RESEARCH | PESQUISA

Factors related to readmissions to the Mobile Emergency Care Service[a]

Fatores relacionados às readmissões ao Serviço de Atendimento Móvel de Urgência

Factores relacionados con los retornos al Servicio Móvil de Atención de Urgencias

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ABSTRACT

Objective: to analyze the factors associated with readmission to the Mobile Emergency Care Service. **Method:** this is an epidemiological, cross-sectional study. Data from 600 adult patients served by the service in a municipality in the countryside of São Paulo, Brazil, in 2015 were analyzed. Multiple logistic regression identified the factors associated with readmission. **Results**: clinical occurrences, male sex, and a mean age of 55.5 years predominated. A 26.7% return rate within six months of prehospital service was identified. Readmissions were associated with patients' clinical factors, procedures performed in the mobile prehospital environment, and intra-hospital flow. Additionally, a relationship with the region of the city where the study was conducted was observed. **Conclusion and implications for the practice:** the analysis revealed a profile of patients with a mean age of 55 years and afflicted by chronic non-communicable diseases. The likelihood of return was associated with the clinical nature of the disease, care flows, and the service region. Studies similar to this one assist in planning and developing public policies and health actions in line with identified needs, aiming to reduce the burden on emergency services.

Keywords: Continuity of Patient Care; Emergencies; Health Services; Patient Readmission; Prehospital Care.

RESUMO

Objetivo: analisar os fatores associados à readmissão de atendimento ao Serviço de Atendimento Móvel de Urgência (SAMU). **Método**: estudo epidemiológico, do tipo seccional. Analisaram-se dados de 600 pacientes adultos atendidos pelo serviço de um município do interior de São Paulo, Brasil, no ano de 2015. Uma regressão logística múltipla identificou os fatores associados à readmissão. **Resultados**: predominaram o atendimento de ocorrências clínicas, pacientes do sexo masculino e média de idade de 55,5 anos. Identificou-se um retorno de 26,7% nos seis meses seguintes ao atendimento no serviço pré-hospitalar. As readmissões se associaram aos fatores clínicos dos pacientes, aos procedimentos realizados no ambiente pré-hospitalar móvel e ao fluxo intra-hospitalar. Ademais, foi possível verificar relação com a região da cidade na qual o estudo foi realizado. **Conclusão e implicações para a prática**: a análise mostrou um perfil de atendimentos a pacientes com idade média de 55 anos e acometidos por doenças crônicas não transmissíveis. A chance de retorno se associou à natureza clínica da doença, aos fluxos assistenciais e à região do atendimento. Estudos como este auxiliam no planejamento e na elaboração de políticas públicas e ações em saúde condizentes com as necessidades identificadas, com potencial de auxiliar na diminuição da sobrecarga dos serviços de urgência.

Palavras-chave: Assistência pré-hospitalar; Continuidade da assistência ao paciente; Emergências; Readmissão do paciente; Serviços de saúde.

RESUMEN

Objetivo: analizar los factores asociados al retorno al Servicio de atención móvil de urgencias. **Método**: estudio epidemiológico transversal. Se analizaron datos de 600 pacientes adultos atendidos por el servicio en una ciudad del interior de São Paulo, Brasil, en 2015. La regresión logística múltiple identificó factores asociados con el retorno. **Resultados**: predominó la asistencia a eventos clínicos, sexo masculino y edad media de 55,5 años. Se identificó un retorno del 26,7% a los seis meses de atención en el servicio prehospitalario. Las recaídas se asociaron con los factores clínicos de los pacientes, los procedimientos realizados en el ambiente prehospitalario móvil y el flujo intrahospitalario. También es posible verificar una relación con la región de la ciudad en la que se realizó el estudio. **Conclusión e implicaciones para la práctica**: el análisis mostró un perfil de atención para pacientes con una edad promedio de 55 años y afectados por enfermedades crónicas no transmisibles. La posibilidad de retorno se asoció con la naturaleza clínica de la enfermedad, los flujos de atención y la región de atención. Estudios como este ayudan en la planificación y elaboración de políticas públicas y acciones de salud acordes con las necesidades identificadas, con el fin de reducir la sobrecarga de los servicios de emergencia.

Palabras-clave: Atención Prehospitalaria; Continuidad de la Atención al Paciente; Readmisión del Paciente; Servicios de Salud; Urgencias Médicas.

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INTRODUCTION

The Mobile Emergency Care Service (SAMU 192) is the mobile component of Brazil's Urgent and Emergency Care Network. It coordinates health services and their points of care, aiming to offer immediate assistance to patients experiencing health issues, irrespective of sex, age, or the nature of the health problem. SAMU 192 provides on-site care and arranges appropriate transportation to a healthcare facility within the Unified Health System (SUS) when necessary.[1,2] The teams operate with Emergency Regulation Centers, regarded as health system observatories. These centers employ professionals trained to manage emergency calls by categorizing and prioritizing needs, thereby organizing emergency response protocols.[3]

In recent years, an increasing number of non-urgent or irrelevant requests for prehospital care have posed challenges for both service management and patients seeking alternative entry points into the healthcare system.[4-8] A Brazilian study conducted in Bahia aimed to characterize the clinical care provided by SAMU and identified discrepancies between users' health demands, post-assessment by the team, and the resources allocated for care.[9]

In Switzerland, over 20% of Emergency Department (ED) admissions result from prehospital care. In 2010, minor cases accounted for 84.4% of admissions, which rose to 87% by 2018; urgent cases comprised 11.48% of all calls.[1] An Italian study estimated that over 80% of ED visits are classified as white and green labels according to the Italian color-coded triage system, undermining the service's principles.[10,11] Hospitals are grappling with the repercussions of increasing ambulance transports as ED admissions continue to rise. This surge directly impacts care quality and contributes to professional frustration, potentially leading to longer waiting times, increased mortality rates, and elevated healthcare costs.[1,11]

Compounding this issue is the phenomenon of "frequent users," described as problematic due to their effects on costs, care quality, and overcrowding. One study in an Italian teaching hospital identified them as a vulnerable group characterized by poor socioeconomic status, mental health challenges, substance abuse, and a high prevalence of chronic illnesses.[11] In the same study, 17.1% of ED admissions were readmissions. A mismatch exists between the predominantly chronic conditions of the demand and the intensive care supply. Consequently, EDs, geared towards acute care, receive all patients whose health needs are not adequately addressed elsewhere.[11]

Research on patient readmissions and frequent users has been conducted nationally[10,12-14] and internationally.[15-17] Definitions vary, but generally, a threshold of four to five calls or more per year classifies a patient as a "frequent user." From the patients' perspective, returning to the ED is primarily due to early discharge, feeling weak upon discharge, lack of at-home support for managing chronic conditions, and insufficient discharge instructions.[15,16] These studies consider readmissions an important indicator of care quality, reflecting the impact of hospital care, the patient's condition after discharge, and the continuity of patient care within the healthcare network.[15]

Nonetheless, studies on readmissions to mobile prehospital care are still in their infancy. Therefore, SAMU 192 Emergency Regulation Centers serve as crucial tools for identifying patient readmissions to prehospital care, aiding in the planning and managing of health services by highlighting potential flaws and gaps in the Emergency Care Network. Hence, this study analyzes the factors associated with patient readmission to SAMU 192.

METHOD

This study is a cross-sectional epidemiological investigation conducted at the SAMU 192 Emergency Regulation Center and the referral emergency department in the countryside of São Paulo. The sample comprises data from 600 adult patients aged 18 or older who received care from SAMU 192 and were subsequently referred to another component of the municipality's Emergency Care Network. The sample size was estimated using simple random sampling, with Type I and II errors set at 0.05 and 0.2, respectively. The incidence of readmission within six months was estimated at 6.45%, based on data from the previous year.

Exclusion criteria included patients treated by SAMU 192 but released at the scene and those who died during prehospital care and thus were not referred to another healthcare service. Data were collected through random selection once a month in 2015, with 25 patients per month for each type of vehicle. The city operates an advanced life support unit and a basic life support unit.

One of the authors collected data using SAMU 192 medical records and the patients' in-hospital electronic medical records. Data were transferred to an Excel® spreadsheet and analyzed using SPSS 21.0® software in August 2022.[18] The dependent variable in this study was the occurrence of patient readmission to prehospital care. Independent variables included patient sex and age, health history variables (e.g., comorbidities and risk factors), type of incident (clinical, traumatic, psychiatric, or gynaeco-obstetric), main complaint, response time (time elapsed from the request for help to the ambulance's arrival), type of vehicle dispatched, region of the city where the service was provided, immediate clinical interventions performed in the prehospital setting, subsequent in-hospital emergency room referrals (orientation, observation, hospitalization, intensive care unit/specialized units), length of hospital stay, and referral to another health care network service post-discharge.

A multiple logistic regression model was employed to explore factors associated with patient readmission to SAMU 192. Associations were considered statistically significant when the error probability was less than 5%. This study was approved by the Research Ethics Committee of the Botucatu Medical School (UNESP) under n. 857.392 and CAAE no. 37496314.4.0000.5411, on November 3, 2014. The study was conducted in compliance with CONEP Resolution no. 466/2012.

RESULTS

Of the 600 cases analyzed, SAMU 192 treated 51.7% of males with a mean age of 55.5 years, ranging from 18 to 104 years (SD = 21.4) (Table 1). Concerning chronic diseases and pre-existing risk factors, 34% had a single chronic condition, predominantly Diabetes Mellitus. Another 19% had two chronic conditions: cerebral vascular accident (CVA) and cardiac arrhythmia. A further 6.5% had three conditions, particularly CVA, chronic respiratory disease, and cardiac arrhythmia. In addition, 29% were hypertensive, 28.3% were both hypertensive and smokers, and 10% were hypertensive, smokers, and alcoholics.

Clinical cases constituted 80% of the occurrences, with "dyspnea" being the most frequently reported clinical complaint (13.3%), followed by "chest pain" (12.2%), "seizure" (9.8%), and "general malaise" (6.7%). Traumatic incidents were primarily "vehicle accidents" (3.5%) and "falls from height" (2.8%). Gynecological and obstetric events included "labor" (3.7%), while psychiatric occurrences were mainly "psychomotor agitation" (3.8%) (Table 1).

After receiving care, 71.8% of patients were referred to the region's referral emergency department. Regarding the length of hospital stay, the data revealed that among the patients who remained under observation (50.2%), 36% stayed in the referral emergency department for 1–6 hours, 15% for 6–12 hours, 9% for 12–18 hours, 4% for 18–24 hours, and 32.8% for over 24 hours. The average length of stay for patients admitted to the hospital was nine days, ranging from 1–90 days (± 11.13).

Of the total sample, 85.2% were discharged from the hospital. Among them, 26.7% were readmitted to SAMU 192 within six months of their initial visit, with 84.4% citing the same primary complaint. The number of visits ranged from one to nine over six months, with the highest frequency occurring in the first month after treatment and accounting for 35.96% of all readmissions (Figure 1).

The relationship between patient readmission and the number of comorbidities and risk factors per patient showed that the greater the number of risk factors, the greater the number of chronic diseases r = 0.16 (p<0.001). The chance of readmission was significantly higher with each additional chronic disease per patient, as shown by OR = 1.36 (1.12-1.64).

As shown in Table 2, the chance of readmission was statistically significant in patients with epilepsy, cancer, and chronic respiratory disease, as well as the use of oxygen therapy as an immediate intervention in mobile prehospital care, corroborating the patient profile and comorbidities described above. Regarding the flow of patients in the in-hospital environment, the chance of readmission was 3.76 times higher in patients who progressed to hospitalization and 3.42 times higher in patients who remained under observation before discharge.

The chance of readmission increased by 64.7% among patients who received some referral at hospital discharge for continuity of care at another service in the Health Care Network, such as specialty outpatient clinics or the Family Health Strategy. Lastly, Table 3 illustrates the statistically significant difference in the chance of patient readmission between the regions of the study municipality.

Table 1. Profile of patients treated in the mobile prehospital service, according to sex, type of incident, intra-hospital flow, and outcome. Botucatu, 2022 (n = 600).

Variables	n	%
Sex		
Male	310	51.7
Female	290	48.3
Type		
Clinic	480	80
Traumatic	64	10.7
GO*	28	4.7
Psychiatric	28	4.7
Prehospital clinical intervention		
Blood glucose test	309	51.5
Clinical assessment	152	25.3
Peripheral venipuncture	137	22.8
Medication	123	20.5
Oxygen therapy	108	18
Immobilization	72	12
Electrocardiogram	68	11.3
Cardiopulmonary resuscitation	10	1.7
Other (GT, dressings, OI)**	22	3.7
Intra-hospital flow		
Observation	301	50.2
Hospitalization	181	30.1
Guidance	90	15
ICU/EW***	28	4.7
In-hospital outcome		
High	511	85.2
Death	58	9.7
Evasion	31	5.2
Referral to the HCN**		
No	354	59
Yes	246	41
Readmission to SAMU-192		
No	440	73.3
Yes	160	26.7

Source: Prepared by the authors.
*GO: gyneco-obstetric; **GT: gastric tube; OI: orotracheal intubation;
***ICU: intensive care unit/emergency ward (coronary or stroke unit);
****HCN: health care network.

The lowest percentage of readmissions (11%) occurred on the highways and in rural areas. The highest percentage was in the west of the city (36%), and the west had a significantly higher

Table 2. Association of variables with the likelihood of readmission to mobile prehospital care. Botucatu, 2022.

Variable	OR	p	Variable	OR	p
Demographics					
Age	1.008	0.085	**Immediate clinical interventions**		
Sex	1.203	0.344	Immobilization	0.498	0.070
Chronic illness			BGT	0.861	0.596
Depression	1.171	0.646	ECG	0.619	0.168
Epilepsy	2.228	**0.027**	Medication	0.847	0.579
Cancer	3.918	**0.001**	Oxygen therapy	1.87	**0.032**
CVD	0.945	0.875	PVP	0.756	0.339
CVA	1.228	0.537	Evaluation	0.617	0.180
CRD	2.154	**0.023**	Others[1]	0	0.999
Hospital flow			**Hospitalization time**	1.092	0.124
Observation	3.421	**0.036**			
Guidance	1.745	0.386			
			Referral	1.647	**0.010**
SU	0.714	0.771			
ICU	0.775	0.664			
Hospitalization	3.761	**0.010**			

CVD = cardiovascular disease; CVA = cerebrovascular accident; CRD = chronic respiratory disease; BGT = blood glucose test; ECG = electrocardiogram; PVP = peripheral venous puncture; [1]Others = cardiopulmonary resuscitation, orotracheal intubation, gastric sounding, dressings; SU = stroke unit; ICU = intensive care unit.
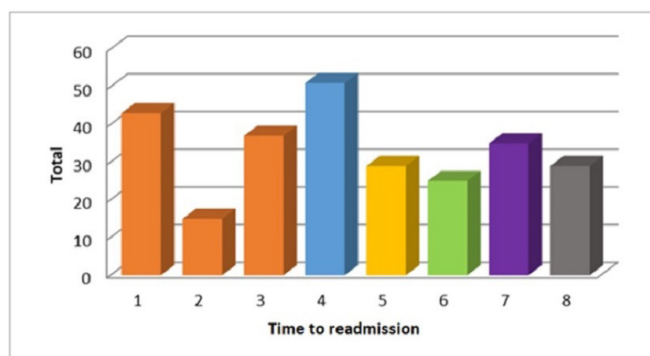
Figure 1. Frequency of readmissions to mobile prehospital care in six months. Botucatu, 2022. 1 =1–7 days; 2 = 8–15 days; 3 = 16–30 days; 4 = 31–60 days; 5 = 61–90 days; 6 = 91–120 days; 7 = 121–150 days; 8 = 151–180 days.

percentage than the northern and central regions. The eastern region had a significantly higher percentage of readmissions than the northern region, as did the city's southern region. There were no statistically significant associations between the likelihood of readmission and patient age, sex, vehicle response time, the

Table 3. Chance of readmission to mobile prehospital care by region. Botucatu, 2022.

Region	Readmission	Significant difference (p<0.05)
West - 4	36/100 (36%)	4 > 1, 0
East - 3	37/113 (33%)	3 > 1
South - 2	32/104 (31%)	2 > 1
Central - 0	36/158 (23%)	
North - 1	18/116 (16%)	
Highways, rural areas - 5	1/9 (11%)	

patient's main complaint, the type of vehicle used, and length of hospital stay.

DISCUSSION

This study analyzed readmissions to SAMU 192 and found associations with patients' clinical factors, immediate prehospital interventions, in-hospital flow, and post-discharge referrals.

A relationship was also noted with the specific region of the city where the study was conducted. The sample was fairly balanced in terms of sex, although men slightly outnumbered women, a trend also observed in other studies from both the south and north of the country.[19-21] The mean age of the sample was 55.5 years, with the majority of services rendered to individuals between 41 and 60 years of age. This suggests that the predominant patient group is of working age.

The main clinical complaints, such as dyspnea, chest pain, seizures, and general malaise, align with the most frequently reported clinical issues in both national and international prehospital care settings.[1,21-23] These complaints correlate with the common chronic diseases and risk factors identified in the sample, including type II Diabetes Mellitus, cardiovascular and cerebrovascular diseases, chronic respiratory disorders, systemic arterial hypertension, smoking, alcoholism, and dyslipidemia. This study reaffirms the consistent patient profiles and types of incidents over the years, which have been observed in other research on this population.[5,24] Such findings become crucial for the development of public policies tailored to the local reality, as well as for the creation of health promotion initiatives and harm prevention, aiming to address the actual needs of the population.

In this study, age and sex did not show a significant relationship with the readmission of patients to mobile pre-hospital care. However, comorbidities and the number of risk factors per patient did. This observation leads us to associate readmission with the decompensation of chronic diseases and the severity of the health status of returning patients, clinical situations that should be monitored at the outpatient level.

The demographic and epidemiological changes in the population lead to new related health challenges, such as population aging and the increasing prevalence of chronic diseases. Such aspects have a direct impact on the pre-hospital system and are responsible for overloading ES and increasing healthcare costs.[1]

A study conducted in Montreal, Canada, aimed at assessing the reasons for returning to the emergency services, found that while some readmissions might be preventable, others are necessary due to the severity of patients' health and symptoms. Even when best practice guidelines are followed, readmissions cannot be entirely eliminated, not only because of the complexity of chronic diseases but also due to administrative and socio-economic reasons, such as access to follow-up care or a lack of communication between parties.[16]

American and Canadian data suggest that readmissions can be avoided in 76% of cases. However, using this indicator to assess the quality of care needs to be approached with caution, as patient characteristics are challenging to manage. That is, they often present with multiple comorbidities associated with the diagnosis justifying the admission. This often results in patients not finding adequate and effective care outside of the hospital setting.[16]

Nevertheless, patients who were most frequently referred to other services after hospital discharge were 3.42 times more likely to be readmitted to mobile pre-hospital care. The majority of

these were patients with epilepsy, cancer, and chronic respiratory disease. In this context, the oxygen therapy intervention performed in the mobile pre-hospital setting was significantly associated with the likelihood of readmission.

With these findings, one can infer that even though referrals were primarily given to patients with shorter hospital stays, they were also given to those with more severe clinical conditions, for which primary healthcare services lack resolution. Such results can be attributed to the presentation of the diseases, patient characteristics, and severity. As a result of their decompensation, these are severe cases where time can affect the patient's prognosis. Transferring patients with complex conditions from the hospital to primary care services requires effective communication and demands greater attention to the entire context involved in the care and discharge of each individual.[25]

In the current study, 36% of all readmissions occurred in the first month following mobile pre-hospital care, of which 16.28% took place within the first seven days. A study conducted in a private hospital in São Paulo, aiming to assess the quality of care provided to patients considered urgent and emergency in an advanced mobile emergency unit through care indicators, found a 13.64% readmission rate for unplanned medical consultations in the emergency room within 15 days of care provided by the ambulance team, with pediatrics being the most sought-after specialty.[12]

Hence, one can observe that readmissions primarily occurred in patients from the western and eastern regions of the municipality. Each of these regions is served by four primary care units.[26] Regional characteristics in emergency care profiles may indicate gaps in service offerings in cities or regions, leading to an increased demand for emergency services.

In the emergency care field, studies related to readmissions are more common in the hospital component, while evaluations of the mobile pre-hospital component remain limited. However, given that a readmission poses a significant burden on the healthcare system and causes discomfort and risks to the patient, it's crucial to understand the profile of this population. This understanding will aid in planning for the continuity of healthcare and in preventing unplanned readmissions.

Given that they store significant data about the population's health, the Emergency Regulation Centers of SAMU 192 need to be used more systematically. This should be done to assist in strategic planning for health prevention, promotion, and recovery, thus aiming to uphold the principle of comprehensive care for the population.

CONCLUSIONS AND IMPLICATIONS FOR PRACTICE

Based on the sample studied, it is possible to conclude that in 2015, SAMU 192 in São Paulo primarily treated men with a mean age of 55.5 years. Most patients presented clinical issues, most notably dyspnea, chest pain, and seizures. Factors significantly associated with the likelihood of readmission over six months

included the presence of epilepsy, cancer, and chronic respiratory disease, as well as the use of immediate oxygen therapy in prehospital care. Both in-hospital management and post-discharge referrals also played pivotal roles in patient readmission rates. Additionally, the results revealed correlations with the specific region of the city where it was conducted.

This study has limitations, including its specific focus on mobile emergency care, which restricts the generalizability of the findings. Furthermore, the data was sourced secondarily, and there is a noticeable lack of research into how patients are integrated into healthcare networks through mobile prehospital care. Future studies could investigate this aspect, focusing on the flow and continuity of patient care within the Urgent and Emergency Care Network. In fact, further research could also expand on these findings by broadly exploring the care processes and characterizing patient profiles and flows within the Urgent and Emergency Care Network. Such studies could identify potential gaps in the healthcare network that might compromise the continuity and comprehensiveness of care. These insights would be invaluable for the planning and formulating public policies and healthcare initiatives aligned with identified needs.

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