffs were trained to interview using the questionnaire. An orientation session for the interviewers on the administration of the questionnaire was conducted by the investigators. Patients were interviewed when they were leaving the health center, after acquiring the OPD services.

Ethics and permissions: Ethical permission to conduct the study was obtained from the Institute Ethics Committee. Permission to use the Hindi PSQ was obtained from the authors of the Hindi validated PSQ questionnaire. Written informed consent was taken from the study participants. Letter No. INT/IEC/2020/SPL-495 dated 22.04.2020.

Data Analysis and Statistical Methods: Data was collected using Epicollect5 and the analysis was done using SPSS 26.0 (Trial Version). Chi-square test was applied between categorical variables. Normality of the continuous variables was tested by Shapiro Wilkes' test. Multiple linear regression was used by including the variables which had a significant level of <0.1 from the univariate

analysis. A p value of <0.05 was considered statistically significant.

Results

Overall response rate of the participants was 97.7% (84/86), with 95.3% response from Sector X and 100% response rate from Sector Y. Majority of the participants in our study were females (57.1%), aged between 31-50 years (45.2%) and married (84.5%). The age of the participants was not normally distributed (p=0.016). The median age of patients was 29 years (IQR- 19) in sector X and 41 years (IQR-21) in sector Y. Majority of the patients (50%) were educated above or till higher secondary and visited the health center 2-5 times over the last year. The difference in the age and education status of the population attending the two health care delivery centers were statistically significant (p<0.05). Sex, marital status and employment status of our patients were similar in both the health centers. (Table 1)

The patient satisfaction scores were not normally distributed (p<0.05). With regards to the individual domain of doctor patient relationship, there was no significant difference between paper based and digitized medical case files OPDs. However, the overall patient satisfaction score was found to be significantly higher in the conventional paper based OPD (median=81) than the digitized OPD (median=74) (p<0.001). (Table 2) Education status was also significantly associated with the overall patient satisfaction score. (Table 3). The significance in association between the overall patient satisfaction score and conventional settings, tends to remain, after adjusting for the education status of the patients.(Table 2) Registration area scores were higher for the conventional OPD (median=28) than the digitized OPD (median=21) (p=0.017), while the general aspects of dispensary scored better in the digitized OPD (median=9) than the conventional one (median=8) (p<0.001). (Table 2)

Majority of them reported a waiting time between 5 and 15 minutes at various places inside the OPD such as the registration area (54.8%), before doctor consultation (52.4%) and pharmacy (51.2%). Majority of the participants had a consultation time of 5 to 15 minutes with the doctor. Patients utilizing the digitized medical case files OPD in our study area were spending significantly less time in waiting at the registration area (median= 4) (p<0.001) and before consultation room(median=3) (p=0.024) when compared with paper based OPD. Whereas, the consultation time spent by the doctor was higher at paper based (median=1) than the digitized OPD (p<0.001). Other aspects of the clinical quality such as explanation given by the doctor about their sickness and sense of concern and involvement with their complaints were found to be statistically similar between the patients attending paper based and digitized medical case files based OPD. (Table 4)

Waiting time of less than 15 minutes at the registration area (p=0.018) and the pharmacy (p<0.001) had a significant association with better patient satisfaction scores.

Discussion

Every organization is concerned with satisfying their consumers. Healthcare, a major service delivery organization, can be no different. Here the equivalent of consumer satisfaction- the patient satisfaction is taken as an important measure of the quality of the care.(9) Patient satisfaction, as a component of quality of care, is influenced by multiple factors, and influences multiple aspects of health care such as patient compliance and treatment outcomes.(10, 11)

There was no significant difference in the scores of doctor-patient relationships (DPR) between the paper based and digitized medical case files OPD in our study. Provider attitude, which has been identified as one of the attributes of patient satisfaction,(10) has found to remain the same in our digitized OPD settings. Tsai et al in their scoping review observed that majority of the studies had reported a better communication between the patients and doctors, owing to the EHR implementation.(12) Integrated data access from multiple EHRs by the physicians has shown a significant positive effect on the patient-physician relation and experiences of care.(3) Eberts et al concluded that patients did not perceive the EHRs as an impediment in the DPR.(13) In contrast, a shift in the type of EHR used has shown to have detrimental effect on the patient satisfaction with the service providers, among the patients attending Mayo Clinic.(14) Studies have also observed that majority of the patients did not report negative association or intrusiveness of the computers in the physician–patient communication during their OPD visits.(1, 5, 15) The factors that affect the doctor-patient relationship domain of the patient satisfaction include maintenance of eye contact and gaze time, by the physicians.(16, 17) While Shaaranai et al reported that majority of the patients believed that Electronic Health Records (EHR) improved the efficiency of the physicians,(18) doubts over the competence and trust deficit was expressed towards those physicians who used digital devise. Competence of the treating physician, as perceived by the patient, is one among the four attributes of patient satisfaction.(10) During COVID-19 pandemic lockdown in Italy, patients were satisfied with the E-TFU (EMR assisted telephone follow-up), wherein the EMRs were used to evaluate the breast cancer patients requiring follow-up and a telephone based follow-up was done.(19)

Our patients perceived that the doctor spent lesser time with him/her at digitized settings than the paper based OPD. Engaging the patients in the EHR assisted patient management such as displaying pictures, graphs and educating the patients have been found to be the major

themes that promotes positive perception about EHR among the patients.(5, 20) However, the above explanations were obtained from those studies that were done in the settings different from that of ours. We could not elicit the reasons for the non-change in doctor-patient communication satisfaction in the present study.

The conventional paper based OPD had a significantly higher overall PS score than the digitized OPD. On the contrary, Cauvoto et el reported that the patient satisfaction remained same for paper based and electronic health records at the pediatric ophthalmic settings in Miami.(21) Patient demographics such as sex, age etc are potential influencers of the patient satisfaction,(10) and in our study we adjusted for the demographics that had a considerable association with the PS scores.

Ease of registration at the health care facilities and higher overall satisfaction has been reported by the patients in paperless systems over the paper based registrations.(22) In our study, we found a paradoxical results wherein the patients who availed the conventional paper based registration services had a better satisfaction scores than the electronic registration. The differential findings might be due to the methodology and population studied. In the study by Lulehjan et al, registration was self-service by the patients, whereas it was done by the para-medical staff in our settings.(22)

Waiting times influence the patient satisfaction in healthcare settings.(23) Health systems around the world work to solve the long patient waiting times. We found a significantly lower waiting times at various areas of our digitized OPD, a positive effect for implementing the EMRs, and potentially EHRs, in India. This is line with the findings of Chen et al, who reported significant reduction in waiting time after the introduction of EHR in their oculoplastic practice.(24) Also, lower waiting times had a significantly higher satisfaction levels in our study. Mehra et al reported only weak association between the waiting time and patient satisfaction in clinical quality,(7) which might have been due to lower expectations. Multi-centric studies may be planned by including the primary health settings in other parts of India to overcome this. The factors that may be associated with differential patient satisfaction such as gaze time, patient engagement, attitude towards physician competency etc., needs to be evaluated in primary care settings. Moreover, cluster randomized, controlled studies may be planned in the Indian settings to implement and evaluate the effect of patient participation in the EHR settings, especially since the National Digital Health Mission (NDHM) has been implemented.

Conclusion

The patient satisfaction towards the doctor-patient relationship was same between conventional, paper based OPD settings and the digitized medical case files settings in India. The factors that may influence the DPR aspect of patient satisfaction such as gaze time, patient engagement and attitude towards physician competency needs to be evaluated in the EMR based, primary care settings. There is also a necessity to frame and conduct studies assessing the EMR aspects of registration, pharmacy and patient outcome domains of patient satisfaction, in Indian settings.

Recommendation

Digitization of medical case files may not decrease the patient satisfaction in terms of DPR, thus can be introduced in the primary health settings of India. The factors that may be associated with differential patient satisfaction such as gaze time, patient engagement, attitude towards physician competency etc., needs to be evaluated in primary care settings.

Limitation of the study

External validity of our study is limited, as we conducted the study in the urban settings of single province in Indian and could not evaluate the same in EHR settings.

Relevance of the study

With launch of the National Digital Health Mission by the government of India which is creating unique health IDs and EHR for all the patients accessing health care in India, the present study has initiated the discussion around the patient satisfaction around digitization in Indian settings.

Authors Contribution

AGP: Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article, revising it critically for important intellectual content; final approval of the version to be published; **KG:** Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; revising it critically for important intellectual content; final approval of the version to be published; **MG:** Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; revising it critically for important intellectual content; final approval of the version to be published; **AS:** Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; revising it critically for important intellectual content; final approval of the version to be published.

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Tables

TABLE 1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS

Variable	Total N=84 (%)	Sector X n=41 (%)	Sector Y n=43 (%)	p value
Age Median (Q1-Q3)	35 (18-47)	29 (23-42)	41 (32-53)	<0.001
Age groups				
18-30 years	33 (39.3)	24 (58.5)	9 (20.9)	0.001
31-50 years	38 (45.2)	15 (36.6)	23 (53.5)	
51-70 years	11 (13.1)	2 (4.9)	9 (20.9)	
>70 years	2 (2.4)	0 (0.0)	2 (4.7)	
Sex				
Male	36 (42.9)	13 (31.7)	23 (53.5)	0.050
Female	48 (57.1)	28 (68.3)	20 (46.5)	
Marital status				
Married	71 (84.5)	32 (78.0)	39 (90.7)	0.065
Unmarried	12 (14.3)	9 (22.0)	3 (7.0)	
Others*	1 (1.2)	0 (0.0)	1 (2.3)	
Education				
Illiterate	11 (13.1)	10 (24.4)	1 (2.3)	0.002
Just Literate	6 (7.1)	5 (12.2)	1(2.3)	
Primary	9 (10.7)	5 (12.2)	4 (9.3)	
Secondary	16 (19.0)	8 (19.5)	8 (18.6)	
Higher Secondary	23 (27.4)	5 (12.2)	18 (41.9)	
Graduate or above	19 (22.6)	8 (19.5)	11 (25.6)	
Employment status				
Employed	28 (33.3)	10 (24.4)	18 (41.9)	0.240
Homemaker	14 (16.7)	8 (19.5)	6 (13.9)	
Others†				
Visit to the dispensary in last 1 year				0.668
First Time	7 (8.3)	4 (9.8)	3 (7.0)	
2-5 times	48 (57.1)	25 (61.0)	23 (53.5)	
>5 times	29 (34.5)	12 (29.3)	17 (39.5)	

**Widowed; †Unemployed, Retired, School/College Students*

TABLE 2: SATISFACTION SCORES AMONG THE PARTICIPANTS IN OUR STUDY

Domain of Patient Satisfaction	Total Median (IQR)	Sector X Median (IQR)	Sector Y Median (IQR)	p value
Total Score†	79 (10)	74 (11)	81 (6)	<0.001*
General aspects of clinic‡	8 (1)	9 (2)	8 (1)	0.017
Registration area score§	25.5 (8)	21 (7.5)	28 (2)	<0.001
Doctor Patient Relationship‖	23 (2)	24 (1.5)	23 (2)	0.453
Pharmacy¶	19 (3)	18 (2)	19 (2)	0.078

**Adjusted for Education of the participants by multiple linear regression †Range- 30 to 111; ‡Range- 3 to 12; §Range- 10 to 38; ‖Range- 9 to 31; ¶Range- 7 to 26*

TABLE 3 ASSOCIATION BETWEEN THE DEMOGRAPHIC-CLINICAL FACTORS AND OVERALL PATIENT SATISFACTION AND THE DOCTOR PATIENT RELATIONSHIP

Variable	Overall Patient Satisfaction score		Satisfaction in Doctor Patient Relationship	
	Mean rank	P value	Mean rank	P value
Age groups				
18-30 years	39.41	0.829	45.03	0.580
31-50 years	44.47		43.14	
51-70 years	44.32		33.91	
>70 years	46.00		35.75	
Sex				
Male	42.24	0.931	37.24	0.082
Female	42.70		46.45	
Marital status				
Married	40.70	0.233	41.35	0.540
Unmarried	49.67		45.88	
Education				
Illiterate	19.00	0.006	50.73	0.513
Just Literate	38.67		41.17	
Primary	35.28		35.89	
Secondary	46.81		47.63	
Higher Secondary	45.09		36.50	
Graduate or above	53.97		44.24	
Employment status				
Employed	44.30	0.471	38.05	0.299
Homemaker	39.48		46.55	
Others†	47.96		39.25	
Visit to the dispensary in last 1 year				0.532
First Time	42.86	0.968	37.07	
Repeater	42.47		42.99	

*Widowed; †Unemployed, Retired, School/College Students

TABLE 4: ITEM WISE SATISFACTION SCORES AMONG THE PARTICIPANTS IN OUR STUDY

Item wise patient Satisfaction	Sector X Median (IQR)	Sector Y Median (IQR)	p value
General aspects of Clinic			
1. Did you face any difficulty in reaching the required rooms/services within this clinic?	4 (1) 3 (2)	3 (0) 3 (1)	<0.001 0.065
2. Did you find any map /signage which guides you in way finding inside the hospital?	3 (1)	3 (0)	0.083
3. How do you rate the arrangements of parking facilities in the clinic?			
Registration/Waiting area			
4. Did you receive the requisite information at reception / registration counter?	2 (0) 1 (2)	2 (0) 3 (1)	0.087 0.026
5. Queue system	3(0.5)	3 (0)	0.093
6. Courteousness of staff at registration	4 (1)	3 (1)	<0.001
7. Time spent for registration process	3 (2)	3 (0)	0.040
8. Waiting area	1 (2)	3 (0)	<0.001
9. Seating arrangements	1 (0)	4 (1)	<0.001
10. Drinking water facility	1 (2)	4 (1)	<0.001
11. Toilet facilities	1 (0)	1 (0)	0.073
12. TV / Magazines / News paper / Telephone etc	3 (2)	3 (0)	<0.001
13. State of cleanliness			
Doctor Patient Relationship			
14. Opinion about the number of doctors available in OPD	2 (0) 3 (1)	2 (0) 2 (1)	0.872 0.024
15. Waiting time to consult doctor	2 (0)	2 (0)	0.581
16. What is your feeling about waiting time?	3 (1)	3 (0)	0.182
17. Consultation room environment (cleanliness, comfort, lighting, ventilation etc)	3 (1) 2 (1)	3 (1) 2 (0)	<0.001 0.067
18. Consultation time spent with doctor	4 (1)	3 (0)	0.001
19. Satisfaction level with consultation time	3 (1)	3 (0)	0.480
20. Explanation by doctor about your sickness / problem	2 (1)	2 (1)	0.254
21. Did the doctor exhibit a sense of concern and involvement with your complaints / illness?			
22. What was your feeling during examination aspect?			
Pharmacy			
23. What is your opinion about the number of counters?	2 (1) 2 (1)	2 (0) 3 (0)	<0.001 <0.001
24. Waiting area	2 (1)	3 (0)	<0.001
25. Queue system	3 (0)	3 (0)	0.368
26. Courteousness of staff	3 (1)	3 (1)	<0.001
27. Waiting time to get medicines	3 (0)	3 (1)	<0.001
28. What was the availability of prescribed medicines?	3 (1)	3 (0)	<0.001
29. Explanation about taking medicines & dosages			
30. What is your overall feeling about the visit to the clinic?	3 (1)	3 (0)	0.111

Figures

FIGURE 1 PATIENT FLOW IN DISPENSARY, SECTOR X-ELECTRONIC MEDICAL RECORDS (EMR)

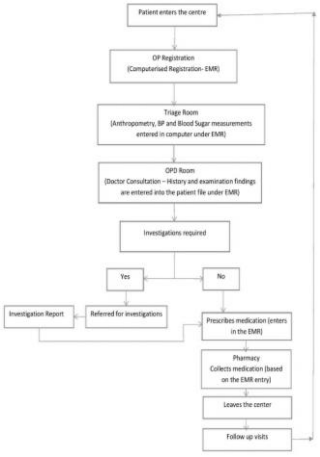

FIGURE 2 PATIENT FLOW IN DISPENSARY, SECTOR Y-PAPER BASED RECORDS