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Evaluation of Electronic Health Records Quality in Outpatient and Inpatient Healthcare Services Using PDQI-9

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ABSTRACT

Despite technological developments in healthcare services, increasing investments, and ongoing research, there are still no standardized definitions for software tools, functions, or datasets related to electronic health records (EHRs). Data entry into EHRs is shaped by the documentation practices, roles, knowledge, and skills of the individuals entering the data. High-quality EHR data are essential for increasing the efficiency of digital healthcare services, facilitating data analysis, and supporting clinical decision-making processes. This study aimed to evaluate admission notes recorded in the EHR system during outpatient and inpatient healthcare services using PDQI-9. The study included EHRs of patients admitted to the general pediatrics outpatient clinic and the pediatric intensive care unit of Adana City Training and Research Hospital between 1 September 2025 and 31 October 2025. Admission notes of patients receiving inpatient and outpatient healthcare services demonstrated moderate to high levels of documentation quality, and no statistically significant difference was found between the total PDQI-9 scores of the two groups. However, differences were identified between inpatient and outpatient admission notes in terms of specific data quality indicators, particularly accuracy, thoroughness, succinctness, and synthesis. No differences were observed in the indicators of being up-to-date, useful, organized, comprehensible, and internally

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consistent, or in the overall impression scores of PDQI-9. EHR data quality is a fundamental component of quality and efficiency in healthcare. Therefore, data quality should be regularly monitored using reliable and objective tools. PDQI-9 is an appropriate, practical, and easy-to-use method for evaluating admission notes of both patients presenting to outpatient clinics and critically ill patients admitted to intensive care units.
Keywords: Electronic Health Records, Health Informatics, Patient Notes, PDQI-9, Quality

INTRODUCTION

EHR is defined as "all kinds of information related to a person's past, present, and future physical and mental health or illnesses, which are recorded, stored, transmitted, accessed, and processed using electronic systems" (Akal, 2021; Evans, 2016). EHR enables patients and physicians to access accurate and up-to-date information, thereby ensuring continuity in treatment and reducing misdiagnosis. Access to patient records independent of time and location allows the provision of fast and effective healthcare services. Rapid access to accurate data helps to provide safe care by reducing medical errors. EHR improves the quality of medical care, and paper use is significantly reduced. The efficiency of healthcare services is increased through less paperwork and fewer repeated tests (Atasoy et al., 2019; O'Donnell et al., 2020; Subaşıoğlu, 2023).

No standards describing EHR software tools, functions, or datasets exist, despite healthcare IT improving, investments growing, and research continuing. The entry of data into EHR, which arises from the outcomes of communication between the patient and healthcare personnel, is shaped according to the application style, role, knowledge, and skills of the person entering the data (Işık et al., 2013). However, the positive effects of EHR are related to the quality of the data it contains. High-quality EHR data are required to increase the efficiency of digital healthcare services, facilitate data analysis, and support clinical decision-making processes (Yang et al., 2024). Poor quality and inappropriate data not only fail to provide benefits but may also lead to incorrect decisions. In critical units providing healthcare services, the cost of data quality problems is high and negatively affects patient safety, resource management, and the reliability of clinical studies. Inaccuracies in data frequently lead to medical mistakes (Wiebe et al., 2019).

The American Health Information Management Association (AHIMA) has established certain standards for data quality. According to the AHIMA data quality model, EHR should be accurate, reliable, complete, up-to-date, accessible, comprehensible, thorough, consistent, and detailed (American Health Information

Management Association, 2019). Reliable data quality assessment tools should be used to determine the strategies and tools that ensure the appropriateness of the data contained in EHR, and to guide and evaluate improvement efforts (Lewis et al., 2023; Ozonze et al., 2023). For the evaluation of EHR data, the physician documentation quality instrument, Physician Documentation Quality Instrument (PDQI-9), is an accepted measurement method. PDQI-9 was developed by Stetson et al. (2008) to evaluate the quality of patient records and was updated in 2012 with 9 indicators. PDQI-9 focuses on the evaluation of three main types of notes: admission, progress, and discharge. Patient records are evaluated using 9 indicators, namely "up-to-date, accurate, thorough, useful, organized, comprehensible, succinct, synthesized, and internally consistent", along with a separate "general impression score". For each indicator, a 5-point Likert scale is used, with the highest value defining the most ideal characteristic (Stetson et al., 2008; Stetson et al., 2012).

In this study, it was aimed to evaluate patient admission notes recorded in the EHR system during outpatient and inpatient healthcare services using PDQI-9.

METHODOLOGY

Evaluation of EHRs in Inpatient Healthcare Services

The inpatient healthcare service evaluation was conducted using the EHRs of patients admitted to the pediatric intensive care unit of Adana City Training and Research Hospital between 1 September 2025 and 31 October 2025. From the patient list generated by the Hospital Information Management System within the specified date range, 50 patient files were selected at regular intervals, with every fifth patient file included in the sample.

Evaluation of EHRs in Outpatient Healthcare Services

The outpatient healthcare service evaluation was conducted using the EHRs of patients who presented to the general pediatrics outpatient clinic of Adana City Training and Research Hospital between 1 September 2025 and 31 October 2025. From the patient list generated by the Hospital Information Management System within the specified date range, 50 patient files were selected at regular intervals, with every fifth patient file included in the sample.

In the Hospital Information Management System, once the relevant date range was selected on the outpatient clinic or intensive care unit screen and the search was performed, the patient list was automatically displayed. The order of the list was not modified. Completely blank files were excluded from the study; however, no further changes were made to the files included in the study.

The files of patients admitted to the intensive care unit were selected and evaluated by a pediatric specialist, while the files of patients presenting to the outpatient clinic were selected and evaluated by a pediatric intensive care specialist. Before the study began, the physician researchers from the outpatient clinic and intensive care unit reviewed the PDQI-9 criteria and scoring system in detail. Each criterion was examined individually, trial evaluations were conducted on patient files not included in the study, and consensus was reached regarding the evaluation process. Thus, evaluator training was completed before data collection.

Approval for the study was obtained from the Scientific Research Ethics Committee of Adana City Training and Research Hospital (Date: 18.12.2025, Meeting No: 20, Decision No: 935). After obtaining ethical committee approval for the study, the files were reviewed retrospectively. In addition to the ethics committee approval, institutional permission for access to and research use of the patient records was obtained from the chief physician's office of Adana City Training and Research Hospital.

Statistical Method

The analysis of the data obtained in the study was conducted using IBM SPSS Statistics v.27 software. Scores related to PDQI-9 indicators were presented with descriptive statistics (frequency, percentage, median, and interquartile range). The Mann–Whitney U test was used to compare the total PDQI-9 scores of admission notes in patients receiving inpatient and outpatient healthcare services, and the Chi-square test of independence (χ^2) was used to compare the PDQI-9 scores related to the indicators. In all analyses, the level of statistical significance was accepted as $p<0.05$.

RESULTS

Admission notes of patients receiving inpatient and outpatient healthcare services showed moderate to high levels of documentation quality, and no statistically significant difference was found between the total PDQI-9 scores ($U=1028.50$, $Z=-1.53$, $p=0.126$). The median total PDQI-9 score was 36 (IQR=12.25) for inpatient healthcare services and 33 (IQR=8) for outpatient healthcare services. When the rank averages were evaluated, it was seen that inpatient healthcare services (mean rank=54.93) tend to score higher than outpatient healthcare services (mean rank=46.07), although this difference did not reach a statistically significant level. This finding indicates that the documentation quality of the two groups is at a similar level in terms of total scores (Table 1).

Table 1: Total PDQI-9 scores of admission notes in inpatient and outpatient healthcare services

Group	n	Median (IQR)	Mean Rank	U	p
Inpatient	50	36(12.25)	54.93	1028.50	0.126
Outpatient	50	33(8)	46.07		
Total	100		—		

In the admission notes of patients receiving inpatient and outpatient healthcare services, differences were detected in terms of the data quality indicators accurate (p=0.036), thorough (p=0.032), succinct (p=0.014), and synthesized (p=0.032). No difference was observed in the indicators up-to-date (p=0.232), useful (p=0.060), organized (p=0.091), comprehensible (p=0.404), and internally consistent (p=0.347), and in the PDQI-9 general impression scores (p=0.162) (Table 2).

Table 2: PDQI-9 results of admission notes of patients

Attribute	Situation	1 Point Number (%)	2 Points Number (%)	3 Points Number (%)	4 Points Number (%)	5 Points Number (%)	p
Up-to-date	Inpatient Outpatient	4 (8%) 0	9 (18%) 11 (22%)	9 (18%) 12 (24%)	14 (28%) 17 (34%)	14 (28%) 10 (20%)	0.232
Accurate	Inpatient Outpatient	0 0	0 0	3 (6%) 3 (6%)	24 (48%) 36 (72%)	23 (46%) 11 (22%)	**0.036**
Thorough	Inpatient Outpatient	0 0	7 (14%) 6 (12%)	14 (28%) 19 (38%)	19 (38%) 24 (48%)	10 (20%) 1 (2%)	**0.032**
Useful	Inpatient Outpatient	0 0	1 (2%) 1 (2%)	12 (24%) 23 (46%)	22 (44%) 20 (40%)	15 (30%) 6 (12%)	0.060
Organized	Inpatient Outpatient	0 0	6 (12%) 2 (4%)	14 (28%) 23 (46%)	19 (38%) 20 (40%)	11 (22%) 5 (10%)	0.091
Comprehensible	Inpatient Outpatient	0 0	1 (2%) 1 (2%)	9 (18%) 8 (16%)	21 (42%) 29 (58%)	19 (38%) 12 (24%)	0.404
Succinct	Inpatient Outpatient	0 0	6 (12%) 6 (12%)	14 (28%) 17 (34%)	12 (24%) 22 (44%)	18 (36%) 5 (10%)	**0.014**
Synthesized	Inpatient Outpatient	0 0	0 0	17 (34%) 20 (40%)	19 (38%) 26 (52%)	14 (28%) 4 (8%)	**0.032**
Internally Consistent	Inpatient Outpatient	0 0	1 (2%) 1 (2%)	1 (2%) 4 (8%)	24 (48%) 28 (52%)	24 (48%) 17 (34%)	0.347
General Assessment	Inpatient Outpatient	0 0	1 (2%) 2 (4%)	16 (32%) 23 (46%)	17 (34%) 18 (36%)	16 (32%) 7 (14%)	0.162

DISCUSSION AND CONCLUSION

Healthcare is a field in which accurate and reliable information is critically important. To ensure effectiveness and efficiency, one must implement a strategically designed information system, a methodical approach to gathering data, and the use of superior-quality information. Administrative data and EHR constitute the backbone of the health system, and clinical notes are the cornerstone of communication. However, no data is perfect, and data quality should be evaluated regularly (O'Donnell et al., 2020; Subaşıoğlu, 2023). PDQI-9 used in our study is an accepted measurement tool developed by Stetson et al. (2008, 2012) to evaluate the quality of patient records. In the emergency department, there are scribes who participate in consultations alongside physicians. No difference was found in terms of PDQI-9 scores between consultation notes written with scribes and non-scribes. It has been reported that it is insufficient in distinguishing between good and poor notes in the emergency department. However, in this study, physician intervention in consultation notes was not investigated. Emergency department conditions were not taken into account; for example, in a patient seen only for suturing, past medical history information may not have been recorded (Walker et al., 2017). Lack of communication between physicians in patients transferred from the intensive care unit to the ward leads to adverse outcomes in patients. On the other hand, it has been shown that evaluating intensive care handover notes with measurement tools and improvement efforts leads to a reduction in medical errors and adverse events. PDQI-9 is a useful tool for the objective evaluation of handover notes which also provides the opportunity to evaluate user performance in the areas of communication skills, practice-based learning and improvement, and system-based practice. It sheds light on the creation of shorter, more understandable, and more efficient notes instead of inflated notes (Lyons et al., 2024). It is suitable for evaluating admission, progress, and discharge notes of hospitalized patients and has the potential to improve documentation (Colussi et al., 2020). As a result of the evaluation of audio scenarios generated from real physician notes with PDQI-9, it has been reported that large language models are a potential way to facilitate patient care by reducing the physician documentation burden (Palm et al., 2025; Patel et al., 2025). As a result of the study, no difference was found between the total PDQI-9 scores of admission notes of patients receiving outpatient and inpatient healthcare services. According to the total PDQI-9 scores and general impression scores, patient admission notes were found to be of moderate and high quality. PDQI-9 is an appropriate, practical, and easy method to evaluate the quality of

admission notes of both children applying to outpatient clinics and critically ill patients admitted to intensive care units. The main limitations of PDQI-9 are the need for evaluator training and the time required for note assessment. However, it was thought that this problem would be resolved in the future with the integration of artificial intelligence-supported systems into EHR.

Although completeness, accuracy, consistency, plausibility, and currency have been reported as the main indicators of EHR data quality, completeness is the most emphasized indicator (Lewis et al., 2023). However, user preferences and workflow, the hospital information management system and management perspective, and differences in the software used affect data quality indicators (Declerck et al., 2024; Penev et al., 2024). In our study, the indicators "accurate, thorough, succinct and synthesized" were found to be of higher quality in the admission notes of patients admitted to the intensive care unit. While the proportion of score 5 was markedly higher in hospitalized patients (46% vs. 22% for accurate; 20% vs. 2% for thorough; 36% vs. 10% for succinct; 28% vs. 8% for synthesized), outpatients were predominantly concentrated at the level of score 4. In outpatient healthcare services, the time allocated to the patient is fixed and limited, and physicians may have to write notes simultaneously while taking the medical history. In this case, the notes may be up-to-date, useful, organized, and comprehensible, but may not be succinct, thorough, and synthesized at the same time. Conversely, in patients admitted to the intensive care unit, more time is allocated for admission notes, and since the patients are critically ill, it may be possible to write notes that are more accurate, thorough, and at the same time succinct, focusing on the disease.

The limitations of the study are that it was conducted in a single center with a limited number of patients and that only admission notes were evaluated. It is possible to improve data quality in EHR and healthcare delivery through multicenter studies with large patient series using different software systems. In this respect, our study has pioneering characteristics.

In conclusion, EHR data quality is a fundamental component of quality and efficiency in healthcare. Data quality should be regularly monitored using reliable and objective tools. PDQI-9 is an appropriate, practical, and easy-to-use method for evaluating admission notes of both patients presenting to outpatient clinics and critically ill patients admitted to intensive care units.

Ethical Approval: Ethical approval for the study was obtained from the Scientific Research Ethics Committee of Adana City Training and Research Hospital (Date: 18.12.2025, Meeting No: 20, Decision No: 935). In addition to the ethics committee approval, institutional permission for access to and research use of the patient records was obtained from the chief physician's office of Adana City Training and Research Hospital.

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