

Evaluating a New Electronic Medical Record System for Emergency Room Performance: Insights from Time Metrics and User Feedback

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Abstract. Implementing Electronic Medical Records (EMRs) is a key advancement in modern healthcare. These systems aim to improve operational efficiency, patient care, and staff satisfaction. However, their implementation often faces challenges that affect workflows, especially in high-pressure environments like emergency rooms (ERs). This paper presents a comprehensive evaluation of an EMR system implemented at Niguarda Hospital's ER, focusing on its impact on documentation efficiency, staff satisfaction, and overall operational performance. We employed a combination of time-based metrics and qualitative staff feedback to capture both the quantitative and human factors influencing the adoption of the system. Our findings indicate significant improvements in documentation times, patient flow, and staff workflow following the adoption of Dedalus' EMR system. However, initial challenges, such as resistance to change and system integration issues, were also observed.

Keywords. Electronic Medical Record (EMR), Workflow efficiency, Time metrics, User satisfaction, Health informatics

1. Introduction

Electronic Medical Records (EMRs) have become essential for modern healthcare delivery. The emergency room (ER) setting presents unique challenges for implementing EMR systems due to the urgent nature of care, high-speed decision-making, and frequent multitasking by staff. The introduction of EMR systems is often accompanied by various challenges, including workflow disruptions, increased documentation times during the initial adoption phase, and resistance to change among healthcare staff [1].

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While there is ample evidence supporting the long-term benefits of EMRs, such as improved clinical outcomes, enhanced data accuracy, and better coordination of care [2,3], the short-term disruptions and barriers to effective implementation cannot be ignored. In emergency settings, where time is critical and patient turnover is high, these disruptions can have significant implications for patient care and staff efficiency. Although the initial implementation may increase the time required for tasks such as documentation and patient processing, these inefficiencies generally decrease as staff become familiar with the system [4].

Dedalus is a global company that creates solutions based on clinical context [5–7] that allow healthcare providers to manage, store, and share patient medical information efficiently and securely. The main aim of this study is to evaluate the impact of the Dedalus EMR system on ER performance at Niguarda Hospital, Milan (Italy) by combining quantitative and qualitative approaches to capture a holistic view of EMR adoption, highlighting both challenges and opportunities.

2. Methods

This study was conducted in the ER of Niguarda Hospital, a high-volume healthcare facility with complex clinical workflows and high patient turnover. To assess the impact of the Dedalus EMR system, we utilized a mixed-method approach that combined quantitative time-based analysis with qualitative feedback from healthcare professionals.

We defined a customer-centric approach to ensure that our evaluation focused on the areas of greatest concern to the end-users.

The study was designed in two phases:

- **Pre-Implementation period:** during the pre-implementation period, we collected baseline data on the time required to complete various administrative tasks such as documentation, discharge summaries, and patient record management. The goal was to establish a baseline for comparison once the new system was in place.
- **Post-Implementation period:** the post-implementation period occurred one month after the Dedalus EMR system was rolled out in the ER. Data collection during this phase mirrored the pre-implementation period, capturing the same metrics to assess changes in task efficiency. Observations were conducted over the same period, ensuring a consistent comparison between the two phases.

We specifically chose the above-mentioned performance indicators based on feedback received during the assessment and presentation phase. The Niguarda staff highlighted these process steps as key challenges in their old system, and thus, we aimed to measure whether the EMR solution would improve these critical areas. A training program was conducted over 20 days, including 5 days of classroom-based training for administrators, clinicians, and nursing staff, followed by 5 days of on-site training in the department with the presence of a Dedalus representative to assist those who could not attend the classroom sessions. The trainees were relatively homogenous in their familiarity with EMR systems, which facilitated a smoother learning process. An additional 10 days of observation and support were provided by a Dedalus observer, who was trained on the solution and worked closely with the delivery team to correct misapplications, clarify procedures, and ensure the effective use of the system's functionalities.

To capture the subjective experiences of ER staff, we designed a questionnaire structured to gather information on various aspects of the new EMR system, including ease of use, workflow efficiency, stress levels, documentation processes, and overall job satisfaction. A Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to quantify staff perceptions of the system.

The questionnaire was distributed to healthcare professionals, including both physicians and nurses, to ensure a representative sample of the ER workforce. Respondents were encouraged to complete the questionnaire during their shifts.

The Niguarda staff has actively participated in defining both quantitative and qualitative measurement items.

For the time metrics, descriptive statistics were used to summarize the duration of key tasks, including time to retrieve patient records, time to process discharge summaries, and time to process orders for order requests. Paired t-tests were employed to compare the pre-and post-implementation periods, assessing whether the introduction of the EMR system led to statistically significant changes in task duration.

For the qualitative questionnaire data, Likert scale responses were analyzed using paired t-tests to assess changes in staff perceptions of the EMR system.

3. Results

The pre-implementation period spanned 88 hours of observation over 11 days in June 2024. The post-implementation was conducted over the same period in August 2024.

The quantitative analysis revealed significant improvements in several key metrics following the implementation of the new EMR system. Table 1 shows the performance indicators, the mean times before and after introducing the EMR, and the *p-value* for each indicator.

Table 1. Quantitative time-based indicators before and after introducing the EMR. INAIL: National Institute for Insurance against Accidents at Work in Italy, LIS: Laboratory Information System, RIS: Radiology Information System.

Indicators	Mean time before (second)	Mean time after (second)	<i>P-Value</i>
Filling in the discharge codes	86.6	11.8	$p < 0.0007$
Time to save the last order or prescription before discharge	192.4	6.4	$p < 0.0162$
Time to send INAIL Certificates	110.4	10.3	$p < 0.0021$
Waiting times for saving order requests – LIS, RIS	12	7	$p < 0.0001$
Waiting times for saving urgent specialist consultation requests	12	7	$p < 0.0001$
Waiting times for viewing reports – LIS, RIS	12	0.5	$p < 0.0001$

The qualitative questionnaire results provided valuable insights into the staff's perceptions of the new EMR. Overall, 42 respondents (32% of the staff) answered the questionnaire. They reported high levels of satisfaction with the system's ease of use, reliability, and ability to reduce errors during data entry. Table 2 describes the qualitative evaluation.

Table 2. Subjective evaluation items, mean Likert scores before and after introducing the EMR, and p-values for each item

Question	mean score before	mean score after	<i>P</i> -value
The software is reliable and doesn't crash during use	2.00	4.14	$p < 0.0001$
The software helps reduce the number of errors during data entry	2.74	3.79	$p < 0.0001$
The software improves patient pathways/flows in the Emergency Room	2.81	3.21	$P < 0.04$
The software's average form completion time is in line with user expectations	2.74	3.52	$P < 0.0014$
The software facilitates the prescription and administration of therapy	3.38	2.17	$p < 0.0001$
The software reduces the time needed to search for patient documentation and information	2.57	3.40	$p < 0.0009$
The software allows immediate and simplified management for signing emergency room reports	2.46	3.40	$p < 0.0009$
The software supports better coordination during shift changes	3.19	3.10	$p < 0.62$
The software facilitates communication between staff and emergency services: care managers, bed managers, diagnostic services (radiology, laboratory, etc.)	2.93	3.48	$p < 0.0077$
The software significantly reduces the use of paper materials	2.69	4.40	$p < 0.0001$
The software makes it easy to generate necessary reports and statistics	2.86	3.47	$p < 0.01$
The software integrates easily with other local IT systems	2.56	3.39	$p < 0.0001$
The software helps reduce stress for medical and nursing staff	2.29	3.17	$p < 0.0002$

4. Discussion

Our findings indicate that the Dedalus EMR system improved task efficiency and staff satisfaction, especially in documentation and patient record management. The reduction in documentation and order request times aligns with studies that highlight EMR systems' potential to enhance clinical efficiency [8]. Qualitative feedback emphasized the importance of user-friendly interfaces and efficient data retrieval in reducing administrative burdens. The results are also consistent with studies showing that initial workflow disruptions during EMR adoption diminish as staff become familiar with the system [4]. Improvements in staff satisfaction and reduced stress levels support previous findings on the importance of involving healthcare professionals in EMR design [9]. Unlike some studies that reported prolonged adaptation periods [1], Niguarda Hospital staff adapted quickly, with improvements within 20 days. This was facilitated by the training, which likely contributed to the relatively quick adoption observed in this study.

We had a response rate of 32% for the questionnaire. Although the responses from the 42 participants provide significant insights into the staff's experience with the new EMR system, the limited sample size may affect the generalizability of the findings. Some challenges were noted in the qualitative feedback.

Several respondents expressed concerns about the initial learning curve associated with the new system, particularly in areas related to therapy management and coordination during shift changes. One common theme that emerged was the desire for additional training to ensure that staff were fully comfortable with all aspects of the system. Despite these challenges, the overall feedback was positive, with many staff members highlighting the system's ability to streamline workflows and reduce the time spent on administrative tasks.

Future studies should aim to increase response rates to better capture the perspectives of the entire ER team.

5. Conclusions

The Dedalus EMR system enhanced ER performance by reducing process times and improving staff satisfaction. Future studies should focus on refining specific functionalities and exploring the long-term impacts of EMR adoption in broader healthcare environments.

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