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Decline in hospitalization for all medical conditions during the COVID-19 pandemic

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Abstract

Introduction: Hospital admissions fell dramatically in Romania during the COVID-19 pandemic partially due to urgent legislation for controlling the infection rates that influenced the selection criteria for hospitalization and also due to fear of infection with SARS-CoV-2 which resulted in avoiding medical services.

Aim: This study aimed to assess the impact of COVID-19 pandemic on the population availability to access medical services by comparing the admission rates for all departments of the University Emergency Hospital, Bucharest, from March to August 2019 and March to August 2020.

Methods: A cohort of 38.730 patients was analyzed according to hospitalization rate from March to August 2019 and March to August 2020.

Results: From March to August 2020 patients were hospitalized as a result of a medical emergency rather than an appointment, as outpatient and hospitalization rates changed dramatically. Thus, 67.4% accessed hospitalization from March to August 2019 and 32.6% accessed hospitalization from March to August 2020. The proportion of the patients admitted from the Ambulatory Care Unit decreased significantly from 44.2% in 2019 to 32.7% in 2020. Also, the structure of the patients' profile has been affected.

Discussion: The COVID-19 pandemic period in 2020 (March-September) affected the hospitalization rate and the structure of the patients' profile that came to the University Emergency Hospital in Bucharest, Romania.

Conclusion: The patients who would have accessed the medical health services that might have resulted in hospitalization could have resulted in out-of-hospital deaths and this should also be the focus of the public health authorities.

Keywords: COVID-19 pandemic, hospitalization rate, medical health

Introduction

The new SARS-CoV-2 first confirmed in Wuhan, China, in December 2019 has spread

rapidly all over the world causing a world COVID-19 pandemic. Since then, most of the countries worldwide have adopted WHO recommendations [1] and specific urgent

legislation for controlling the infection rates [2]. Those legislative procedures influenced the admission criteria for hospitalization, except for the Emergency Departments.

The first case of COVID-19 in Romania was confirmed on February, 26, 2020. Since then, admission rates declined considerably. Patients with chronic diseases restrict their choice of seeking hospitalization due to the elevated levels of anxiety or anger [3,4] triggered by the COVID-19 pandemic and also due to the selection criteria for hospitalization [2]. Moreover, the concept of "excess mortality" [5] may seem relevant for this period. This concept emphasizes the fact that the mortality rate caused directly by SARS-CoV-2 coexists with the mortality rate caused indirectly by the COVID-19 pandemic by avoiding hospitalization or avoiding medical services [6]. Media coverage of the COVID-19 pandemic along with the high mortality rate that was anticipated generated complex psychological mechanisms that encouraged the population to avoid medical services.

Study design

This study aimed to assess the impact of COVID-19 pandemic on the population availability to access medical services. A better understanding of the COVID-19 pandemic impact on medical admission would provide information about certain groups of patients with acute or chronic medical illnesses, who avoided medical services and continued to be at risk. In this respect, this study used data from a large hospitalist group of the University Emergency Hospital from Bucharest, Romania. The University Emergency Hospital is the largest public hospital in Bucharest that provides healthcare for hundreds of thousands of people from Bucharest and other adjacent areas. Bucharest is the largest city in Romania with a population of 2.104.967 inhabitants of which 1.123.784 are female (53%) and 981.183 are male [7].

The study's hypothesis was that the number of patients who were hospitalized in the first 6 months after the first confirmed case of COVID-19 in Romania was smaller than the number of patients who were hospitalized in the same period of time, one year before the COVID-19 pandemic. Moreover, the study sought to compare the admission rates for all departments of the University Emergency Hospital, Bucharest, from March to August 2019 and from March to August 2020.

For evaluating the difference in the number of the patients from March to August 2019 and from March to August 2020, it was necessary to analyze the medical profile of the patients (e.g., age, sex, marital status, etc.) and the type of hospital admission. In Romania, in order to have access to hospitalized treatment one needs to access the Emergency Department or the Ambulatory Care Unit. If the Emergency Department provides emergency care on an outpatient and inpatient basis, the Ambulatory Care Unit allows patients to come in for the day to undergo routine investigations, observations, treatments or, in certain conditions, to benefit from hospitalization care if complex medical procedures or treatments are required. The legislative procedures influenced the selection criteria for hospitalization [2] and 80% of the future programmed hospitalizations had to be declined beginning with March 2020.

Study setting and population

A cohort of 38.730 patients was analyzed, according to the year of hospitalization. The data was provided by the Department of Statistics of the University Emergency Hospital, Bucharest. Thus, 26.095 patients, who represent 67.4%, accessed hospitalization from March to August 2019 and 12.635 patients, who represent 32.6%, accessed hospitalization from March to August 2020.

Table 1 shows a representation of the hospitalization rate in all medical departments. According to these analyses, which included combined hospitalization rate from March to August 2019 and from March to August 2020, the largest proportion of hospitalized patients was in the Departments of Surgery (General Surgery, Thoracic Surgery), but this differed in 2019 as compared to 2020 (e.g., 22.9% vs. 20.2%). The lowest

hospitalization rate was in the Department of Otorhinolaryngology (e.g., 1% in 2019 and 1.1% in 2020). Another remarkable difference in terms of hospitalization rate could also be noticed in the Department of Neonatology (e.g., 5% in 2019 and 8.4% in 2020) and in the Department of Ophthalmology (e.g., 8.5% in 2019 and 4.5% in 2020).

Table 1. Hospitalization rate in all medical departments (2019 and 2020)

Hospitalization category	Medical Departments	2019		2020	
		Number of patients	Percentage	Number of patients	Percentage
	Dep. of Cardiology	2203	8.4%	1140	9.0%
	Dep. of Surgery	5980	22.9%	2550	20.2%
	Dep. of Endocrinology and Gastroenterology	570	2.2%	352	2.8%
	Dep. of Hematology	698	2.7%	286	2.3%
	Dep. of Internal Medicine	2642	10.1%	1285	10.2%
	Dep. of Nephrology	1009	3.9%	474	3.8%
	Dep. of Neonatology	1303	5.0%	1066	8.4%
	Dep. of Neurosurgery	1819	7.0%	734	5.8%
	Dep. of Neurology	2182	8.4%	1340	10.6%
	Dep. of Obstetrics and Gynecology	3249	12.5%	1768	14.0%
	Dep. of Ophthalmology	2224	8.5%	566	4.5%
	Dep. of Otorhinolaryngology	283	1.1%	123	1.0%
	Dep. of Orthopedics	1933	7.4%	951	7.5%
	TOTAL	26095	100%	12635	100%

Table 2 shows a representation of the length of hospitalization rate from March to August 2019 and from March to August 2020. It can be noticed that 20.8% of the patients have spent at most 2 days in hospital in 2019, but this proportion decreased sharply to 15.8% in 2020. The figures suggested that the

number of cases in which the length of hospitalization was at most 5 days decreased in 2020 as compared to 2019, but the number of cases in which the length of hospitalization was at least 6 days increased in 2020 as compared to 2019.

Table 2. Length of hospitalization (2019 and 2020)

Length of hospitalization	Days	2019		2020	
		Number of patients	Percentage	Number of patients	Percentage
	At most 2 days	5437	20.8%	1995	15.8%
	Between 3 and 5 days	9577	36.7%	4406	34.9%
	Between 6 and 8 days	4333	16.6%	2355	18.6%
	Between 9 and 12 days	3378	12.9%	1799	14.2%
	At least 12 days	3370	12.9%	2080	16.5%
	TOTAL	26095	100%	12635	100%

Table 3 shows a representation of the type of hospital admission rate from March to August 2019, when 55.8% of the patients were admitted from the Emergency Department and from March to August 2020, when 67.3% of the patients were admitted from the

Emergency Department. On the other hand, the proportion of the patients admitted from the Ambulatory Care Unit decreased significantly from 44.2% in 2019 to 32.7% in 2020.

Table. 3 Type of hospital admission (2019 and 2020)

Type of hospital admission	Units	2019		2020	
		Number of patients	Percentage	Number of patients	Percentage
	Ambulatory Care Unit	11528	44.2%	4126	32.7%
	Emergency Department	14567	55.8%	8509	67.3%
	TOTAL	26095	100%	12635	100%

Results

Demographic variables such as hospitalization category, length of hospitalization and type of hospital admission were considered independent variables. There were also three variables such as age, patient’s occupation and gender, which were considered controlled variables. Given the fact that the dependent variable (e.g., year of admission) is categorical, binomial logistic regression analysis was used. The independent variables included in this analysis are also categorical, as dummy variables (one being the reference). Moreover, multinomial logistic

regression analysis showed results similar to those presented by the binomial logistic regression analysis, if the dependent variable has split into two categories.

The data recorded by the hospital showed that in the analyzed period of 2019 (between March and August), 26,095 patients used the hospital’s services. In contrast, from March to August 2020, 12,635 patients used hospital services (i.e., 48.4% of the patients from the same period in 2019) (**Table 4**). The large number of cases in the database provided robustness to the obtained results.

Table 4. Patients who used the hospital services

Year of hospitalization		Parameter Estimates					Exp (B)	95% Confidence Interval for Exp (B)	
		B	Std. Error	Wald	df	Sig.		Lower Bound	Upper Bound
2020 Hospitalization category	Intercept	-.238	.073	10.546	1	.001			
	Dep. of Cardiology	-.068	.056	1.502	1	.220	.934	.838	1.042
	Dep. of Surgery	-.138	.047	8.545	1	.003	.871	.794	.956
	Dep. of Endocrinology and Gastroenterology	.064	.080	.645	1	.422	1.066	.912	1.247
	Dep. of Hematology	.012	.083	.023	1	.880	1.013	.861	1.191
	Dep. of Internal Medicine	-.091	.054	2.878	1	.090	.913	.822	1.014
	Dep. of Nephrology	-.171	.070	5.946	1	.015	.843	.735	.967
	Dep. of Neonatology	.686	.186	13.639	1	.000	1.986	1.380	2.859
	Dep. of Neurosurgery	-.120	.061	3.890	1	.049	.887	.787	.999
	Dep. of Neurology	.055	.054	1.044	1	.307	1.057	.950	1.176
Dep. of Obstetrics and Gynecology	.004	.056	.005	1	.946	1.004	.899	1.121	

	Dep. of Ophthalmology	-.379	.064	34.794	1	.000	.684	.603	.776
	Dep. of Otorhinolaryngology	.033	.118	.078	1	.781	1.033	.820	1.303
	Dep. of Orthopedics	0 ^b	.	.	0	.	.	.	.
Gender	Female	-.062	.024	6.563	1	.010	.940	.897	.986
	Male	0 ^b	.	.	0	.	.	.	.
	NR	.566	.061	86.935	1	.000	1.761	1.563	1.983
Occupation	Self-employed or Entrepreneur	-.005	.154	.001	1	.974	.995	.735	1.346
	Pupil/Student	-.414	.110	14.136	1	.000	.661	.533	.820
	Retired	-.131	.048	7.400	1	.007	.877	.798	.964
	Employee	-.074	.040	3.363	1	.067	.929	.858	1.005
	Unemployed	0 ^b	.	.	0	.	.	.	.
Age	Max.18 years	.125	.182	.467	1	.494	1.133	.792	1.619
	Min. 18 max. 29 years old	-.059	.068	.733	1	.392	.943	.825	1.078
	Min. 30 max. 39 years old	.047	.063	.563	1	.453	1.048	.927	1.186
	Min. 40 max. 49 years old	-.032	.059	.300	1	.584	.968	.863	1.087
	Min. 50 max. 59 years old	.038	.053	.499	1	.480	1.038	.935	1.153
	Min. 60 max. 69 years old	.036	.042	.736	1	.391	1.037	.954	1.127
	Min. 70 max. 79 years old	.029	.043	.437	1	.509	1.029	.945	1.120
Length of hospitalization	Min. 80 years old	0 ^b	.	.	0	.	.	.	.
	At least 2 days	-.308	.041	55.709	1	.000	.735	.678	.797
	Between 3 and 5 days	-.235	.037	40.753	1	.000	.790	.735	.850
	Between 6 and 8 days	-.096	.039	5.993	1	.014	.909	.842	.981
	Between 9 and 12 days	-.134	.041	10.651	1	.001	.874	.807	.948
Type of admission	At least 12 days	0 ^b	.	.	0	.	.	.	.
	Ambulatory Care Unit	-.548	.028	391.796	1	.000	.578	.548	.611
	Emergency Department	0 ^b	.	.	0	.	.	.	.

a. The reference category is: 2019.

b. This parameter is set to zero because it is redundant.

c. The reference categories for independent variables: Hospitalization category – Orthopedics; Gender – Male; Occupation – unemployed or without occupation; age – minimum 80 years old; Length of hospitalization – more than 12 days; Type of admission – emergency.

Compared to the same period of time, during March-August 2020, patients were hospitalized as a result of a medical emergency rather than an appointment, as an outpatient. Thus, the “type of hospital admission” was the variable that explained most of the variation in the number of hospitalizations in 2019 vs. 2020 in University Emergency Hospital, Bucharest. During March-August 2020, patients who were hospitalized for a longer period of time (i.e., over 12 days) rather than a short period of time (i.e., up to 5 days) visited the hospital. This explained that during March-August 2020 compared to March-August 2019 patients with milder diseases (i.e., requiring shorter hospitalization) were present in smaller numbers at the hospital, compared to patients

with more serious diseases, who required a longer period of hospitalization.

According to the department they turned to, the analysis of the profile of the patients also showed that in March-August 2020 compared to the same period in 2019, fewer patients came to the Department of Ophthalmology or Surgery, compared to the Department of Orthopedics. This indicated that medical issues that required medical intervention were postponed, such as ophthalmic treatments or certain types of surgeries (i.e., cosmetic surgery) and as a consequence, attracted fewer patients to the hospital compared to those that required prompt interventions, such as orthopedic interventions. Even more eloquent is the fact that in March-August 2020 the only medical specialty in which the level of patients was at

the same level as in the previous year was that of the Department of Neonatology. This is obvious because this medical event (i.e., birth or care of a newborn) could not be declined.

Moreover, in March-August 2020 compared to March-August 2019, retirees and students were less likely to go to the hospital compared to the unemployed - controlling the effect of the other variables included in the model. The possible explanation is that retirees were considered the most vulnerable group to SARS-CoV-2 infection due to age, and most of the students remained in their county residence due to online lessons.

Fig. 1 shows the proportion of patients who were discharged from the University Emergency Hospital in Bucharest.

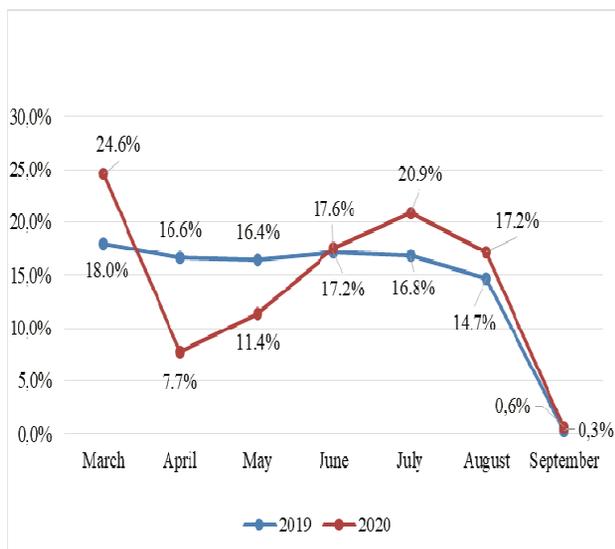


Fig. 1 The proportion of patients discharged from hospital each month in 2019 and 2020

The proportion of discharged patients in 2019 was similar each month, compared to 2020 when the proportion largely varied from one month to the other: the highest rate of discharged patients was registered in March 2020 (24.6%), and it decreased fiercely in April (7.7%) immediately after the effects of the specific urgent legislation for controlling the infection rates, increasing steadily the following months.

Discussions

The COVID-19 pandemic period in 2020 (March-August) affected the hospitalization rate and the structure of the profile of the patients who came to the University Emergency Hospital, Bucharest. The results of the analysis suggested that hospital treatment of certain diseases has been postponed due to the COVID-19 pandemic context as other studies also concluded. The rate of the patients discharged suddenly in April 2020 as compared to the previous month as a consequence of a lower rate of hospitalization. The option of coming to the hospital exclusively for medical emergencies seemed to have been widely followed by the population. In some cases, this behavior might increase the risk of worsening chronic illness or even death. It would have been important to assess the health status of the population during and after the COVID-19 pandemic, as well as whether the avoidance of hospitals by certain categories of patients has deteriorated the general health of the population - separated by the direct impact of SARS-CoV-2 infection. Indicators on the mortality rate for certain causes of disease might be taken into account, such as the self-perceived state of the population regarding health. However, all these remain study directions and hypotheses that would be worth investigating in the future in order to support the management of health policies.

Limitations

This study is not representative of the Romanian population who accessed medical services and it reflects the situation at University Emergency Hospital in Bucharest, in the aforementioned time frame.

Another limit of this study is the number of variables, as a greater number of variables

might have not shown relevant characteristics of hospitalized patients. Another important variable to be studied would have been the patients' level of education, but also variables that reflect patients' opinions regarding the COVID-19 pandemic context, the perceived level of anxiety when consulting hospital services, etc. It would have been useful to analyze the usage of hospital services in reduced time frames (e.g., monthly). This will be the object of a future analysis.

This study cannot claim that the decline in accessing medical services during the COVID-19 pandemic has led to an increase in morbidity and mortality. This is a hypothesis that deserves a future investigation by analyzing the excessive mortality in certain types of diseases.

Conclusion

The growing complexity of the modern healthcare system is partially due to the incorporation of essential concepts such as preventive medicine, early diagnosis, cost efficiency, risk and performance management and evidence-based data. Although neither health policies nor clinical decisions are based on opinions alone, the general perception over a medical system is still a subjective reflection of the population beliefs and is based on past personal experiences, personality traits, level of education and access limitation.

A decline in hospitalization for all medical conditions has been noticed since the start of the COVID-19 pandemic, but based on the analysis in a tertiary emergency hospital in Bucharest the plunge has not been entirely caused by forceful violation of the aforementioned core concepts of the patient centered health system framework. Despite guidelines-oriented protection measures against viral transmission, governmental awareness campaigns and no change in the emergency cases admission criteria, the fear

of getting SARS-CoV-2 might have a major impact on the decline of admission rates.

Public health authorities should focus more on the patients who avoided hospital admission due to fear of being infected and due to legislative procedures, that influenced the admission criteria for hospitalization. Notably, the "missing" patients who would have accessed the medical health services that might have resulted in hospitalization could result in out-of-hospital deaths.

Conflict of Interest

The authors state no conflict of interest.

Informed Consent and Human and Animal Rights statements

An informed consent has been obtained from the individual included in this study.

Authorization for the use of human subjects

Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies, is in accordance with the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or equivalent committee.

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Disclosures

None.

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