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Assessing Urgent Referral Trends From Primary Health Care Centres to Emergency Departments in the United Arab Emirates: A Retrospective Cohort Study

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Abstract

Background

Efficient referral pathways between primary health care centres (PHCs) and emergency departments (EDs) are important for appropriate healthcare utilization and resource allocation. Limited evidence exists regarding urgent referral patterns and outcomes within the Emirates Health Services (EHS) system in the United Arab Emirates (UAE).

Objectives

The primary objective was to characterize urgent referrals from primary health care (PHC) centres to emergency departments (EDs) within the Emirates Health Services network and evaluate diagnostic concordance, referral-to-ED arrival time, ED disposition, and 72-hour ED returns. The secondary objective was to identify factors associated with referral-to-ED arrival time, discharge against medical advice (DAMA), and 72-hour ED returns.

Methods

We conducted a retrospective cohort study of adult urgent PHC-to-ED referral encounters across 63 EHS primary health care centres from January 1, 2024, to December 8, 2025. Data was extracted from the Wareed electronic medical record system and analyzed using descriptive and multivariable statistical methods.

Results

A total of 475 urgent referral encounters were analyzed. Patients aged ≥51 years constituted the largest age group (n=235, 49.5%), 255 (53.7%) were male, and 384 (80.8%) belonged to the Middle Eastern nationality group. Cardiovascular conditions accounted for the largest proportion of provisional PHC diagnoses (n=120, 25.3%), followed by respiratory (n=70, 14.7%) and neurological disorders (n=58, 12.2%). Diagnostic agreement between PHC provisional and ED final diagnoses was moderate (κ=0.453, 95% CI: 0.400-0.506; p<0.001), with an overall concordance of 258 (54.4%). Most referral encounters resulted in discharge from the ED with medical approval (n=380, 80.0%), and 31 (6.5%) returned to the ED within 72 hours. The median referral-to-ED arrival time was 82.5 minutes (IQR: 55.8-119.1). Male sex was associated with higher odds of 72-hour ED return than female sex (aOR=2.79; 95% CI: 1.20-6.46; p=0.017), and discharge against medical advice (DAMA) was also associated with higher odds of return (aOR=2.30; 95% CI: 1.00-5.27; p=0.049).

Conclusions

Moderate diagnostic concordance between PHC provisional and ED final diagnoses suggests potential opportunities for quality-improvement initiatives focusing on diagnostic assessment, referral documentation, and care coordination. Further prospective research is needed to determine whether targeted interventions improve referral processes, resource utilization, and patient outcomes.

Categories: Family/General Practice, Emergency Medicine, Quality Improvement
Keywords: diagnostic concordance, emergency department, health services research, primary health care, united arab emirates

Introduction

Emergency departments (EDs) across the world face rising demand and overcrowding, which negatively impacts patient outcomes, satisfaction, and healthcare worker performance [1]. Studies have shown that

approximately 20-40% of ED visits are non-urgent [2]. Similarly, an analysis of over one million ED visits in Italy found a growing influx of low-priority patients, which may compromise care of urgent, time-sensitive patients [3]. Contributing factors include the lack of a universally accepted definition of overcrowding and the unpredictable nature of patient influx, which complicate resource planning and quality improvement efforts [4]. Among the drivers of avoidable ED utilization is the lack of efficient referral systems, particularly between primary healthcare (PHC) settings and emergency services. In integrated health systems, primary care should act as the first contact and manage routine cases, referring only urgent conditions to hospitals. Well-coordinated referral pathways are essential to ensure that truly emergent cases reach the ED quickly, while lower-acuity cases are treated in the community or outpatient settings [5,6].

A well-functioning referral system ensures that patients receive timely care at the appropriate level while reducing unnecessary ED visits. Streamlining referrals improves care coordination, aligns clinical urgency with service delivery, and enhances resource utilization [7]. The World Health Organization emphasizes the importance of high-value referrals, particularly in the context of resilient health systems that can respond efficiently to patient needs [7]. Urgent referral refers to directing a patient during the same encounter to emergency care for timely management. Appropriate urgent referrals improve patient outcomes by speeding up critical interventions and preventing deterioration. Conversely, failing to refer (under-referral) can lead to missed emergencies, while referring too many non-urgent cases (over-referral) exacerbates ED overcrowding [6]. Overcrowded EDs suffer longer wait times and lower quality; one study noted that a higher proportion of non-urgent patients leads to significantly longer ED length-of-stay and delayed discharges. Thus, efficient urgent referral pathways can both alleviate ED congestion and improve system efficiency. They help ensure that ED resources focus on true emergencies, optimizing health system performance and patient safety [3].

Coordination between urgent care centres (UCCs) embedded within PHC and EDs plays a critical role in addressing avoidable referrals. Several studies highlight inefficiencies in current referral practices. A retrospective study by Poyorena et al. revealed that 55% of patients referred from UCCs to EDs did not require ED-specific resources, and 64% received discordant diagnoses, indicating a mismatch between referral decisions and actual ED needs [8]. Similarly, Virji et al. found that many self-initiated visits for cervical trauma lacked clinical indicators for ED-level care, suggesting opportunities for improved triage and patient education at the primary care level [9]. Despite global efforts to enhance referral quality, there remains a lack of UAE-specific data evaluating PHC-to-ED referral patterns. Within the Emirates Health Services (EHS) network, optimizing referral pathways between primary health care centers and emergency departments is important for improving care coordination, resource utilization, and patient-centred care. However, the absence of standardized referral protocols across PHCs in the UAE may contribute to fragmented care, inconsistent decision-making, and delays in appropriate treatment.

To address this gap, the primary objective of the current study was to characterize urgent referrals from PHCs to EDs and evaluate referral patterns, diagnostic concordance, referral-to-ED arrival time, ED disposition, and 72-hour ED returns. The secondary objective was to assess factors associated with 72-hour ED return, discharge against medical advice (DAMA), and referral-to-ED arrival time using multivariable analyses. These findings may inform data-driven recommendations to optimize referral pathways, improve healthcare system performance, and support EHS's broader goals for clinical excellence.

Materials And Methods

Study design and population

This retrospective cohort study analyzed data collected from January 1, 2024, to December 8, 2025, across all 63 primary health care centres (PHCs) operating under the Emirates Health Services (EHS) network in the United Arab Emirates. The study population comprised adult referral encounters involving patients aged ⩾18 years who were referred from PHCs to emergency departments (EDs) following visits registered under the "Urgent Care" service category in the Wareed electronic medical record (EMR) system.

An urgent care encounter was operationally defined as a patient visit initially registered at PHC reception under this designated service category. An eligible urgent PHC-to-ED referral was defined as an encounter in which the patient was subsequently referred to an EHS ED and attended the ED on the same calendar day as the PHC referral. Registration under the "urgent care" service category was a mandatory inclusion criterion and reflected the PHC service classification rather than an independently assessed clinical acuity score. Patients younger than 18 years, cancelled or deleted referrals, and referrals without corresponding same-day ED attendance were excluded.

The unit of analysis was the referral encounter rather than the individual patient; therefore, a patient could contribute multiple eligible encounters during the study period. Although medical record numbers were used to identify ED return visits within 72 hours, unique patients were not systematically identified across the complete referral dataset, and the total number of distinct patients could not be determined.

Referral and outcome measures

Referral and outcome measures were assessed using predefined operational definitions. Referral-to-ED arrival time was defined as the interval between issuance of the PHC referral and arrival at the ED. ED disposition was categorized according to the outcome documented in the EMR, including discharge against medical advice (DAMA).

A 72-hour ED return was defined as any unscheduled visit to an EHS ED within 72 hours following discharge from the index ED encounter, including discharge against medical advice. Returns to any EHS ED, including a different ED from the index encounter, were identified using the patient's medical record number (MRN) in Wareed.

PHC provisional diagnoses and ED final diagnoses were grouped by two investigators into seven organ-system categories: cardiovascular, respiratory, gastrointestinal, neurological, trauma/injury, renal, and infectious/systemic. Disagreements in diagnostic categorization were resolved by consensus. Nonspecific, undocumented, or unclassifiable diagnoses were assigned to an additional "uncategorized" category. Encounters with missing PHC provisional diagnoses were also classified as uncategorized. Uncategorized diagnoses were retained in the diagnostic concordance analysis.

Data collection

Data were extracted from the Wareed EMR system using SAP BusinessObjects BI Launchpad. The final dataset was obtained from updated extraction files provided following refinement of the PHC-to-ED referral reporting process. Extraction criteria included encounters registered under the PHC "Urgent Care" service category, referrals to an EHS ED between January 1, 2024, and December 8, 2025, and patient age ⩾18 years. Cancelled or deleted referrals and referrals without documented same-day ED attendance were excluded. Extracted variables included patient demographics (age, sex, and nationality), referral details (referring PHC and referral date and time), clinical information (PHC provisional diagnosis, ED final diagnosis, and reason for referral), and ED outcomes, including arrival time, disposition, and 72-hour return status. All data were anonymized before analysis to maintain patient confidentiality and comply with institutional data protection standards.

Statistical analysis

Descriptive statistics were used to summarize study variables. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using appropriate measures of central tendency and dispersion according to their distributions. Diagnostic agreement between PHC provisional and ED final diagnostic categories was assessed using Cohen's kappa (κ) with 95% confidence intervals.

Because referral-to-ED arrival time was not normally distributed, Mann-Whitney U tests were used for comparisons between two groups, and Kruskal-Wallis tests were used for comparisons among three or more groups. Pearson's chi-square tests were used to assess associations between categorical variables. Multivariable logistic regression was used to identify factors associated with 72-hour ED return and DAMA. For the DAMA analysis, ED disposition was dichotomized as DAMA versus no DAMA. Results were reported as adjusted odds ratios (aORs) with 95% confidence intervals. Given the relatively small number of 72-hour ED return events (n=31), the corresponding logistic regression model was restricted to four clinically relevant predictors: age, sex, referral-to-ED arrival time, and DAMA. The multivariable logistic regression model for DAMA included age, sex, referral-to-ED arrival time, PHC diagnostic category, and ED diagnostic category. Model fit was assessed using the omnibus likelihood-ratio test and Hosmer-Lemeshow goodness-of-fit test.

Multivariable linear regression was used to identify factors associated with referral-to-ED arrival time. Because arrival time was right-skewed, it was log-transformed before regression analysis. Age, sex, nationality, PHC diagnostic category, and ED diagnostic category were entered simultaneously into the model. Female sex, age ⩽50 years, Middle Eastern nationality, cardiovascular PHC diagnosis, and cardiovascular ED diagnosis served as reference categories. Multicollinearity was assessed using tolerance and variance inflation factor values, and model residuals were evaluated using residual diagnostic plots. All multivariable models used the forced-entry method, with predictors entered simultaneously based on clinical relevance rather than selected according to their univariable statistical significance. Categorical predictors were represented using indicator (dummy) coding, with the reference categories specified in the analyses. Apart from missing PHC diagnoses, which were assigned to the uncategorized group, no other study variables had missing values. All 475 eligible encounters were included in the descriptive analyses and the multivariable models for referral-to-ED arrival time and DAMA. The 72-hour ED return regression included 453 encounters with ED disposition classified as discharge with medical approval or DAMA; 22 encounters with other dispositions were excluded from this model.

All analyses were conducted at the referral-encounter level. Because unique patients were not systematically identified across the full dataset, potential within-patient correlation arising from repeated encounters could not be accounted for in the statistical analyses. Statistical significance was defined as a two-sided p-value <0.05. All analyses were performed using IBM SPSS Statistics version 28 (IBM Corp., Armonk, NY,

USA).

Ethical considerations

Ethical approval was obtained from the Ministry of Health and Prevention (MOHAP) Ethics Committee (Approval number: MOHAP/DXB-REC/A.A.A/No. 64/2025). All data were anonymized to ensure patient confidentiality. As the study involved retrospective data with no direct patient contact, informed consent was not required.

Results

A total of 475 urgent PHC-to-ED referral encounters were included in the analysis. Approximately half of the referral encounters involved patients aged ⩾51 years (n=235, 49.5%), followed by those aged 36-50 years (n=139, 29.3%) and 18-35 years (n=101, 21.3%). Male patients accounted for 53.7% of referral encounters (n=255), and 80.8% involved patients from the Middle Eastern nationality group (n=384). Regarding regional distribution, the largest proportion of referral encounters originated from Fujairah (n=224, 47.2%), followed by Ras Al Khaimah (n=148, 31.2%) and Sharjah (n=94, 19.8%) (Table *1*).

Variable	Category	n (%)
Age Group	18-35 years	101 (21.3)
	36-50 years	139 (29.3)
	≥51 years	235 (49.5)
Sex	Male	255 (53.7)
	Female	220 (46.3)
Nationality Group	Asia	76 (16.0)
	Middle East	384 (80.8)
	Africa	15 (3.2)
Region	Sharjah	94 (19.8)
	Fujairah	224 (47.2)
	Ras Al Khaimah	148 (31.2)
	Umm Al Quwain	6 (1.3)
	Ajman	3 (0.6)

TABLE 1: Characteristics of Urgent Primary Health Care-to-Emergency Department Referral Encounters (N=475).

Referrals occurred almost equally across 2024 and 2025. January was the most common referral month (13.0%), Tuesday was the most common referral day (20.8%), and the median referral-to-ED arrival time was 82.5 minutes (IQR, 55.8-119.1).

The most common provisional PHC diagnoses were cardiovascular conditions (25.3%, n=120), respiratory diseases (14.7%, n=70), neurological disorders (12.2%, n=58), and gastrointestinal disorders (11.6%, n=55). The most common final ED diagnoses were cardiovascular conditions (27.4%, n=130), respiratory diseases (14.9%, n=71), gastrointestinal disorders (13.7%, n=65), and neurological disorders (9.1%, n=43). Overall diagnostic concordance between provisional PHC and final ED diagnoses was 54.4%, with moderate agreement (κ=0.453; 95% CI, 0.400-0.506; p<0.001) (Table *2*).

Diagnosis	Provisional PHC Diagnosis n (%)	Final ED Diagnosis n (%)
Cardiovascular	120 (25.3)	130 (27.4)
Respiratory	70 (14.7)	71 (14.9)
Gastrointestinal	55 (11.6)	65 (13.7)
Neurological	58 (12.2)	43 (9.1)
Trauma/injury	48 (10.1)	46 (9.7)
Renal	10 (2.1)	10 (2.1)
Infectious/Systemic	34 (7.2)	48 (10.1)
Uncategorized	80 (16.8)	62 (13.1)

TABLE 2: Distribution of Provisional Primary Health Care Diagnoses and Final Emergency Department Diagnoses Among Urgent Referral Encounters (N = 475).

Values are presented as n (%). The unit of analysis was the referral encounter; individual patients could contribute more than one eligible encounter. Overall diagnostic concordance was 54.4% (Cohen's κ= 0.453, 95% CI, 0.400–0.506; p< 0.001).

Most referral encounters resulted in discharge from the ED with medical approval (80.0%, n=380), while 15.4% (n=73) resulted in discharge against medical advice. Other ED dispositions accounted for 4.6% (n=22). Overall, 31 referral encounters (6.5%) were followed by an ED return within 72 hours (Table 3).

Variable	Category	n (%)
ED disposition	Discharged with approval	380 (80.0)
	Discharged against medical advice	73 (15.4)
	Other dispositions	22 (4.6)
Details of other dispositions	Deceased	7 (1.4%)
	Discharged—beyond scope of service	2 (0.4%)
	Transferred to an acute-care hospital	3 (0.6%)
	Left without being seen by a physician	5 (1.0%)
	Refused payment	3 (0.6%)
	Admitted as inpatient	2 (0.4%)
Return within 72 hours	No	444 (93.5)
	Yes	31 (6.5)

TABLE 3: Emergency Department Disposition and 72-Hour Return Visits Following Urgent PHC-to-ED Referral Encounters (N=475)

ED, emergency department; PHC, primary health care. Values are presented as n (%).

Referral-to-ED arrival time was not normally distributed, with an overall median of 82.5 minutes (IQR, 55.8-119.1). Arrival time did not differ significantly according to 72-hour ED return status (Mann-Whitney U=6776.0, p=0.886) or age group (Kruskal-Wallis H=2.260, p=0.323). However, significant differences were observed by sex (U=22989.0, p=0.001), nationality (H=9.934, p=0.007), PHC diagnostic category (H=44.866, p<0.001), and ED diagnostic category (H=32.558, p<0.001). Females had higher mean ranks than males, while infectious/systemic, respiratory, and gastrointestinal PHC diagnoses were associated with higher mean ranks. Trauma/injury ED diagnoses demonstrated comparatively lower mean ranks (Table 4).

Variable	Category	n	Referral-to-ED arrival time, mean ± SD (min)	Test statistic	p-value
Return to ED within 72 hours	No	444	92.73 ± 82.03	Mann–Whitney U = 6776.000, Z = −0.143	0.886
	Yes	31	90.46 ± 53.76		
Gender	Male	255	86.86 ± 96.56	Mann–Whitney U = 22989.000, Z = −3.393	0.001
	Female	220	99.22 ± 55.77		
Age group	18–35 years	101	94.71 ± 74.49	Kruskal–Wallis H = 2.260, df = 2	0.323
	36–50 years	139	94.29 ± 121.31		
	≥51 years	235	90.66 ± 45.29		
Nationality	Asia	76	78.56 ± 67.42	Kruskal–Wallis H = 9.934, df = 2	0.007
	Middle East	384	95.53 ± 83.30		
	Africa	15	88.13 ± 59.88		
PHC diagnosis	Cardiovascular	120	71.73 ± 39.51	Kruskal–Wallis H = 44.866, df = 7	<0.001
	Respiratory	70	105.94 ± 53.73		
	GI	55	123.99 ± 178.19		
	Neuro	58	84.39 ± 40.10		
	Trauma/injury	48	66.98 ± 41.67		
	Uncategorized	80	100.79 ± 62.26		
	Renal	10	79.33 ± 41.71		
	Infectious/systemic	34	122.56 ± 92.23		
ED diagnosis	Cardiovascular	130	80.66 ± 43.90	Kruskal–Wallis H = 32.558, df = 7	<0.001
	Respiratory	71	99.87 ± 57.77		
	GI	65	111.78 ± 166.60		
	Neuro	43	82.84 ± 43.46		
	Trauma/injury	46	62.37 ± 38.11		
	Uncategorized	62	98.43 ± 63.06		
	Renal	10	90.26 ± 49.01		
	Infectious/systemic	48	118.73 ± 76.17		

TABLE 4: Comparison of Referral-to-Emergency Department Arrival Time According to Patient Characteristics and Diagnostic Categories

GI: gastrointestinal; PHC: primary healthcare centre; SD: standard deviation. Referral-to-ED arrival time is presented as mean ± SD in minutes. Mann–Whitney U tests were used for comparisons between two groups and Kruskal–Wallis tests for comparisons among three or more groups. Higher mean ranks indicate longer Referral-to-Emergency department arrival time.

Among the 475 referral encounters included, 31 (6.5%) were followed by an ED return within 72 hours, while 444 encounters (93.5%) were not followed by a 72-hour ED return. There was no significant association between age group and return to the ED within 72 hours (p=0.739), although a slightly higher proportion of return visits was observed among patients aged ⩾51 years (7.2%) compared to younger groups. A significant association was observed with sex (p=0.018), with males showing a higher proportion of return visits compared to females (9.0% vs. 3.6%). Nationality was not significantly associated with return visits. Similarly, no significant association was found between PHC diagnosis and return to the ED (p=0.758). The association between ED disposition and 72-hour return approached statistical significance (p=0.052), with a higher return proportion following DAMA than following discharge with medical approval (12.3% vs. 5.8%). There was no statistically significant association between ED diagnosis and return to the ED within 72 hours

(p=0.258). However, higher return rates were observed among patients with infectious/systemic (12.5%) and neurological conditions (11.6%) compared to other diagnostic categories (Table 5).

Variable	Group	Yes, n (%)	No, n (%)	χ^2	p-value
Age	18-35 years	5 (5.0)	96 (95.0)	0.605	0.739
	36-50 years	9 (6.5)	130 (93.5)		
	≥51 years	17 (7.2)	218 (92.8)		
Sex	Male	23 (9.0)	232 (91.0)	5.610	0.018
	Female	8 (3.6)	212 (96.4)		
Nationality	Asia	4 (5.3)	72 (94.7)	0.237	0.888
	Middle East	26 (6.8)	358 (93.2)		
	Africa	1 (6.7)	14 (93.3)		
PHC diagnosis	Cardiovascular	5 (4.2)	115 (95.8)	4.183	0.758
	Respiratory	4 (5.7)	66 (94.3)		
	Gastrointestinal	2 (3.6)	53 (96.4)		
	Neurological	6 (10.3)	52 (89.7)		
	Trauma/injury	4 (8.3)	44 (91.7)		
	Uncategorized	6 (7.5)	74 (92.5)		
	Renal	1 (10.0)	9 (90.0)		
	Infectious/systemic	3 (8.8)	31 (91.2)		
ED outcome	Discharged with approval	22 (5.8)	358 (94.2)	5.903	0.052
	Other dispositions	0 (0.0)	22 (100.0)		
	Discharged against medical advice	9 (12.3)	64 (87.7)		
ED diagnosis	Cardiovascular	6 (4.6)	124 (95.4)	8.922	0.258
	Respiratory	1 (1.4)	70 (98.6)		
	Gastrointestinal	4 (6.2)	61 (93.8)		
	Neurological	5 (11.6)	38 (88.4)		
	Trauma/injury	3 (6.5)	43 (93.5)		
	Uncategorized	5 (8.1)	57 (91.9)		
	Renal	1 (10.0)	9 (90.0)		
	Infectious/systemic	6 (12.5)	42 (87.5)		

TABLE 5: Factors Associated with Return to the Emergency Department Within 72 Hours (N = 475)

Values are presented as n (%). Percentages were calculated within each category. p-values were obtained using Pearson's chi-square test. The χ^2 statistic represents the overall comparison for each variable. The unit of analysis was the referral encounter; individual patients could contribute more than one eligible encounter.

A parsimonious multivariable logistic regression analysis was performed to identify independent predictors of return to the ED within 72 hours. Owing to the limited number of outcome events, only clinically relevant variables were included in the final model to reduce the risk of overfitting. The model was statistically significant (Omnibus likelihood ratio $\chi^2(4)=11.17$, p=0.025) and demonstrated adequate calibration based on the Hosmer-Lemeshow goodness-of-fit test ($\chi^2(7)=7.76$, p=0.355). Male sex was associated with higher odds of 72-hour ED return compared with female sex (aOR=2.79; 95% CI, 1.20-6.46; p=0.017). DAMA was also

associated with higher odds of 72-hour return compared with discharge with medical approval (aOR=2.30; 95% CI, 1.00-5.27; p=0.049). Age ⩾51 years (adjusted OR=1.44, 95% CI: 0.68-3.04; p=0.338) and a referral-to-ED arrival time exceeding 120 minutes (adjusted OR=1.44, 95% CI: 0.63-3.28; p=0.386) were not independently associated with 72-hour ED return (Table 6).

Variable	Category	Adjusted OR (95% CI)	p-value
Age	≤50 years (Reference)	1.00	-
	≥51 years	1.44 (0.68–3.04)	0.338
Referral-to-ED arrival time	≤120 min (Reference)	1.00	-
	>120 min	1.44 (0.63–3.28)	0.386
Sex	Female (Reference)	1.00	-
	Male	2.79 (1.20–6.46)	0.017
ED outcome	Discharged with approval (Reference)	1.00	-
	Discharged against medical advice	2.30 (1.00–5.27)	0.049

TABLE 6: Multivariable Logistic Regression Analysis of Predictors of Return to the Emergency Department Within 72 Hours (N=453)

The analysis included 453 referral encounters with ED disposition classified as either discharge with medical approval or discharge against medical advice; 22 encounters with other dispositions were excluded from this model.

Female sex, age ≤50 years, Referral-to-ED arrival time ≤120 minutes, and discharge with medical approval served as the reference categories. Model fit was assessed using the Omnibus likelihood ratio test and the Hosmer–Lemeshow goodness-of-fit test.

A multivariable linear regression analysis was performed using log-transformed referral-to-ED arrival time as the dependent variable. The overall model was statistically significant (F=3.106, p<0.001) and explained 10.9% of the variance (R^2=0.109; adjusted R^2=0.074). Male sex was associated with shorter log-transformed referral-to-ED arrival time (B=−0.207, p=0.006). Compared with cardiovascular PHC diagnoses, respiratory (B=0.343, p=0.013), gastrointestinal (B=0.444, p=0.003), neurological (B=0.322, p=0.025), uncategorized (B=0.349, p=0.005), and infectious/systemic diagnoses (B=0.427, p=0.020) were associated with longer log-transformed referral-to-ED arrival time. Among final ED diagnoses, trauma/injury was associated with shorter log-transformed referral-to-ED arrival time compared with cardiovascular diagnoses (B=−0.349, p=0.042). Age group and nationality were not significantly associated with the outcome after adjustment. No evidence of substantial multicollinearity was observed (Table 7).

Variable	B	Standardized β	Test statistic	p-value	95% CI
Age ≥51 years	0.124	0.076	1.597	0.111	-0.029 to 0.276
Male Sex	-0.207	-0.126	-2.751	0.006	-0.355 to -0.059
PHC diagnosis					
Respiratory	0.343	0.149	2.486	0.013	0.072 to 0.615
Gastrointestinal	0.444	0.174	2.936	0.003	0.147 to 0.742
Neurological	0.322	0.129	2.244	0.025	0.040 to 0.603
Trauma/injury	0.130	0.048	0.765	0.445	-0.205 to 0.465
Uncategorized	0.349	0.160	2.797	0.005	0.104 to 0.594
Renal	0.247	0.043	0.892	0.373	-0.297 to 0.791
Infectious/systemic	0.427	0.135	2.335	0.020	0.068 to 0.786
ED diagnosis					
Respiratory	-0.010	-0.004	-0.077	0.939	-0.270 to 0.250
Gastrointestinal	0.039	0.016	0.278	0.781	-0.237 to 0.315
Neurological	-0.083	-0.029	-0.524	0.600	-0.394 to 0.228
Trauma/injury	-0.349	-0.126	-2.042	0.042	-0.685 to -0.013
Uncategorized	0.000	0.000	-0.002	0.998	-0.259 to 0.258
Renal	0.018	0.003	0.066	0.947	-0.516 to 0.552
Infectious/systemic	0.212	0.078	1.317	0.188	-0.104 to 0.528
Nationality					
Asian	-0.050	-0.022	-0.471	0.638	-0.258 to 0.158
African	-0.036	-0.008	-0.172	0.864	-0.453 to 0.380

TABLE 7: Multivariable Linear Regression Analysis of Factors Associated With Referral-to-Emergency Department Arrival Time (N=475).

The dependent variable was log-transformed Referral-to-emergency department arrival time. B represents the unstandardized regression coefficient and β represents the standardized regression coefficient. Reference categories were female sex, age ≤50 years, Middle Eastern nationality, cardiovascular primary health care diagnosis, and cardiovascular emergency department diagnosis. The overall model was statistically significant (F=3.106, p< 0.001), explaining 10.9% of the variance (R^2=0.109; adjusted R^2=0.074).

In univariable analyses, DAMA was not significantly associated with age group (p=0.275), sex (p=0.331), nationality (p=0.607), region (p=0.151), PHC diagnostic category (p=0.664), or ED diagnostic category (p=0.125) (Table *8*).

Variable	Category	No DAMA n (%)	Discharged Against Medical Advice n (%)	χ^2	p-value
Age	18–35 years	81 (80.2)	20 (19.8)	2.579	0.275
	36–50 years	122 (87.8)	17 (12.2)		
	≥51 years	199 (84.7)	36 (15.3)		
Sex	Male	212 (83.1)	43 (16.9)	0.945	0.331
	Female	190 (86.4)	30 (13.6)		
Nationality	Asia	65 (85.5)	11 (14.5)	0.999	0.607
	Middle East	323 (84.1)	61 (15.9)		
	Africa	14 (93.3)	1 (6.7)		
Region	Sharjah	79 (84.0)	15 (16.0)	6.720	0.151
	Fujairah	182 (81.2)	42 (18.8)		
	Ras Al Khaimah	134 (90.5)	14 (9.5)		
	Umm Al Quwain	5 (83.3)	1 (16.7)		
	Ajman	2 (66.7)	1 (33.3)		
PHC diagnosis	Cardiovascular	101 (84.2)	19 (15.8)	4.963	0.664
	Respiratory	62 (88.6)	8 (11.4)		
	Gastrointestinal	48 (87.3)	7 (12.7)		
	Neurological	47 (81.0)	11 (19.0)		
	Trauma/injury	39 (81.2)	9 (18.8)		
	Uncategorized	67 (83.8)	13 (16.2)		
	Renal	7 (70.0)	3 (30.0)		
	Infectious/systemic	31 (91.2)	3 (8.8)		
ED diagnosis	Cardiovascular	114 (87.7)	16 (12.3)	11.331	0.125
	Respiratory	66 (93.0)	5 (7.0)		
	Gastrointestinal	53 (81.5)	12 (18.5)		
	Neurological	31 (72.1)	12 (27.9)		
	Trauma/injury	37 (80.4)	9 (19.6)		
	Uncategorized	52 (83.9)	10 (16.1)		
	Renal	9 (90.0)	1 (10.0)		
	Infectious/systemic	40 (83.3)	8 (16.7)		

TABLE 8: Univariable Association of Patient and Clinical Characteristics With Discharge Against Medical Advice (DAMA) Among 475 Referral Encounters

Values are presented as n (%). Percentages were calculated within each category. Pearson's chi-square test was used for overall comparisons.

In the multivariable logistic regression analysis of DAMA, final ED neurological diagnosis was associated with higher odds of DAMA compared with cardiovascular diagnosis (aOR=3.55; 95% CI, 1.30-9.74; p=0.014). Age, sex, referral-to-ED arrival time, PHC diagnostic category, and other ED diagnostic categories were not significantly associated with DAMA after adjustment (Table *9*).

Variable	Category	Adjusted OR (95% CI)	p-value
Age	Age ≤50 years (reference)	1.00	-
	Age ≥51 years	1.15 (0.67-1.97)	0.606
Referral -To-ED Arrival time	≤120 minutes (reference)	1.00	-
	>120 minutes	1.30 (0.69-2.46)	0.418
Sex	Female (reference)	1.00	-
	Male	1.15 (0.67-1.96)	0.618
PHC diagnosis	Cardiovascular (reference)	1.00	-
	Respiratory	0.73 (0.25-2.10)	0.556
	Gastrointestinal	0.48 (0.16-1.42)	0.184
	Neurological	0.64 (0.24-1.70)	0.373
	Trauma/injury	0.74 (0.24-2.33)	0.610
	Uncategorized	0.78 (0.33-1.88)	0.581
	Renal	2.28 (0.46-11.31)	0.315
	Infectious/systemic	0.30 (0.07-1.31)	0.110
ED diagnosis	Cardiovascular (reference)	1.00	-
	Respiratory	0.64 (0.20-2.02)	0.442
	Gastrointestinal	2.23 (0.86-5.81)	0.100
	Neurological	3.55 (1.30-9.74)	0.014
	Trauma/injury	2.30 (0.72-7.32)	0.159
	Uncategorized	1.68 (0.66-4.25)	0.274
	Renal	0.61 (0.06-5.95)	0.673
	Infectious/systemic	2.25 (0.74-6.83)	0.154

TABLE 9: Multivariable Logistic Regression Analysis of Factors Associated With Discharge Against Medical Advice Following Emergency Department Evaluation (N=475).

Female sex, age ≤50 years, referral-to-ED arrival time ≤120 minutes, cardiovascular primary health care diagnosis, and cardiovascular emergency department diagnosis served as the reference categories. aOR indicates adjusted odds ratio.

Discussion

This retrospective observational study of 475 urgent PHC-to-ED referral encounters across 63 EHS centres identified several important patterns in referral diagnoses, diagnostic concordance, referral-to-ED arrival time, ED disposition, and short-term ED return. Approximately half of the referral encounters involved patients aged ⩾51 years, and 53.7% involved male patients. This finding is consistent with a study conducted in Saudi Arabia, which reported a mean age of 53 years, with males accounting for 54% of the study population [10]. In the present study, cardiovascular and respiratory conditions were the most common diagnoses, followed by neurological issues. Some of our referral findings align with previous studies, whereas others differ. For example, a study from Turkey analyzed 8,746 referrals from PHCs. They reported that chest pain was the most common referral reason (1,429; 16.3%, $p < 0.001$), followed by trauma (1,172; 13.4%, $p< 0.001$) [11]. Compared to this study, the proportion of injury/trauma referrals was substantially lower in the present study. However, a Spanish study of primary care referrals reported trauma (27.0%) and cardiac issues (13.8%) as top reasons for referral, with 85.7% of referrals deemed clinically appropriate [12]. These findings suggest regional or system differences in what triggers an ED referral. For instance, a Japanese PHC-based study found fever and pneumonia to be the top reasons for ED referral [13]. Similarly, a recent systematic review found musculoskeletal injuries to be the most common reason for ED referral from

primary care, with other frequent causes including cardiovascular and other acute conditions [14].

Despite these urgent referral labels, the vast majority of referred patients were managed without admission. Our ED outcome data showed that 80% of referred patients were discharged from the ED without an inpatient admission, whereas 15.4% were discharged against medical advice (DAMA). International data indicate much higher admission yields from PHC referrals. For example, in Japan, Satoi et al. reported a 64.7% admission rate among patients referred from an urban clinic to the ED [13]. Similarly, a UK study of general practitioner referrals to hospitals found that about two-thirds were admitted [15]. The high proportion of ED discharges may reflect differences in referral thresholds, local service organization, access to diagnostic resources, or clinical risk tolerance. However, ED discharge alone cannot establish whether an urgent referral was inappropriate. Similar findings were reported by Anwar et al. [6], who found that the majority of emergency referrals from PHCs were considered inappropriate (59.9%, n=354). However, our findings align with those of Diaz et al., who reported that 90.7% of referred patients were discharged [12]. Our high ED discharge rate may suggest opportunities to optimize referral decision-making; however, discharge alone should not be interpreted as evidence of inappropriate referral.

The median referral-to-ED arrival time was about 82.5 minutes. While there are no standard benchmarks published for PHC referral timeliness, any delay in acute referral could impact patient outcomes. We also examined short-term safety of ED discharge by tracking 72-hour revisit rates. In our cohort, 6.5% of referral encounters were followed by an ED return within 72 hours. This rate is within the range reported in general ED populations, though it can vary widely. Furthermore, males were significantly more likely to return than females. This sex difference echoes other findings. For instance, a study found that male patients had higher odds of return admission (OR 1.44) after a 72-hour ED revisit [16].

Limitations

This study has several limitations that should be considered when interpreting its findings. First, the retrospective design limits the ability to establish causal relationships between referral characteristics and ED outcomes. The study relied on routinely collected electronic medical record data, which may be subject to incomplete documentation. Additionally, the unit of analysis was the referral encounter rather than the individual patient, and unique patients were not systematically identified across the full study period. Consequently, some patients may have contributed more than one eligible referral encounter, and potential within-patient correlation could not be accounted for in the statistical analyses. This may have affected the precision of variance estimates and confidence intervals, although the magnitude of this effect could not be determined from the available data. Another limitation is that the analysis was restricted to referrals documented within the Wareed electronic medical record system under the EHS network. This may have resulted in an underestimation of the true referral burden from primary care to emergency services across the UAE. Furthermore, the study included only patients who attended the ED on the same day as the referral and excluded those who did not present after being referred. Another limitation is that the study did not include several potentially important clinical variables (comorbidities, vital signs, severity scores, diagnostic investigations, or treatment) provided at the PHC level prior to referral. The absence of these factors limits the ability to comprehensively evaluate clinical decision-making. Because the retrospective dataset did not contain a validated measure of referral appropriateness, and ED discharge status could not be reliably used as a surrogate measure, the study could not directly distinguish appropriate from inappropriate urgent referrals.

Additionally, several methodological considerations warrant emphasis. Because individual patients could not be systematically identified, repeated referral encounters may have introduced within-patient correlation that was not accounted for in the statistical analyses, potentially affecting the precision of variance estimates and confidence intervals. The relatively small number of 72-hour ED return events may have limited the stability of multivariable regression estimates and increased the risk of overfitting. Furthermore, grouping PHC and ED diagnoses into broad diagnostic categories may have introduced classification errors and influenced estimates of diagnostic concordance. Finally, regional differences in referral volumes may have resulted in unequal representation across the EHS network, limiting the generalizability of findings across individual regions and PHC centres.

Despite these limitations, this study illustrates valuable real-world evidence on urgent referral practices across the Emirates Health Services network. By identifying referral patterns, diagnostic concordance, referral timeliness, and factors associated with ED outcomes, the findings contribute to a better understanding of current referral practices and highlight opportunities to strengthen referral pathways, optimize resource utilization, and enhance continuity of care within the UAE healthcare system.

Conclusions

This study provides real-world evidence on urgent PHC-to-ED referral encounters within the EHS network in the UAE. Diagnostic concordance between provisional PHC and final ED diagnoses was moderate, while 72-hour ED returns were relatively uncommon. Male sex and DAMA were associated with higher odds of 72-hour ED return, and neurological ED diagnoses were associated with higher odds of DAMA. These findings suggest potential opportunities for quality-improvement initiatives focusing on diagnostic assessment,

referral documentation, clinical decision support, and continuity of care at the PHC-ED interface. However, given the retrospective observational design, these associations should not be interpreted as causal, and further prospective research is needed to evaluate whether targeted interventions improve referral processes and patient outcomes.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

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