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“Out-of-hours primary care services: Demands and patient referral patterns in a Veneto region (Italy) Local Health Authority”

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ABSTRACT

Purpose: The aim of this study was to describe the characteristics of patients admitted to an out-of-hours (OOH) service and to analyze the related outputs.

Setting: A retrospective population-based cohort study was conducted by analyzing an electronic database recording 23,980 OOH service contacts in 2011 at a Local Health Authority in the Veneto Region (North-East Italy).

Method: A multinomial logistic regression was used to compare the characteristics of contacts handled by the OOH physicians with cases referred to other services.

Results: OOH service contact rates were higher for the oldest and youngest age groups and for females rather than males. More than half of the contacts concerned patients who were seen by a OOH physician. More than one in three contacts related problems managed over the phone; only ≈10% of the patients were referred to other services. Many factors, including demographic variables, process-logistic variables and clinical characteristics of the contact, were associated with the decision to visit the patient's home (rather than provide telephone advice alone), or to refer patients to an ED or to a specialist. Our study demonstrated, even after adjusting, certain OOH physicians were more likely than their colleagues to refer a patient to an ED.

Conclusion: Our study shows that OOH services meet composite and variously expressed demands. The determining factors associated with cases referred to other health care services should be considered when designing clinical pathways in order to ensure a continuity of care. The unwarranted variability in OOH physicians' performance needs to be addressed.

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1. Introduction

There is robust evidence of the ability of primary-care-oriented health systems to provide better, more equitable health care at a lower cost [1,2]. Out-of-hours (OOH) primary care services are a fundamental part of primary

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health care services as a whole, providing support in situations where patients' clinical conditions are such that they cannot wait until the next working day to see a doctor. Appropriate OOH services are important for a well-functioning h24/7/365 primary health care system, and any efforts to redesign a country's primary health care organizations in order to improve their quality of care must necessarily discuss how OOH care is organized too [3,4]. OOH services are organized differently in different countries [3–8], but are frequently based on family doctors operating in small- or large-scale organizations. In their review of the literature, Van Uden et al. [9] found at least seven common models for providing primary care to patients out of hours, while a more recent analysis by Linda Huibers et al. [10] identified nine organizational models currently in use in various parts of Europe. The literature also describes some relatively new models, such as OOH primary care integrated in hospitals, deputizing services, minor injury centers, and walk-in centers [11].

To better organize OOH services, customizing them to the users' needs, it is important to characterize the demand for these services. To incorporate this service as part of a network – along with other primary care services and with second-level health care – it is also essential to know what part of this demand is handled directly by the OOH service and what proportion is referred to other services.

To our knowledge, this is the first population-based study to analyze the demand for OOH services in a given territory, characterizing the patients using OOH facilities and analyzing the OOH services they receive, focusing on the features of the demand that is met directly by the OOH service as opposed to the those of the demand forwarded by the OOH physicians to other health care services, such as emergency departments (ED) or specialist visits.

2. Materials and methods

2.1. Context

The INHS (Italian National Health System) was established in 1978 and was modeled along the lines of the British NHS. It is a mainly public system financed by general taxation. From an organizational viewpoint, the INHS divides the Italian territory into 140 Local Health Authorities (LHAs), each responsible for providing health services to its local population. General practitioners (GPs) are primary care physicians working for LHAs as independent contractors, and they act as gatekeepers for higher levels of care. Italian GPs traditionally ran their practices alone, without any auxiliary staff, and with no formal links with other GPs [12]. The first national contract mentioning that organizational formats involving some form of cooperation among GPs could be negotiated at a local level was signed in 1996, and it was only when the contract was renewed in 2000 that the rules governing GP networks were laid out. According to the national contract in place at the time of this study, GPs willing to engage in some form of cooperation in providing health services to their patients can choose one of three formats,

i.e. an association (“*medicina in associazione*”), a network (“*medicina in rete*”), or a group (“*medicina di gruppo*”), each of which implies a different level of cooperation between the GPs involved. In all three formats, GPs have to coordinate their office hours (remaining open until 7 pm on weekdays), and they commit to sharing guidelines and to meeting to discuss and improve their service. In the case of networks (or nets), which involve an intermediate level of cooperation, GPs also have to share an electronic database of their patients. While GPs in associations and nets can continue to work at their own offices, the group format (with the highest level of cooperation) requires that GPs share the same clinic, so they can also jointly invest in medical equipment and employ nursing or administrative staff. In the LHA analyzed in this study, some GPs form part of a more advanced, integrated primary care unit called a UTAP, which is like a House of Health [13], which works with structured practices, protocols and procedures and with specialists which supply outpatient treatments.

A deputized service has been in use ever since the inception of the NHS in 1978. The organization of this service later acquired regional differences when responsibilities for the NHS were decentralized, but there is still a nationally shared agreement [14] defining the tasks, activities and salaries of OOH physicians, and the infrastructure and resources to be allocated to OOH services by the LHA. In Italy, OOH services are now provided by about 12,000 physicians working under an agreement with the LHA at 2952 OOH service delivery points [15] that operate every day of the week from 8 pm to 8 am, and at weekends from 10 am on Saturdays to 8 am on Mondays, plus bank holidays, and also from 8 am to 8 pm on days when GPs are attending continuing education courses. The OOH services receive telephone requests from patients and deliver the service by providing advice over the phone, visiting a patient at home (or in a rest home), or examining them as walk-in patients (at premises provided by the LHA).

2.2. Setting

The LHA “ULSS 4 – Alto Vicentino” serves the north-western part of the Veneto region, a mainly hilly and mountainous area with a population of about 190,000. In 2011, foreign residents accounted for approximately 10.3% of the population (a proportion about 2% higher than the national average of foreign residents) [16]. The LHA 4 has three OOH service delivery points, each of which also has an OOH clinic for walk-in patients.

In 2006, the LHA 4 implemented computer technologies to connect the OOH service physicians with both GPs and hospital emergency departments (EDs), consistently with the recommendations in the recent international literature concerning the development of coordinated systems for the exchange of information [1,4] to support a valid integration – particularly at local level – of all services related to emergency and after-hours health care. The aim of this approach is to assure a better, more patient-centered care around the clock. Thanks to the implementation of this system, this is one of the first LHAs in Italy to provide an accountable OOH service.

2.3. Participants and materials

This study was based on data collected from 1 January to 31 December 2011 in the LHA 4 electronic database. A contact to request OOH care (as a statistical unit) was defined as any walk-in patient visit, home visit, rest home visit, or telephone consultation followed by no further contact in the 12 h thereafter (so OOH contacts were registered as telephone consultations only if the physician provided advice over the phone and did not see the patient afterwards, neither at the walk-in clinic, nor at the patient's home or rest home).

The computer database of OOH contacts recorded patients' demographic details, i.e. sex, age, nationality and place of residence, so Google Maps could be used to calculate the distance of their home from the nearest OOH service point. Further information was recorded concerning the primary care services available for a given patient's condition, e.g. non-cancer integrated homecare, cancer-related integrated homecare, palliative homecare, and nursing homecare.

The electronic database also recorded logistic aspects such as: date of contact classified for analytical purposes as working or non-working days (the latter including Saturdays and days before public holidays); time of contact, classified as daytime (8 am to 8 pm) or night-time (8 pm to 8 am). The clinically relevant variables recorded for each contact included the diagnosis grouped into major diagnostic categories, some of which were collapsed, and another six categories were added (see Table 2). The database also recorded the OOH outputs possible for each contact, classified as patients returning home or remaining at home (if the contact had involved the patient seen at the walk-in clinic, at home, or at a rest home), transfer to an ED service by ambulance or a private car (for all types of contact), referral for an appointment with a specialist, or telephone counseling alone. Finally, the database was linked with some socio-demographic characteristics of the OOH physicians handling the contact (such as age, sex).

2.4. Statistical methods

Statistical analyses were performed using the STATA 12 software. The data were summarized as numbers [percentages] of patients for categorical variables and means [standard deviations] for continuous variables. Bivariate analyses were run to measure mean differences using the independent *t*-test for continuous variables, and the chi-square test for categorical variables. A *p*-value of less than 0.05 was considered significant. The main epidemiological OOH access rates per year by sex, age, citizenship and municipality were calculated and expressed per 100 residents. Only contacts made by residents were considered in this analysis for the purpose of calculating these rates. The standard reference population considered was the mean number of residents in the area served by the LHA 4 during the year 2011.

After excluding contacts relating to ascertain deaths or to renew medical prescriptions, a multinomial logistic regression model was applied to see which variables predicted the output of OOH contacts (the output of the

contact being the dependent variable: a patient's problem was managed over the phone, or an OOH physician examined the patient at home or at the OOH walk-in clinic, or the patient was referred to an ED or to a specialist). The independent variables were divided into three categories: socio-demographic, process-contextual, and clinical, as detailed in the regression table footnotes. The organizational format adopted by the patient's GP was used as a dummy variable: taking GPs who worked alone for reference, as opposed to GPs working in associations, networks, groups, or integrated units (UTAP) [12,17].

A fully adjusted logistic regression was also run on the output of the contact (with referral to an ED vs other outputs as the dependent variable), after including another independent variable, which was a unique code for anonymously identifying the 34 OOH physicians working at the LHA 4 considered (dummy variable, taking a randomly selected OOH physician coded as No. 1 for reference) to test whether different operators influenced the way in which patients contacting the OOH were managed, after accounting for all other covariates. Finally, a multilevel logistic regression analysis (again with referral to ED vs other outputs as the dependent variable) was applied using the same independent variables as above on a first level (to adjust the regression) and then, on a second level, the characteristics (age, sex) of OOH physician handling the contact.

The final overall assessment of the OOH service demands and outputs was shared with the public health director and the management team at the LHA, and with the associations of physicians interested in clarifying the reference population's demand for OOH services and the outputs they provide. Finally, an internal audit was conducted to shed light on the reasons for variability in the provision of the service.

3. Results

3.1. Rates and features of demand

During the year considered, 23,980 contacts with the LHA 4 OOH service were recorded. They included 23,504 contacts made by residents, amounting to a 12.4% rate of access for the population served; 17,367 patients residing within the LHA 4 contacted the OOH primary care service more than once, in fact 9.2% of the area's residents accessed the OOH primary care service at least once in the course of the year.

The service access rates for residents by age group, sex, and nationality are shown in Table 1.

The crude rates varied for the 32 municipalities served by the LHA 4, ranging from 17.4% (95%CI 14.4–20.7) to 7.6% (95%CI 6.7–8.7), and the three municipalities where the OOH clinics were located were among the five places with the highest access rates (data not shown).

Table 2 shows the distribution of the top five reasons for contacting the OOH service by age group. The reasons for contacting the OOH service depended on the patients' age ($p < 0.001$). The three main reasons for contacting the OOH services were the same for immigrants as for Italians, i.e. gastroenterological conditions, fever, or ear, nose, mouth and throat disorders (respectively involving 13.5%,

Table 1
Distribution of patients contacting the OOH services by sex, age and country of origin.

Categories	No. of contacts	Contacts (%)	Contact rate/year (%) (95%CI)
Sex	Female	12,727	54.06
	Male	10,777	45.94
Age (years)	0–1	1,256	1.90
	2–14	4,994	13.20
	15–18	632	4.00
	19–44	6,451	33.80
	45–64	4,059	27.30
	65–74	1,971	10.50
	75–84	2,263	6.70
	>84	1,914	2.60
Country of origin	Italy	20,908	90.30
	Bangladesh	365	1.60
	Tunisia	70	0.30
	Serbia	369	1.60
	Senegal	91	0.40
	Morocco	435	1.90
	Macedonia	70	0.30
	Albania	116	0.50
	Ghana	133	0.60
	Romania	247	1.10
	Moldova	138	0.60
	Bosnia and Herzegovina	130	0.60
	India	23	0.10
	Croatia	25	0.10
	China	32	0.10
Ukraine	11	0.00	

12% and 11% of Italian people, and 12.2%, 11.7% and 17.1% of immigrants).

3.2. OOH response to the demand

More than half of the contacts (52.1%, 12,036 cases) concerned patients who were examined by a GP at home (or in a rest home) or at the walk-in clinic. More than one in three contacts (37.9%, 8743) concerned problems managed over the phone; only 0.8% involved patients being referred to a specialist; and 9.18% of the patients were referred to an ED.

Table 3a shows the results of a multivariate multinomial analysis on the characteristics of patients more likely to be referred to a specialist than to have their problems managed over the phone. Table 3b shows the results of a multivariate multinomial analysis on the characteristics of patients more likely to be examined by an OOH physician at home or at the clinic than to have their problem managed over the phone. Table 3c shows the results of a multivariate multinomial analysis on the characteristics of patients more likely to be referred to the ED than to have their problem managed over the phone.

When a fully adjusted logistic regression was performed (with referral to an ED vs other outputs as the dependent variable) including the codes identifying the OOH physicians, the results showed that 6 physicians had a statistically significant higher likelihood than the reference physician of referring patients to an ED, while 3 had a lower likelihood of doing so (data not shown). Finally, the multilevel logistic regression analysis showed that OOH physicians of female gender and older age had a

statistically significant higher likelihood of referring patients to an ED.

4. Discussion

This study provides detailed information on how OOH services are used and, to our knowledge, it is the first study to investigate the overall demand for OOH services in a given area based on the users' characteristics, and to analyze how their needs are met. OOH service contact rates were higher for the oldest and youngest age groups, and for females. The reasons for contacting the OOH service varied by age group. Not only clinical characteristics, but also logistic-context aspects and patients' socio-demographic characteristics influenced the OOH physicians' propensity to refer a patient to an ED or to see a specialist. Our study demonstrated, however, that – even after adjusting for all these variables – certain OOH physicians were more likely than their colleagues to refer a patient to an ED.

Our figures indicate a patient access rate to OOH services similar to that of some studies [18,19], but lower than in other reports [20,21]. Variable rates may relate to patients preferring to consult their GPs, or tending to bypass OOH services and going to the ED instead. Be that as it may, the real consistency between studies on OOH demand is an issue that needs to be addressed. Other researchers [22] have called for a more consistent data collection, using preset categories, as a way to strengthen the information obtained in order to help managers and practitioners assess and adapt their services. Differences in health care systems and approaches to OOH care in different countries may make it difficult to attempt any strict comparisons,

Table 2
Top five reasons^a for contacting the OOH services by age group.

0–1-year-olds	Fever (31.1%) Gastroenterological disease (17.1%) Ear–nose–throat disease (12.36%) Advice about ongoing therapy (9.06%) Respiratory disease (8.7%)
2–14-year-olds	Fever (25.1%) Ear–nose–throat disease (19.6%) Gastroenterological disease (14.0%) Dermatological disease (7.9%) Respiratory disease (7.7%)
15–18-year-olds	Ear–nose–throat disease (22.1%) Fever (15%) Gastroenterological disease (13.6%) Dermatological disease (8.8%) Advice about ongoing therapy (5.9%)
19–44-year-olds	Ear–nose–throat disease (14.8%) Gastroenterological disease (13.1%) Fever (8%) Musculoskeletal disease (7.9%) Dermatological disease (7.5%)
45–64-year-olds	Gastroenterological disease (12.9%) Musculoskeletal disease (11.7%) Advice about ongoing therapy (9.2%) Ear–nose–throat disease (8.3%) Dermatological disease (6.5%)
65–74-year-olds	Cardiovascular disease (14.2%) Gastroenterological disease (12.8%) Advice about ongoing therapy (11.1%) Musculoskeletal disease (8.2%) Respiratory disease (6.6%)
75–84-year-olds	Cardiovascular disease (14.7%) Gastroenterological disease (12.8%) Advice about ongoing therapy (9.9%) Respiratory disease (8.8%) Neurological disease (6.6%)
84-year-olds and older	Cardiovascular disease (14.9%) Respiratory disease (13.1%) Gastroenterological disease (12%) Certification of death (10.8%) Advice about ongoing therapy (8.9%)

^a The reasons for access were grouped into main diagnostic categories, some of which were collapsed by system (nervous system; eye; ear, nose, mouth and throat; respiratory system; circulatory system; digestive system and hepatobiliary system and pancreas; musculoskeletal system and connective tissue; skin and burns; endocrine, nutritional and metabolic system; kidney and urinary tract and male reproductive system; female reproductive system and pregnancy; blood and blood-forming organs, and immunological disorders and myeloproliferative disorders; infectious and parasitic disorders and human immunodeficiency virus infection; mental diseases and disorders, and alcohol/drug use, or induced mental disorders; injuries and poisoning, and toxic effects of drugs and multiple significant trauma). Another six categories were also added (health certification, death certification, renewal of medical prescriptions, information about prescribed drugs; fever; and others not specified).

however. Our service access rates also varied considerably from one municipality to another. In a review analyzing the demand for OOH care, Salisbury [23] found a marked variability between areas, practices and individual doctors. He said that the reasons for this variability remained largely unexplained, but may relate to a different distribution of deprivation, a different prevalence of diseases by area, or local differences in the population's age profile. Another possible explanation (suggested by our results) relates to people's proximity to an OOH service point, and

this has been demonstrated in other studies too [24,25]. Our findings also point to immigrants coming from certain countries having higher contact rates than Italians [though the figures vary widely by the immigrants' country of origin]. Another study analyzing the demands for primary health care found the user's origin an important key in explaining different intensities of access to OOH services and visits to primary health care services [26]. This could be because the daytime general medical services fail to meet the needs of such immigrant patients; patients, for instance, could have difficulty making timely contact with a doctor during office hours, so they may choose to use the OOH services as a source of routine general medical care [27]. On the other hand, the markedly different access rates within immigrant subgroups by local origin could relate to matters of cultural identity: religion, for instance, has been suggested as a marker of different types of behavior in relation to the health system and, also, one of the reasons prompting the use of OOH primary care services [28–30]. Language difficulties might also be a determining factor in influencing the lower rate of telephone consultations for immigrant residents [31].

There were gender-related differences too. In our sample, women sought OOH care more frequently than men. This finding is consistent with other studies [10,20,32] reporting that women tended to contact OOH primary care services whereas men tended to go straight to an ED [22,33].

The age-related patterns of access to OOH services in our sample – more frequent for children and the elderly – have also been observed in other studies [21,32], and are consistent with the generally U-shaped distribution of the demand for (and cost of) health services by age group [33].

The broad spectrum of illnesses seen in patients contacting the OOH services is typical of the primary care setting [34]. The main diagnostic categories most frequently prompting contact with the OOH services, i.e. for respiratory, musculoskeletal, skin and digestive disorders, were the same as Huibers et al. [10] found in a study on demands for OOH services in 8 European countries. Our analyses also showed that the most often-involved diagnostic categories depended on patients' ages. In particular, the main reason why people over 65 contacted the OOH services related to cardiovascular diseases, followed by respiratory diseases in those over 85, and these two categories cover the chronic diseases most common in the elderly. This means that OOH physicians should be actively involved in chronic disease management pathways for elderly patients, and in organizing and defining the diagnostic-therapeutic actions demanded by a good clinical practice. For young people up to 18 years old, the most common reasons why people contact the OOH services relate to acute conditions such as fever and gastroenterological or ear, nose and throat diseases, which are the most typical acute diseases in children. Here again, OOH physicians need to be familiar with the evidence-based medicine (EBM) guidelines for treating these conditions, with a special focus on the pediatric population.

Our investigation into how the demand was handled showed that more than one in three contacts were managed over the phone. This provision of advice over the

Table 3a

Results of multinomial regression analysis: variables associated with contacts managed by referring patients for a specialist visit as opposed to over-the-phone consultation alone (only statistically significant results are included in the table).

		RR	[95%CI]		P > z
Referral for a specialist visit					
<i>Demographic variables</i>					
Age (ref 0–1 years)	19–44 years old	0.28	0.13	0.60	0.002
	45–64 years old	0.07	0.02	0.26	<0.001
Nationality (ref Italian)	Foreign	6.78	4.54	10.12	<0.001
	<i>Process-context variables</i>				
Time (ref 8 am–8 pm)	8 pm–8 am	0.29	0.20	0.42	<0.001
GPs' organization (ref. GP working alone)	UTAP	0.20	0.04	0.91	0.037
<i>Clinical variables</i>					
Disease (ref Dermatology)	Ear, nose, mouth and throat diseases	0.25	0.11	0.57	0.001
	Pregnancy and reproductive system disease	11.96	5.30	26.97	<0.001
	Gastroenterological disease	0.49	0.26	0.90	0.023
	Fever	0.27	0.15	0.50	<0.001
	Advice about ongoing therapy	0.01	0.002	0.11	<0.001

phone should therefore be a well-structured procedure, based on checklists and protocols that can be backed up with written information that can be mailed to the patient or accessed online. More advanced solutions could involve decision-supporting software packages to help doctors consulted over the phone to provide comprehensive advice on conditions that may not need a face-to-face assessment [35,36]. On the other hand, using the telephone may

increase service inequalities for those who do not have access to a phone, or who have language difficulties or communication impairments [37].

Our multivariate multinomial analysis found numerous characteristics associated with how contacts were handled. The diagnostic category was obviously one of the most important determinants of the way in which a contact was managed: several diagnostic categories (including

Table 3b

Results of multinomial regression analysis: variables associated with contacts managed by referring patients to the doctor's office or to receive a home visit as opposed to over-the-phone consultation alone (only statistically significant results are included in the table).

		RR	[95%CI]		P > z	
OOH home or ambulatory visit						
<i>Demographic variables</i>						
Age (ref. 0–1 years)	2–14 years old	1.46	1.25	1.70	<0.001	
	15–18 years old	2.32	1.80	2.99	<0.001	
	19–44 years old	2.03	1.71	2.41	<0.001	
	45–64 years old	2.17	1.80	2.59	<0.001	
	65–74 years old	2.12	1.73	2.59	<0.001	
	75–84 years old	1.80	1.47	2.19	<0.001	
	>84 years old	1.83	1.48	2.27	<0.001	
	Female	0.81	0.75	0.86	<0.001	
Nationality (ref Italian)	Foreign	5.20	4.51	6.00	<0.001	
	<i>Process variables</i>					
Time (ref 8 am–8 pm)	8 pm–8 am	0.46	0.43	0.49	<0.001	
Distance from nearest OOH	km	0.96	0.95	0.97	<0.001	
Day (ref working day)	Not working day	1.17	1.09	1.25	<0.001	
GPs' organization (ref. GP working alone)	Network GP group	1.16	1.00	1.33	0.047	
	UTAP	0.78	0.66	0.91	0.002	
<i>Clinical variables</i>						
Disease (ref Dermatology)	Musculoskeletal disease	0.49	0.40	0.58	<0.001	
	Ophthalmological disease	0.60	0.47	0.78	<0.001	
	Odontostomatological disease	0.72	0.57	0.93	0.011	
	Oncological and hematological disease	0.37	0.24	0.59	<0.001	
	Pregnancy and reproductive system disease	0.25	0.17	0.36	<0.001	
	Psychiatric disease	0.27	0.21	0.35	<0.001	
	Renewal of medical prescriptions	1.87	1.29	2.71	0.001	
	Trauma	0.42	0.33	0.52	<0.001	
	Nervous system disease	0.39	0.31	0.48	<0.001	
	Infectious disease	0.45	0.35	0.59	<0.001	
	Kidney and urinary tract disease	0.45	0.37	0.55	<0.001	
	Gastroenterological disease	0.24	0.20	0.27	<0.001	
	Fever	0.22	0.19	0.26	<0.001	
	Endocrinological disease	0.09	0.06	0.14	<0.001	
	Advice about ongoing therapy	0.01	0.01	0.02	<0.001	
	Cardiovascular	0.37	0.30	0.45	<0.001	
	Not specified	0.25	0.20	0.32	<0.001	
	Patient on home nursing program	Yes	0.84	0.72	0.99	0.032

Table 3c

Results of multinomial regression analysis: variables associated with contacts managed by referring patients to an ED as opposed to over-the-phone consultation alone (only statistically significant results are included in the table).

		RR	[95%CI]		P > z	
Referral to second evaluation in ED						
<i>Demographic variables</i>						
Age (ref 0–1 years)	19–44 years old	1.51	1.09	2.10	0.012	
	45–64 years old	2.20	1.58	3.06	<0.001	
	65–74 years old	2.61	1.84	3.70	<0.001	
	75–84 years old	3.01	2.14	4.25	<0.001	
	>84 years old	3.38	2.37	4.80	<0.001	
Gender (ref Male)	Female	0.67	0.60	0.75	<0.001	
	Nationality (ref Italian)	Foreign	2.93	2.33	3.67	<0.001
<i>Process context variables</i>						
Time (ref 8 am–8 pm)	8 pm–8 am	0.87	0.78	0.96	0.008	
	Distance from nearest OOH	km	0.98	0.97	1.00	0.015
Day (ref working day)	Not working day	1.13	1.02	1.26	0.020	
	GPs' organization (ref. GP working alone)	Network GP group	1.45	1.16	1.81	0.001
		UTAP	0.76	0.58	0.98	0.038
<i>Clinical variables</i>						
Disease (ref Dermatology)	Musculoskeletal disease	1.77	1.19	2.62	0.005	
	Ophthalmological disease	4.70	3.03	7.30	<0.001	
	Oncological and hematological disease	2.55	1.41	4.61	0.002	
	Ear, nose, mouth and throat	1.68	1.12	2.52	0.012	
	Pregnancy and reproductive system disease	4.15	2.37	7.25	<0.001	
	Respiratory disease	4.88	3.33	7.16	<0.001	
	Trauma	5.35	3.60	7.92	<0.001	
	Nervous system disease	4.07	2.76	6.00	<0.001	
	Kidney and urinary tract disease	2.07	1.39	3.10	<0.001	
	Gastroenterological disease	1.48	1.04	2.12	<0.001	
	Fever	0.32	0.21	0.49	<0.001	
	Advice about ongoing therapy	0.05	0.02	0.09	<0.001	
	Cardiovascular	4.64	3.20	6.73	<0.001	
	Not specified	1.70	1.11	2.62	0.015	
	Patient on home nursing program	Yes	1.24	1.02	1.51	0.016

The independent variables were divided into three categories: demographic, process-context and clinical. The socio-demographic variables included: age group, sex, nationality [Italians vs foreigners]. The process-context variables were: time of contact (as a dichotomous variable, 8.00–20.00 or 20.00–8.00 h), day of week (as a dummy variable, taking working days for reference vs non-working days, which included Saturdays and Holiday), distance from nearest OOH point (as a continuous variable), organizational format of the contact's GP (dummy variable, taking GPs working alone for reference as opposed to GPs in basic associations, networking GPs, GPs in groups, GPs in UTAPs); clinical characteristics of the contact: a patient receiving integrated home care from the GP (yes/no), a patient receiving home nursing services (yes/no), home physiotherapist (yes/no), and diagnostic category (ref der = dermatology).

diseases of the respiratory, cardiovascular, and nervous systems, but also ophthalmological diseases) understandably carried a higher likelihood (than the chosen reference diagnostic category, dermatology) of patients referred to an ED instead of having their problems managed over the phone because such clinical conditions are more likely than skin diseases to require specialist visits or diagnostic equipment unavailable at the OOH clinic. Only cases of fever and requests for advice about ongoing therapies were referred to an ED less frequently than dermatological conditions. On the other hand, dermatological diseases (which are usually diagnosed by visually examining the lesion) were more likely to be seen by an OOH physician than almost any other diagnostic category.

Even after adjusting for diagnostic categories, however, our analysis identified other characteristics that were associated with how OOH services managed patients who contacted them. Foreigners contacting the service were more likely than Italian people to be examined by an OOH physician or referred to a specialist or to an ED instead of having their problems managed over the phone. This could be because language problems made advice delivered over the phone less effective and reassuring, as already mentioned elsewhere [31].

Older age also made patients contacting the service more likely to be seen by an OOH doctor or referred to an ED instead of having their problems managed over the phone. This could be because older people are more likely to have comorbidities [38] that make it necessary for doctors to examine them or refer them to an ED. Older patients may also find it increasingly difficult to communicate over the phone due to hearing loss or cognitive problems, so a face-to-face visit may be more appropriate to ascertain their real clinical conditions [38].

Gender-related differences in the way patients are handled have been demonstrated in various health systems and different health settings [39]. Our results showed that women were less likely than men to be visited by an OOH doctor or referred to an ED, instead of having their problems managed over the phone. This may be because the women's problems were generally less urgent, so the advice they received over the phone was often enough (and the higher rates of women contacting the OOH services than men might also suggest that some of the former's requests were less urgent). But physicians might also take a different attitude to patients with the same clinical needs depending on their gender. In fact, one review underscored the impact of gender on the use of primary care services [40]:

for example, women with cardiovascular disease were less likely than men to be referred to a specialist and have their cholesterol tested, and they were less likely to be prescribed medication. An interesting finding emerging from our data is that patients handled by an UTAP GP rather than by an association GP had a 25% lower likelihood of being referred to an ED. A systematic review [41] had previously shown that action to make primary care more accessible (e.g. by increasing the number of primary care physicians and of the centers providing such care) is effective in reducing the numbers of people going to the ED. It has also been demonstrated that: patients who have an ongoing relationship with their family physician are more likely to seek their own GP's advice before going to an ED [42]; and that high-quality, timely and family centered pediatric services are associated with a lower tendency for non-urgent cases to be seen at the ED [43]. Our study likewise indicated that an advanced, integrated primary care organization enables a more accessible, better coordinated management of health care needs, leading to fewer urgent requests for the OOH services to manage, or refer to an ED.

Further studies are needed, however, to see whether patient referral to an ED by OOH doctors is appropriate and, more in general, what processes are implemented at the ED for patients referred there by the OOH services, and their outcomes. A previous systematic review found, for instance, that action taken to increase OOH primary care services did not generate any reduction in ED attendance (though the studies considered received low global quality ratings and various different models of OOH primary medical care services had been considered) [40]. Some studies found that the referral of a patient to an ED correlated not only with the patients' characteristics, but also those of the physicians involved. For instance, one such study [44] found a more than fourfold difference in the rates of referral to EDs between GPs working at the same OOH services, meaning that each doctor's attitude had an important part in determining their referral rates (GPs with a lower tolerance of risk were more likely to send patients to hospital), and so did the doctor's gender (as confirmed by our results). After adding codes to identify each OOH physician, our complex regression model showed that some physicians had a statistically different propensity to send patients to an ED instead of managing their problems over the phone (one physician was almost 5 times more likely to do so than the randomly selected reference physician No. 1). It has also been demonstrated that giving doctors feedback on their performance vis-à-vis a benchmark can influence their clinical performance in some cases, and may have an impact on their rates of patient referral to an ED [45].

Our study suffers from several limitations. Firstly, because we used administrative data, we did not control for potential inaccuracies in data collection; in addition, some data were unavailable (e.g. level of formal education, which is an important determinant of people's perception of their health status and demand for health care [46]). Another limitation concerns our use of disease categories, based on the dataset considered: it may be that some visits were misclassified. Even though a researcher checked the consistency between the disease code applied

and the written text available on the computer concerning diagnosis, therapy and advice, our results should be interpreted with caution. Another limitation of our study lies in that we only analyzed the OOH archives and could not follow up patients' further management or subsequent care at ED services for example, after their OOH contact. In addition, the present study on the population's demand for OOH services measured only the (more or less appropriate) expressed part of patients' actual health care needs. It would be impossible to establish and investigate the population's real needs without considering any unexpressed needs and the appropriateness of their access to health care services. Finally, the generalizability of our results is limited by the fact that our survey focused on a specific geographical area.

Our study also has several strengths, however. The questions addressed are timely and very important to health policy decision-making and for the purpose of organizing the often somewhat neglected OOH services as an essential part of primary care. Another strength of our study lies in that it was conducted on an unrestricted and unselected population of primary care patients using routinely recorded data, which consequently could not be distorted by any research hypothesis.

In conclusion, our study shows that OOH services address a composite demand variously expressed depending on the age, sex and nationality of the patients involved. Our findings could be useful in delineating the demand for OOH services with a view to improving the design of such services and characterizing the continuing professional education of OOH physicians, who should also be actively involved in clinical disease management pathways to enable them to assure patients the best possible continuity of management and care.

Further research is needed, however, on how appropriately the OOH services are used, and on patient outcomes (physical improvement and satisfaction) in order to investigate thoroughly the quality of care provided by OOH services with a view to improving their performance.

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Ethical approval

The study was performed on data routinely collected by the health services in anonymized records that make it impossible to identify individuals. The data analysis was performed on aggregated data. The study complies with the Declaration of Helsinki and with the Italian Law n. 196/2003 on the protection of personal data.

Competing interests

The authors have no competing interests to disclose.

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