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ORIGINAL RESEARCH

Agreement Between Emergency Department Admission and Hospital Discharge Diagnoses; A Retrospective Observational Study

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Abstract: **Introduction:** An accurate emergency department (ED) diagnosis is critically important for providing proper treatment during the so-called "Golden Hour." This study aimed to evaluate the agreement between admitting and discharge diagnoses in ED. **Methods:** This retrospective cross-sectional study was conducted over the course of 6 months in the emergency department (ED) of a tertiary care center. The main aim of the study was to evaluate the agreement between admission and hospital discharge diagnoses. The patients were categorized into two groups based on whether the admitting and discharge diagnoses were matched or mismatched. The reasons for diagnostic discrepancies, as well as their impact on patient outcomes, were assessed. **Results:** A total of 6812 cases with mean age of 43.2 ± 17.9 (range: 1–95 years) years were included (59.30% male). The admitting and discharge diagnoses were matched in 5585 (81.99%) cases and mismatched in 1227 (18.01%) cases (7.2% were completely unmatched). The proportion of mismatched diagnoses did not differ significantly between males and females ($p = 0.0977$). Mismatched diagnoses were significantly more common in 0–15 years age group (37.86%), and the lowest proportion was seen in patients aged 15–65 years (9.65%) ($p < 0.001$). The most frequent reason for diagnostic discrepancy was "writing chronic disease as discharge diagnosis (relabeling)," (37.08%). Other contributing factors included radiological tests after hospital admission (20.37%), physical examination findings (18.1%), additional laboratory tests (15.81%), and other causes (8.57%). A change in diagnosis impacted the clinical outcomes of 103 (8.39%) patients. **Conclusion:** Diagnostic agreement between ED and discharge diagnoses was observed in 81.99% of cases, with a 7.2% complete mismatch rate. The most frequent causes were discharge relabeling and delayed investigations. These discrepancies had measurable impacts on management, hospital stay, and mortality.

Keywords: Emergency service, hospital; Diagnosis, differential; Diagnostic errors; Hospital records; Retrospective studies

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1. Introduction

Accurate diagnostic decision-making in the emergency department (ED) is foundational to patient safety, efficient care delivery, and healthcare resource optimization. As the first point of contact for acutely ill patients, the ED is tasked with formulating provisional diagnoses under time constraints, often with incomplete information. Diagnostic accuracy at this stage not only guides initial treatment but also determines appropriate disposition, preventing both unnecessary admissions and premature discharges (1). Thus, an accurate working diagnosis in the ED is critically important for providing proper treatment during the so-called "Golden Hour." Making a precise admitting diagnosis remains a constant challenge, given the complexity of undifferentiated presentations, limited initial investigations, and institutional performance metrics. Notably, one of the key performance indicators (KPIs) in many emergency departments is that patients should not exceed a 4-hour stay in the ED, placing additional time pressure on physicians to reach early decisions, which may affect diagnostic accuracy.

Recent studies have evaluated diagnostic concordance between ED admission and hospital discharge. In Saudi Arabia, Abuguyan et al. reported 89.8% matched diagnoses, 6.7% partial matches, and 3.5% mismatches, mainly clarified by inpatient MRI and endoscopy, with no link to hospital length of stay (2). Bastakoti et al. found a 21.8% mismatch rate in Qatar, associated with higher mortality (OR 3.64), inten-

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sive care unit (ICU) transfer (OR 5.51), and longer hospital stays (3). Avelino-Silva et al. identified a 12.5% discrepancy among older U.S. adults, with particularly high rates in psychiatric and endocrine cases, and associations with mortality and prolonged admission (4). Fatima et al. in Pakistan found 18.6–19.4% mismatches and nearly 48% partial matches, contributing to increased ICU transfers, mortality, and ED readmissions. Contributing factors included older age, multimorbidity, incomplete history, and delayed investigations (5).

Despite the relevance of this issue, few large-scale investigations have examined diagnostic agreement within high-volume tertiary EDs operating under stringent KPI frameworks. Therefore, this study aims to assess the level of concordance between ED admission and hospital discharge diagnoses in a Saudi tertiary hospital and to identify the contributing factors and outcome implications.

2. Methods

2.1. Study design and setting

This retrospective cross-sectional study was conducted over the course of 6 months from January 2020 to June 2021 in the emergency department (ED) of a tertiary care center (Dr. Sulaiman Al-Habib Hospital), Al Khobar, Saudi Arabia. The main aim of the study was to evaluate the agreement between admission and hospital discharge diagnoses. The patients were categorized into two groups based on whether the admitting and discharge diagnoses were matched or mismatched. The reasons for diagnostic discrepancies, as well as their impact on patient outcomes, were also assessed. Dr. Sulaiman Al-Habib Hospital, Khobar Branch, is a HIMSS-7 accredited institution, and access to complete and accurate patient records was facilitated by the Medical Administration.

The study was approved by the Institutional Review Board (IRB) of Dr. Sulaiman Al-Habib Hospital under approval number RC21.10.30. All methods were carried out in accordance with relevant ethical guidelines and regulations. Given the retrospective nature of the study, the requirement for informed consent was waived by the IRB. Patient confidentiality was strictly maintained through anonymization of data, and no identifiable personal information was used at any stage of the analysis.

2.2. Participants

All the patients who attended the ED and underwent clinical and diagnostic evaluations by EM residents and specialist and later hospitalized in different wards were included. Those who were referred to the ED with a definitive diagnosis from another hospital or physicians who had previously seen the patient or referred by out-patient clinic for admission; patients with no clear final diagnosis in ED, for example a patient who was hospitalized for more workups; and patients, who had visited ED before and had a diagnosed condition were excluded from the study.

2.3. Data gathering

Age, gender, duration of hospital stays, differences in physical examination, radiological examination, and laboratory tests, as well as details about admitting and discharge diagnoses, were recorded using the patients' profiles. The admission diagnoses were made by emergency medicine residents and emergency specialists, while the discharge diagnoses were made by the attending consultants in the respective inpatient departments and documented on discharge or death certificates. Data extraction and compilation were carried out by the medical records department under the supervision of the hospital's Medical Administration. The diagnoses were registered on electronic patients' profile based on the ICD-10 classification.

2.4. Statistical analysis

The sample size was calculated using a single population proportion formula, assuming an expected diagnostic concordance rate of 80%, a 95% confidence level, and a 2% margin of error, yielding a minimum required sample of 1,537 patients. To enhance validity and statistical power, all eligible admissions during the study period were included. Quantitative data were presented as mean ± standard deviation, while qualitative /categorical data were presented as number (%). Patients were categorized to cases with or without mismatched diagnosis. The two groups were compared regarding sex and age distribution as well as specialty type. In addition, the frequency of mismatched diagnosis was calculated and the reasons of mismatched diagnosis as well as the impact of mismatched diagnosis on final outcomes of patients were evaluated. The comparisons were done using Chi-square test. P value less than 0.05 was considered as significant and statistical analysis was done using statistical software R version 3.5.1.

3. Results

A total of 6812 cases with mean age of 43.2 ± 17.9 (range: 1–95 years) years were included (59.30% male). The admitting and discharge diagnoses were matched in 5585 (81.99%) cases and mismatched in 1227 (18.01%) cases (7.2% were completely unmatched). Table 1 compares the baseline characteristics of patients with and without matched diagnoses. The proportion of mismatched diagnoses did not differ significantly between males and females (18.66% vs. 17.06%, respectively; $p = 0.0977$). Mismatched diagnoses were significantly more common in the pediatric age group (0–15 years: 37.86%), with the lowest proportion seen in patients aged 15–65 years (9.65%) ($p < 0.001$). Regarding specialty, mismatched cases were most frequent in pediatrics (37.68%) and neurology (28.55%), with the lowest rates observed in obstetrics and gynecology (3.20%) cases ($p < 0.001$).

As shown in table 2, the most frequent reason for diagnostic discrepancy was "writing chronic disease as discharge diagnosis (relabeling)," accounting for 455 (37.08%) cases,

which was most commonly seen in the pediatric age group (52.28%). Other contributing factors included radiological tests after hospital admission (20.37%), physical examination findings (18.1%), additional laboratory tests (15.81%), and other causes (8.57%).

A change in diagnosis impacted the clinical outcomes of 103 (8.39%) patients. Delays in care were noted in 40 (3.26 %) cases, changes in management occurred in 37 (3.02%) cases, and prolonged hospital stays were recorded in 26 (2.12%) cases. Most patients with mismatched diagnoses were eventually discharged (n = 1224; 99.76%), while death was reported in 3 (0.24%) cases (table 2).

4. Discussion

This study aimed to assess the diagnostic concordance between ED admission and final hospital discharge diagnoses in a large tertiary care center. Among 6,812 patients, 81.99% had matched diagnoses, while 18.01% showed discrepancies, of which 7.2% were completely unmatched. The most common causes of mismatch included relabeling with chronic diagnoses at discharge, delayed radiology findings, missed clinical signs in the ED, and late-arriving laboratory results. Mismatches modified management in 3.02% of mismatched cases, delays in care in 3.26%, extended hospital stay in 2.12%, and in-hospital mortality in 0.24%. These findings address our primary objective and highlight that even in well-resourced systems, diagnostic mismatch remains clinically significant.

Our diagnostic concordance rate (81.99%) is comparable to that reported in Saudi Arabia by Abuguyan et al. (89.8%), where only 3.5% of cases had a complete mismatch. In their study, mismatch was frequently due to inpatient imaging (MRI 48.08%, endoscopy 15.39%) and not significantly associated with hospital stay duration (2). However, our overall mismatch rate aligns more closely with the findings of Bastakoti et al., who observed a 21.77% discordance and reported higher mortality (OR: 3.64) and ICU up-triage (OR: 5.51) among mismatched patients (3). Fatima et al. also reported similar mismatch rates (18.6–19.4%) with adverse outcomes including ICU transfers (5.6–8.7%), mortality (8–11%), and readmissions (14.4–16.7%) (5). In contrast, Chiu et al. found lower concordance (71.4%), with diagnostic accuracy influenced by specialty, patient age, and the extent of ED investigations (1).

Other international studies reinforce these patterns. Avelino-Silva et al. found that 21.77% of elderly patients had discordant diagnoses, associated with increased mortality and ICU transfers, similar to our observed impact on care modification and mortality (4). Manohar et al., in a Mumbai-based study, reported a 53.34% full match rate, 38.46% partial match, and 8.1% mismatched cases. Their findings also identified lower accuracy in hematology and vascular medicine, and higher mismatch in non-trauma presentations—closely mirroring our own mismatched neurology rate (28.55%), which was markedly higher than in previous studies. Notably, our lowest mismatch rate was observed in obstetrics and gynecology (3.20%), comparable to ranges in other reports but demonstrating a statistically significant difference in diagnostic consistency across specialties ($p < 0.001$) (6).

Zhang et al. reported a 49.2% mismatch in a Chinese pediatric cohort, especially in nervous and respiratory conditions. These mismatches were associated with longer hospital stays, more frequent antibiotic use, and higher medical costs (7). Schols et al. observed a 16% mismatch rate, associated with increased number of diagnostics (2.4 vs. 2.0; $p = 0.002$) and longer ED stays (5.9 vs. 4.7 hours; $p = 0.008$), reinforcing the operational burden of diagnostic errors (8). Hautz et al. found mismatch in 12.3% of patients, linked to higher mortality (8.6% vs. 3.78%; OR 2.40) and longer hospital stay (10.29 vs. 6.90 days) (9). Eames et al. reported diagnostic discordance in 5.1% of over 6,000 ED patients, with significantly increased ICU admission, LOS, and mortality (10).

Two additional studies underscore broader systemic implications. Hautz et al. identified the diagnosing physician's atypical clinical impression at admission as the strongest predictor of mismatch, with an odds ratio of 3.04 (9). Mihailovic et al. found improvement in diagnostic agreement over time with electronic coding systems; however, mismatches in the earlier cohort (2006–2013) were associated with longer hospital stays (9.1 vs. 7.5 days) and younger age (11).

Our finding of high mismatch in pediatrics contrasts with most previous studies emphasizing elderly vulnerability, suggesting that pediatric relabeling at discharge (e.g., chronic asthma instead of acute wheeze) may obscure accurate tracking of ED diagnoses. Additionally, the frequent labeling of chronic conditions as final diagnoses (especially in patients with multisystem issues) contributed to the appearance of mismatch, despite accurate acute ED evaluation. Our mismatched neurology rate (28.55%) was also notably higher than that observed in prior studies, highlighting potential gaps in documentation, delayed imaging, or diagnostic uncertainty. Conversely, mismatched rates were lowest in obstetrics and gynecology (3.20%), aligning with findings from cohorts with less diagnostic variability and narrower differential ranges.

This study's strengths include its large sample size, detailed breakdown by specialty and age group, and explicit linkage of diagnostic mismatch to downstream effects on care. The use of a HIMSS-7 certified Electronic Medical Record (EMR) allowed robust traceability of diagnostic reasoning and investigation timing. The stratified mismatch analysis (e.g., relabeling, radiology, signs, labs) adds novel insight into practical contributors to diagnostic discrepancy.

5. Limitations

This is a retrospective single-center study. Inter-observer variability between ED and inpatient teams was not evaluated, and physician-level data were not captured. Diagnostic accuracy was assessed based on final discharge codes rather than on prospective diagnostic reasoning, which may mis-

classify clinical nuance. Additionally, we did not evaluate post-discharge outcomes or use standardized severity scores to risk-adjust for clinical complexity. The COVID-19 pandemic may have influenced diagnostic practices and documentation patterns.

Future research should focus on prospective tracking of diagnostic transitions, incorporating real-time feedback from inpatient services and exploring the role of structured discharge templates. Identifying interventions that reduce avoidable relabeling, support early imaging in high-risk complaints, and integrate ED-inpatient diagnostic communication could meaningfully reduce mismatch rates and improve patient safety.

6. Conclusions

Diagnostic agreement between ED and discharge diagnoses was observed in 81.99% of cases, with a 7.2% complete mismatch rate. The most frequent causes were discharge relabeling and delayed investigations. These discrepancies had measurable impacts on management, hospital stay, and mortality.

7. Declarations

7.1. Acknowledgments

The authors would like to express their gratitude to Dr. Sulaiman AlHabib Hospital for their contributions to this research.

7.2. Ethical approval

Ethical approval (HAP-01-R-082) was obtained from the Dr. Sulaiman AlHabib Hospital Alkhobar Ethical Academic Institutional Review Board Committee for the study. All methods adhered to relevant guidelines and regulations, ensuring participant confidentiality, privacy, and rights.

7.3. Data Availability Statement

The data used in this cohort study are available upon reasonable request. Due to privacy and ethical considerations, access to the raw data and individual-level participant information cannot be provided publicly. However, researchers interested in accessing the data can contact the corresponding author or the responsible ethics committee for further information and to initiate the data sharing process. The availability of data is subject to approval from the relevant authorities and compliance with applicable data protection regulations.

7.4. Competing interests

The authors declare that they have no competing interests regarding the research presented in this publication.

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7.6. Authors' contributions

All authors made significant contributions to this research publication by contributing to the conceptualization and design of the study, data collection, analysis, interpretation of results, and writing of the manuscript. All authors participated in data collection, analysis, interpretation of results, manuscript preparation, provided expertise in statistical analysis, interpretation of results, and critical revision of the manuscript. All authors have read and approved the final version of the manuscript.

7.7. Using artificial intelligence chatbots

AI chatbots were used for language and formatting assistance only.

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Table 1: Comparing the baseline characteristics between cases with and without matched diagnosis

Variable	Number	Matched diagnosis		P value
		Yes (n= 5585)	No (n = 1227)	
Sex				
Male	4040	3286 (81.34)	754 (18.66)	0.09774
Female	2772	2299 (82.94)	473 (17.06)	
Age Group (year)				
0 - 15	1981	1231 (62.14)	750 (37.86)	< 0.001
15 – 65	3358	3034 (90.35)	324 (9.65)	
Above 65	1473	1320 (89.61)	153 (10.39)	
Specialty				
Internal medicine	1341	1223 (91.20)	118 (8.80)	< 0.001
Cardiology	473	414 (87.53)	59 (12.47)	
Orthopedics	166	138 (83.13)	28 (16.87)	
Pediatrics	1802	1123 (62.32)	679 (37.68)	
Surgery	926	834 (90.06)	92 (9.94)	
Neurology	564	403 (71.45)	161 (28.55)	
Obstetrics & Gynecology	1498	1450 (96.80)	48 (3.20)	

Data are presented as number (%).

Table 2: The reasons of change in diagnosis and outcomes of cases with mismatched admitting and discharge diagnoses (n=1227)

Reason	Number (%)
Physical examination after hospital admission	223 (18.1)
Additional laboratory test after hospital admission	194 (15.81)
Radiological tests after hospital admission	250 (20.37)
Writing chronic disease as discharge diagnosis	455 (37.08)
Others	105 (8.57)
Outcomes	
Change in patient management	37 (3.02)
Delay in patient care	40 (3.26)
Prolonged hospital stay	26 (2.12)
Disposition	
Discharged	1224 (99.7)
Died	3 (0.24)