

# Inappropriate Use of Ambulance Services by Elderly Patients with Less Urgent Medical Needs

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Elderly patients with less urgent medical needs represent a high proportion of all emergency patients in Japan; this trend is gradually increasing, presenting a burden on the emergency medical system. To design effective interventions, it is important to understand the basic characteristics of emergency service use. For elderly Japanese patients, there is currently no detailed report on less urgent cases (LUC), or those cases that could be diagnosed by primary care physicians. Since there is a need for a timely reporting of detailed LUC data, we used data of 2004-2006 from an immediately available database at the Yao Tokushukai General Hospital. With a focus on LUC, we analyzed 7,800 cases of elderly patients, aged over 65 years, who were transported via ambulance to a secondary emergency hospital in Osaka. Of these, 3,354 patients (43.0%) were classified as having initial emergencies and were given outpatient care in the emergency department, and 1,544 patients (19.8%) were LUC, in which 541 subjects (6.9%) may have used ambulance services somewhat inappropriately owing to a lack of alternate transportation. In the remaining 1,003 patients, ambulance use could have been avoided if primary care clinics were available at night and during holidays. We therefore focus on three important points: awareness-raising activities to prevent inappropriate ambulance use, strengthening of transport services to healthcare facilities, and expanding primary care clinic office hours. This study is the first detailed report on the use of ambulance services in Japan by elderly patients with less urgent medical needs.

**Keywords:** ambulance services; elderly patients; initial emergency; less urgent cases; primary care physician  
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## Introduction

The use of ambulance services in Japan increases annually (Fire and Disaster Management Agency 2013). The rate of ambulance use is especially high among elderly patients who, despite using the emergency department (ED) appropriately, may be using ambulance services for less urgent problems (Salvi et al. 2007; Iwai et al. 2008). Thus, the emergency medical system is becoming overloaded with patients who may not require emergency care. Consequently, emergency physicians are experiencing exhaustion due to the increased patient loads, a shortage of emergency physicians, and fear of medical malpractice lawsuits. In Japan, emergency patients are classified into primary (initial), secondary, or tertiary emergencies according to the severity of their illness. Initial emergency healthcare facilities provide medical treatment for patients, including less urgent cases (LUC), on an outpatient basis. Secondary emergency hospitals are responsible for patients who require inpatient care, and tertiary emergency hospitals are responsible for treating life-threatening diseases or inju-

ries.

The use of ambulance services has increased gradually with an aging society (Fire and Disaster Management Agency 2014). There is currently no effective solution for this problem in emergency care settings. To design appropriate interventions effectively, it is important to understand the basic trends of ambulance use by elderly patients. However, there are, currently, no detailed reports on ambulance use by elderly patients with less urgent needs in Japan. The objective of this study was to provide basic statistical information about ambulance-based transport of elderly patients with less urgent needs to our secondary emergency hospital.

## Methods

This study was conducted using the medical record database of Yao Tokushukai General Hospital (415 beds) from January 1, 2004 to December 31, 2006. Yao Tokushukai General Hospital is a secondary emergency hospital in Yao City in eastern Osaka prefecture. In 2006, the population of Yao City was 274,448, of whom 47,465 (17.3%) were above the age of 65 years. All data were anonymized and

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exported to a Microsoft Excel file. Only patients aged above 65 years who were transported to Yao Tokushukai General Hospital via ambulance during the study period were included in the analysis.

The variables analyzed included age, sex, date and time of each patient visit, initial diagnosis in the ED, and patient outcome. The initial diagnoses by emergency physicians were recorded according to the International Classification of Diseases (ICD-10). Patient outcomes were classified into four groups: discharge, hospitalization, transfer to another hospital, and death at the ED. Discharged patients were those characterized as receiving initial emergency level care, hospitalized patients were defined as those receiving secondary care, and those patients who were transferred or died were classified as receiving tertiary level care.

Patients classified as LUC presented with conditions that could be treated by primary care physicians. We included common diseases, low emergent diseases, and injuries, but excluded life-threatening diseases, diseases that require specialized treatment, very rare diseases, and diseases that require special tests such as computed tomography scans. We investigated the number of LUC who received initial emergency care.

We set four time zones for visits to the ED. Time zone A refers to the typical operating hours of Japanese primary care clinics (9:00-12:00 and 16:00-19:00 from Monday to Friday, and 9:00-12:00 on Saturday). Time zone B is outside regular clinic hours (0:00-7:00 from Monday to Saturday, and 19:00-24:00 from Monday to Friday). Time zone C represents days that the clinics are typically closed (Sunday, public holidays, and at the end of the year), and time zone D is the time during which patients would have to wait for primary care clinics to open (7:00-9:00 from Monday to Saturday, and 12:00-16:00 from Monday to Friday). We investigated how often elderly patients with less urgent needs used ambulances during each time category.

As this epidemiological study did not include personal data, approval from the institutional ethical committee was not obtained. However, this study was performed according to the ethical standards of the Helsinki Declaration.

## Results

In total, 16,326 patients were transported to a hospital

via ambulance from January 1, 2004 to December 31, 2006. Of these, 7,800 (47.8%) patients were aged 65 years or older. The average age of these patients was  $77.9 \pm 8.1$  years, and 45.0% (3,508) were men.

The 75-79-year age group comprised the highest number of patients (Fig. 1). The 70-74-year age group had the highest number of men, and the 80-84-year age group had the highest number of women. The number of men decreased gradually after the age 80 years, and no male patients were older than 100 years.

Of the selected 7,800 cases, 4,165 patients (53.4%) were hospitalized, 3,354 patients (43.0%) were discharged and treated as outpatients, 250 patients (3.2%) died, and 31 patients (0.4%) were transferred to another hospital (Fig. 2). The initial emergencies included "Injury, poisoning and certain other consequences of external causes" as the most common diagnostic category according to the organ-based classification in the ICD-10 (Fig. 3). The second most common category for initial emergencies was "Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified" in the ICD-10 (Table 1). LUC accounted for 1,544 cases (Table 2), representing 19.8% of elderly ED cases (Fig. 4). Thus, among the 3,354 patients who were treated as initial emergency cases, 1,544 (46.0%) patients were LUC.

We then analyzed the time zones of emergency department visits by 1,544 patients classified as LUC. The number of patients transported by ambulance during normal primary care clinic operating hours (time zone A) was 289, accounting for 18.7% of all LUC (Fig. 5). In time zones B and C, the numbers of patients transported by ambulance were 517 (33.5%) and 486 (31.5%), respectively. Time zones B and C comprised 1,003 (65.0%) patients. These patients would not have used ambulance services if they had access to nighttime and holiday emergency clinics. In addition, 252 patients (16.3%) were transported when

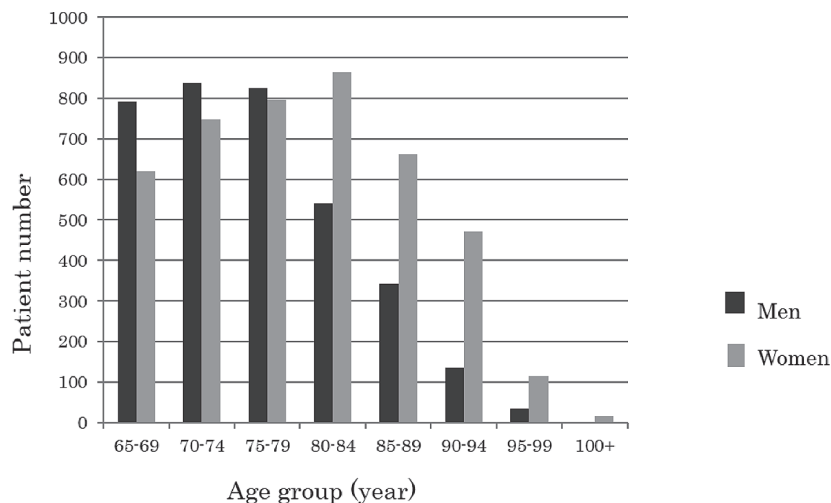


Fig. 1. Number of patients according to sex and age group.

The number of men in the 65-79-year old age group was higher than that of women in the same age group, while the number of women over 80 years was higher than that of men in the same age group.

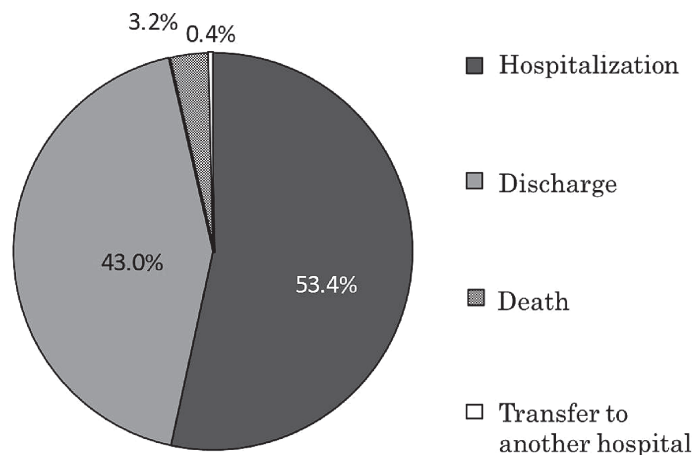


Fig. 2. Patient outcomes after the emergency department visit. In Japan, the discharged group is classified as having received initial emergency care.

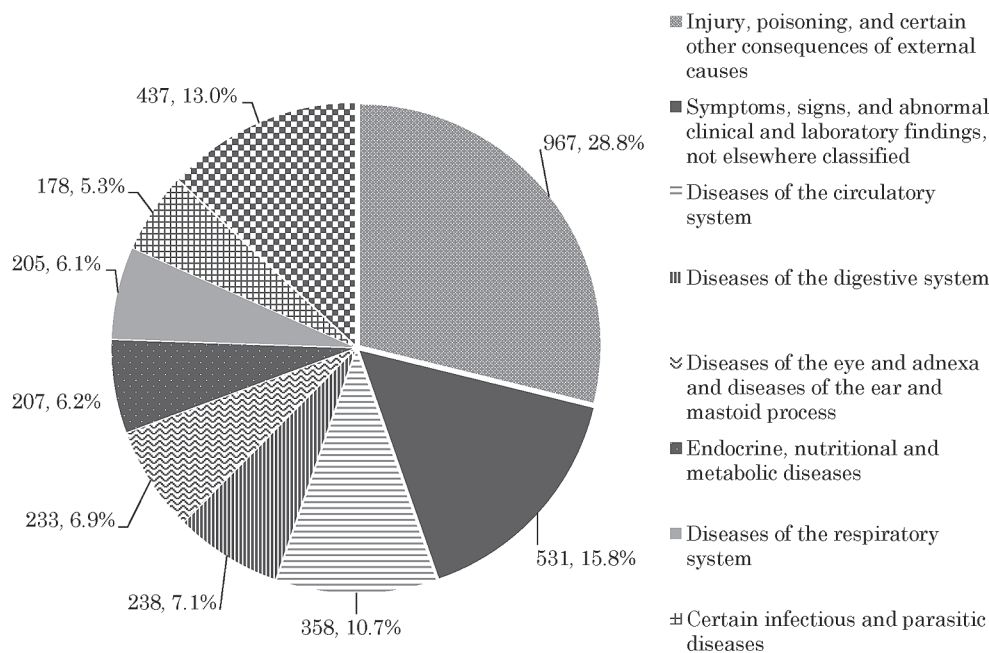


Fig. 3. Classification of initial diagnoses using ICD-10 in initial emergencies. “Injury, poisoning, and other external causes” was the most common cause in elderly initial emergency cases. ICD, International Classification of Diseases.

patients would have to wait for the primary care clinic to open (time zone D). Time zones A and D collectively comprised 541 patients (35.0% of the total patients with LUC). These patients may have used ambulance services owing to behavioral or social problems.

### Discussion

The percentage of elderly patients transported via ambulance accounted for almost half of the total cases. The proportion of the aging population is rapidly increasing, and elderly individuals will be the major focus of emergency medicine in the future (Schumacher 2005; Wilber et al. 2006).

Elderly patients requiring emergency services have a

high hospitalization rate, with a poor prognosis and prolonged hospital stay. They also represent a significant burden on the emergency medical system (Schumacher et al. 2006). A high proportion of these initial emergency cases are LUC (Iwai et al. 2008), but this does not mean that elderly patients used the ED services inappropriately (Salvi et al. 2007). To better understand whether the use was inappropriate, it was necessary to extract true LUCs from emergency cases.

Among the initial emergencies, “Injury, poisoning and certain other consequences of external causes” was the most common reason for seeking treatment, according to ICD-10 organ-based classification. This is in contrast to previous studies reporting circulatory diseases as the most

Table 1. Details of the second most common diagnostic category in elderly patients who visited emergency departments (symptoms, signs, and abnormal clinical and laboratory findings not elsewhere classified).

Rank	ICD-10 Code	Disease	Patient number
1	R55	Syncope and collapse	137
2	R074	Chest pain, unspecified	109
3	R040	Epistaxis	72
4	R33	Retention of urine	44
5	R002	Palpitations	30
6	R11	Nausea and vomiting	21
6	R51	Headache	21
8	R060	Dyspnea	20
8	R104	Abdominal pain	20
10	R252	Muscle cramp	19
11	R53	Malaise and fatigue	16
12	R509	Fever	10
		Others	12
		Total	531

ICD, International Classification of Diseases.

Table 2. Less urgent cases\* of the initial emergencies.

Rank	ICD-10 Code	Disease	Patient number	Percentile
1	A084	Viral intestinal infection, unspecified	168	10.88
2	E86	Volume depletion	108	6.99
3	K590	Constipation	79	5.12
4	R040	Epistaxis	71	4.60
5	I10	Essential hypertension	66	4.27
6	J069	Acute upper respiratory infection, unspecified	57	3.69
7	M545	Low back pain	53	3.43
8	G442	Tension-type headache	48	3.11
9	R33	Retention of urine	44	2.85
9	S008	Superficial injury of other parts of head	44	2.85
11	J45	Asthma	41	2.66
12	S300	Contusion of lower back and pelvis	37	2.40
13	N201	Calculus of ureter	36	2.33
14	N390	Urinary tract infection, site not specified	34	2.20
14	S202	Superficial injury of thorax	34	2.20
16	F453	Somatoform autonomic dysfunction	33	2.14
17	F41	Other anxiety disorder	31	2.01
18	R002	Palpitations	24	1.55
19	K25	Gastric ulcer	23	1.49
19	K291	Other acute gastritis	23	1.49
		Others	490	31.74
		Total	1,544	100.00

\*Less urgent cases were defined as conditions that could be diagnosed by primary care physicians.

ICD, International Classification of Diseases.

common (Hu et al. 1999; Aminzadeh and Dalziel 2002). This difference may be due to a variation in the degree of patient's needs. We focused on initial care, while previous studies included all emergency patients and did not focus

on disease severity. The high rate of traumatic injuries among the elderly might reflect falls due to age, lower-extremity weakness, instability of posture, and disturbances in balance. The second most common diagnostic category

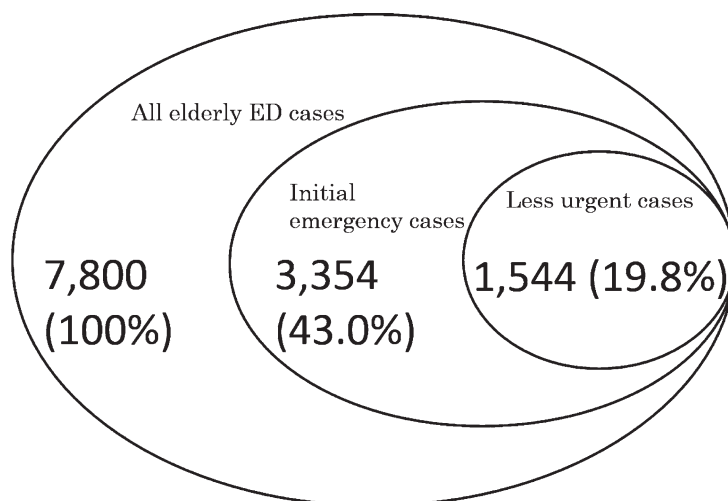


Fig. 4. The classification and severity of elderly ED cases, indicated by patient number and percentile. ED, emergency department.

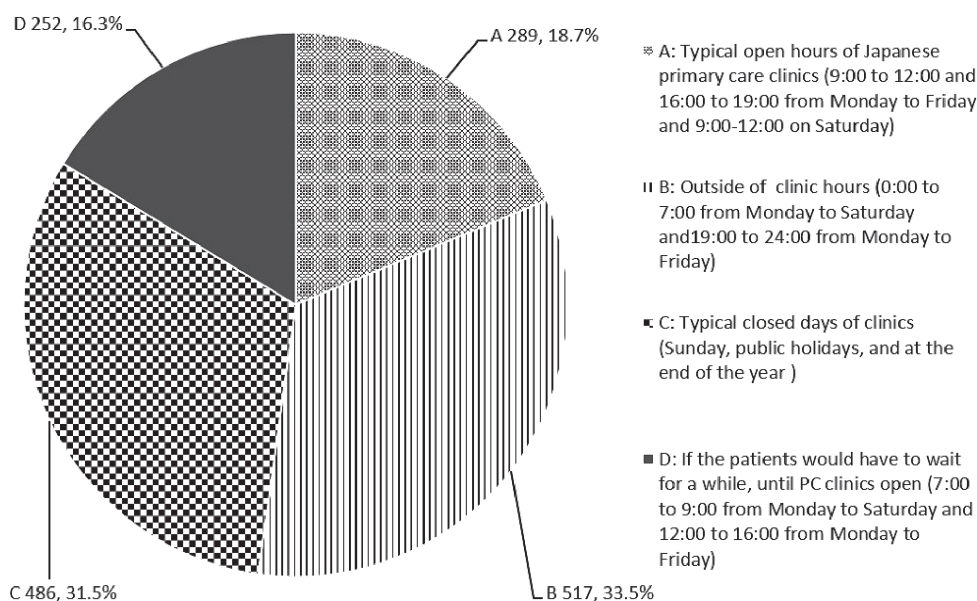


Fig. 5. Time of emergency department visits by elderly classified as less urgent cases.

was “Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified.” The details of this category are presented in Table 1. This category consists of signs and symptoms rather than any specific diseases, which may be due to inappropriate coding by emergency physicians. However, after considering the outcomes of discharged patients, all symptoms and signs were probably related to LUC.

LUC accounted for approximately half of the initial emergencies, although primary care physicians could treat these patients. These cases could be diagnosed using medical history taking and basic physical examinations with simple laboratory tests, including radiography, ultrasound, complete blood cell count, and urinalysis, all of which are usually performed at many Japanese primary care clinics.

Nevertheless, patients used ambulances and sought care at the ED. We analyzed this problem in relation to the patients’ visit times (Fig. 5). Surprisingly, even during normal primary care clinic operating hours (time zone A), 289 patients were transported by ambulance, while the 252 patients were transported when patients would have to wait for the primary care clinic to open (time zone D). The 541 patients in time zones A and D (35.0% of LUC) may have used ambulance services owing to behavioral or social problems, leading to inappropriate use of ambulance services. The 1,003 patients in time zones B and C (65.0% of LUC) would not have used ambulance services if nighttime and holiday emergency clinics were available. There is a need for awareness-raising interventions to prevent inappropriate ambulance use by patients with behavioral or



social problems (Ohshige 2008; Kawakami and Ohshige 2010).

Social problems surrounding elderly patients comprise a difficult issue. In Yao City, the number of solitary elderly individuals and couples is increasing, and this trend is expected to continue (Iwai et al. 2008). Some elderly patients living alone and classified as LUCs called ambulances owing to difficulty or inability to travel to the ED using their own or commercial vehicles. Many elderly patients also live in poverty and cannot perform activities of daily living because they are bedridden or receive insufficient care (Rutschmann et al. 2005; Iwai et al. 2008). These patients may have used the ambulance service reluctantly. This underscores a need to strengthen transport services to healthcare facilities other than ambulances.

We reviewed several previous studies on geriatric emergency medicine and primary care medicine and considered several measures to reduce inappropriate use of ambulance services from a long-term perspective. As a result, we suggest that increasing primary and secondary preventive interventions for diseases, including geriatric syndrome, will reduce the number of elderly emergency patients who use ambulance services inappropriately (Aminzadeh and Dalziel 2002; Caplan et al. 2004). After discharge from the ED, elderly patients have a high rate of adverse outcomes, including re-use of the ED, re-admittance to the hospital, and death (Salvi et al. 2007); in the current study, more than 40% of all elderly ambulance patients who were classified as having initial emergencies were discharged. House calls made by a primary care physician are expected to reduce adverse outcomes (Salvi et al. 2007). In Japan, it is expected that house calls will reduce the inappropriate use of ambulance services by elderly individuals, and the government has taken measures to implement this service (Fire and Disaster Management Agency 2014).

In summary, over the 3-year study period, 7,800 patients aged over 65 years admitted to the ED at our hospital used ambulance services. Of this population, 3,354 patients (43.0%) were classified as having initial emergencies, and 1,544 patients (19.8%) were LUCs. Among LUCs, 541 people (6.9%) may have used ambulance services somewhat inappropriately to address their ED transport needs. We conclude that 1,003 individuals (12.9%) in the current study could have avoided ambulance use if primary care clinics were accessible at night and on holidays. Depending on the severity of the disease, many different medical institutions may play a role in treatment; for example, primary care physicians may be able to take charge of initial emergency care (Grumbach et al. 1993; Thompson et al. 2013).

This study has important strengths: it was conducted with a large sample size and is the first detailed report in Japan of elderly patients having less urgent needs. However, there are also several limitations. First, since we were using a relatively old database with data from 2004 to

2006, the data may not accurately reflect the present situation. However, even in 2014, the situation of Japanese emergency medical care has not changed from that a decade ago; in fact, this problem has been aggravating further (Fire and Disaster Management Agency 2013). The older database was used because of the immediate need for detailed data on elderly patients classified as LUCs. Extrapolation of the data to explain the current situation requires additional analysis of the present results. Nevertheless, further investigation is needed. A second limitation is that the data were obtained from a single city center and cannot be generalized to other areas owing to institutional bias. Finally, although an initial diagnosis was provided at the first medical examination, diagnoses may have changed later in the patients' treatment course.

In conclusion, the proportion of the aging population is progressively increasing, and elderly patients will soon be the prime focus of emergency medicine. Our study focused on elderly patients with less urgent needs. Because of transportation problems, some of these patients may have inappropriately used ambulance services. Based on the present data, we suggest focusing on three important points to prevent the inappropriate use of emergency services. First, there is a need for awareness-raising interventions to prevent inappropriate ambulance use. Second, there is a need to strengthen transport services, other than ambulance use, to health care facilities. Finally, expanding primary care clinic operating hours may also be helpful.

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### Conflict of Interest

The authors declare no conflict of interest.

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