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Factors associated with inappropriate use of emergency departments: findings from a cross-sectional national study in France

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ABSTRACT

Background Inappropriate visits to emergency departments (EDs) could represent from 20% to 40% of all visits. Inappropriate use is a burden on healthcare costs and increases the risk of ED overcrowding. The aim of this study was to explore socioeconomic and geographical determinants of inappropriate ED use in France.

Method The French Emergency Survey was a nationwide cross-sectional survey conducted on June 11 2013, simultaneously in all EDs in France and covered characteristics of patients, EDs and counties. The survey included 48 711 patient questionnaires and 734 ED questionnaires. We focused on adult patients (≥15 years old). The appropriateness of the ED visit was assessed by three measures: caring physician appreciation of appropriateness (numeric scale), caring physician appreciation of whether or not the patient could have been managed by a general practitioner and ED resource utilisation. Descriptive statistics and multilevel logistic regression were used to examine determinants of inappropriate ED use, estimating adjusted ORs and 95% CIs.

Results Among the 29 407 patients in our sample, depending on the measuring method, 13.5% to 27.4% ED visits were considered inappropriate. Regardless of the measure method used, likelihood of inappropriate use decreased with older age and distance from home to the ED >10 km. Not having a private supplementary health insurance, having universal supplementary health coverage and symptoms being several days old increased the likelihood of inappropriate use. Likelihood of inappropriate use was not associated with county medical density.

Conclusion Inappropriate ED use appeared associated with socioeconomic vulnerability (such as not having supplementary health coverage or having universal coverage) but not with geographical characteristics. It makes us question the appropriateness of the concept of inappropriate ED use as it does not consider the distress experienced by the patient, and segments of society seem to have few other choices to access healthcare than the ED.

INTRODUCTION

Background

Several studies have underlined significant inequities in primary healthcare in selected Organisation for Economic Co-operation and Development countries.¹ In the context of healthcare system evaluation, hospital readmissions² as well as emergency department (ED) use for non-urgent care³⁻⁵ are indicators of suboptimal primary care delivery. Across Europe, different models of out-of-hours primary care exist^{6,7} and ED use must be considered among other unscheduled care options. Unscheduled care in France includes EDs but also general practitioners (GPs) performing home visits during the day time and out-of-hours or GPs with extended opening hours.⁸ In 2004, the French Head Office of Research, Studies, Evaluation and Statistics of the Social Affairs Ministry estimated that GPs performing home visits accounted for 5% of unscheduled care, and GPs with extended opening hours represented 11% of unscheduled care.⁹ However, a high number of avoidable ED visits still represent an issue.

Some have defined the use of ED resources for self-referred patients, with non-urgent conditions, which could have been handled by other services as primary care, pharmacies or telephone advice, as 'inappropriate'.¹⁰⁻¹² These patients use EDs to seek for immediate consultation, diagnostic tests and medication delivery to alleviate non-urgent symptoms.¹¹ However, classifying some ED visits as inappropriate raises the question of what should be considered appropriate or not and the underlying assumptions

of these decisions. Several studies have described that the distress experienced by the patient (defined as the lived experience and anxiety of the person seeking help in an ED) might contrast with the discharge diagnosis.^{13–17} From caregivers' perspectives, 'inappropriate' visits could represent from 20% to 40% of all ED visits,^{11 18–20} with the different estimates mostly determined by the definition used for appropriateness.^{11 21}

IMPORTANCE

Although they may appear appropriate from the patient's perspective, the 'inappropriate' ED visits may partly explain the steady increase in annual ED visits in France (13.6 to 21 million in less than 20 years)^{22 23} and worldwide.²⁴ They have been described as possibly related to overcrowding^{3 5 25} but with a negligible effect on waiting times for patients with more urgent needs.²⁶ However, they could possibly result in an additional burden on healthcare costs and have negative consequences on staff attitudes toward these patients.²⁷ In 2014, a French administrative report estimated 20% of ED visits as inappropriate, corresponding to an avoidable expenditure of about €500 million.²⁸

Recent studies have reported on substantial social disparities in health^{29–31} and healthcare access^{1 32} worldwide. From the patient perspective, the choice to self-refer to an ED (rather than an GP) depends on both individual characteristics (such as socioeconomic and health insurance coverage) and contextual factors, with the availability of primary care services possibly being one of the most important. Having a GP has been described as associated with reduced ED use at any age of life.^{33–36} Medical density (ratio of GPs to the total population of a given area³⁷) discrepancies might be involved in patient difficulties in obtaining a prompt appointment with a GP.⁴ Both social disparities in health and territorial healthcare access disparities could be associated cofactors explaining ED use.

Previous studies explored the socioeconomic factors that could be related to ED inappropriate usage,^{18 38–40} based on a sample of ED patients, but none examined the effect of territorial healthcare access disparities.

Goals of this investigation

The aim of our study was to explore the socioeconomic and territorial factors (ie, territorial healthcare access) associated with inappropriate ED use based on data from a national survey of French EDs. We hypothesised that some indicators of socioeconomic vulnerability and some local territorial features (such as medical density of counties) might be associated with inappropriate ED use.

METHODS

Study design and setting

As previously described,⁴¹ the French Emergency Survey (FES) was a nationwide cross-sectional survey, with a two-level design, aiming to depict emergency care in France by describing ED organisation and patients. The FES was developed by the French Society of Emergency Medicine and the French Head Office of Research, Studies, Evaluation and Statistics of the Social Affairs Ministry. Data were collected from 734 of the 736 adult and paediatric EDs listed for the French territory. All patients who had visited a French ED during the 24-hour inclusion period (Tuesday, 11 June 2013) were eligible for inclusion. The FES final database included data for 48 711 patients and 734 EDs, corresponding to a response rate of 94%.

Selection of participants

Among the 48 711 patients of the FES, we selected all patients ≥ 15 years old (the age for care in paediatric EDs versus adult EDs) who had presented to an ED in France (excluding overseas territories). We included all patients except the ones with missing data on all three main measures of ED use appropriateness.

Method of measurement

The methods of this study and the type of data collected were described in a previous publication.⁴¹ Briefly, the study took place on 11 June 2013, in all EDs in France. Data were collected from questionnaires concerning the organisation of the participating EDs (completed once by each ED administrator), patient characteristics (sociodemographic, usual use of the healthcare system and prior care procedures undertaken) and care management (completed by the emergency physician (EP) for each patient who presented to any of the surveyed EDs during the study period).

OUTCOME MEASURES

Measures of ED use appropriateness

To assess the appropriateness of ED visit, we used three different measures.

The first one (Appropriate Use Score Method) was assessed by the caring physician at the end of the ED visit. The physician had to answer the following question: 'According to you, how appropriate is this ED visit on a scale from 0 to 10 (0, totally not appropriate, to 10, totally appropriate)'. This continuous variable had a normal distribution. According to the literature, 20% to 40% of ED visits are considered inappropriate from EPs' perspective.^{18–20} After the analysis of our variable distribution, we found that 20% of the study population had a score < 4 . We therefore transformed our continuous appropriateness variable to a binary one and considered all visits with a score < 4 as inappropriate (corresponding to the 20% of the population with the lowest appropriateness of ED visits, according to the literature previously cited).

The second measure (Possible GP Use Method) was also assessed by the caring physician. The physician had to answer the following question: 'According to you, could the patient have been managed by a GP the same day or the next day?'—called « possible GP use » method. These two measures were subjective and based on EP's judgement at the end of ED visit, as previously described in several studies.^{18 20 42–51}

The last measure (Resource Utilisation Method) referred to ED resource utilisation. This method assesses urgency based on common resources used during the ED visit, including testing, therapeutics and hospital admission. This method assumes that ED visits of higher acuity necessitate greater use of healthcare resource. Resource use method has been used in several studies.^{52–54} Here, we defined inappropriate ED use as a patient who was discharged after ED visit and did not have any of the following criteria: admitted to the hospital, transferred to another hospital, deceased in the ED, diagnostic tests performed or treatments administered. As explained by Mistry *et al*,²¹ current literature suggests that resource utilisation method is the best feasible method for ED urgency assessment, taking into account the limited data.

MEASURED VARIABLES

Sociodemographic variables

The following sociodemographic variables were assessed by the survey: age (classified in 10-year age groups), sex, residence (home/institution/other (hotel, homeless, etc)), level of education (no high-school graduation/high-school graduation and higher), having a GP (yes/no) and employment status (employed/unemployed/inactive). According to the French National Institute for Statistics and Economic Studies definition, inactive work status included any person who was neither employed nor unemployed (students, retired, housewife, disabled). Patients were also asked about their health insurance coverage (none/state medical assistance/public health insurance) and supplementary health insurance coverage (none/private/universal health coverage (CMU-c)). In France, most healthcare costs are covered by the state under a public health insurance scheme. State medical assistance is available to people living in France for more than 3 months but for whom the application for legal residence has not been finalised and offers the same coverage as public health insurance. The copayment expenses must be paid by the patient or by any supplementary health insurance. In France, a large part of the population has private supplementary health insurance to cover reinsurable expenses not covered by public health insurance. Below a certain income threshold, individuals can benefit from a free complementary health insurance called the CMU-c.

ED visit-related variables

The following variables were assessed: presenting problem (medical complaint/traumatic injury), the onset of symptoms (the same day/>24 hours before), time of ED arrival (08:00–20:00/after 20:00) and type of care performed (blood tests/radiology imaging/therapeutic care/specialised advice). Reasons and motivations for ED visits were also recorded during the physician interview. They were then recoded by the physician in one or more modalities proposed in the questionnaire.

Variables related to ED as well as county and medical density

The following variables were included: annual visits for the ED visited (<15 000, 15 000–30 000, 30 000–45 000, >45 000), type of hospital (public academic/public non-academic/non-for-profit private/for-profit private), distance from home to ED (<10/>10 km) and county medical density of outpatient physicians (corresponding to the county number of specialists and GPs per 100 000 inhabitants). This county medical density was classified in three levels (low/medium/high) by the French National Medical Council (available on the French National Medical Council website⁵⁵). In 2013, low, medium and high levels corresponded to <302, 302–393 and >393 doctors per 100 000 inhabitants, respectively.

Primary data analysis

Categorical variables are expressed as number (%). χ^2 test was used to compare characteristics between patients with appropriate and inappropriate ED use. To analyse factors associated with inappropriate ED use (considering our three measures: appropriate ED use score, possible GP use method and resource utilisation method), adjusted ORs (aORs) and their 95% CIs were estimated from multilevel logistic regression models,^{56 57} which allowed us to consider the hierarchical structure of our data. We used multilevel logistic regression to account for the heterogeneity between EDs and to explain the appropriateness of ED use according to both patient and ED characteristics. First, we tested the non-adjusted model (the empty model), considering the cluster effect, but no explanatory variable. The aim of this first step was to confirm the possible intergroup heterogeneity and to justify the multilevel approach. Indeed, the intraclass correlation coefficients obtained in the empty model indicated, respectively, for the three measure methods that 12%, 6%, and 9% of the total variance of inappropriate ED use was explained by the ED level. We also tested the county level but did not find intergroup heterogeneity which justified a third level. Finally, we built the multilevel multivariate logistic regression model, adjusting for both patient and ED characteristics that were statistically significant on χ^2 analysis at $p < 0.20$ and included in the models. The nature

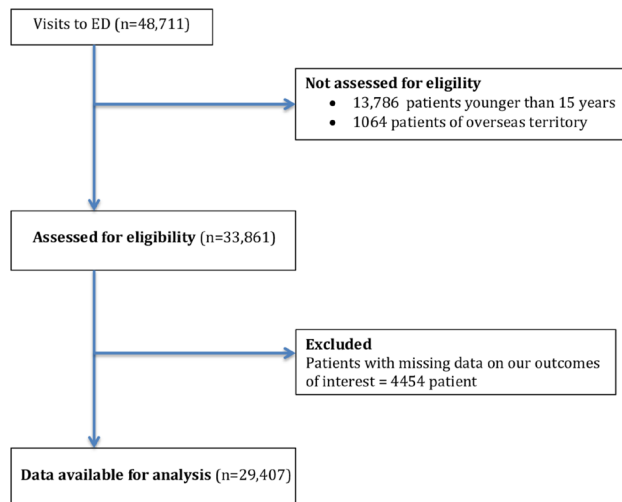


Figure 1 Flow chart. ED, emergency department.

of complaint was not included in our model because it is integral to whether a visit is appropriate or not (so the outcome would be represented on both sides of the equation). Sensitivity analyses had also been performed with a threshold for the Appropriate Use Score of 3 and 5. All statistical analyses involved using SAS/STAT 2002–2003 (SAS Institute, Cary, North Carolina, USA) and the GLIMMIX procedure. P value of <0.05 was considered statistically significant.

RESULTS

Study participants' characteristics

Among the 48 711 patients of FES, 29 407 were included in our study. Comparison between study population and patient excluded is available in online supplementary table 1. The study flow chart is shown in figure 1. About 48% (n=13 972) of participants were women and 87% (n=25 597) were living at home (table 1). Most patients (87.5%, n=25 719) had public health insurance, 71.5% (n=21 037) private supplementary health insurance, 7.2% (n=2126) CMU-c and 6.7% (n=1956) no supplementary health insurance (table 1).

For half of the participants (n=14 351), the symptoms had been present for <24 hours and the chief complaint concerned traumatic injuries for 30.8% (n=9068) (table 1). About 74% (n=21 751) of patients had consulted during the usual hours of outpatient care (08:00–20:00 hours).

Reasons and motivations for ED visits

The three most common motivations for the ED visit were because the patient had an accident (29.2%, n=8591), based on a doctor's advice (27.3%, n=8027) or because the patient felt that their problem needed to be dealt with promptly (26.9%, n=7919) (table 2). Almost 9% (n=2568) of patients reported being anxious and not knowing where to consult. About 7% (n=2087) and 5% (n=1429) of patients reported

having consulted an ED because it was faster than obtaining an appointment with their GP or because their GP was not available.

CHARACTERISTICS OF EDS AND COUNTIES

More than 80% of patients (80.7%; n=23 738) consulted an ED in a public hospital (academic and non-academic; table 3). About half (47%; n=13 811) sought care in an ED with $<30\,000$ visits per year and about 26% (n=7570) in an ED with $>45\,000$ visits per year. For 59.5% of patients (n=17 501), the distance from home to the ED was ≤ 10 km (table 1). County medical density was considered high and low for 51.7% (n=15 916) and 38.8% (n=11 695) of patients, respectively.

Appropriateness of ED use

Among the 29 407 patients, respectively, 23.6% (n=6938), 27.4% (n=8052) and 13.5% (n=3968) were considered to have inappropriate ED use considering the appropriateness score, possible GP use and resource utilisation. Overall, 1812 patients (6.16%) were considered inappropriate according to all method measures. Lack of availability of the GP, anxiety about knowing where to consult and the possibility of seeing a doctor after working hours and not paying for care were reported significantly more often by patients with inappropriate versus appropriate use, regardless of the measure method used ($p<0.0001$) (table 2).

MULTILEVEL LOGISTIC REGRESSION MODEL

Regardless of the measure method used, likelihood of inappropriate use decreased with age and distance from home to the ED >10 km (table 4). It also increased with female sex, patient's probability of not having reported a private supplementary health insurance, having universal supplementary health coverage and presenting symptoms several days old. Likelihood of inappropriate ED use did not seem associated with county medical density. Living in institution was associated with lower likelihood of inappropriate use considering possible GP use and resource utilisation but not appropriateness score. Having a GP was associated with lower likelihood of inappropriate use considering possible GP use but not with the appropriateness score and resource utilisation. Sensitivity analyses are available in online supplementary table 2. Results for a threshold of 5 are similar to the reference threshold of 4. Results for the threshold of 3 are quite similar to the reference threshold except for having a GP and number of annual visits for the ED visited.

DISCUSSION

In this study, we have investigated the socioeconomic and demographic factors associated with inappropriate ED use by including data from all EDs on a national scale and by using different types of measures of ED appropriateness use. Our results confirmed one of our

Table 1 Characteristics of study population

	Appropriate score method			Possible GP use method			Resourcetilisation method			
	Inappropriate ED use	Appropriate ED use	P value	Inappropriate ED use	Appropriate ED use	P value	Inappropriate ED use	Appropriate ED use	P value	Total
Patient characteristics	n=6938 (23.59)	n=22 469 (76.41)		n=8052 (27.38)	n=21 355 (72.62)		n=3968 (13.49)	n=25 439 (86.51)		N=29 407
Age, years, n (%)										
15–24	1665 (24.00)	3627 (16.14)	<0.0001	2018 (25.06)	3275 (15.33)	<0.0001	1012 (25.50)	4280 (16.82)	<0.0001	5292 (18.00)
25–34	1414 (20.38)	3615 (16.09)		1747 (21.70)	3282 (15.37)		931 (23.46)	4098 (16.11)		5029 (17.10)
35–44	1120 (16.14)	3191 (14.20)		1322 (16.42)	2989 (14.00)		703 (17.72)	3608 (14.18)		4311 (14.66)
45–54	929 (13.39)	2942 (13.09)		1056 (13.11)	2815 (13.18)		583 (14.69)	3288 (12.93)		3871 (13.16)
55–64	704 (10.15)	2573 (11.45)		774 (9.61)	2503 (11.72)		362 (9.12)	2915 (11.46)		3277 (11.14)
65–74	459 (6.62)	2002 (8.91)		479 (5.95)	1982 (9.28)		196 (4.94)	2265 (8.90)		2461 (8.37)
75–84	392 (5.65)	2492 (11.09)		399 (4.96)	2485 (11.64)		126 (3.18)	2758 (10.84)		2884 (9.81)
>85	255 (3.68)	2027 (9.02)		257 (3.19)	2025 (9.48)		55 (1.39)	2227 (8.75)		2282 (7.76)
Sex, n (%)										
Male	3447 (49.68)	11 635 (51.78)	0.0056	3963 (49.22)	11 119 (52.07)	<0.0001	2106 (53.07)	12 976 (51.01)	0.0086	15 082 (51.29)
Female	3397 (48.96)	10 575 (47.06)		3986 (49.50)	9986 (46.76)		1804 (45.46)	12 168 (47.83)		13 972 (47.51)
Missing data	94 (1.35)	259 (1.15)		103 (1.28)	250 (1.17)		58 (1.46)	295 (1.16)		353 (1.20)
Supplementary health insurance, n (%)										
None	590 (8.50)	1366 (6.08)	<0.0001	650 (8.07)	1306 (6.12)	<0.0001	341 (8.59)	1615 (6.35)	<0.0001	1956 (6.65)
Universal complementary health coverage	637 (9.18)	1489 (6.63)		755 (9.38)	1371 (6.42)		406 (10.23)	1720 (6.76)		2126 (7.23)
Private	4664 (67.22)	16 373 (72.87)		5614 (69.72)	15 423 (72.22)		2548 (64.21)	18 489 (72.68)		21 037 (71.54)
Missing data	1047 (15.09)	3241 (14.42)		1033 (12.83)	3255 (15.24)		673 (16.96)	3615 (14.21)		4288 (14.58)
Health insurance, n (%)										
None or state medical assistance	212 (3.06)	461 (2.05)	<0.0001	229 (2.84)	444 (2.08)	<0.0001	140 (3.53)	533 (2.10)	<0.0001	673 (2.29)
Public health insurance	6021 (86.78)	19 698 (87.67)		7161 (88.93)	18 558 (86.90)		3365 (84.80)	22 354 (87.87)		25 719 (87.46)
Missing data	705 (10.16)	2310 (10.28)		662 (8.22)	2353 (11.02)		463 (11.67)	2552 (10.03)		3015 (10.25)
Employed status, n (%)										
Employed	2860 (41.22)	8429 (37.51)	<0.0001	3641 (45.22)	7648 (35.81)	<0.0001	1737 (43.78)	9552 (37.55)	<0.0001	11 289 (38.39)
Unemployed	624 (8.99)	1438 (6.40)		695 (8.63)	1367 (6.40)		390 (9.83)	1672 (6.57)		2062 (7.01)
Inactive	2504 (36.09)	9702 (43.18)		2762 (34.30)	9444 (44.22)		1199 (30.22)	11 007 (43.27)		12 206 (41.51)
Missing data	950 (13.69)	2900 (12.91)		954 (11.85)	2896 (13.56)		642 (16.68)	3208 (12.61)		3850 (13.09)
Level of education, n (%)										
High-school graduation or less	4436 (63.94)	13 867 (61.72)	0.0026	5225 (64.89)	12 078 (61.24)	<0.0001	2446 (61.64)	15 857 (62.33)	0.4834	18 303 (62.24)
More than high school graduation	1048 (15.11)	3516 (15.65)		1328 (16.49)	3236 (15.15)		641 (16.15)	3923 (15.42)		4564 (15.52)
Missing data	1454 (20.96)	5086 (22.64)		1499 (18.62)	5041 (23.61)		881 (22.20)	5659 (22.25)		6540 (22.24)

Continued

Table 1 Continued

	Appropriate score method			Possible GP use method			Resourcetilisation method			
	Inappropriate ED use	Appropriate ED use	P value	Inappropriate ED use	Appropriate ED use	P value	Inappropriate ED use	Appropriate ED use	P value	Total
Residence, n (%)										
Home	6100 (87.92)	19497 (86.77)	<0.0001	7299 (90.65)	18298 (85.68)	<0.0001	3477 (87.63)	22129 (86.95)	<0.0001	25597 (87.04)
Institution	163 (2.35)	892 (3.97)		142 (1.76)	913 (4.28)		49 (1.23)	1006 (3.95)		1055 (3.59)
Other	675 (9.73)	2080 (9.26)		611 (7.59)	2144 (10.04)		442 (11.14)	2313 (9.09)		2755 (9.37)
Having a GP, n (%)										
Yes	5930 (85.47)	19816 (88.19)	<0.0001	7025 (87.25)	18721 (87.67)	<0.0001	3222 (81.20)	22524 (88.54)	<0.0001	25746 (87.55)
No	603 (8.69)	1334 (5.94)		665 (8.26)	1272 (5.96)		387 (9.75)	1550 (6.09)		1937 (6.59)
Missing data	405 (5.84)	1319 (5.87)		362 (4.50)	1362 (6.38)		359 (9.05)	1365 (5.37)		1724 (5.86)
ED visit characteristics										
Chief complaint of ED visit, n (%)										
Medical complaint	4622 (66.62)	13107 (58.33)	<0.0001	5250 (65.20)	12479 (58.44)	<0.0001	2702 (68.09)	15027 (59.07)	<0.0001	17729 (60.29)
Traumatic injury	1746 (25.16)	7322 (32.59)		2335 (29.00)	6733 (31.53)		773 (19.48)	8295 (32.61)		9068 (30.84)
Missing data	570 (8.22)	2040 (9.08)		467 (5.80)	2143 (10.04)		493 (12.42)	2117 (8.32)		2610 (8.88)
Onset of complaint, n (%)										
The day of ED visit	2638 (38.02)	11713 (52.13)	<0.0001	3577 (44.42)	10774 (50.45)	<0.0001	1607 (40.50)	12744 (50.10)	<0.0001	14351 (48.80)
Before the day of ED visit	3773 (54.38)	8866 (39.46)		4058 (50.40)	8581 (40.18)		1907 (48.06)	10732 (42.19)		12639 (42.98)
Missing data	527 (7.60)	1890 (8.41)		417 (5.18)	2000 (9.37)		454 (11.44)	1963 (7.72)		2417 (8.22)
Time of ED arrival, n (%)										
08:00–20:00	5069 (73.06)	16682 (74.24)	0.0496	5731 (71.17)	16020 (75.02)	<0.0001	2689 (67.77)	19062 (74.93)	<0.0001	21751 (73.97)
20:00–08:00	1869 (26.94)	5787 (25.76)		2321 (28.83)	5335 (24.98)		1279 (32.23)	6377 (25.07)		7656 (26.03)
Distance from home to ED, n (%)										
≤10 km	4372 (63.02)	13129 (58.43)	<0.0001	5102 (63.36)	12399 (58.06)	<0.0001	2601 (65.55)	14900 (58.57)	<0.0001	17501 (59.51)
>10 km	2386 (34.39)	8740 (38.90)		2751 (34.17)	8375 (39.22)		1267 (31.93)	9859 (38.76)		11126 (37.83)
Missing data	180 (2.59)	600 (2.67)		199 (2.47)	581 (2.72)		100 (2.52)	680 (2.67)		780 (2.65)
Type of resources used, n (%)										
Radiological imaging	2052 (29.58)	12681 (56.44)	<0.0001	2527 (31.38)	12206 (57.16)	<0.0001	**	**	**	14733 (50.10)
Blood tests	1511 (21.78)	11328 (50.42)	<0.0001	1940 (24.09)	10899 (51.04)	<0.0001	**	**	**	12839 (43.66)
Therapeutic care	1702 (24.53)	11125 (50.09)	<0.0001	2359 (29.30)	10597 (49.62)	<0.0001	**	**	**	12956 (44.06)
Inappropriateness in other measures, n (%)										
Appropriate use score method	**	**		4800 (59.61)	2138 (10.01)		2303 (58.04)	4625 (18.20)		6938 (23.59)
GP possible use method	4800 (69.18)	3252 (14.47)		**	**		2463 (62.07)	5573 (21.93)		8052 (27.38)
Resource utilisation method	2303 (33.19)	1665 (7.41)		2463 (30.59)	1505 (7.05)		**	**	**	3968 (13.49)

ED, emergency department; GP, general practitioner.

Table 2 Reasons and motivations for ED visits

	Appropriate score method				Possible GP use method				Resource utilisation method			
	Inappropriate ED use		Appropriate ED use		Inappropriate ED use		Appropriate ED use		Inappropriate ED use		Appropriate ED use	
	ED use	P value	ED use	P value	ED use	P value	ED use	P value	ED use	P value	ED use	Total
Because the patient was a victim of an accident	1575 (22.70)	<0.0001	7016 (31.23)	<0.0001	2149 (26.69)	<0.0001	6442 (30.17)	<0.0001	858 (21.62)	<0.0001	7733 (30.40)	8591 (29.21)
On doctor's advice	1476 (21.27)	<0.0001	6551 (29.16)	<0.0001	1472 (18.28)	<0.0001	6555 (30.70)	<0.0001	672 (16.94)	<0.0001	7355 (28.91)	8027 (27.30)
Because the patient needed the problem to be fixed quickly	2069 (29.82)	<0.0001	5850 (26.04)	<0.0001	2609 (32.40)	<0.0001	5310 (24.87)	<0.0001	1262 (31.80)	<0.0001	6657 (26.17)	7919 (26.93)
Because patient could have blood tests or radiology imaging	1528 (22.02)	0.2514	4803 (21.38)	0.2514	1818 (22.58)	0.0072	4513 (21.13)	0.0072	658 (16.58)	<0.0001	5673 (22.30)	6331 (21.53)
Because of ED proximity	1580 (22.77)	0.0006	4685 (20.85)	0.0006	2042 (25.36)	<0.0001	4223 (19.78)	<0.0001	978 (24.65)	<0.0001	5287 (20.78)	6265 (21.30)
Because the patient thought the problem was serious	1465 (21.12)	0.0007	4328 (19.26)	0.0007	1888 (23.45)	<0.0001	3905 (18.29)	<0.0001	806 (20.31)	0.2965	4987 (19.60)	5793 (19.70)
Because firefighters or emergency responders bring the patient to ED	500 (7.21)	<0.0001	3544 (15.77)	<0.0001	624 (7.75)	<0.0001	3420 (16.01)	<0.0001	259 (6.53)	<0.0001	3785 (14.88)	4044 (13.75)
Because it was possible to see a specialist physician	788 (11.36)	0.0388	2355 (10.48)	0.0388	769 (9.55)	0.0001	2374 (11.12)	0.0001	421 (10.61)	0.8641	2722 (10.70)	3143 (10.69)
Because the patient was anxious and did not know where to consult	912 (13.14)	<0.0001	1656 (7.37)	<0.0001	1066 (13.24)	<0.0001	1502 (7.03)	<0.0001	532 (13.41)	<0.0001	2036 (8.00)	2568 (8.73)
Because the patient thought it was faster to wait in the ED than obtain an appointment	793 (11.43)	<0.0001	1294 (5.76)	<0.0001	923 (11.46)	<0.0001	1164 (5.45)	<0.0001	420 (10.58)	<0.0001	1667 (6.55)	2087 (7.10)
Because the patient thought he would be hospitalised	225 (3.24)	<0.0001	1234 (5.49)	<0.0001	254 (3.15)	<0.0001	1205 (5.64)	<0.0001	94 (2.37)	<0.0001	1365 (5.37)	1459 (4.96)
Because the GP was not available	466 (6.72)	<0.0001	963 (4.29)	<0.0001	643 (7.99)	<0.0001	786 (3.68)	<0.0001	277 (6.98)	<0.0001	1152 (4.53)	1429 (4.86)
Because the patient had already consulted but the problem was not better	451 (6.50)	<0.0001	931 (4.14)	<0.0001	470 (5.84)	<0.0001	912 (4.27)	<0.0001	245 (6.17)	<0.0001	1137 (4.47)	1382 (4.70)
Because the patient needed biological or radiological examinations and could not have an appointment	405 (5.84)	<0.0001	905 (4.03)	<0.0001	478 (5.94)	<0.0001	832 (3.90)	<0.0001	242 (6.10)	<0.0001	1068 (4.20)	1310 (4.45)
Because the patient tried self-care but it did not work	453 (6.53)	<0.0001	798 (3.55)	<0.0001	564 (7.00)	<0.0001	687 (3.22)	<0.0001	264 (6.65)	<0.0001	987 (3.88)	1251 (4.25)
Because it is possible to be seen by a doctor beyond the working hours	222 (3.20)	<0.0001	441 (1.96)	<0.0001	267 (3.32)	<0.0001	396 (1.85)	<0.0001	138 (3.48)	<0.0001	525 (2.06)	663 (2.25)
Because there was no GP available	242 (3.49)	<0.0001	385 (1.71)	<0.0001	308 (3.83)	<0.0001	319 (1.49)	<0.0001	158 (3.98)	<0.0001	469 (1.84)	627 (2.13)
Because the patient did not have to pay for care	256 (3.69)	<0.0001	339 (1.51)	<0.0001	275 (3.42)	<0.0001	320 (1.50)	<0.0001	145 (3.65)	<0.0001	450 (1.77)	595 (2.02)
Because there was no GP doing home visits	82 (1.18)	0.5674	247 (1.10)	0.5674	120 (1.49)	0.0002	209 (0.98)	0.0002	46 (1.16)	0.7943	283 (1.11)	329 (1.12)
Because the patient could not stay at home	14 (0.20)	0.4065	58 (0.26)	0.4065	13 (0.16)	0.0756	59 (0.28)	0.0756	5 (0.13)	0.1034	67 (0.26)	72 (0.24)

ED, emergency department; GP, general practitioner.

Table 3 Characteristics of EDs

	%	n
Type of hospital visited		
Public academic	12.56	80
Public non-academic	65.31	416
Not-for-profit private	6.59	42
For-profit private hospitals	15.54	99
Annual visits of ED visited		
≤15 000	26.06	166
15 000–30 000	41.92	267
30 000–45 000	19.15	122
>45 000	12.87	82
County medical density		
Low	42.54	271
Intermediate to high	57.46	366

ED, emergency department.

two hypotheses as we found an association between inappropriate use of ED and some indicators of socio-economic vulnerability but not with the county medical density. In our multilevel model, age, sex, supplementary health insurance coverage, onset of complaint and distance from home to ED remained significant, independent of the method used to define inappropriate use of the ED. Some results were consistent with previous studies. Young age,^{18–20} female sex^{11 19 20 58 59} and symptoms several days old^{18 52} were previously found associated with a higher likelihood of inappropriate ED use. Some studies have underlined the association between poor or no supplementary health coverage and social health inequalities in both care access^{29–31} and frequency of ED visits.^{24 29–31}

Patients >65 years corresponded to 25.9% of ED patients versus 17.6% in the general population in 2013 and those >75 years corresponded to 17.6% versus 9% in the general population.⁶⁰

Our results help in understanding the impact of supplementary health coverage on ED use. Whatever the method of ED appropriateness measure used, we found increased likelihood of inappropriate ED associated with not having supplementary health coverage or having CMU-c. Supplementary health coverage is directly linked to the level of reimbursement (and copayment expenses) and has been identified as one of the financial reasons for not seeking care.⁶¹ In our study population, 7.2% and 71.5% reported CMU-c or a private health insurance coverage as compared with 6.8% and 89% in the general population.⁶² Moreover, 2% of patients reported visiting an ED because they think they did not have to pay for their care, and this percentage was significantly higher for patients with inappropriate use (regardless of the measure method used). In France, healthcare is first paid by the patient, who is then reimbursed in part by the public health insurance. The reinsurable copayments are then covered by the supplementary health insurance

coverage, when the patient has coverage. In some cases (some chronic illness and pregnancy in particular), care is directly paid by the public health insurance, called ‘third-party payment’. A reform to the generalisation of third-party payment to the entire population, as in most Europe countries, has been discussed but has not been implemented.^{63 64} We assume that the generalisation of the third-party payment could positively affect both health behaviour and ED use.

All these results probably reflect two major considerations: first, delay in seeking care and treatment—relative to financial and social difficulties in care access—may explain part of the overall increased use of EDs.^{38 39 65–69} Second, not seeking healthcare for financial reasons may contribute to distress experienced by the patient. Distress has been described as related to physiological health, spiritual health or social support, and patients’ discharge diagnoses might be trivial in the context of their stories.¹³ This distress experienced by the patient may induce a displacement of non-urgent consultations from primary care to the ED.

A part of our work was to analyse the possible links between individual and environmental characteristics with inappropriate ED use. However, contrary to our hypothesis, in the multilevel logistic regression model, likelihood of inappropriate ED use was not associated with county medical density, whatever the measure method used. The heterogeneity of medical density in the same county might explain the lack of significant results. This explanation seems even more likely because it agrees with results from our empty models. As explained in the Methods section, we did not find intergroup heterogeneity at the county level which justified the use of a third level in our models. The impact of medical density might not be at the county level but rather at a smaller geographical one. In the last decade, several studies have investigated indicators of access to care, territorial distribution of physicians and medical ‘deserts’.^{70–72} These indicators tend to take into account both the proximity and availability of doctors, as well as local demand for care, and have been described as more efficient than traditional indicators of medical density.⁷² Completing our analysis with data from these indicators of patients’ local district might be revealing. However, for reasons of statistical confidentiality, the local district of each patient was not available.

About 7% and 5% of patients reported having consulted at an ED because it was faster than obtaining an appointment or because their GP was not available. This percentage was about twice as high with inappropriate versus appropriate ED use (regardless of the measure method used). And for about 30% and 20% of patients with inappropriate ED use according to EP judgement (appropriateness score and possible GP use methods), ED visits included EP consult as well as radiological examinations or blood tests. Only

Table 4 Multilevel logistic regression model of determinants of inappropriate use of EDs

	Appropriate use score method			Possible GP use method			Resource utilisation method		
	aOR	95% CI		aOR	95% CI		aOR	95% CI	
Patient characteristics									
Age, years									
15–24	Ref			Ref			Ref		
25–34	0.799	0.716	0.891	0.810	0.732	0.895	0.872	0.767	0.990
35–44	0.721	0.642	0.809	0.708	0.636	0.787	0.755	0.658	0.865
45–54	0.640	0.568	0.722	0.595	0.533	0.665	0.710	0.616	0.817
55–64	0.556	0.490	0.631	0.485	0.431	0.546	0.509	0.434	0.598
65–74	0.475	0.406	0.555	0.413	0.356	0.478	0.401	0.325	0.495
75–84	0.344	0.292	0.406	0.296	0.253	0.347	0.240	0.188	0.307
>85	0.242	0.196	0.300	0.237	0.194	0.288	0.136	0.094	0.199
Sex									
Male	Ref			Ref			Ref		
Female	1.242	1.160	1.331	1.270	1.192	1.354	1.133	1.040	1.233
Supplementary health insurance									
Private	Ref			Ref			Ref		
Universal complementary health coverage	1.150	1.014	1.305	1.190	1.058	1.338	1.331	1.150	1.541
None	1.342	1.170	1.539	1.160	1.018	1.322	1.268	1.075	1.497
Health insurance									
Public health insurance	Ref			Ref			Ref		
None or state medical assistance	1.192	0.932	1.525	1.142	0.905	1.441	1.241	0.943	1.632
Employment status									
Employed	Ref			Ref			Ref		
Unemployed	1.044	0.921	1.184	0.899	0.798	1.012	0.964	0.831	1.120
Inactive	0.956	0.865	1.056	0.875	0.798	0.961	0.906	0.804	1.022
Level of education									
High-school graduation or less	Ref			Ref			Ref		
More than high-school graduation	0.889	0.813	0.972	0.919	0.847	0.997	0.943	0.847	1.050
Residence									
Home	Ref			Ref			Ref		
Institution	0.798	0.613	1.038	0.629	0.483	0.820	0.661	0.445	0.982
Other	0.858	0.647	1.138	0.705	0.535	0.928	0.744	0.523	1.058
Having a GP									
No	Ref			Ref			Ref		
Yes	0.902	0.784	1.038	0.859	0.755	0.978	0.926	0.786	1.091
ED visit characteristics									
Onset of complaint									
The day of ED visit	Ref			Ref			Ref		
Before the day of ED visit	2.094	1.951	2.248	1.535	1.439	1.638	1.499	1.374	1.635
Time of ED arrival									
08:00–20:00	Ref			Ref			Ref		
20:00–08:00	1.083	0.999	1.175	1.170	1.086	1.260	1.358	1.234	1.494
Distance from home to ED									
≤10 km	Ref			Ref			Ref		
>10 km	0.886	0.822	0.955	0.850	0.794	0.911	0.831	0.758	0.912

ED characteristics

Continued

Table 4 Continued

	Appropriate use score method			Possible GP use method			Resource utilisation method		
	aOR	95% CI		aOR	95% CI		aOR	95% CI	
Type of hospital visited									
Public academic	Ref			Ref			Ref		
Public non-academic	1.253	0.998	1.573	1.198	1.011	1.421	1.025	0.824	1.275
Not-for-profit private	0.953	0.681	1.334	0.844	0.655	1.089	0.880	0.635	1.219
For-profit private	0.659	0.498	0.872	0.722	0.585	0.892	0.871	0.665	1.141
Annual visits for the ED visited									
≤15 000	Ref			Ref			Ref		
15 000–30 000	1.234	1.020	1.493	1.008	0.869	1.169	0.826	0.683	1.001
30 000–45 000	1.187	0.954	1.478	1.042	0.881	1.232	0.783	0.630	0.973
>45 000	1.329	1.044	1.692	1.033	0.859	1.241	0.958	0.758	1.212
County medical density									
Low	Ref			Ref			Ref		
Intermediate to high	1.010	0.873	1.170	0.983	0.879	1.099	1.002	0.868	1.158

Significant results are in light colour (versus non-significant in dark colour). aOR, adjusted OR; ED, emergency department; GP, general practitioner; Ref, reference.

1812 (6.16%) patients were considered inappropriate according to all three measures (more when focusing on only inappropriate use score and possible GP use). Considering all barriers to outpatient care access previously discussed and leading to an ED visit (not able to pay out-of-pocket expenses and difficulties in obtaining appointments), the concept of inappropriate ED use itself may not be appropriate because of no other choice than visiting an ED. First, our results show that individualising how patients would be considered as ‘inappropriate’ from any point of view is difficult. Also, to the extent that the doctors seem to have difficulty defining what is appropriate or not, how could we expect patients to? Here, our work focused on EP’s point of view and resource utilisation but did not consider the patient’s view of urgency either at the time of arrival nor at the end of the ED visit. Thus, as previously discussed, defining and measuring the appropriateness of ED use is difficult and is highly depending on whether we considered patient’s or healthcare provider’s/system’s perspectives. Some ED visits might be considered as inappropriate from the EP’s perspective but would be appropriate considering the patient’s point of view either because they felt that their condition was urgent or because of no other alternative for healthcare access.

Additional primary care appointments during out-of-hours might be a way to reduce ED attendance, as it was suggested by the results of a large study in the Greater Manchester Area.⁷³ However, other studies have found that extending opening hours in the evenings and at weekends in the UK were only modestly associated with patient satisfaction⁷⁴ and that its association with the use of emergency hospital services was small or inconsistent.⁷⁵ Urgent care centres (UCCs) have also been implemented in the USA and UK and were

intended to reduce rates of ED visits and short-stay emergency admissions to hospital. However, more research is needed to examine the effect of the introduction of the UCCs on the frequency of ED attendance and emergency admissions to hospital, especially when the UCC is not colocated with the ED.⁷⁶

In our study, almost 10% of patients reported being anxious and not knowing where to consult, significantly higher among patients with inappropriate versus appropriate ED use (regardless of the measure method used). Even though there are other options for unscheduled care (including out-of-hours time), it appears here that some patients could have self-referred to the ED because of lack of knowledge about the offer of unscheduled care or because of system deficiency (insufficient availability of out-of-hours consultation). Even with a more efficient system of out-of-hours consultations or UCCs, we do not know whether this anxiety (or urgency felt) did not lead the patient to the ED anyway. All these results suggest that educating the public about unscheduled care offer as well as public policies (whose goal would be to develop and promote alternatives to ED) could be enhanced.⁷⁷

Limitations

Our study has several limitations. The first limitation is related to the missing data, including on our outcomes of interest, which led to the exclusion of some patients and therefore risk of attrition bias. The second limitation is that one of our method to measure appropriateness, the appropriateness score, was based on the subjective assessment of the caring physician (based on a numeric scale) at the end of the ED visit, which may lead to a possible measurement bias. However, the authors have preferred to split the outcome of interest into two categories, which allowed us to identify

20% of patients with the least appropriate use of ED among all patients. After comparison with possible GP consult and resource utilisation, the results from our multilevel regression model for the appropriateness score are consistent with the other measures. It suggests that even if the assessment of appropriateness by the caring physician is subjective, it was associated with the resource use and so, the fact that the patient could have been managed by a GP. As explained earlier in the discussion, measuring the appropriateness of ED use remains difficult and strongly depends on the chosen perspective, as well as the method used. Here, the data from the survey did not allow us to consider the patient's perspective.

CONCLUSION

Our results suggest that inappropriate ED use was more likely among individuals presenting some indicators of socioeconomic vulnerability (eg, not having supplementary health coverage or having universal health coverage for people with lower income), but we did not find an association with the county medical density. Our results make us question the appropriateness of the concept of inappropriate ED use because it does not consider the distress experienced by the patient, and segments of society seem to have few other choices to access healthcare than the ED (lack of healthcare coverage and/or lack of physician availability).

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