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# Frequent Users of a Provincial 112 Emergency Medical Service in Türkiye: A Retrospective Cross-sectional Study

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## Abstract

**Aim:** A small minority disproportionately burdens emergency medical services (EMS), yet frequent users of Türkiye's 112 system remain uncharacterised. We determined the proportion, predictors, and subgroups associated with frequent EMS use.

**Materials and Methods:** This retrospective cross-sectional study analysed all 112 EMS calls from Karaman Province, Türkiye, in 2025. After excluding records lacking a national identification number and records of inter-facility transfers, 26,347 calls from 18,653 patients remained. Frequent users were defined a priori as ≥5 calls/year. Patient-level multivariable logistic regression identified independent predictors; a patient-clustered call-level model separated per-encounter signal from cumulative signal.

**Results:** Of 18,653 patients, 430 (2.3%) were frequent users, generating 3,260 calls (12.4%). The two largest patient-level associations differed: a yellow or red triage code [adjusted odds ratio (AOR): 12.66, 95% confidence interval (CI): 7.30-21.96] carried no per-encounter signal [call-level odds ratio (OR): 0.98], whereas 24-hour recontact (AOR: 12.15, 95% CI: 9.46-15.60) retained the strongest per-encounter association (call-level OR: 4.59). The strongest clinical predictors were primary psychiatric or substance-use diagnoses (AOR: 7.99) and respiratory diagnoses (AOR: 6.53). Psychiatric diagnosis showed no association at the call level (8.1% vs 7.6%), but was present in 26.7% of frequent users versus 8.9% of others at the patient level. Estimates were stable across thresholds. Two subpopulations differed in composition: the younger characterized by psychiatric and social vulnerabilities, and the older by chronic respiratory disease; yet the strength of predictors did not differ by age.

**Conclusion:** Frequent users formed a small group comprising two distinct subpopulations and characterized by identifiable predictors. Coordinated primary care, mental health, and chronic disease pathways warrant evaluation; multi-centre replication is needed before policy change.

**Keywords:** Emergency medical services, health services needs and demand, mental health, primary health care, Türkiye

## Introduction

Demand for emergency medical services (EMS) has risen across health systems over the past two decades, driven by population ageing, chronic disease and constrained primary care access (1,2). This growth is not uniform: in most systems, a small minority accounts for a disproportionate share of contacts which is increasingly read as a signal of unmet need that surfaces only when patients reach the ambulance. Türkiye's 112 EMS system, coordinated under the Ministry of Health, operates in every province through a command centre under physician oversight, yet Turkish evidence comes largely from metropolitan systems such as İzmir (2,3) and Konya (4), with little from smaller Anatolian provinces.

Frequent use is as much a public health observation as an operational one. In a systematic review, Scott et al. (5) found that 0.2-23% of EMS patients met various definitions of frequent use, generating 1.4-40% of activity. Such patients present more often with chronic conditions than with acute trauma, particularly respiratory and psychiatric diagnoses and substance-use disorders (1,6); these point upstream to unmet primary care and mental health needs, while repeated use strains resources (7,8).

No standard definition exists. In a scoping review of 19 studies, Harring et al. (9) found thresholds for frequent callers averaged 42.5 calls/year and those for frequent users 4.7 responses/year; the terms capture different populations, frequent users being the subset whose contacts result in resource deployment (9,10).

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Kjærgaard et al. (11) compared a literature-based threshold (≥43 calls/year) with percentile cut-offs in a Danish dataset, where the top 1% of callers corresponded to roughly five or more calls per year. We adopted ≥5 calls/year a priori, as this fixed count identifies a clinically meaningful group and, unlike a size-dependent percentile, stays comparable across systems.

The evidence originates almost exclusively from Northern and Western Europe (1,7,8,10-13), North America (6,14) and Singapore (15); Türkiye and other middle-income settings are absent. Turkish research has addressed general demand (2) and older-adult utilization (3), but none has profiled frequent users within the 112 system, a gap that matters because the demographic composition, primary care access, social safety net, and urban–rural balance of Turkish provinces differ from the settings that dominate the literature. Using a full calendar year of system-wide data from a mid-sized province, we investigated who the frequent users of the Karaman 112 EMS were, which factors independently predicted frequent use, and whether they formed clinically distinct subgroups requiring differentiated responses.

## Materials and Methods

### Study Design and Setting

This retrospective cross-sectional study examined all prehospital 112 EMS records from Karaman Province, Türkiye, for the 2025 calendar year. A single 112 command centre serves the province by dispatching ambulances across urban and rural districts. Reporting follows the STROBE guidelines for cross-sectional studies. The study was approved by the Karamanoğlu Mehmetbey University Faculty of Medicine Dean's Office, Local Scientific Medical Research Ethics Committee (approval number: 01-2026/05, date: 10.02.2026) and conducted in accordance with the Declaration of Helsinki (as revised in Brazil 2013). Because it used routinely collected, fully anonymised administrative records without patient contact, the committee waived the requirement for informed consent.

### Data Source

Each record is a crew-completed patient care report for a single EMS episode from the provincial 112 information system, containing demographics, call characteristics, field assessment, field International Classification of Diseases 10th Revision, (ICD-10) diagnosis, and pre-computed operational intervals; it does not include call-taker logs. Each "call", therefore, denotes a crew-attended episode resulting in resource deployment (a response), which underlies our focus on frequent users rather than frequent callers. Patient identity was established through the Turkish national identification number, linking multiple records to the same individual.

### Study Population

Of the 30,255 initial records, we excluded records with a missing national identification number (n=1,462; 4.8%; precluding linkage) or with an inter-facility transfer outcome (n=2,446; 8.1%). The final cohort comprised 26,347 records from 18,653 unique patients (Figure 1).

### Definition of Frequent Users

Frequent users were defined a priori as those with five or more calls within the study year (n=430, 2.3%; 3,260 calls, 12.4%). This threshold was numerically comparable to prior prehospital studies (7,11) but more conservative, because those studies counted emergency calls to the dispatch centre whereas we counted crew-attended responses. It was fixed in advance rather than derived from the present data. The annual count aggregated the records by national identification number. Three stricter thresholds served as sensitivity definitions: ≥6 (n=282), ≥8 (n=142) and ≥10 (n=79) calls/year.

### Variables

Variables included: age (continuous and dichotomised at 65 years for modelling), sex, incident area (urban vs. rural, reflecting incident location, not a verified home address), incident location (home, street/public, health care facility, prison, other), district, triage priority (red, yellow, green, black), field ICD-10 diagnosis, insurance status (retiree vs. other), and on-scene and total crew engagement intervals (seconds). Three derived indicators were defined: a primary psychiatric or substance-use diagnosis (ICD-10-chapter F) and a primary respiratory diagnosis (chapter J), both from the first-listed diagnosis, and 24-hour recontact, a call ≤24 h after the patient's preceding call; full definitions appear in the Supplementary Methods. For patient-level summaries, each patient was assigned the modal incident area and median intervals across their calls.

### Statistical Analysis

Because the study analysed every eligible EMS record in the province during the study year, it constituted a complete population census, and no a priori sample-size estimation was performed. Analyses were conducted using IBM SPSS Statistics v28.0 (IBM Corp., Armonk, NY, USA); significance was set at $p<0.05$, two-tailed. Continuous variables are reported as medians with 25th-75th percentiles (interquartile range, IQR), and categorical variables as counts (%); at the call level (n=26,347), groups were compared with Mann-Whitney U and chi-square tests (Fisher exact test for expected counts <5). Missing data were minimal [326 calls (1.2%) carried no red, yellow, or green triage code: black, social-indication, or unrecorded; primary chapter unassignable in 13 calls (<0.1%)] and were retained as

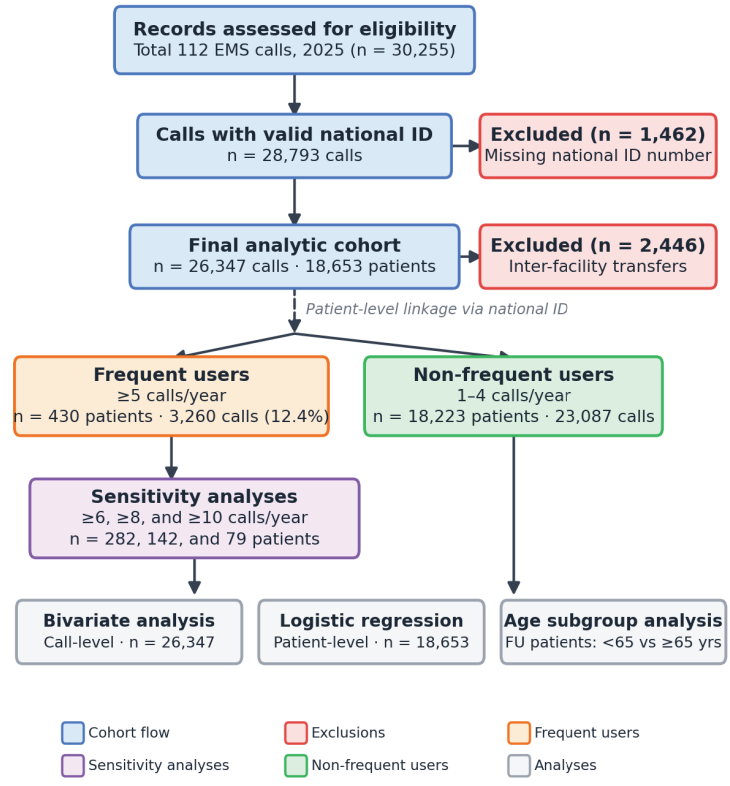


**Figure 1.** Study cohort flow. The initial 30,255 call records underwent sequential exclusions: records missing a national identification number (n=1,462; 4.8%) and inter-facility transfers (n=2,446; 8.1%), leaving 26,347 calls from 18,653 patients. Frequent users (≥5 calls/year): 430 patients (2.3%), 3,260 calls (12.4%). Maximum annual calls by one patient: 41

EMS: Emergency medical services, ID: Identification, FU: Frequent users

zeros. To identify independent predictors, we fitted a patient-level multivariable logistic regression model (n=18,653). Each patient was considered positive for a predictor if it was present in at least one call, so patient-level prevalences differ from call-level proportions (Table 1). Nine a priori predictors were entered simultaneously: yellow or red triage code, 24-hour recontact, psychiatric or substance-use diagnosis, respiratory diagnosis, home location, retiree insurance, urban incident area, male sex and age ≥65 years. Results are presented as adjusted odds ratios (AORs) with 95% confidence intervals (CIs); multicollinearity variance inflation factor (VIF) and model fit (Nagelkerke pseudo-$R^2$, Hosmer-Lemeshow) were assessed. Pre-specified secondary analyses comprised the two age-interaction terms; a full ICD-10-chapter comparison (Bonferroni-corrected, 21 chapters); separate injury (S-T) and external-cause (V-Y) flags; re-estimation under stricter thresholds; and two volume-dependence models for the triage and recontact flags: one omitting them, one with patient-clustered errors (Supplementary Methods; Tables S1, S2). The frequent-user group was further described at the patient level, stratified at 65 years of age.

## Results

### Cohort and Prevalence

After exclusions, 26,347 calls from 18,653 patients remained (Figure 1). Under the ≥5 calls/year threshold, 430 patients (2.3%) were frequent users, generating 3,260 calls (12.4%); the single most frequent user accounted for 41 calls.

### Call-level Characteristics

At the call level, frequent-user calls differed across most domains (Table 1): patients were older (median age 64 vs 45 years), were more often male and from urban areas, and called more often from home (66.4% vs 48.2%), while respiratory diagnoses were roughly twice as common and 24-hour recontacts were over three times as common. One informative contrast is that a primary psychiatric or substance-use diagnosis was almost equally frequent in both groups (8.1% vs 7.6%; p=0.40), yet ranked among the strongest patient-level predictors.

| Table 1. Characteristics of EMS calls by frequent-user status (call-level) | | | | |
|---|---|---|---|---|
| **Variable** | **Total (n=26,347)** | **FU (n=3,260)** | **NFU (n=23,087)** | **p** |
| Age, median (IQR), years | 47 (23-70) | 64 (37-77) | 45 (22-69) | <0.001 |
| Age ≥65 years, n (%) | 8,498 (32.3) | 1,623 (49.8) | 6,875 (29.8) | <0.001 |
| Male sex, n (%) | 13,438 (51.0) | 1,922 (59.0) | 11,516 (49.9) | <0.001 |
| Urban incident area, n (%) | 22,198 (84.3) | 2,947 (90.4) | 19,251 (83.4) | <0.001 |
| Incident location | | | | <0.001 |
| Home, n (%) | 13,286 (50.4) | 2,164 (66.4) | 11,122 (48.2) | <0.001 |
| Street/public, n (%) | 6,331 (24.0) | 539 (16.5) | 5,792 (25.1) | <0.001 |
| Prison, n (%) | 804 (3.1) | 165 (5.1) | 639 (2.8) | <0.001 |
| Triage priority | | | | <0.001 |
| Red code, n (%) | 531 (2.0) | 47 (1.4) | 484 (2.1) | 0.013 |
| Yellow code, n (%) | 15,671 (59.5) | 2,021 (62.0) | 13,650 (59.1) | 0.002 |
| Green code, n (%) | 9,819 (37.3) | 1,162 (35.6) | 8,657 (37.5) | 0.041 |
| Psychiatric/substance-use dx (primary F), n (%) | 2,028 (7.7) | 263 (8.1) | 1,765 (7.6) | 0.397 |
| Respiratory dx (primary J), n (%) | 1,302 (4.9) | 309 (9.5) | 993 (4.3) | <0.001 |
| Retiree insurance, n (%) | 1,885 (7.2) | 341 (10.5) | 1,544 (6.7) | <0.001 |
| Recontact within 24 h, n (%) | 927 (3.5) | 315 (9.7) | 612 (2.7) | <0.001 |
| On-scene interval, median (IQR), s | 563 (375-797) | 618 (410-866) | 555 (372–785) | <0.001 |
| Crew engagement interval, median (IQR), s | 2,181 (1,665-3,005) | 2,256 (1,748-3,021) | 2,170 (1,655-3,001) | <0.001 |

FU: Frequent users, NFU: Non-frequent users, EMS: Emergency medical services, IQR: Interquartile range, Mann-Whitney U for continuous, Pearson chi-square/Fisher exact for categorical. Triage p from 3-category test. Triage rows do not sum to 100%: the remaining 326 calls (1.2%) were assigned a black code (n=293), a social-indication code (n=18), or had no recorded code (n=15); percentages are calculated using all calls in each column as the denominator. Incident locations other than home, street/public, and prison (i.e., health care facility and other locations; n=5,926; 22.5%) are not shown. Psychiatric and respiratory conditions were defined based on the primary (first-listed) diagnosis. Call-level comparisons are descriptive and do not account for within-patient clustering; the p values are unadjusted and exploratory, and formal inference rests on the patient-level model (Table 2) and the patient-clustered call-level model (Table S2).

### Independent Predictors

In the patient-level model (n=18,653), all nine predictors were independently associated with frequent use (Table 2). The two largest were a yellow or red triage code (AOR: 12.66, 95% CI: 7.30-21.96) and 24-hour recontact (12.15, 9.46-15.60), followed by psychiatric or substance-use (7.99) and respiratory (6.53) diagnoses, then home location (4.00); retiree insurance, urban area, male sex and age ≥65 years were weaker but significant. The model showed moderate explanatory power (Nagelkerke pseudo-$R^2$=0.372), adequate calibration (Hosmer-Lemeshow p=0.56) and no multicollinearity (all VIFs ≤1.33).

The psychiatric finding shows why the unit of analysis matters: it had no call-level association (8.1% vs 7.6%); yet, at the patient level, a primary psychiatric diagnosis was recorded in 26.7% of frequent users (115/430) versus 8.9% of others (1,614/18,223). This corresponded to an unadjusted odds ratio (OR) of 3.76 (95% CI: 3.02-4.68), rising to an AOR of 7.99 after adjustment. The shift from call-level to patient-level, rather than confounder adjustment, accounts for most of the apparent magnitude.

### Diagnostic Spectrum

Across all 21 primary ICD-10 chapters (Table S3), frequent-user calls were over-represented in respiratory disease (9.5% vs 4.3%), care coordination (Z) factors, and nervous system, endocrine, and blood disorders. They were markedly under-represented among external causes (4.3% vs 17.3%) and injuries (1.9% vs 7.1%). The principal contrasts survived Bonferroni correction. Injury or external-cause presentations occurred in 6.2% of frequent-user calls versus 24.4% of other calls (Table S3) and were concentrated in younger patients (Table 3).

### Sensitivity Analyses

Under stricter thresholds (≥6, ≥8, ≥10 calls/year; Table 4), the core predictors (psychiatric and respiratory diagnoses, 24-hour recontact, home location and retiree insurance) held their direction and magnitude; male sex and age ≥65 years lost significance in smaller strata, with overlapping rather than reversed CIs. Removing the two volume-entangled terms left the seven remaining predictors essentially unchanged (Table S1). In a call-level model with patient-clustered errors (Table S2), the yellow-or-red triage estimate was null (OR: 0.98,

**Table 2. Adjusted predictors of frequent EMS use (n=18,653; 430 frequent users)**

| Predictor | AOR | 95% CI | p |
|---|---|---|---|
| Yellow or red triage code | 12.66 | 7.30-21.96 | <0.001 |
| Recontact within 24 hours | 12.15 | 9.46-15.60 | <0.001 |
| Psychiatric/substance-use dx (F) | 7.99 | 6.01-10.63 | <0.001 |
| Respiratory dx (J) | 6.53 | 4.96-8.59 | <0.001 |
| Home incident location | 4.00 | 2.91-5.49 | <0.001 |
| Retiree insurance | 3.28 | 2.51-4.27 | <0.001 |
| Urban incident area | 2.27 | 1.55-3.33 | <0.001 |
| Male sex | 1.51 | 1.20-1.90 | <0.001 |
| Age ≥65 years | 1.40 | 1.08-1.83 | 0.011 |

AOR: Adjusted odds ratio, CI: Confidence interval, VIF: Variance inflation factor. EMS: Emergency medical services, patient-level multivariable, logistic regression. Nagelkerke pseudo-$R^2$ =0.372. All VIFs ≤1.33. Hosmer-Lemeshow goodness-of-fit test: $\chi^2$=6.77, df=8, p=0.56 (no evidence of poor fit). Effect modification (separate model with interaction terms): age ≥65 × psychiatric AOR: 0.81 (95% CI: 0.41-1.61, p=0.54); age ≥65 × respiratory AOR: 1.14 (95% CI: 0.65-1.99, p=0.64). Neither significant

p=0.71), confirming that its large patient-level association arises from accumulation across repeated calls rather than from per-encounter acuity. By contrast, 24-hour recontact retained the strongest call-level association (OR: 4.59), and respiratory diagnosis and home location also remained independently associated (OR: 2.10 and 1.77), indicating genuine per-encounter characteristics rather than volume artefacts.

### Age-stratified Profiles

When analyzed at the patient level and stratified at 65 years (Table 3), the 430 frequent users formed two clinically distinct groups. Younger users (<65 years, n=213) more often had a psychiatric or substance-use diagnosis (44.6% vs 9.2%), street or public encounters (56.8%) and prison encounters (12.2%), and 24-hour recontact. Older users (≥65 years, n=217) called almost exclusively from home (95.9%), more often had a respiratory diagnosis (36.9%), nearly all received a yellow or red triage code (99.5%), more often held retiree insurance (63.1%) and needed longer intervals. Neither the age × psychiatric (p=0.54) nor the age × respiratory (p=0.64) interaction was significant; therefore, these differences reflect variation in prevalence rather than age-dependent effect sizes.

### Temporal Distribution

The monthly distribution did not differ between groups (Figure S1; p = 0.37), nor did shift or day-of-week patterns.

## Discussion

In this province-wide, year-long dataset of 112 EMS records, 2.3% of patients accounted for 12.4% of calls. The concentration is consistent with structurally different systems: Kjærgaard et al. (11) found the top 1% of Danish callers corresponded to roughly five or more calls per year (the same ≥5 threshold identified 2.3% of patients here), and Viken et al. (7) reported 3.2% of Bergen callers generated about one in four calls.

**Table 3. Age-stratified profiles of the 430 frequent users (patient-level)**

| Variable | <65 years (n=213) | ≥65 years (n=217) | p |
|---|---|---|---|
| Male sex, n (%) | 122 (57.3) | 137 (63.1) | 0.215 |
| Urban incident area (modal), n (%) | 203 (95.3) | 191 (88.0) | 0.006 |
| Location: home, n (%) | 168 (78.9) | 208 (95.9) | <0.001 |
| Location: street/public, n (%) | 121 (56.8) | 62 (28.6) | <0.001 |
| Location: prison, n (%) | 26 (12.2) | 3 (1.4) | <0.001 |
| Psychiatric/substance-use dx, n (%) | 95 (44.6) | 20 (9.2) | <0.001 |
| Respiratory dx (primary J), n (%) | 42 (19.7) | 80 (36.9) | <0.001 |
| Yellow or red triage, n (%) | 200 (93.9) | 216 (99.5) | <0.001 |
| Retiree insurance, n (%) | 28 (13.1) | 137 (63.1) | <0.001 |
| Recontact within 24 h, n (%) | 95 (44.6) | 66 (30.4) | 0.002 |
| Injury dx (S-T), n (%) | 33 (15.5) | 13 (6.0) | 0.001 |
| External-cause dx (V-Y), n (%) | 62 (29.1) | 34 (15.7) | <0.001 |
| Any injury/external-cause, n (%) | 77 (36.2) | 43 (19.8) | <0.001 |
| On-scene interval, median (IQR), s | 520 (408-720) | 712 (588-861) | <0.001 |
| Crew engagement interval, median (IQR), s | 2,031 (1,684-2,489) | 2,430 (2,095-2,872) | <0.001 |

IQR: Interquartile range, patient-level; each patient counted once. Binary flags = recorded in ≥1 call; location and diagnosis categories within a domain are not mutually exclusive (a patient with calls from both home and the street is counted in both rows), so within-domain percentages may exceed 100%. Mann-Whitney U/chi-square/Fisher exact as appropriate; all comparisons are descriptive, with unadjusted p values interpreted as exploratory

| Table 4. Sensitivity analysis across frequency thresholds adjusted odds ratio | | | | |
|---|---|---|---|---|
| **Predictor** | **≥5 (main, n=430)** | **≥6 (n=282)** | **≥8 (n=142)** | **≥10 (n=79)** |
| Yellow or red triage code | 12.66 | 11.04 | 14.49 | 20.82 |
| Recontact within 24 hours | 12.15 | 11.79 | 15.28 | 13.81 |
| Psychiatric/substance-use dx (F) | 7.99 | 8.81 | 8.08 | 7.50 |
| Respiratory dx (J) | 6.53 | 7.62 | 7.62 | 9.62 |
| Home incident location | 4.00 | 3.53 | 4.64 | 4.71 |
| Retiree insurance | 3.28 | 3.15 | 3.03 | 4.91 |
| Urban incident area | 2.27 | 2.87 | 3.02 | 2.47 |
| Male sex | 1.51 | 1.48 | 1.34 | 0.89 |
| Age ≥65 years | 1.40 | 1.34 | 1.53 | 1.35 |
| Nagelkerke: 0.372 (≥5), 0.37 (≥6), 0.398 (≥8),0.412 (≥10). At ≥10, the triage estimate is unstable (95% confidence interval: 2.83-153.3) owing to near-complete separation. Male sex and age ≥65 lose significance at stricter thresholds | | | | |

The two largest patient-level associations are not equivalent: yellow or red triage codes reflect repeated contact rather than per-encounter severity (null at the call level, Table S2), whereas 24-hour recontact retains a genuine per-encounter signal even as it rises with call volume. The primary psychiatric and respiratory diagnoses are the underlying clinical drivers.

Nearly one in ten frequent-user calls occurred within 24 hours of a preceding call (9.7% vs 2.7%), the second-largest adjusted association, a pattern Kjærgaard et al. (11) also reported. Structural features of the provincial Turkish healthcare system plausibly channel these early returns toward ambulance services. Primary care rests on family-medicine practices that operate largely during weekday daytime hours, and hospital care requires no referral. After hours, the free 112 line is the only telephone access to medical help; there is no counterpart to the out-of-hours services that absorb low-acuity demand in the Norwegian and Danish systems (10,11). At the receiving emergency departments, heavy caseloads can shorten observation and limit structured discharge guidance. When symptoms persist or anxiety recurs overnight, a further 112 call may follow. Each subgroup faces a different service gap: older users with respiratory disease are not routinely offered early follow-up after discharge, whereas younger users in psychiatric crisis lack round-the-clock community mental health services, leaving the emergency department as the only after-hours option. Because the records capture neither the reason for a recontact nor the disposition of the preceding encounter, these mechanisms remain hypotheses.

Among our frequent users, psychiatric diagnoses and male sex were both prominent, as described in Norway (7), Denmark (1) and the United States (6); in the US cohort, frequent use concentrated among younger and middle-aged patients (6). Respiratory diagnoses were more common in older frequent users (36.9% vs 19.7%) and independently associated with frequent use (AOR: 6.53), echoing Søvsø et al. (1). The longer intervals of older users fit recurrent chronic obstructive pulmonary disease exacerbations, the commonest final diagnosis among repeated EMS users (16), for whom proactive follow-up has been proposed (14). Across all chapters, repeated use reflected chronic and care-coordination needs rather than injury; residual trauma was concentrated mainly among younger users.

At the patient level, the group split at 65 years: younger users were characterized by psychiatric diagnoses and social vulnerability (encounters on the street and in prison), whereas older users were characterized by chronic respiratory disease. A younger-social, older-medical division was also reported in Singapore (15). Interaction testing showed that the strength of each association did not differ by age; therefore, the profiles reflect differences in prevalence across age groups rather than age-dependent effects.

Frequent use concentrated in home settings within urban areas (home 66.4% vs 48.2%; urban 90.4% vs 83.4%; urban an independent predictor, AOR: 2.27), consistent with Pakdemirli et al. (3), who found 88.6% of elderly İzmir calls urban. Retiree insurance independently predicted frequent use (AOR: 3.28) even after age adjustment. Because 112 transport is free, this likely reflects a pensioner population with comprehensive coverage and a high chronic disease burden rather than insurance-specific access. Its concentration among older home-based users (63.1%) is consistent with an access-facilitated pattern in which a free, appointment-free service lowers the threshold for using the ambulance as a route to care. Whether social isolation also contributes, given that 38.8% of Canadian frequent callers live alone (17), lies beyond what can be determined from administrative data.

Unlike general Turkish EMS demand, where Sariyer et al. (2) documented daytime–evening variation, our groups showed no temporal difference (Figure S1).

### Strengths

To our knowledge, this is the first patient-level characterisation of frequent users within the Turkish 112 system, a middle-income setting not covered by the existing literature. Linkage of repeated contacts to the same individual through the national identification number lets us separate per-encounter associations from cumulative associations. The a priori threshold also held under three stricter cut-offs and in a patient-clustered call-level model (Table S2).

### Clinical Implications

These subgroups point to distinct service responses: psychiatric liaison and social support for younger users, and coordinated chronic-disease and geriatric care for older users, the kind of case management that has reduced frequent use elsewhere (13). Within the Turkish 112 framework, such responses require system-level change, as ambulances currently convey patients almost exclusively to emergency departments. For services developing automated frequent-user flags, a note of caution: the yellow-or-red triage code, although the largest patient-level association, carried no per-encounter signal (Table S2) and would mislabel these patients if applied predictively. Cumulative contact count and clinical phenotype are more reliable.

### Research Implications

Multi-centre replication across Turkish provinces is needed before these findings can inform policy. Whether prospective identification of frequent users, coupled with coordinated follow-up, can reduce avoidable activations is testable but unproven and represents the natural next step. Linking EMS records to the social, housing, and clinical data that administrative systems omit would clarify the upstream drivers that this study can only outline. Linkage with hospital electronic health records, adding emergency department disposition, admission, and short-term outcomes, would allow direct evaluation of the clinical appropriateness and, ultimately, the preventability of these transports.

### Study Limitations

This was a retrospective, single-centre, single-year study. Prevalence was calculated using EMS users, rather than provincial residents, as the denominator; therefore, per-capita rates were not computed. The 4.8% of records excluded for missing identification numbers may over-represent socially isolated, homeless, or undocumented individuals who are linked to elevated EMS use and behavioural health needs (6,17), thereby underestimating both the prevalence of frequent use and the psychiatric association. ICD-10 codes reflect field impressions rather than confirmed diagnoses, and socioeconomic status, housing, social isolation and comorbidity measures, associated with frequent use elsewhere (17,18), were unavailable. The records do not identify who placed each call; including third-party calls roughly doubled frequent contacts in one Norwegian system (10). Because a patient was counted as positive whenever an indicator appeared in any call, patients with higher call volumes had more opportunities to screen positive for every binary predictor; this effect was most pronounced for the triage code, which showed a large patient-level association that was absent at the call level (Tables 1 and S2). Although the composition of frequent users may vary across provinces, the 112 system operates under the same national organisation, command-centre structure, and free-transport policy in every province of Türkiye, which supports cautious transferability of the system-level findings; the multi-centre replication called for above remains the definitive test. The cross-sectional design precludes causal inference, and post-encounter outcomes were unavailable, limiting assessment of clinical appropriateness.

## Conclusion

Frequent users of the Karaman 112 EMS system are a small yet disproportionately demanding group: 2.3% of patients generated 12.4% of calls; they constitute two clinically distinct subpopulations rather than one. The largest patient-level signal, a yellow or red triage code, reflects accumulated contact rather than per-encounter acuity, while primary psychiatric and respiratory diagnoses identify the clinical drivers.

### Ethics

**Ethics Committee Approval:** The study was approved by the Karamanoğlu Mehmetbey University Faculty of Medicine Dean's Office, Local Scientific Medical Research Ethics Committee (approval number 01-2026/05, dated 10.02.2026) and conducted in accordance with the Declaration of Helsinki (as revised in Brazil 2013).

**Informed Consent:** This is retrospective cross-sectional study.

### Footnotes

### Authorship Contributions

Concept: S.Ö., Design: S.Ö., Data Collection or Processing: S.Ö., M.S.Y., Analysis or Interpretation: S.Ö., M.S.Y., Literature Search: S.Ö., Writing: S.Ö., M.S.Y.

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**Supplementary Link:** https://d2v96fxpocvxx.cloudfront.net/d363ec1e-9e5e-4591-a00a-d656bfcabb80/content-images/91b0de03-b3af-47bf-b99c-dc45706e8876.pdf

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