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Title:

Analysis of users and reasons for use of a physician-on-call service in an Italian local health unit

Running Head: “Physician-on-call service analysis”

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Conflict of interest

The authors declare that there are no conflicts of interest.

Title:

Analysis of users and reasons for use of a physician-on-call service in an Italian local health unit

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Abstract

Background: In recent years, several countries have proposed changes to primary care organization.

Objective: Our study investigated the characteristics of "physician-on-call" usage in a local health unit of Lombardy (ASL MI1).

Methods: We analysed the incoming calls to the Operative Medical Central Station and collected the user characteristics, the call reasons and the outcomes from October 1st to December 31st, 2012. Then, we randomly extracted 10% of the call sample from this period. We focused on two outputs: telephone advice and emergency department referral. We fit a logistic regression model to identify potential predictors of these outputs.

Results: In total, we evaluated 2,146 calls. Women made most of the calls. Older age was associated with the referral to emergency care (aOR 3.1), while paediatric calls were associated with telephone advice (aOR 1.9). Information requests were related to telephone advice (aOR 2.3), while cardiovascular symptoms (aOR 3.5), pain (aOR 2.6) and traumas (aOR 4.7) were linked to emergency care.

Conclusions: Our study outlined the increasing use of telephone advice, particularly for calls regarding paediatric patients. In contrast, calls for elderly patients were more frequently referred to emergency care. These findings led to the implementation of an age-targeted educational programme. Overall, our observations highlighted that women used the physician-on-call service more frequently than men. Furthermore, some reasons for calling were significantly associated with emergency care.

Keywords:

Primary care, telephone consultations, organization, emergency, physician-on-call, out-of-hour services

Background

Recently, several countries proposed changes to primary care organization (1,2). Thus, there has been an increase in the use of telephone consultations(3-5). Telephone consultations can reduce both the emergency care visits and the number of visits overtime for general practitioners (GPs) (3-5). Moreover, the availability of telephone consultations in primary care could effectively reduce costs (6). In the literature, there is evidence that telephone consultations guarantee patient safety (7-9) and user satisfaction (3, 10).

In Italy, primary care assures the continuity of care, managing local healthcare requests. The primary care department ensures the service's homogeneity, the development of healthcare pathways and the integration between the hospital and the territory. Thus, GPs filter the population's requests for a higher level of care. Out-of-hours services assure the continuity of care, managing health requests that cannot be postponed. These services work every evening and night and all day long during weekends and bank holidays (11, 12). Hence, these services guarantee assistance when the medical offices of GPs and paediatricians are closed (11, 12).

In Italy, a local health unit in Milan (ASL MI1), which provided healthcare for approximately 1 million inhabitants, is carrying out an organized version of the "continuity of care service" (CCS). This service is performed by physicians-on-call and can be requested by calling a toll-free number that is run by medical staff (12). Telephone requests can be managed by telephone advice, home medical visits, outpatient visits or referral to the emergency department when the care needed is urgent and unrelated to the primary care field. In the latter case, when the disease cannot be managed at home or in an outpatient setting, physicians can activate the emergency service.

In the literature, comparable organizations were described, but few services are managed entirely by doctors. Indeed, non-medical healthcare professionals, sometimes with the aid of informatics decision support (9, 13), manage most of these services. For example, in the Netherlands, trained triage nurses who are supervised by physicians handle the primary care calls (1, 14).

In Italy, few published data are available regarding the user characteristics, the reasons for the calls, the time of the calls, and the outcomes of the medical consultations. Therefore, the ASL MI1 promoted a study in order to obtain updated data that is useful for the reorganization of the service. The aim of the service rearrangement was to reduce the number of inappropriate referrals to the emergency department (14), managing patients within the more affordable setting of primary care (15).

Our study, therefore, investigated the utilization statistics of the physician-on-call service (including user characteristics, the reason for the calls, the time of the calls, and the outcomes) by analysing the incoming calls to the ASL MI1 Operative Medical Central Station (OMCS). Furthermore, we compared our findings with the results of comparable studies from other Italian regions or other countries.

Methods

The context

The “Continuity of Care Service” (CCS) of the ASL MI1 guarantees the coverage of unpostponable healthcare services while the offices of GPs and family paediatricians are closed. The CCS includes the following three levels of organization:

1. Operative Medical Central Station (OMCS) (an operative office that filters the incoming calls)
2. Local workstations (composed of physicians who perform the outpatient or home visits in accordance with the directions from the OMCS)
3. Outpatient activities (performed through direct access with the patient or by following the recommendations from the OMCS)

According to the clinical situation, the medical staff of the OMCS arranges one of the four possible outcomes:

- Telephone advice (TA)
- Outpatient services
- Medical home visits
- Referral to the emergency department (ED)

The medical staff records each call in a hardcopy archive.

The study

The present work is a risk management project of the ASL MI1. We collected data with an online checklist by systematically reviewing the OMCS records. For the incoming calls from October 1st to December 31st, 2012, eleven employees were trained to insert and encode the data. Each call was numbered. Then, we extracted 10% of the sample by employing a numerical randomization system. The work was organized in late 2013 and the analysis in 2014.

Online checklist

The online link for data entry was published on the corporate intranet within the primary care reserved area.

The online checklist was elaborated by the research team and included the following items:

- ID call number
- Time of the call (Morning: 06:01-12:00, Afternoon: 12:01-18:00, Evening: 18:01-00:00, Night: 00:01-06:00)
- Patient age group (0-14 years, 15-64 years, 65-80 years,>80 years)
- Reason for the call (multiple reasons could be selected, including the following: cardiovascular symptoms, respiratory symptoms, pain, fever, gastrointestinal symptoms, urogenital symptoms, neurological symptoms, psychiatric symptoms, traumas, sensory organ symptoms, dermatological symptoms, certificates/prescriptions, chronic diseases, information or other)
- Outcome of the call (TA, outpatient visit, home visit, referral to ED)

Statistical analysis

For the analysis, we used STATA MP11 (Stata Corp., College Station TX, 2011). We summarized the categorical variables as absolute numbers and percentages. To assess any potential differences related to the call outcome, we used a chi square test. Considering an economic and organizational point of view, we selected two opposite outputs, TA and ED referral, as the main outcomes. Then, we fit a logistic regression model in order to identify the potential predictors of these outcomes. The covariates that were included in the model were chosen using stepwise-forward selection with a $p \leq 0.25$ cut off. The results are expressed as odds ratio (OR) with their 95% confidence interval (CI). A p -value ≤ 0.05 was considered statistically significant.

Results

During 2012, the OMCS received over 110,000 calls. Among these, 22,245 calls matched our observation period. We randomly extracted 10% of the sample, obtaining 2,146 calls in total. Table 1 describes the main sample characteristics.

Gender

Women made most of the calls (56.64%, $n=1012$). We found no significant difference in the outcomes related to gender. In particular, for both men and women, 55% of the calls required only TA, while between 9.05% (in females) and 12.79% (in males) required an ED referral (see Table 1).

Age Groups

Adults (15-64 years) made the majority of the calls (n=849; 57.68%), followed by paediatric users (0-14 years) (n=358; 22.5%), 65- to 80-year-old users (n=235; 14.74%), and >80-year-old patients (n=155; 9.71%). Only 65 adult calls (7.5%) required an ED referral, while nearly a fourth of the calls from octogenarians needed this service (n=38; 24.52%). Older patients also required home visits more frequently than younger subjects did (>80 years: 30.32% and 65-80: 17.02% vs. 15-64 years: 10.95%). On the contrary, approximately 70% (n=60) of the calls for children diseases were managed with TA, and only 3% (n=11) required a home visit (Table 1).

Time of the call

Most of the calls (n=687; 41.06%) took place during the evening, followed by calls during the morning (n=445; 26.6%), afternoon (n=326; 19.49%) and night (n=245; 12.85%). ED referral was less frequent in the afternoon (7.36%) than it was in the morning and evening (10.56% and 11.64%, respectively) and increased during night shifts (15.81%). On the contrary, outpatient visits were more common during the morning (35.06%) and decreased throughout the day. Finally, calls that required TA increased from the morning (8.9%) to the night (67.91%) (See Table 1).

Reasons for the call

Table 2 reports the main reasons for the calls and their outcomes. The six most common reasons for calling were gastrointestinal symptoms (n=367; 20.11%), fever (n=319; 17.48%), sensory organ symptoms (n=186; 10.19%), respiratory symptoms (n=185; 10.14%), pain (n=155; 8.49%), and certificates/prescriptions (n=140; 7.67%). The TA outcome was more frequent for information requests (n=70; 88.61%), psychiatric symptoms (n=12; 66.67%), and gastrointestinal symptoms (n=241; 65.67%). In contrast, ED referrals were more common for traumas (n=32; 37.50%), cardiovascular symptoms (n=71; 28.17%) and chronic diseases (n=54; 24.07%). Home visit outcomes were more often for calls regarding psychiatric symptoms (n=4; 22.22%), chronic diseases (n=11; 20.37%) and urogenital symptoms (n=14; 17.50%). Finally, outpatient visits were offered more frequently for calls regarding certificates/prescriptions (n=130; 71.43%), sensory organ symptoms (n=72; 38.71%) and dermatologic symptoms (n=19; 31.15%).

Multivariate analysis

Table 3 presents the multivariate results for TA, while Table 4 reports the findings regarding ED referrals.

The analysis outlined no significant correlations between gender and outcome.

In contrast, we found a significant correlation of evening and night calls with TA (aOR 1.89 and aOR 2.20, respectively), while there was no relationship between the time of the call and ED referrals. Considering the age of the patients, calls regarding paediatric patients were significantly associated with TA (aOR 1.85), while calls regarding elderly patients (>80 years) had high odds of ED referral (aOR 3.09). Only calls that were information requests were positively associated with TA (aOR 2.3), but calls regarding cardiovascular symptoms (aOR 0.45), respiratory symptoms (aOR 0.40), sensory organ symptoms (aOR 0.48), and certificates/prescriptions (aOR 0.20) were negative predictors of a TA outcome. Moreover, cardiovascular symptoms (aOR 3.54), pain (aOR 2.58) and traumas (aOR 4.69) were related to ED referrals.

Discussion

We investigated the use of the physician-on-call service in the ASL MI1 in order to gather valuable information to improve this service. From our analysis, we found that adults primarily used this service (53.16%). However, relative to the population of district residents in this age cohort (65.9%) (11), their service utilization appears to be below our expectations. Indeed, adults are generally healthy, and they visit primary care especially for acute problems (16). Moreover, calls regarding adult patients required ED referral less often than those regarding older patients, a fourth of which required ED referral. The multivariate analysis confirmed this age trend. Older users also presented a greater use of home visits (30.32%). In summary, these findings highlight the efficient filtering action of the OMCS. The elderly group includes more frail users who require a higher intensity of care. Although the paediatric population represented only 14.4% of the local population (11), over 22% of the calls concerned them. However, the calls regarding children often required only TA (68.16%). This tendency was confirmed in the multivariate analysis. These remarks are in agreement with statistics on the higher share of paediatric ED visits for minor clinical problems (11) and with the findings from Buja et al., who conducted a study on out-of-hours primary care in Veneto (17). In summary, these interesting age-related observations were consistent with both national (17) and international studies (18). Based on these findings, the ASL MI1 started a working group, including family paediatricians and hospital specialists, in order to develop parents-targeted information programmes. These information campaigns aimed to educate families on the main causes of inappropriate ED visits, such as fever or

diarrhoea. Given the high participation and interest towards these programmes, the project was enlarged to educate on the main inappropriate causes of ED visits independent of age.

Despite the high number of calls from women, we found no difference in the outcomes related to gender. The greater use of the service by women was described previously in studies from other countries (2, 5). Men were previously shown to self-refer themselves to the ED (19). In contrast, this lack of difference in gender was in opposition with the results of other studies that outlined that men were more frequently referred to the ED or to outpatient visits than women (17).

The physician-on-call service was utilized more during the evening (over 40% of the calls). Despite the lower use during the night, we found that this time period had the greatest need for emergency care. The increased demand for out-of-hour care during the evening hours is in accordance with the results outlined in studies of other countries, where this observation led to the implementation of a new model of care (5). In our district, this finding supported the development of the Functional Territorial Aggregations, which grouped GPs, paediatricians and primary care doctors together so that they were available overtime. Similar large-scale programmes were implemented successfully, over the last years, in other countries such as the Netherlands (1, 14).

The main reasons for calling, i.e., gastrointestinal symptoms, respiratory symptoms and pain, did not differ from those outlined in previous studies (17, 18). However, we observed a large portion of calls regarding sensory organ symptoms. The analysis of the call reasons and the wide use of TA in 2013 led to the implementation of training courses regarding telephone triage techniques. An Italian study that investigated telephone triage quality confirmed the importance of these courses and outlined the need for improvement in this area (20). Indeed, the correct use of TA can decrease the medical workload by nearly 40% (4, 10); this result is welcomed by patients (3, 8, 10), and it appeared safe when it was conducted by trained operators (9). Considering the overall outcomes, our analysis outlined a lower use of outpatient and home visits than that outlined in another national study (17), highlighting to the greater number of TA outcomes.

Moreover, using the collected information on the main reasons for calling, the ASL developed a map of hospitals to which patients should be referred according to their symptoms and the severity of their disease.

The main limitation of the study was that we worked on hardcopy archives. In particular, we were limited because these registries were incomplete. These limitations were extensively discussed during

the risk management meetings. However, the less legible fields corresponded to the name and surname information, which were not used in our research.

Furthermore, the symptom categories were simplifications that did not allow us to discriminate the disease severity. Our classification is in accordance with similar international studies (17-19). Moreover, in our analysis, we considered a three-month period. Consequently, the retrieved data could have varied with respect to the season. We assumed that the three-month observation did not significantly affect the general results; Salisbury et al. (2000) showed only limited seasonal variations (21). Finally, the incoming calls were not followed up, thus, we could not provide information concerning the final outcomes. The collection of these data would allow us to identify the appropriateness of the triage. Therefore, further studies are required to assess the appropriateness of the outcomes. However, exploring the final outcome of all the incoming calls appeared to be unfeasible.

Our analysis considered the usage pattern throughout the day. It could be interesting for further analyses to evaluate the potential differences in usage between weekdays or weekends. Moreover, previous studies observed different patterns of use according to the patient's country of origin(17). It could be interesting to assess this potential difference in our local health unit.

Because our study suggested some interesting variations in primary care organization, similar studies that focus on other local settings could be valuable.

In conclusion, our results outlined the efficient triage work of the OMCS staff and provided practical suggestions to improve this service. Indeed, the OMCS can operate as a gatekeeper to reduce inappropriate ED visits. Additionally, it was fascinating to note the difference in service utilization according to patient age. These findings led to the implementation of an age-targeted educational programme. Finally, this work was particularly valuable for the reorganization of primary care in the Lombardy region.

Compliance with Ethical Standards:

Conflicts of interest: The authors declare that they have no conflicts of interest.

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Table 1: Sociodemographic characteristics and the time of the call (N=2146) according to their outcomes – incoming calls to the ASL MI1 Operative Medical Central Station (October 1st - December 31st, 2012)

		Outcomes				
		Total % (N)	ED (N=198)	Telephone advice (N=1059)	Home visit (N=192)	Outpatient (N=376)
Outcome			10.85 (198)	58.03 (1059)	10.52 (192)	20.60 (376)
Gender	Men	43.46 (778)	12.79 (87)	55.44 (377)	11.91 (81)	19.85 (135)
	Women	56.54 (1012)	9.05 (80)	55.54 (491)	11.76 (104)	23.64 (209)
Age group	0-14 years	22.42 (358)	12.01 (43)	68.16 (244)	3.07 (11)	16.76 (60)
	15-64 years	53.16 (849)	7.66 (65)	51.35 (436)	10.95 (93)	30.04 (255)
	65-80 years	14.74 (235)	19.57 (46)	53.62 (126)	17.02 (40)	9.79 (23)
	>80 years	9.71 (155)	24.52 (38)	40.65 (63)	30.32 (47)	4.52 (7)
CallTime	Morning	26.60 (445)	10.56 (47)	45.39 (202)	8.99 (40)	35.06 (156)
	Afternoon	19.49 (326)	7.36 (24)	55.83 (182)	7.98 (26)	28.83 (94)
	Evening	41.06 (687)	11.64 (80)	63.32 (435)	12.81 (88)	12.23 (84)
	Night	12.85 (215)	15.81 (34)	67.91 (146)	11.63 (25)	4.65 (10)

Table 2: Main reasons for the incoming call to the ASL MI1 Operative Medical Central Station (October 1st- December 31st, 2012) according to their outcome (N=1863)

Reason for the call	Total % (N)	Outcomes			
		Emergency Service (N=198)	Telephone advice (N=1059)	Home visit (N=192)	Outpatient (N=376)
Cardiovascular Symptoms	3.89 (71)	28.17 (20)	45.07 (32)	16.90 (12)	9.86 (7)
Respiratory Symptoms	10.14 (185)	15.68 (29)	42.70 (79)	17.30 (32)	24.32 (45)
Pain	8.49 (155)	21.29 (33)	51.61 (80)	15.48 (24)	11.61 (18)
Fever	17.48 (319)	8.46 (27)	58.31 (186)	12.85 (41)	20.38 (65)
Gastrointestinal Symptoms	20.11 (367)	10.08 (37)	65.67 (241)	15.26 (56)	8.99 (33)
Urogenital Symptoms	4.38 (80)	12.50 (10)	50.00 (40)	17.50 (14)	20.00 (16)
Neurological Symptoms	6.36 (116)	20.69 (24)	48.28 (56)	16.38 (19)	14.66 (17)
Psychiatric Symptoms	0.99 (18)	5.56 (1)	66.67 (12)	22.22 (4)	5.56 (1)
Traumas	1.75 (32)	37.50 (12)	46.88 (15)	6.25 (2)	9.38 (3)
Sensory organs Symptoms	10.19 (186)	5.38 (10)	51.08 (95)	4.84 (9)	38.71 (72)
Dermatological Symptoms	3.34 (61)	11.48 (7)	55.74 (34)	1.64 (1)	31.15 (19)
Certificates/Prescriptions	7.67 (140)	1.43 (2)	23.57 (33)	3.57 (5)	71.43 (100)
Chronic Diseases	2.96 (54)	24.07 (13)	50.00 (27)	20.37 (11)	5.56 (83)
Information	4.33 (79)	0.00 (0)	88.61 (70)	5.06 (4)	6.33 (5)

Table 3: Odds (and 95% CI)of the telephone advice outcome for the sociodemographic characteristics of the users, the time of the call and the reason for the call.

	Item	OR	p	CI (95%)	aOR	p	CI (95%)
Gender	Men	Ref.			Ref.		
	Women				1.02	0.875	(0.80;1.28)
Time of the call	Morning	Ref.			Ref.		
	Afternoon	1.52	0.004	(1.14;2.03)	1.34	0.092	(0.95;1.89)
	Evening	2.08	<0.001	(1.63;2.65)	1.89	<0.001	(1.42;2.52)
	Night	2.55	<0.001	(1.81;3.58)	2.20	<0.001	(1.47;3.27)
Age group	15-64	Ref.			Ref.		
	0-14	2.03	<0.001	(1.56;2.63)	1.85	<0.001	(1.33;2.55)
	65-80	1.09	0.539	(0.82;1.46)	1.08	0.0645	(0.78;1.50)
	>80	0.65	0.015	(0.46;0.92)	0.57	0.007	(0.38;0.86)
Reason for the call	Cardiovascular Symptoms	0.58	0.026	(0.36;0.93)	0.45	0.011	(0.25;0.83)
	Respiratory Symptoms	0.50	<0.001	(0.36;0.94)	0.40	<0.001	(0.27;0.59)
	Pain	0.75	0.092	(0.54;1.05)	0.69	0.078	(0.46;1.04)
	Gastrointestinal Symptoms	1.49	0.001	(1.18;1.90)	1.03	0.850	(0.76;1.40)
	Urogenital Symptoms	0.71	0.138	(0.45;1.12)	0.59	0.082	(0.32;1.07)
	Neurological Symptoms	0.66	0.029	(0.45;0.96)	0.67	0.073	(0.43;1.04)
	Sensory Organs Symptoms	0.73	0.04	(0.54;0.99)	0.48	<0.001	(0.32;0.72)
	Traumas	0.63	0.201	(0.31;1.28)	0.54	0.134	(0.24;1.21)
	Certificates/Prescriptions	0.20	<0.001	(0.13;0.30)	0.20	<0.001	(0.12;0.34)
	Chronic Diseases	0.72	0.227	(0.42;1.23)	0.95	0.887	(0.50;1.83)
	Information	5.95	<0.001	(2.95;11.99)	2.30	0.046	(1.01;5.22)

Table 4: Odds (and 95% CI) of emergency department (ED) referral for the sociodemographic characteristics of the users, the time of the call and the reason for the call.

	Item	OR	p	CI (95%)	aOR	p	CI (95%)
Gender	Men	Ref.			Ref.		
	Women				0.68	0.124	(0.47;0.97)
Time of the call	Morning	Ref.			Ref.		
	Afternoon	0.67	0.131	(0.40;1.12)	0.79	0.232	(0.44;1.40)
	Evening	1.12	0.573	(0.76;1.63)	0.98	0.223	(0.62;1.53)
	Night	1.59	0.055	(0.99;2.56)	1.44	0.417	(0.81;2.54)
Age group	15-64	Ref.			Ref.		
	0-14	2.02	<0.001	(1.56;2.63)	1.83	0.486	(1.09;3.08)
	65-80	1.09	0.539	(0.82;1.46)	2.30	0.552	(1.44;3.68)
	>80	0.65	0.015	(0.46;0.92)	3.09	<0.001	(1.85;5.19)
Reason for the call	Cardiovascular Symptoms	3.47	<0.001	(2.02;5.96)	3.54	<0.001	(1.83;6.84)
	Respiratory Symptoms	1.62	0.027	(1.06;2.48)	1.60	0.075	(0.95;2.69)
	Pain	2.47	<0.001	(1.63;3.74)	2.58	<0.001	(1.55;4.30)
	Fever	0.72	0.133	(0.47;1.10)	0.80	0.407	(0.47;1.35)
	Neurological Symptoms	2.30	0.001	(1.43;3.70)	1.77	0.052	(1.00;3.16)
	Sensory Organs Symptoms	0.44	0.014	(0.28;0.84)	0.48	0.095	(0.20;1.14)
	Traumas	5.18	<0.001	(2.49;10.77)	4.69	<0.001	(1.97;11.14)
	Certificates/Prescriptions	0.11	0.002	(0.03;0.45)	0.27	0.078	(0.07;1.15)
Chronic Diseases	2.71	0.002	(1.43;5.17)	1.50	0.319	(0.67;3.35)	