

Uncompleted Emergency Department Care (UEDC): a 5-year population-based study in the Veneto Region, Italy

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Keywords

Health care management • Emergency department • Quality of care

Summary

Introduction. Uncompleted visits to emergency departments (UEDC) are a patient safety concern. The purpose of this study was to investigate risk factors for UEDC, describing not only the sociodemographic characteristics of patients who left against medical advice (AMA) and those who left without being seen (LWBS), but also the characteristics of their access to the emergency department (ED) and of the hospital structure.

Methods. This was a cross sectional study on anonymized administrative data in a population-based ED database.

Results. A total of 9,147,415 patients attended EDs in the Veneto Region from 2011 to 2015. The UEDC rate was 28.7‰, with a slightly higher rate of AMA than of LWBS (15.3‰ vs 13.4‰). Age, sex, citizenship, and residence were sociodemographic fac-

tors associated with UEDC, and so were certain characteristics of access, such as mode of admission, type of referral, emergency level, waiting time before being seen, and type of medical issue (trauma or other). Some characteristics of the hospital structure, such as the type of hospital and the volume of patients managed, could also be associated with UEDC.

Conclusion. Cases of UEDC, which may involve patients who leave AMA and those who LWBS, differ considerably from other cases managed at the ED. The present findings are important for the purpose of planning and staffing health services. Decision-makers should identify and target the factors associated with UEDC to minimize walkouts from public hospital EDs.

Introduction

Emergency departments (EDs) are becoming increasingly overcrowded, with patients waiting longer to be seen and becoming more dissatisfied, and sometimes leaving the ED prematurely [1, 2].

Cases of uncompleted emergency department care (UEDC) are a patient safety concern. There are two types of UEDC, one involving *patients who leave without being seen* (LWBS) by a physician, and the other concerning patients who leave *against medical advice* (AMA).

There is a growing body of literature on patients who LWBS [3-8], possibly because such cases are more common than patients who leave AMA, and because LWBS events are associated with ED overcrowding [1, 9-11].

While it is commonly believed that patients who LWBS may have medical problems that are not really urgent, some studies have shown that they may actually require hospitalization and surgery on further consultation [3, 4, 12], and also that many patients who LWBS seek medical attention elsewhere [13]. As such cases may have severe clinical outcomes and subsequently require critical treatment, health systems may miss an opportunity to make contact with these patients. The rate of patients who LWBS has been judged one of the most important performance indicators for EDs [6, 14, 15].

Several studies from high-income countries with well-established primary health care systems have reported LWBS rates ranging from less than 1% to 20% of all arrivals at EDs [8, 12, 16-18].

Several factors have been found associated with cases of LWBS and AMA, such as low-acuity illness, young age, male sex, and long waiting times [5, 11, 13, 19, 20]. Triage times, previous ED visits, seasonal variations, accessibility of primary care, and ED overcrowding have also revealed a significant impact on LWBS rates [8, 21-25]. The purpose of this study was to further investigate the risk factors for UEDC, describing not only the sociodemographic characteristics of the patients (both those who left AMA and those who LWBS), but also how they accessed the emergency services, and the characteristics of the EDs and hospitals involved.

Methods

This was a cross-sectional study on anonymized administrative data in a population-based ED database [26].

All patients admitted to EDs at public and private hospitals in the Veneto Region, in north-east Italy, between 1 January 2011 and 31 December 2015 were included in the sample. During the period investigated, there were 52 EDs in the Veneto Region, 46 of them public and 6

private. Healthcare facilities are connected within a regional hospital network comprising: a) 7 “hub” hospitals with highly-specialized services located in the main cities, 2 of which are university hospitals; b) 24 medium-sized “spoke” hospitals, each serving an average population of 250,000; and c) 21 small local hospitals.

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

Information on patients’ age, sex, citizenship, and residence were extracted from the ED records for each episode of care. The mode of access to the EDs and the characteristics of the hospitals were also taken into account.

The triage codes assigned to patients at the check-in desk featured four emergency levels, based on the level of assistance required, and its urgency.

Finally, to compare the UEDC rates, the LWBS and AMA rates were calculated separately. These analyses give an extension of previous data evaluating only LWBS phenomena [27].

Odds ratios (ORs) and 95% confidence intervals (95%CI) were calculated to shed light on which factors most affected the probability of LWBS or AMA events.

ETHICAL ISSUES

The study was conducted on data routinely collected by the health services in anonymized records with no chance of individuals being identified. The data analysis was performed on aggregated data. The data in the Local Health Authority registries are recorded with the patient’s consent, and can be used as aggregated data for scientific studies without further authorization (*Garante per la protezione dei dati personali*, Resolution of 1 March 2012, n. 85). The study complies with the Declaration of Helsinki, and with the Italian Decree n. 196/2003 on the protection of personal data.

Results

A total of 9,147,415 patients attended the EDs of the Veneto Region from 2011 to 2015. The UEDC rate among them was 28.7%, and there were slightly more patients who left AMA than those who LWBS (15.3% vs 13.4%; OR 1.14; 95%CI 1.13-1.15; $p < 0.05$). There were more males than females among the cases of UEDC (OR 1.18; 95%CI 1.18-1.19; $p < 0.05$); and the average age was higher among the female patients (F 47.2 vs. M 43.5; $p < 0.05$).

Table I shows the sex and age distribution of the UEDC patients. The probability of self-discharge was higher for patients 15-24 years old (OR 1.06; 95%CI 1.05-1.07; $p < 0.05$), followed by the group 25-44 years old (taken for reference because it was the most represented, accounting for 25% of the whole sample). The AMA and LWBS risk distribution by age group was similar except for the very young and the very old. ED admissions involving newborn infants accounted for 2% of the sample and were associated with the highest risk of patients leaving AMA (OR 1.19; 95%CI 1.15-1.23; $p < 0.05$), as opposed to a distinctly low

risk of their LWBS (OR 0.53; 95%CI 0.15-0.16; $p < 0.05$). Advanced age was clearly associated with a very low risk of UEDC. The majority of patients attended an ED at the Local Health Unit nearest their home (71%) and the risk of self-discharge was lower for people who lived in the area served by the same unit, while it increased with distance, becoming highest for patients who lived abroad (OR 2.59; 95%CI 2.54-2.64; $p < 0.05$).

Foreign citizenship was associated with UEDC: the risk of patients leaving AMA was almost twice among foreigners (OR 1.95; 95%CI 1.93-1.98; $p < 0.05$).

As shown in Table II, the vast majority of patients arrived at the ED at their own discretion (72%), and with their own means of transport (86%). ED admissions on the advice of a physician (OR 0.71; 95%CI 0.71-0.72; $p < 0.05$) or by ambulance (OR 0.58; 95%CI 0.58-0.59; $p < 0.05$) were major protective factors against self-discharge, particularly for LWBS events.

As expected, after stratifying the UEDC risk by underlying medical conditions and levels of urgency at the time of triage, there was an association between the severity of a patient’s condition and how their visit to the ED concluded, both overall ($p < 0.05$), and for patients LWBS ($p < 0.05$). Another factor protecting against UEDC events, though more for AMA than for LWBS, was trauma as a reason for accessing the ED (OR 0.79; 95%CI 0.79-0.80; $p < 0.05$), which was the case for 30% of all patients accessing these services.

As regards waiting times, 77% of patients were examined within 1 hour of arrival, and 90% within 2 hours. It emerged that the waiting time was an important significant determinant of UEDC events. The statistical association was significant ($p < 0.05$), underscoring that having to wait for more than 4 hours was associated with a high risk of patients LWBS (OR 12.9; 95%CI 12.71-13.13; $p < 0.05$).

As shown in Table III, EDs with higher volumes of activity correlated with higher rates of UEDC (X2 trend: 283883,120; $p < 0.05$), both for AMA and LWBS events. The data regarding private hospitals reflected this trend (OR 0.62; 95%CI 0.61-0.63; $p < 0.05$): 3 of the 6 private hospitals included in our analysis reported fewer than 25,000 ED admissions a year, while the other 3 had between 25,000 and 50,000 ED admissions a year.

A similar trend emerged for the hospitals’ role in the regional network: 5 of 7 hub hospitals always had more than 75,000 ED admissions a year, and it was these hospitals that reported the highest risk of self-discharge (OR 2.33; 95%CI 2.30-2.36; $p < 0.05$). Teaching hospitals also carried a higher risk of UEDC than other hospitals.

Discussion

Age, sex, citizenship, and residence are sociodemographic factors associated with UEDC. Some characteristics of access to ED services, such as mode of admission, type of referral, emergency level, waiting time, and type of medical issue (trauma vs other) also influence UEDC rates, and so certain features of the hospitals con-

Tab 1. Uncompleted emergency department care by sociodemographic factors.

	ED contacts	p%	N° UEDC	P% UEDC	OR	95%CI	p	N° AMA	P% AMA	OR	95%CI	p	N° LWBS	P% LWBS	OR	95%CI	p	
Gender																		
Female	4486308	49%	118028	26.3	1			54983	12.3	1			63045	14.1	1			
Male	4661107	51%	144524	31.0	1.18	1.18-1.19	p < 0.05	67736	14.5	1.19	1.18-1.20	p < 0.05	76788	16.5	1.18	1.16-1.19	p < 0.05	
Age																		
0 Y	188704	2%	6085	32.3	0.86	0.83-0.88	p < 0.05	4165	22.1	1.19	1.15-1.23	p < 0.05	1920	10.2	0.53	0.50-0.55	p < 0.05	
01-05 Y	643686	7%	19190	29.8	0.79	0.78-0.80	p < 0.05	12222	19.0	1.02	1.00-1.04	p > 0.05	6968	10.8	0.56	0.55-0.58	p < 0.05	
06-14 Y	606753	7%	16263	26.8	0.71	0.70-0.72	p < 0.05	9180	15.1	0.81	0.79-0.83	p < 0.05	7083	11.7	0.61	0.59-0.62	p < 0.05	
15-24y	800309	9%	31962	39.9	1.06	1.05-1.07	p < 0.05	15682	19.6	1.05	1.03-1.07	p < 0.05	16280	20.3	1.07	1.05-1.09	p < 0.05	
25-44y	2308377	25%	87138	37.8	1			45091	18.7	1			44047	19.1	1			
45-64 Y	1994940	22%	59064	29.6	0.78	0.77-0.79	p < 0.05	30084	15.1	0.81	0.79-0.82	p < 0.05	28980	14.5	0.76	0.75-0.77	p < 0.05	
65-74y	990328	11%	20859	21.1	0.56	0.55-0.56	p < 0.05	12134	12.3	0.65	0.64-0.67	p < 0.05	8725	8.8	0.46	0.45-0.47	p < 0.05	
75-84y	1053817	11%	16282	15.8	0.41	0.41-0.42	p < 0.05	9737	9.4	0.5	0.49-0.51	p < 0.05	6545	6.3	0.33	0.32-0.34	p < 0.05	
+85 Y	580521	6%	5709	9.9	0.26	0.25-0.27	p < 0.05	3538	6.1	0.32	0.31-0.34	p < 0.05	2171	3.8	0.19	0.19-0.20	p < 0.05	
Residence																		
Same LHU	6473783	71%	156482	24.2	1			81087	12.5	1			75395	11.7	1			
Veneto Region	2075420	23%	77225	37.2	1.56	1.55-1.57	p < 0.05	42376	20.4	1.64	1.62-1.66	p < 0.05	34849	16.8	1.45	1.43-1.47	p < 0.05	
Other region	395526	4%	16635	42.1	1.77	1.74-1.80	p < 0.05	8742	22.1	1.78	1.74-1.82	p < 0.05	7893	20.0	1.75	1.69-1.77	p < 0.05	
Abroad	202686	2%	12210	60.3	2.59	2.54-2.64	p < 0.05	7628	37.6	3.08	3.01-3.16	p < 0.05	4582	22.6	1.96	1.90-2.02	p < 0.05	
Citizenship																		
Italian	7849343	86%	203012	25.9	1			106021	13.5	1			96991	12.4	1			
Foreign	1298072	14%	59540	45.9	1.81	1.79-1.83	p < 0.05	33812	26.1	1.95	1.93-1.98	p < 0.05	25728	19.8	1.61	1.59-1.74		
Exemption from co-payment																		
No	8402314	92%	255891	30.5	1			134838	16.1	1			121053	14.4	1			
Yes	745101	8%	6661	8.9	0.29	0.28-0.29	p < 0.05	4995	6.7	0.41	0.40-0.43	p < 0.05	1666	2.2	0.15	0.15-0.16		

cerned, including the type of facility, and the volume of patient admissions.

The rate of UEDC found in this study (28.7%) is among the lowest to have been reported in the literature [8,12,16,17,18]. Unlike the trend reported in similar studies, the AMA rate was significantly higher than the LWBS rate, for both males and females [3-11]. Young adults were more likely to LWBS than to leave AMA, whereas the newborn were more likely to leave AMA. A possible explanation for this latter phenomenon lies in that such admissions often involve an important element of parents needing to be reassured [12]. The high rate of UEDC among foreigners could be explained by their going to an ED for primary care, bearing in mind that most LWBS cases are likely to be of low acuity. In fact, a previous study found that foreigners visiting the country, and those from high migration pressure countries were less likely than Italians to seek a primary care physician (family physicians, or doctors providing continuity of care), who should serve as the health system's gatekeepers and be consulted before seeking secondary healthcare services [28].

In line with other studies, higher-acuity visits (high triage priority, arrival by ambulance) were less likely to conclude with LWBS events [5, 12, 25]. This would again suggest that patients who LWBS have less urgent medical issues and may be at lower risk of complications. Research has shown a dose-response relationship between LWBS and triage level [29], with 0.1% of the highest-level patients and 15.2% of the lowest-level patients LWBS [8]. Another study found a 58.3 times higher risk of LWBS for non-urgent than for urgent triage levels [30]. In recent times, there has been a significant increase in ED attendance worldwide, relating largely to higher numbers of non-urgent cases. In Italy, for example, the

Tab. II. Uncompleted emergency department care by mode of access to EDs.

	N° access	%	N° UEDC	p% UEDC	OR	95%CI	p	N° AMA	p% AMA	OR	95%CI	p	N° LWBS	p% LWBS	OR	95%CI	p
Mode of admission																	
Ambulance	1259112	14%	22485	18.0	0.58	0.58-0.59	p < 0.05	14962	12.0	0.75	0.74-0.77	p < 0.05	7523	6.0	0.41	0.40-0.42	p < 0.05
By oneself	7888303	86%	240067	30.4	1			124871	15.8	1			115196	14.6	1		
Referral																	
Physician	2535103	28%	56646	22.4	0.71	0.71-0.72	p < 0.05	34199	13.5	0.84	0.83-0.85	p < 0.05	22447	8.9	0.58	0.57-0.59	p < 0.05
Own discretion	6612312	72%	205906	31.2	1			105634	16.0	1			100272	15.2	1		
Emergency level																	
Not reported	182132	2%	6265	34.4	0.8	0.78-0.82	p < 0.05	2027	11.1	0.5	0.48-0.53	p < 0.05	4238	23.3	1.12	1.08-1.15	p < 0.05
1. Very urgent	133891	1%	1776	14.0	0.32	0.30-0.33	p < 0.05	1607	12.7	0.57	0.54-0.60	p < 0.05	169	1.3	0.06	0.05-0.07	p < 0.05
2. Urgent	1562065	17%	18434	11.8	0.27	0.26-0.27	p < 0.05	14637	9.4	0.42	0.42-0.43	p < 0.05	3797	2.4	0.11	0.11-0.12	p < 0.05
3. Low acuity	4124388	45%	101448	24.6	0.56	0.56-0.57	p < 0.05	52710	12.8	0.58	0.57-0.59	p < 0.05	48738	11.8	0.56	0.55-0.57	p < 0.05
4. No acuity	3144939	34%	134629	42.8	1			68852	21.9	1			65777	20.9	1		
Waiting time																	
< 1 hours	7025159	77%	149798	21.4	1			89318	12.7	1			60480	8.6	1		
1-2 hours	1213763	13%	33738	27.8	1.31	1.30-1.33	p < 0.05	16959	14.0	1.1	1.08-1.12	p < 0.05	16779	13.8	1.61	1.58-1.64	p < 0.05
2-3 hours	483366	5%	24812	51.3	2.48	2.45-2.52	p < 0.05	10744	22.2	1.76	1.73-1.80	p < 0.05	14068	29.1	3.45	3.38-3.51	p < 0.05
3-4 hours	212532	2%	17568	82.7	4.13	4.06-4.20	p < 0.05	7638	35.9	2.89	2.82-2.96	p < 0.05	9930	46.7	5.64	5.52-5.76	p < 0.05
> 4 hours	212595	2%	36636	172.4	9.55	9.43-9.67	p < 0.05	15174	71.4	5.96	5.86-6.07	p < 0.05	21462	101.0	12.9	12.71-13.13	p < 0.05
Type of medical issue																	
Trauma	2733345	30%	66699	24.4	0.79	0.79-0.80	p < 0.05	30375	11.1	0.77	0.76-0.78	p < 0.05	36324	13.3	0.82	0.81-0.83	
No trauma	6414070	70%	195853	30.6	1			92344	14.4	1			103509	16.2	1		

Italian Society of Emergency Medicine (SIMEU) reported in 2010 that ED visits had risen by 5-6% a year over the previous 5 years, and this was partly as a consequence of inappropriate referrals by primary care physicians [31]. Strengthening primary healthcare can help to improve the equity, efficiency, effectiveness, and responsiveness of health systems [32-34] also reducing the inappropriate use of ED – especially by disadvantaged population groups [35].

Even if patients who LWBS have low-acuity conditions, many studies nevertheless report that approximately half of these patients will seek care elsewhere. On the other hand, an important proportion of patients may be sufficiently reassured by their triage assessment and no longer feel such an urgent need to seek medical advice. Although it would seem that care for patients triaged as non-urgent could be deferred, studies have found that such patients may still be genuinely ill [36]. It is notable, however, that 1% of the patients in our sample with the highest triage levels LWBS. As unexpected as this might seem, other studies also found that patients in the highest triage categories might still LWBS [36]. At the same time, the higher odds of LWBS events involving patients with non-traumatic conditions is to be expected given that most patients with injuries required acute attention, while those with a low acuity rating sought alternative medical care.

This study found a strong association between waiting time and the risk of UEDC, but waiting time did not appear to influence patients who left AMA as much as it did those who LWBS. The association between UEDC and waiting time, for LWBS events in particular, explains the high UEDC rates at hospitals with large volumes of ED admissions and consequent overcrowding, as amply described elsewhere [37-40]. Overcrowding is a well-known barrier affecting access to healthcare, and keeping ED waiting times short is fundamental to reducing the numbers of patients LWBS. These findings also highlight the importance of accurate triaging, as this clearly influences waiting times and the chances of a patient becoming a case of UEDC.

Other strategies could be implemented, however, to address the problem of UEDC. In fact, other studies found social issues fundamentally important, especially in such a sensitive environment as the ED,

Tab. III. Uncompleted emergency department care by characteristics of hospitals.

	N° access	%	N° UEDC	p% UEDC	OR	95%CI	p	N° AMA	p% AMA	OR	95%CI	p	N° LWBS	p% LWBS	OR	95%CI	p
Type of hospital																	
Private	659144	7%	12177	18.5	0.62	0.61-0.63	p < 0.05	5362	8.1	0.51	0.50-0.52	p < 0.05	6815	10.3	0.75	0.74-0.77	p < 0.05
Public	8488271	93%	250375	29.5	1			134471	15.9	1			115904	13.7	1		
Territory served																	
HUB	2979227	33%	124839	41.9	2.33	2.30-2.36	p < 0.05	65169	21.89	2.63	2.58-2.68	p < 0.05	59670	20.045	2.02	1.99-2.06	p < 0.05
Spoke	4510443	49%	107152	23.8	1.3	1.28-1.31		60690	13.47	1.61	1.58-1.64		46462	10.314	1.03	1.01-1.05	p < 0.05
Integrative of network	1657745	18%	30561	18.5	1			13974	8.436	1			16587	10.014	1		
University hospital																	
Yes	1242581	0,136	58588	47.2	1.87	1.85-1.89	p < 0.05	32415	26.1	1.94	1.92-1.97	p < 0.05	26173	21.1	1.74	1.72-1.76	p < 0.05
No	7904834	0,864	205964	25.8	1			107418	13.6	1			96546	12.2	1		
Annual volume of patients																	
< 25,000	1310776	14%	19701	15.0	1			8462	6.5	1			11239	8.6	1		
25,000-50,000	4053574	44%	115551	28.5	1.92	1.89-1.95	p < 0.05	67370	16.6	2.6	2.54-2.66	p < 0.05	48181	11.9	1.39	1.36-1.42	p < 0.05
50,000-75,000	1446234	16%	38608	26.7	1.8	1.77-1.83	p < 0.05	17345	12.0	1.86	1.82-1.91	p < 0.05	21263	14.7	1.73	1.69-1.77	p < 0.05
> 75,000	2356831	26%	88692	38.0	2.59	2.55-2.63	p < 0.05	46656	20.0	3.14	3.06-3.21	p < 0.05	42056	18.0	2.12	2.07-2.16	p < 0.05

where patients and those accompanying them are often in a state of physical pain and psychological distress. It is therefore worth considering architectural design features and other factors of the built environment in an effort to make waiting at the ED less stressful, and more comfortable [41, 42].

In conclusion, patients involved in UEDC, whether they leave AMA or LWBS, differ considerably from other patients admitted to EDs. It is important to bear these differences in mind when planning and staffing health services. Decision-makers should identify and target factors to minimize walkouts from public hospital EDs, taking a broad approach to the issues involved. Action could range from structural improvements to humanizing the services. For example, the Veneto Regional Authorities have introduced stewards (or assistants) to make attending the ED less stressful [43]: these assistants provide patients with information and advice, collect details from them, reporting them to the healthcare personnel if necessary, but mainly responding to the patient's need to have someone who will listen, understand, and provide information. This figure integrates, but does not replace the function of the healthcare personnel. It serves mainly to make contact with patients and prevent them from feeling abandoned. Another approach involves reducing inappropriate uses of EDs, which can generate UEDC phenomena. A greater continuity of care between primary and secondary healthcare services is associated with a lower risk of avoidable ED admissions. Integrating health care and social care services can help too. For example, the Veneto Regional Authorities have created territorial centers that operate around the clock to ensure continuity of care. These centers have a central role in the healthcare network, and are intended for people with special needs and their families or caregivers, who are particularly in need of care, assistance and support in the case of illness. The territorial centers also provide a functional link between health, social and other care facilities, with a view to humanizing the care process and ensuring the centrality of the individual in the delivery of such services [44].

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Conflicts of interest statement

None declared.

Authors' contributions

VB conceptualized the study, coordinated all study phases, and approved the final manuscript as submitted. AB reviewed and revised the manuscript, and approved the final manuscript as submitted. MF wrote the paper. RF draft paper and approved the final manuscript as submitted. CB coordinated data collection and approved the

final manuscript as submitted. MS conducted analyses, collected data and approved the final manuscript as submitted.

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