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DOI: 10.2478/rjom-2023-0008

Original papers

Emergencies in occupational medicine: the experience of an on-site medical office

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Abstract

Objective: Medical emergencies (ME) in the occupational medicine (OM) office represent an increasingly frequent challenge, because they may require treatment or an ambulance, involving monitoring the patient, halting scheduled activity. The objective of this retrospective observational study was to study ME in the on-site medical office of a local pharmaceutical company, with an emphasis on the differences between major and minor emergencies, and on the factors associated with a longer duration of consultations, in order to optimize management.

Methods: ME in the on-site office of a local company, January - June 2023 (109 working days), were recorded. The presentations were divided into 2 groups (G): G1 - ME that required ambulance/hospitalization/immediate treatment (etiological and/or symptomatic) and G2 - ME without immediate intervention.

Results: During the 109 working days analyzed, 173 consultations involved ME (12.5% of the total presentations), with a mean of 1.6 presentations/day, On the 62 days with ME, the average was 2.7 presentations/day. The presentations, with a mean age of 40.8 years and a female predominance (69.4%), were divided into 2 groups: G1 included 95 (54.9%) presentations with immediate intervention, G2 - 78 (45.1%). In G1, 8 (8.4%) presentations required ambulance to hospital, 39 (41.1%) received etiological treatment, and 76 (81.1%) symptomatic treatment. Presentations for infectious diseases in a pandemic context ranked first This emphasizes the role of the OM physician in assessing Covid-19 contacts/patients. An ME consultation lasted on average 16.2 minutes, with a maximum of 19.4 minutes (excluding Covid-19 rapid testing). The most frequent ME complaints/humors were of cardiovascular, neurological, digestive and musculoskeletal origin. The maximum duration was in cardiovascular disease, associated with each type of intervention ($p<0.0001$ in the 3 cases: ambulatory/symptomatic/ etiological treatment).

Conclusion: ME in the OM doctor' activity are frequent, more so in middle-aged women, especially between 12:01-16:00. They add approximately 2-3 consultations daily, in addition to the scheduled ones (30-45 additional minutes). Most ME require medical intervention: treatment in the office/ambulance. Apart from the COVID-19 context, most ME were cardiovascular (most time-consuming), digestive, neurological, and musculoskeletal. The duration of emergency consultations, additional to appointments, could require dedicated intervals, in order not to overload the physician. A systematized analysis of ME, paralleled by a good feedback towards the employer, could favor an individualized approach and an optimized endowment of the office, allowing identification of undiagnosed chronic disease, which would enhance productivity.

Keywords: *medical emergencies, on-site office, occupational medicine*

Introduction

Occupational medicine (OM) consultations involve mostly preventive medical evaluations that ensure the supervision and improvement of workers' health, in the form of medical check-ups "upon employment, adaptation, periodically, upon resumption of activity, special supervision, and health promotion at the workplace " (by Government Decision (HG) 355 of 2007 updated by HG 1169 of 2011) [1]. Medical emergencies (ME) in the OM office represent an increasingly frequent challenge for the OM specialist, in the context of the global increase in morbidity at younger ages, in addition to work accidents, public health emergencies or other force majeure situations that may appear during the work schedule [2,3]. Since 1986, the American College of Emergency Physicians has defined the role of the emergency physician with additional skills in OM, considering the growing interest in this category of patients since those years, but there was also the problem that OM physicians and office staff be trained in providing emergency care [4,5]. In Romania, the ages between which an individual can work are 18 to 65, for men, and 61 years and 9 months for women respectively, in 2022, with a gradual increase until 63 years in January 2030 [6]. A separate category of the labor force is represented by teenagers (15 or older) who can be employed with certain restrictions regarding the work they can perform, specified in Romanian legislation, as well as people past retirement age.

An early approach to the health problems of employees can result in fewer sick leave days and disability allowances, economically benefitting the state or the company. There are very few studies dedicated to ME in the workplace, especially those that involve the national emergency system, ambulance, hospitals. A very recent analysis from Poland studied the data of the national emergency system, exclusively regarding 1601 calls made for emergency situations in various workplaces [7]. The on-site medical office (an authorized office on the premises of the company) can represent the first medical contact in the case of many minor or major ME, and its equipment is regulated by the Order of the Ministry of Health no. 240/2004: minimum equipment (couch for consultations; cabinet for instruments and medicines; stethoscope; blood pressure monitor; reflex hammer; scale for adults; thaliometer; optotypes for distance and near vision tests) and optional equipment (electrocardiograph; audiometer; otoscope; spirometer; specific equipment to evaluate work factors etc.) [8]. A study of ME in the on-site medical office could guide the equipment needed for an individualized and rapid approach, substantially improving the prognosis of patients affected by ME during working hours. At the same time, ME may involve serious cases or they require the administration of treatments or the request of an ambulance, which involves monitoring the patient, becoming a time consumer and sometimes stalling the usual, scheduled activity for important time intervals. These aspects demonstrate the need for systematic analyzes regarding the characteristics of ME in the OM office.

Objective

The objective of this retrospective observational study was to study the ME situation in the on-site office of a local company, with an emphasis on the differences between patients with major and minor emergencies, as well as on the factors that are associated with a longer duration of emergency consultations, with the aim of optimizing the individualized management of patients.

Method

ME in the on-site office of a local company during January-June 2023 (109 working days) were recorded in the office's consultations registry. ME were defined as medical presentations for reasons that excluded consultations for other purposes (administrative, medical check-up at employment, periodical, upon resuming work etc.). The studied population included consecutive patients, employees of a company in the pharmaceutical industry in Romania or contractors who carry out their activity at its headquarters, who presented at the medical office for ME. The inclusion criteria were: presentations for ME at the on-site office during its opening hours, 8 hours/day (08:00 - 16:00) on working days, age over 18 years. The exclusion criteria were: consultations scheduled for administrative purposes, incomplete data in the consultations registry, and patients' refusal to participate in the research.

177 presentations were documented, 3 of which had missing data, and 1 patient refused to participate in the research, leaving 173 presentations in the study, corresponding to 137 individual patients. The presentations were divided into two groups (G): G1 - with ME that required ambulance/hospitalization/

immediate treatment (etiological and/or symptomatic) and G2 – ME patients that did not require immediate intervention. The grouping was done according to the received medical recommendation, even if the patient refused the treatment, the trip to the hospital or the ambulance consultation.

The study variables included demographic data (sex, age), chief medical complaint (diagnosis, symptoms), type of diagnosis by category, if the problem was an acute chronic disease or a manifestation of a new disease, the clinical-paraclinical parameters measured in the office (blood pressure, heart rate, oxygen saturation, blood glucose measured with a glucometer), the need to request an ambulance with/without transport to the hospital, death, solving the case by administering symptomatic/etiological treatment in the office, issuing a prescription, referral ticket to the specialist or for investigations, the time of the presentation and the duration of the consultation, onset of symptoms at the workplace or before, whether the patient was sent home (by communicating the medical decision in writing to the direct manager), refusal of compliance to medical recommendations. The diagnostic categories used in the analysis were the chapters from the international classification of diseases ICD-10, with the codes found in the studied patients [9].

The statistical analysis was performed via Microsoft Excel version 2013 and Epi Info version 7.2.2.2. Numerical variables were expressed as mean and median, while qualitative variables were expressed as absolute value and percentage. The comparison was performed by ANOVA, and non-parametric tests for quantitative variables, and the Chi-square test and Fisher Exact for qualitative variables, statistical significance being established for the value $p < 0.05$. Access to the computer system and data storage on the healthcare provider's computers were password protected and all ethical requirements were met.

Table 1. Main characteristics of the study population on inclusion. G=group, n=number.

Parameter	Total presentations (n=173)	G1 (n=95)	G2 (n=78)	p-value
Age (years)	40.8 (41)	41.4 (41)	40.1 (41)	0.45
Male sex (n, (%))	53 (30.6)	25 (26.3)	28 (35.9)	0.17
Number of disease categories involved	1 (1)	0.9 (1)	1 (1)	0.08
Morning presentations (n, (%))	141 (81.5)	67 (70.5)	74 (94.9)	0.0004
Check-up duration (minutes)	16.2 (10)	21.1 (15)	10.4 (10)	0.0001
Onset of symptoms at work (n, (%))	160(92.4)	89 (93.7)	71 (91)	0.51
Blood pressure (mmHg)	132.5/81.1	134.1/ 72.3	127.1/68.1	0.35
Heart rate (/min)	84.3 (80)	86.5 (85)	76.7 (76)	0.06
Oxygen saturation (%)	97.5 (97)	97.6 (97)	97.4 (97)	0.45
Blood glucose (mg/dL)	108.5 (105)	109 (106)	102 (102)	0.7
Acute episode of previously known disease (n, (%))	19 (10.9)	14 (14.7)	5 (6.4)	0.08

Results

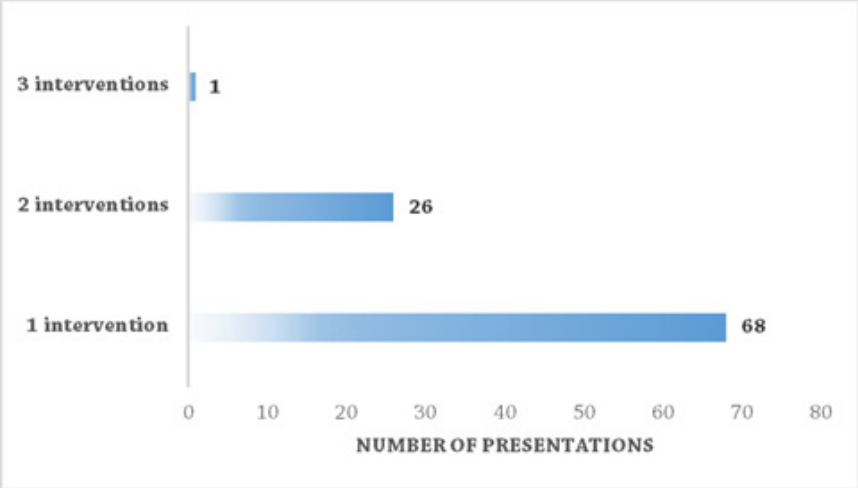
For the 109 working days analyzed, 1213 medical evaluations were carried out to determine the ability to work (11.1 on average/day), 173 ME consultations in the OM's on-site office, on average 1.6 presentations/day; on the 62 days in which there were emergency presentations, their average was 2.7 presentations/day, and 5 presentations for triage. These presentations involved a number of 137 individual patients (15.3% of the total of 898 in the Bucharest headquarters of the company), with a mean of 1.3 presentations/patient in the studied interval (25 employees with multiple presentations, minimum 2 and maximum 6). ME represented 12.5% of the total office presentations.

Out of the 173, 4 patients requested referral for routine laboratory tests, without an actual medical complaint, and 1 diabetic worker requested blood glucose monitoring.

The 173 studied presentations, with an average patient age of 40.8 years, were divided into 2 groups: G1 included 95 (54.9%) presentations that required immediate intervention, while G2 included 78 presentations (45.1%) without the need for immediate treatment. Table 1 summarizes the main characteristics of the studied presentations on inclusion, with a clear female predominance (120 presentations, i.e. 69.4%, involved women). The clinical-paraclinical parameters were determined according to patient needs (blood pressure and heart rate in 66 cases, oxygen saturation in 57 presentations, blood sugar in 14 presentations). Consultations/ Check-ups between 08:00 am - 12:00 were considered morning presentations, and the afternoon ones were between 12:01 - 16:00.

In G1, 8 (8.4%) presentations required an ambulance to the hospital in all cases, 39 (41.1%) received etiological treatment, and 76 (81.1%) involved the administration of a symptomatic treatment, to improve the patient's comfort. The graph in Figure 1 illustrates the number of interventions involved in the analyzed presentations (ambulance or immediate etiological or symptomatic treatment). No deaths were recorded in the studied interval.

Figure 1. The number of immediate interventions (ambulance/ etiological treatment/ symptomatic treatment) required by presentations with serious medical emergencies in the occupational medicine office.

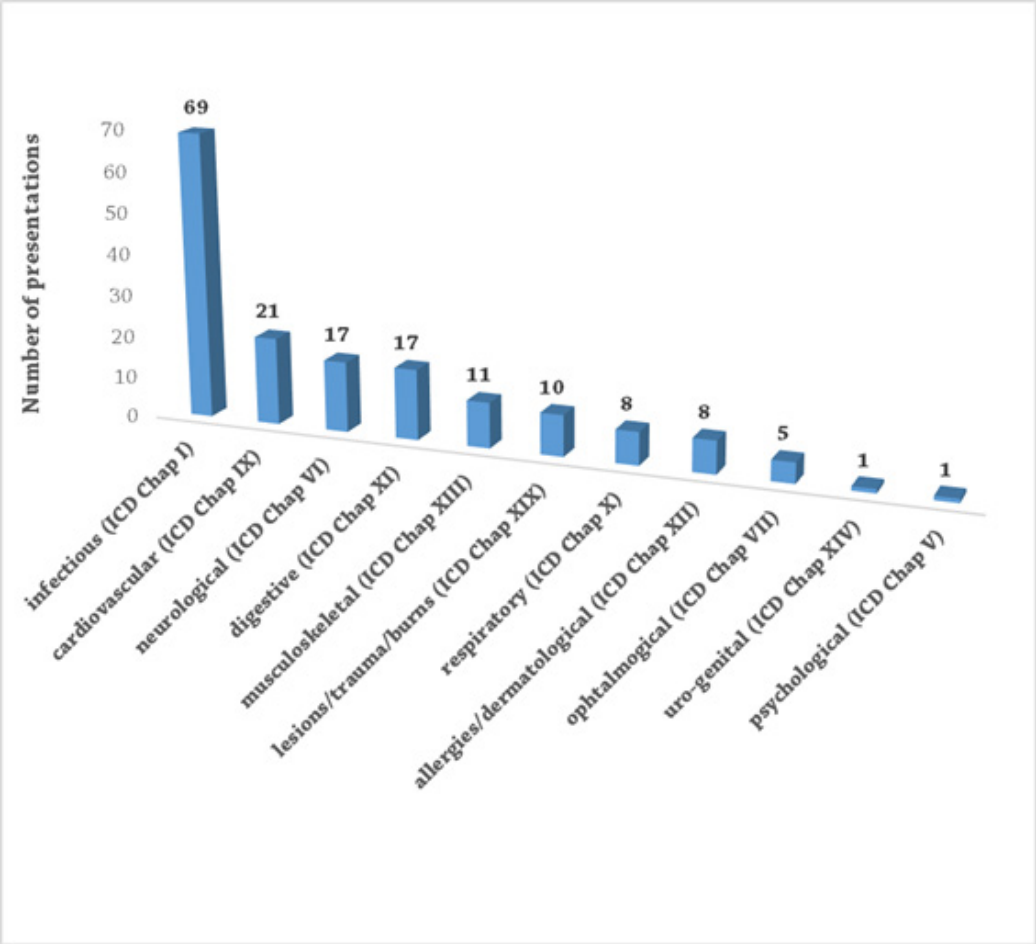


A number of 10 presentations (5.7% of the total) required the patient to be sent home for the rest of the workday, each time with written notice to the direct manager regarding the medical recommendation, while keeping the confidentiality of the medical consultation. In 9 (5.2%) cases, a referral ticket was issued for investigations, and in 9 (5.2%) cases, a referral letter to a specialist outpatient consultation.

The disease categories that dominated the studied presentations are shown in Figure 2, organized according to respective ICD-10 chapters.

An interesting association was found between the female sex and neurological symptoms, especially headache (p=0.049). The average age of patients with cardiovascular problems was significantly higher than in the case of the other reasons (47.3 years versus 39.9 years, p=0.008). Presentations for decompensated chronic diseases also had a much higher age of the respective patients compared to those with acute events, unrelated to pre-existing pathology (47.3 years versus 40.1 years, p=0.02).

Figure 2. Distribution of cases according to the reason for presentation to the on-site occupational medicine office. ICD= International Classification of Diseases, Chap=chapter.



The reasons for emergency presentation in the on-site office, as recorded in the consultation registry according to anamnesis, were, in descending order of frequency: contact with a COVID-19 patient (59 presentations, 34.1%) , hypertension (17, 9.8%), abdominal pain with various locations, with or without associated symptoms (14, 8.1%), headache (13, 7.5%), rhinorrhea/allergic rhinitis (9, 5.2%), back pain (8 , 4.6%), burns (6, 3.5%), request for lab test interpretation or recommendation (6, 3.5%), diarrhea, weakness, cough, flu vaccination (4 presentations each, i.e. 2.4%), bloating, eye irritation (3 each, i.e. 1.7%), dizziness, faintness, palpitations (2 presentations each, i.e. 1.2%), and with one presentation each (0.6% of the total) there were falls, head trauma, ankle trauma, conjunctivitis, dermatitis, nausea, vomiting, insect bite, glucose monitoring in a diabetic patient, paresthesias, cut wound, panaritium, allergy to a plant. The 25 patients with multiple presentations in the studied interval generally had complaints from different categories, with the exception of 6 patients who presented exclusively for the same pathology (one patient with 6 presentations for dressing a post-burn wound, 3 patients with multiple presentations for high blood pressure, one patient with 2 presentations for palpitations, and one patient with 3 presentations for recurrent headache).

There were a total of 10 presentations in which the professional factor was involved (5 distinct dangerous incidents that occurred during work, unclassifiable as work accidents according to legislation), all taking place in the morning.

Factors influencing emergency consults' duration

The duration of an emergency consultation in the studied interval was a maximum of 110 minutes and a minimum of 10, with an average of 16.2 minutes. If consultations with rapid testing in the case of Covid-19 contacts are excluded, the average duration of an ME consultation extends to 19.4 minutes. The longest duration was in the case of consultations for cardiovascular diseases, but was also significantly associated with each type of intervention required by the various presentations, with $p<0.0001$ in all 3 cases (ambulance/symptomatic treatment/etiological treatment). The time of the presentation had an impact on the duration of the consultations, as morning presentations required an average of 14.8 minutes to solve the case, and the afternoon ones - 22.8 minutes ($p=0.01$). The cases that required referral to investigations generated an association of borderline statistical significance ($p=0.06$), but the duration of those that did or did not require referral to a specialist was similar ($p=0.5$). Figure 3 shows the significant difference in mean duration between consultations without and with cardiovascular diseases (14.7 vs 27.4 minutes, respectively), and Figure 4 details the duration of consultations according to the nature of the respective condition.

Figure 3. The difference in the mean duration of consultations for cardiovascular diseases versus other pathologies. n=no, y=yes.

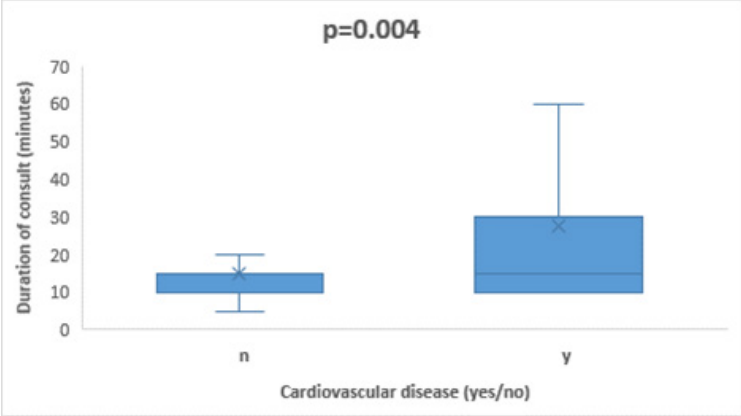
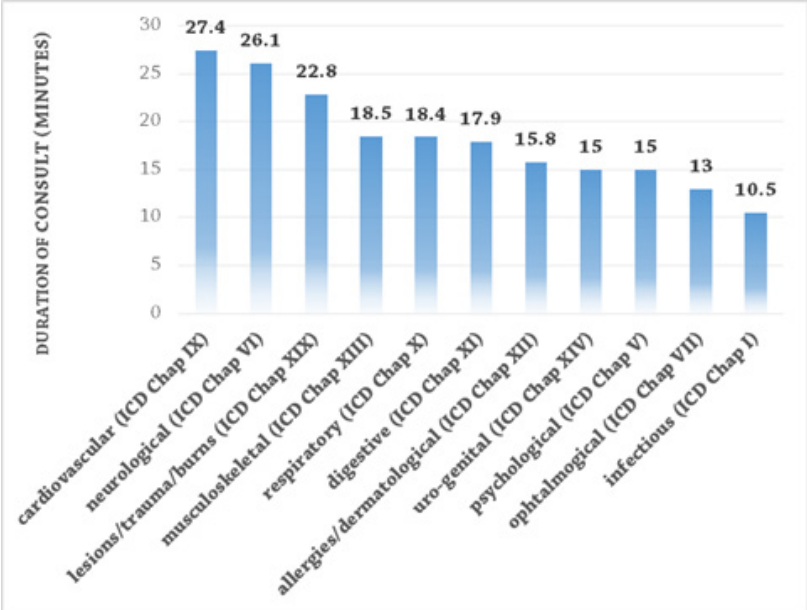


Figure 4. Mean duration of consults according to the diagnosis category. ICD= International Classification of Diseases, Chap=chapter.



Discussion

ME in the OM office were frequent in the studied company and time period, reaching almost 3 urgent presentations per day on the respective days. The patients were predominantly women, in accordance with the personnel structure of the respective company (62.2%) and different from the literature, in the case of more serious ME in G1 the proportion of men being even lower than the over 57% men in the Polish study related to ME that required an ambulance [7]. The age of the patients, approximately 40 years, was consistent with other studies, but also with the working age in Romania [6,7].

The duration of the emergency consultation was significantly longer in G1, an expected result and proportional to the severity of these ME, but also to the need to administer treatment and/or monitor the patient. This explains why on the days with ME in the office between 30-45 minutes were dedicated to unscheduled consultations, disrupting the order of the scheduled examinations, to which almost 3 additional consultations were added on each of these days. In the past, the existence of a company office dedicated to work-related emergencies and health hazards was the rule, but industrial restructuring favored the outsourcing of these services, and their conglomeration with administrative ones, becoming secondary in favor of the company's financial profitability [5]. However, the frequency with which ME occur during work, including in the present study, even in the context of a relatively limited time interval, demonstrates that OM must become a priority in ensuring the continuity of medical care, and thus productivity will increase, employees being the main focus. One-sixth of the employees presented at the office 1.3 times in 6 months for emergencies. A meta-analysis focused on occupational medicine services in the UK revealed as early as 2004 the need to replace the relative paucity of specialist doctors with other resources, such as office nurses, the use of expert computerized evaluation systems (for example, spirometry for asthmatic patients), followed by an online consultation or telephone interview [10].

The time of day when the patients presented to the doctor's office was an important element, so that almost 95% of the less serious presentations took place before lunch, but almost 30% of G1 came in the afternoon, after spending a longer time interval at work. Afternoon consultations had a significantly longer duration, suggesting an increased severity. Similarly, between the groups, symptoms started at work in over 90% of cases. In the Polish study regarding national emergency services, 38% of the presentations were in the morning, but in the present study the difference could be explained by the lower global level of severity, only 8 presentations requiring an ambulance [7]. There were no significant intergroup differences in clinical parameters, only in the case of heart rate the difference was at the limit of statistical significance (p=0.06). No deaths were recorded in the studied cases and all patients for whom an ambulance was requested were transported to the hospital, in accordance with literature data [7]. Over 70% of the presentations in G1 required at least one intervention by the OM doctor, while 27% required 2, and one presentation involved etiological and symptomatic treatment while waiting for the ambulance, in parallel with monitoring. 5% of the presentations resulted in patients being sent home for the rest of the day, thus affecting productivity.

There were 5 professional incidents that generated 10 presentations to the office for first aid (1 head injury, 1 cut wound, 1 burn, 1 ankle injury, 1 fall from the same level). None generated sick leave days.

The reporting procedure requires that the employer be briefed on a monthly basis about the emergency medical consults performed in the OM office. Confidentiality is strictly kept by only offering statistical data, in view of reducing occupational risk, and adapting the workplace to the employees. Every three months, working conditions are evaluated by performing a visit in the factory, followed by a discussion with the head of each department, on how to amend the identified issues. Within the annual medical report, presented during the occupational safety and health committee meeting, recommendations are made regarding healthcare programs, adapted to general employee health. In this company, due to a high rate of cardiovascular ME, and workplace-related injuries, the employer was advised to set up meetings with specialists in these departments, to enhance awareness among employees.

The overwhelming proportion of infectious disease presentations in a pandemic context is an expression of the OM doctor's role in evaluating COVID-19 contacts and affected patients. This includes medical consultation, monitoring of vital parameters, actual testing, symptomatic treatment, and subsequent referral of patients according to their health status. Depending on protocols, the involvement in infectious pathology could emphasize the need for a space dedicated to the isolation of patients after diagnosis

and until their transport to the quarantine areas. World Health Organization and International Labor Office have recently developed a handbook to address the main global public health emergencies at the workplace, before the COVID-19 pandemic [11]. The next most frequent were cardiovascular, neurological (especially headaches), digestive and musculoskeletal ME, consistent with the reasons for presentation, which were dominated by arterial hypertension, abdominal pain with/without associated symptoms, headache, back pain. The company studied is a factory where cardiovascular diseases and disc diseases occupy main places in the employees' pathology, but patients with multiple presentations generally did not return for the same medical complaints. Women presented more often for headaches, and patients with acutely decompensated cardiovascular and chronic diseases were older, as expected, in trend with the tendency of progressive disease worsening with the increase in age. A relatively recent article emphasizes that a separation between injuries caused by working conditions and others is counterproductive, and that OM targets pathologies sometimes burdened by major health risks, thus becoming extremely relevant from the perspective of the continuous changes of new professions that appear or of work conditions in continuous evolution [12].

The mean duration of the emergency consultation, of almost 20 minutes, shows the workload of the OM doctor, these examinations being additional to the scheduled ones. Presentations in the cardiovascular sphere took an additional half an hour on average, requiring treatment, monitoring, proportional to the severity, also translated by significantly higher heart rate in those who required interventions, close to the limit of statistical significance.

The number of presentations to determine the ability to work exceeds the number of employees, because some of the employees work in isolation conditions, being examined every six months, and some are reevaluated at intervals of less than a year (at 1 month, at 2 months, at 3 months) due to the pathology that requires closer monitoring.

The current study is limited by its retrospective nature, by analyzing a single center, and over a relatively short period of time. A prospective study, extended to several companies and over a longer period of time, could further clarify the profile of patients who develop ME during work, and the more common pathologies.

Conclusion

ME are common in the OM office (12.5% of all presentations), they appear more often in middle-aged women, during work, and especially between 12:01-16:00. These add approximately 2-3 consultations daily, in addition to those already scheduled, corresponding to approximately 30-45 additional minutes. Most ME lead to the need for physician intervention, treatment in the office or summoning the ambulance. Excluding the context of COVID-19, which still poses epidemiological problems, most ME were cardiovascular (and the most time-consuming), digestive, neurological, and musculoskeletal. The duration of emergency consultations, additional to the scheduled activity, could impose intervals dedicated to these potential presentations, in order not to overload the OM specialist.

Thus, the activity of the OM physician in an on-site office is not a routine job as it is often seen from the outside, consisting only of the organization of the intrinsic OM activity, and supervision of the employees' health according to professional factors, but it is extremely important, and due to providing primary healthcare, sometimes the lives of employees literally depend on it.

Although the number of employees who cross the threshold of on-site medical offices for ME is extremely high, after an extensive literature search, studies that address ME are few, given the high addressability.
The employer is briefed monthly about the nature of the emergency medical consults performed in the OM office, while maintaining strict confidentiality, in order to diminish occupational risk, and adapt the workplace to the employees.

The ME profile specific to OM offices could facilitate the generation of courses for doctors working in the field, possibly with the drafting of guidelines dedicated to emergencies in the field, adapted to OM. A systematized analysis of the ME could favor an individualized approach, and an optimized endowment of the office, which would lead to a better health of the employees by identifying some chronic undiagnosed pathologies, some common pathologies in the departments, with a possible professional cause, ensuring a higher productivity, and a healthier work environment.

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