



# Emergency department patients who leave without being seen (LWBS): A population-based study in Veneto region, Italy

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## Abstract

Uncompleted visits in the emergency department are a patient safety concern and the two types of uncompleted visits are patients who leave without being seen (**LWBS**) by a physician and patients who leave the ED against medical advice.

This was a retrospective case-control study on administrative anonymous data using a population-based emergency department database including all patients admitted to 52 EDs of Veneto Region, North-East Italy, between 2011 and 2015.

The LWBS rate is 13.4%. Physician advice for ED admission and arriving by ambulance present major protective factors against LWBS. On the other hand the length of waiting time was the central issue for LWBS, justifying the high rate of hospitals with a large volume of ED activity and a consequent overcrowded environment.

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## Introduction

Emergency departments (**ED**) are becoming increasingly overcrowded, leading to longer waiting times and greater patient dissatisfaction, which are associated with patients leaving the ED prematurely [1,2].

Uncompleted visits in the emergency department are a patient safety concern and the two types of uncompleted visits are patients who leave without being seen (**LWBS**) by a physician and patients who leave the ED Against Medical advice (**AMA**).

There is a growing literature on patients who LWBS [3-8] perhaps because patients who LWBS are more common than patients who leave AMA, and LWBS visits are associated with

ED crowding [1,9-11].

Although it is commonly thought that patients who LWBS have non urgent medical problems, some studies have shown that they may actually require important medical attention on further consultation, such as hospitalization or surgery [3,4,12] and also, many patients who LWBS seek further medical care elsewhere [13]. As these patients may have important clinical outcomes and therefore require a critical treatment, the health system missed an opportunity of contact with these patients. The rate of patients who LWBS has been considered one of the most important performance indicators for EDs [6,14,15].

A number of studies from high income countries with a well-established primary health care system have reported a vari-



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able number of LWBS which ranges from <1% up to 20% of all ED visits [8,12,16-18].

Several factors have been found as being associated with LWBS such a slow acuity illness, young age, male sex and prolonged waiting time [5,11,13,19,20]. Additionally, the triage time, previous ED visits, seasonal variation, access to primary care, diversion status and ED overcrowding also have significant impact on LWBS [8,21-29].

## Methods

This was an observational retrospective case-control study based on administrative anonymous aggregated data using the regional ED database of Veneto Region, a 5 million inhabitants region of North-East Italy.

All patients admitted to 52 EDs of public and private hospitals, between 2011 and 2015 were included. EDs are connected within a regional hospital network constituted by: a) 7 "hub" hospitals with highly-specialized services located in the main cities, of which 2 university hospitals, b) 24 "spoke" hospitals, medium size, each serving an average population of 250,000 inhabitants, and c) 21 small local hospitals.

EDs were also classified on the ground of the annual number of admissions (< 25,000; 25,000-50,000; 50,000-75,000 and > 75,000).

Age, sex, citizenship and residence were established from the ED record for each episode of care and other aspects considered were about ED access and hospital characteristic.

The code at the check-in desk triage was assigned in accordance with level of need.

In order to obtain information about which factors affects more the probability of LWBS a Chi-squared analysis on contingency tables was performed. Moreover, ORs and 95% confidence interval were calculated.

## Results

Overall 9,147,415 patients attended the EDs of Veneto Region from 2011 to 2015, and the LWBS rate is 13.4%.

Sex and age distribution of patients are shown in **Table 1**. The probability of self-discharge is higher for the patients aged 15-24 (OR: 1.07; CI95%: 1.05-1.09;  $p < 0.05$ ) followed by subsequent group (25-44 years) took as reference due to its representativeness (25%).

Hospital admissions of newborns represent the 2% of the sample and they show an extremely contained LWBS risk (OR: 0.53; CI95%: 0.15-0.16;  $p < 0.05$ ). Moreover, it is evident how advanced age is associated with a lower risk of uncompleted visits.

The majority of ED accesses was in the Local Health Unit (LHU) of patients' residence (71%) and there was a risk of LWBS lower for the ones who access to ED of the LHU of residence (11.7%) showing how the proximity of patients' homes represents a protective factor against LWBS.

The probability of LWBS increases with distance, achieving the highest value in the ones resident abroad (OR: 1.96; CI95%: 1.90-2.02;  $p < 0.05$ ) and also in strangers (OR: 1.61; CI95%: 1.59-1.74;  $p < 0.05$ ).

As shown in **Table 2**, the vast majority of patients arrives to

the hospital by own decision (72%) and by their own means of transport (86%). Physician advice for ED admission (OR: 0.58; CI95%: 0.57-0.59;  $p < 0.05$ ) and arriving by ambulance (OR: 0.41; CI95%: 0.40-0.42;  $p < 0.05$ ) represent major protective factors against LWBS.

After stratifying self-discharge risk by underlying medical conditions and subsequent attribution of emergency level, it is of particular interest to notice, as expected, an association between seriousness of illness and LWBS ( $\chi^2$  for trend: 29044.455;  $p < 0.05$ ).

Another protective factor resulted to be the traumatic pathology as cause of access (OR: 0.82; CI95%: 0.81-0.83;  $p < 0.05$ ) present in 30% of overall access.

After stratifying the sample by waiting time, 77% of patients were evaluated within 1 hour and 90% within 2 hours. It comes to light that waiting time represents a significant determinant for leaving ED. This association resulted to be significant ( $\chi^2$  for trend: 161335.676;  $p < 0.05$ ), highlighting how a waiting time of more than 4 hour is strongly associated with an elevated risk of LWBS (OR: 12.9; CI95%: 12.71-13.13;  $p < 0.05$ ).

As shown in **Table 3**, an increase in ED volume of activity correlates with an increase in LWBS ( $\chi^2$  for trend: 283883.120;  $p < 0.05$ ). Data regarding private hospitals could explained this trend (OR: 0.62; CI95%: 0.61-0.63;  $p < 0.05$ ): three private hospitals out of six included in the analysis reported less than 25,000 ED admissions per year and the other three between 25,000 and 50,000 ED admissions per year.

A similar trend is followed by data regarding hospitals' role in the regional network: 5 of 7 Hub hospitals, where the highest risk for self-discharge is reported (OR: 2.02; CI95%: 1.99-2.06;  $p < 0.05$ ), have a volume of access constantly greater than 75,000 admission per year.

## Discussion

This study draws attention to the fact that uncompleted care pathways due to self-discharge not only affect hospital admissions [29], but also ED admission. This can be identified as a consistent indicator of quality of care in the same hospitals and risks associated with healthcare activities.

The rate of LWBS shown in this study (13.4%) is one of the lowest in literature [8,12,16-18].

Young adults (18-39 year old) were the most likely to LWBS, as it was shown in other studies, and foreigners may be using the ED as a source of primary care, given the finding that most LWBS visits are of low acuity.

As in other studies, higher-acuity visits (high triage priority, high pain level, ambulance arrival) were less likely to LWBS [5,12,21].

Data demonstrated that the length of waiting time was the central issue for LWBS, and justifies the high rate of hospitals with a large volume of ED activity and a consequent overcrowded environment, as widely described elsewhere [26-28].

This observational study suggests that patients who leave ED without been seen represent a small but important subgroup of ED patients and identifies the main risk factors for this phenomenon. It would also be beneficial to further evaluate what happen to LWBS patients in a prospective follow-up study.

In the light of a relative lack of studies and information on Italian situation this study provides useful evidence in order to sharpen up strategies and interventions against LWBS.

## Tables

	ED accesses	%	N° LWBS	LWBS ‰	OR	CI95%	p
<b>Gender</b>							
Female	4,486,308	49%	63,045	14.1	1		
Male	4,661,107	51%	76,788	16.5	1.18	1.16-1.19	<0.05
<b>Age (yrs)</b>							
0	188,704	2%	1,920	10.2	0.53	0.50-0.55	<0.05
1-5	643,686	7%	6,968	10.8	0.56	0.55-0.58	<0.05
6-14	606,733	7%	7,083	11.7	0.61	0.59-0.62	<0.05
15-24	800,309	9%	16,280	20.3	1.07	1.05-1.09	<0.05
25-44	2,308,377	25%	44,047	19.1	1		
45-64	1,994,940	22%	28,980	14.5	0.76	0.75-0.77	<0.05
65-74	990,328	11%	8,725	8.8	0.46	0.45-0.47	<0.05
75-84	1,033,817	11%	6,545	6.3	0.33	0.32-0.34	<0.05
85	580,521	6%	2,171	3.8	0.19	0.19-0.20	<0.05
<b>Residency</b>							
Same LHU	6,473,783	71%	75,395	11.7	1		
Veneto Region	2,075,420	23%	34,849	16.8	1.45	1.43-1.47	<0.05
Other region	395,526	4%	7,893	20	1.73	1.69-1.77	<0.05
Abroad	202,686	2%	4,582	22.6	1.96	1.90-2.02	<0.05
<b>Citizenship</b>							
Italy	7,849,343	86%	96,991	12.4	1		
Abroad	1,298,072	14%	25,728	19.8	1.61	1.59-1.74	<0.05

LHU: Local Health Unit

**Table 1:** Veneto Region 2011-2015. LWBS distribution by socio-demographic factors.

	ED accesses	%	N° LWBS	LWBS ‰	OR	CI95%	p
<b>Admission mode</b>							
Ambulance	1,259,112	14%	7,523	6	0.41	0.40-0.42	<0.05
Byself	7,888,303	86%	115,196	14.6	1		
Referred by Physician	2,535,103	28%	22,447	8.9	0.58	0.57-0.59	<0.05
Own Decision	6,612,312	72%	100,272	15.2	1		
<b>Emergency level</b>							
Not reported	182,132	2%	4,238	23.3	1.12	1.08-1.15	<0.05
1. Emergent	133,891	1%	169	1.3	0.06	0.05-0.07	<0.05
2. Urgent	1,562,065	17%	3,797	2.4	0.11	0.11-0.12	<0.05
3. Low acuity	4,124,388	45%	48,738	11.8	0.56	0.55-0.57	<0.05
4. Not acuity	3,144,939	34%	65,777	20.9	1		

Waiting Time (hrs)							
<1	7,025,159	77%	60,480	8.6	1		
1–2	1,213,763	13%	16,779	13.8	1.61	1.58-1.64	<0.05
2–3	483,366	5%	14,068	29.1	3.45	3.38-3.51	<0.05
3–4	212,532	2%	9,930	46.7	5.64	5.52-5.76	<0.05
>4	212,595	2%	21,462	101	12.9	12.71-13.13	<0.05
Type of complaint							
Trauma	2,733,345	30%	36,324	13.3	0.82	0.81-0.83	<0.05
no trauma	6,414,070	70%	103,509	16.2	1		

**Table 2:** Veneto Region 2011-2015. LWBS distribution by characteristics of accesses.

	ED accesses	%	N° LWBS	LWBS %	OR	CI95%	p
Type of hospital							
Private	659,144	7%	6,815	10.3	0.75	0.74-0.77	<0.05
Public	8,488,271	93%	115,904	13.7	1		
Territory served							
Hub	2,979,227	33%	59,670	20.045	2.02	1.99-2.06	<0.05
Spoke	4,510,443	49%	46,462	10.314	1.03	1.01-1.05	<0.05
Integrative	1,657,745	18%	16,587	10.014	1		
University							
Yes	1,242,581	14%	26,173	21.077	1.74	1.72-1.76	<0.05
No	7,904,834	86%	96,546	12.227	1		
Volume of access							
<25,000	1,310,776	14%	11,239	8.6	1		
25,000-50,000	4,053,574	44%	48,181	11.9	1.39	1.36-1.42	<0.05
50,000-75,000	1,446,234	16%	21,263	14.7	1.73	1.69-1.77	<0.05
>75,000	2,336,831	26%	42,036	18	2.12	2.07-2.16	<0.05

**Table 3:** Veneto Region 2011-2015. LWBS distribution by Hospital's characteristics.

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