

Surgical emergencies during SARS-CoV-2 pandemic lockdown: what happened?

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Abstract. – OBJECTIVE: The pandemic from SARS-CoV-2 is having a profound impact on daily life of a large part of world population. Italy was the first Western country to impose a general lockdown to its citizens. Implications of these measures on several aspects of public health remain unknown. The aim of this study was to investigate the effects of the lockdown on surgical emergencies volumes and care in a large, tertiary referral center.

MATERIALS AND METHODS: Electronic medical records of all patients visited in our Emergency Department (ED) and admitted in a surgical ward from February 21st 2020 to May 3rd 2020 were collected, analyzed and compared with the same periods of 2019 and 2018 and a cross-sectional study was performed.

RESULTS: Number of surgical admissions dropped significantly in 2020 with respect to the same periods of 2019 and 2018, by almost 50%. The percentage distribution of admissions in different surgical wards did not change over the three years. Time from triage to operating room significantly reduced in 2020 respect to 2019 and 2018 ($p < 0.001$).

CONCLUSIONS: The lockdown in Italy due to SARS-CoV-2 pandemic arguably represents the largest social experiment in modern times. Data provided by our study provide useful information to health authorities and policymakers about the effects of activity restriction on surgical accesses and changing epidemiology due to an exceptional external event.

Key Words:

SARS-CoV-2, Pandemic, Lockdown, Emergency surgery.

Introduction

The recent epidemic from SARS-CoV-2 is having a profound impact on several aspects

of our daily life. The impact of the epidemic is forcing governments across the entire planet to adopt unprecedented measures to stop spreading of the infection¹. On March 9th, 2020 the Italian government, first among Western countries, imposed a national lockdown due to the overwhelming impact of the SARS-CoV-2 epidemic on its national health care system. Despite being a necessary measure to stop the spread of the infection, many implications of the quarantine in terms of general health, psychological, and economic impact remain unknown^{2,3}.

One of the main aspects we are facing as general and emergency surgeons during these difficult times is how to effectively provide safe care for our patients^{4,5}. Draconian measures were undertaken in order to save resources (e.g., ICU beds, PPEs) needed for the care of patients with respiratory symptoms from SARS-CoV-2 infection. All elective cases were canceled or postponed, clinic appointments were postponed and switched to telemedicine. Only one aspect remained unchanged, and this was surgical care for emergencies. Nevertheless, nobody among health care providers, hospital administrators or health authorities were able to anticipate the impact of the quarantine or other containment measures on trauma volumes at the beginning of the epidemic.

The aim of this study was to evaluate the impact of the recent SARS-CoV-2 pandemic on emergency surgery volumes and epidemiology during the two months of lockdown, comparing them with the same periods of 2019 and 2018, in a large tertiary referral center in Rome, Italy.

Materials and Methods

Following Institutional Review Board (IRB) approval, we retrospectively reviewed all consecutive medical records of ED visits at our ED from February 21st (date of first COVID-19 patient officially declared in Italy) to May 3rd 2020 (last day of ‘lockdown’).

All patients visited in our ED and admitted in a surgical ward from February 21st, 2020 to May 3rd, 2020 were collected, analyzed and compared with the same periods of 2019 and 2018.

Collected data included access date and time, age, sex, triaging priority, admitting diagnosis and discharging diagnosis. Data were entered into a dedicated database for further analysis.

Triaging priority was determined by the ED nurse at the front desk. Each patient was assigned a color code depending on the severity and priority of the condition. Code white was used for noncritical, not acute and not serious cases; code green was used for noncritical, acute cases with no risk of worsening if delayed; code yellow was used for fairly critical cases whose treatment cannot be delayed; code red was used for very critical, urgent cases or life threatening conditions.

Discharging diagnoses were classified and grouped under several subheadings according to their ICD-9 codes.

Different surgical ward admission was registered and compared between the three study periods.

Regarding “grade of surgery”, as “minor surgery”, a percutaneous drainage and/or laparoscopic peritoneal lavage and drainages were considered.

As “major surgery”, a visceral resection, either Hartmann procedure or resection with primary anastomosis and ileostomy, or abdominal packing were considered.

Data were analyzed and a direct comparison was made between the same periods of 2020, 2019 and 2018.

Statistical Analysis and Sample Size

Data were expressed as counts and percentages unless stated otherwise; average \pm standard deviation was used as appropriate. Normality distribution of the data was checked visually through histogram analysis and Shapiro-Wilk test. Counts and percentages were compared between groups using χ^2 -test; Fisher’s exact test was used as appropriate. Student’s *t*-test was used to compare continuous variables between

groups. All tests were two tailed. Categorical variables were assessed by the Pearson’s chi-squared test. A *p* level ≤ 0.05 was considered statistically significant. Data were analyzed using SPSS Statistic software, version 23 (IBM Corp., Armonk, NY, USA) and Microsoft Office Excel 2016 Professional (Microsoft, Redmont, WA, USA).

Results

A total of 575 patients (average age 43 ± 6 years-old, 53% males) were observed during the three study periods: 226 in 2018, 229 in 2019 and 120 in 2020.

Number of ED visits and admission rates in a surgical ward during the study periods are reported on Table I.

Number of surgical admissions dropped significantly in 2020 respect to the same periods of 2019 and 2018 (*p* < 0.001).

During lockdown period, from week 2 to week 6, surgical cases significantly dropped by almost 50%. Conversely, on week 8, just at the end of lockdown, surgical cases were equivalent compared to previous years (Figure 1).

No difference in age, sex and triaging priority distribution was observed between the three years.

Regarding surgical procedures, major surgery was significantly higher in 2020 respect to the previous two years (*p* = 0.003). No difference was observed for minor surgery and no surgery groups during the three years (*p* = ns).

Time from triage to operating room significantly reduced in 2020 respect to 2019 and 2018 (*p* < 0.001).

Mortality rate within 24 hours from admission was similar during the three years (*p* = ns).

Admission in different surgical wards is resumed in Table II.

As far as admissions in different surgical wards is concerned, no difference among the three years was observed (*p*=ns). The Emergency Surgical ward was the only one slightly increasing (in percentage) acute admissions.

Surgical diagnosis at admission are summarized in Table III.

Appendicitis, occlusion, diverticulitis, gastrointestinal bleeding and proctological urgencies were significantly lower in 2020 respect to 2018 and 2019.

No difference was observed for cholecystitis, hernia and perforation.

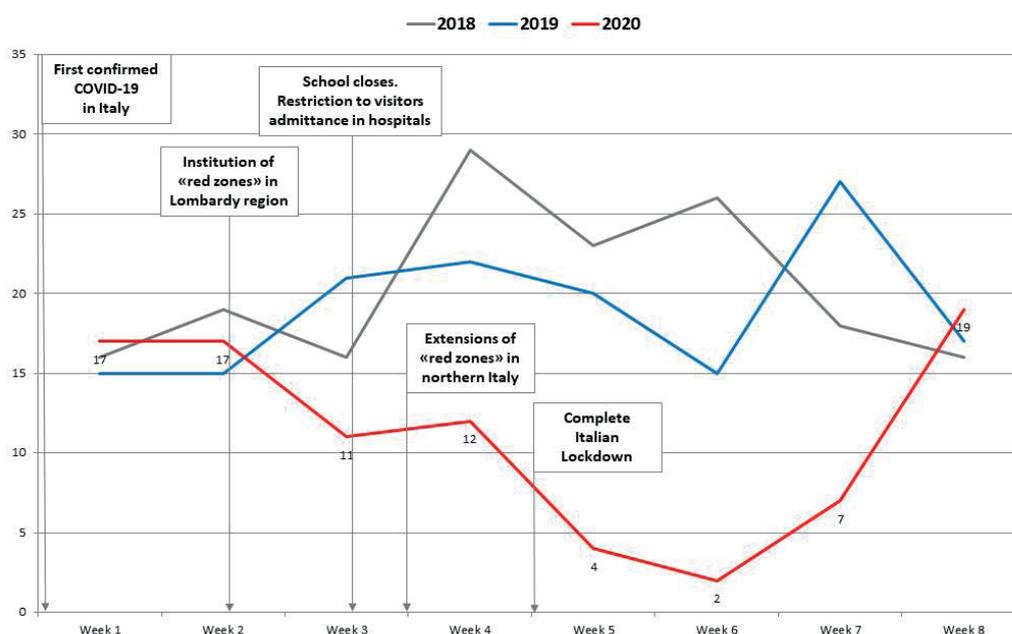


Figure 1. Comparison of surgical volumes among the same periods of 2020, 2019 and 2018 (from February 21st to May 3rd).

Discussion

The current SARS-CoV-2 pandemic is arguably the first pandemic of modern times currently affecting 170 countries and territories across the globe. Its widespread and quick diffusion across the entire planet is unprecedented⁶. Italy was the first country to be affected in Europe and the Western hemisphere. In less than 2 months, the epidemic had a devastating impact on the Italian health care system imposing a heavy death toll. As a result, several unprecedented social measures have been taken¹.

On February 21st 2020, the first COVID-19 patient has been officially declared in Italy. Consequently, on March 9th the Italian government enacted a national quarantine and all non-necessary activities were closed. The lockdown was a drastic but necessary measure in order to slow the spread of the infection⁷. This also caused a dramatic change in people lifestyle. Millions of Italians had to switch to home working (also known as “smart working”), schools and universities were closed, and no outdoor sport activity was allowed. In itself, this arguably represent the largest social experiment ever undertaken by a Western country. The immediate and long term effects on health, psychology, society and economies will be studied for months after the end of the epidemic^{2-4,8,9}.

To the best of our knowledge, no previous research is available on this specific subject on surgical emergencies.

The national lockdown imposed by the government in Italy in order to stop the spread of the infection of the SARS-CoV-2 virus represent an unprecedented measure.

Seasonal variations in epidemiology and direct correlation between surgical emergencies and outdoor activities are well known¹⁰⁻¹³. However, the lockdown in Italy represents a unique opportunity to directly assess the effects of social distancing and home quarantine on emergency surgery.

Our study shows that in just 4 weeks, the lockdown had a profound impact on surgical emergency volumes and epidemiology in a large tertiary referral center in Rome, Italy.

Part of the observed changes were expected, but some others were not and represent, we believe, a very interesting aspect worth further investigation and discussion in future.

General practitioners (GP) and emergency medical services has been still active as before the lockdown and the ED worked in all the hospitals.

GP tended to manage the patients by phone to avoid contacts due to the shortage of personal protective equipment.

People were encouraged to stay at home and to call the emergency number or the GP in case of

Table I. Number of ED visits and admission rates in a surgical ward during the study periods.

Study period	Admissions to Surgery Wards						Grade of Surgery						Triaging				Time to Surgery Room		Death (within 24 hours)	
	N° (575)	p*	Age	p*	Males	p*	Major Surgery	p*	Minor Surgery	p*	No Surgery	p*	Green	Yellow	Red	p*	Minutes	p*		p*
Feb 20 th – May 3 rd 2018	226 (39.2)		58±5.2		50.1%		98 (43.4)		69 (30.5)		59 (26.1)		97 (42.9)	115 (50.8)	14 (0.6)		1190		2	
Feb 20 th – May 3 rd 2019	229 (40)	<0.001	63±4.7	0.31	60.3%	0.25	85 (36.2)	0.003	77 (33.6)	0.12	67 (29.3)	0.11	90 (39.3)	119 (51.9)	20 (0.9)	0.092	1244	<0.001	4	0.887
Feb 20 th – May 3 rd 2020	120 (20.8)		60±7.1		58.3%		67 (55.8)		33 (27.5)		20 (16.7)		36 (30)	74 (61.7)	10 (0.8)		815		3	

Values in parentheses are percentages. *Two-tailed Pearson’s chi-squared test (2020 vs. 2018-2019).

Table II. Most common Surgery Wards admission from ED visits.

	Total	From February 20 th to May 3 rd 2018	From February 20 th to May 3 rd 2019	From February 20 th to May 3 rd 2020
	(n = 575)	(n = 226)	(n = 229)	(n = 120)
#1	Emergency Surgery 272 (47.3)	109 (48.3)	102 (44.6)	61 (50.9)
#2	Thoracic Surgery 36 (6.3)	16 (7)	16 (7)	4 (3.3)
#3	Urology 90 (15.7)	33 (14.6)	37 (16.2)	20 (16.8)
#4	General Surgery # 89 (15.5)	41 (18.1)	35 (15.3)	13 (10.8)
#5	Digestive Surgery 23 (4)	4 (1.8)	13 (5.7)	6 (5)
#6	Endocrine Surgery 31 (5.4)	12 (5.3)	15 (6.4)	4 (3.3)
#7	Vascular Surgery 25 (4.3)	11 (4.9)	10 (4.4)	4 (3.3)
#8	Other* 9 (1.5)	0 (0)	1 (0.4)	8 (6.6)

*Neurologic Surgery, Orthopedic Surgery, Values in parentheses are percentages.

Table III. Most frequent surgical diagnosis at admission.

Study period	Diagnosis															
	Appendicitis (47)	<i>p</i> *	Cholecystitis (91)	<i>p</i> *	Occlusion (74)	<i>p</i> *	Diverticulitis (26)	<i>p</i> *	Bleeding (26)	<i>p</i> *	Hernia (16)	<i>p</i> *	Perforation (25)	<i>p</i> *	Proctology (18)	<i>p</i> *
Feb 20 th – May 3 rd 2018	20 (42.5)		42 (46.2)		25 (33.8)		11 (42.3)		13 (50)		4 (25)		13 (52)		5 (27.7)	
Feb 20 th – May 3 rd 2019	18 (38.3)	0.05	27 (29.7)	0.427	34 (45.9)	0.09	9 (34.6)	0.004	9 (34.6)	0.03	6 (37.5)	0.11	8 (32)	0.092	12 (66.7)	<0.0001
Feb 20 th – May 3 rd 2020	9 (19.2)		22 (24.1)		15 (20.3)		6 (23.1)		4 (15.4)		6 (37.5)		4 (16)		1 (5.5)	

Values in parentheses are percentages. *Two-tailed Pearson's chi-squared test (2020 vs. 2018-2019).

illness. This could explain the reduced affluence to the ED in respect to the past¹⁴.

Most of health conditions that inappropriately crowded the EDs were managed at home by the GP. On the other hand, this could not explain the tremendous reduction in the number of emergencies requiring surgery. As a matter of fact, there may be an increasing unknown number of patients suffering of acute abdominal and thoracic diseases at home. The destiny of such patients is still unpredictable.

Several COVID-19 positive critically ill patients could be inappropriately admitted to the COVID hospital where they might receive a suboptimal diagnosis and treatment for their primary pathology. Patients with mild forms of abdominal emergencies, such as diverticulitis, cholecystitis, and appendicitis were managed conservatively at home by the GPs but this could not be feasible for hemorrhages, bowel perforations, and obstructions.

Changing in diet habits and social behavior due to social isolation could further explain reduction in bowel obstruction and other diet-related pathologies, but these factors are really unpredictable.

Nevertheless, in the near future, this situation could lead to the access to EDs of a large amount of patients with abdominal and thoracic complicated acute diseases quickly saturating the few number of surgeons still on duty and the already crowded intensive care units. An emergency into the emergency could be the scenario that is going to happen.

The same trend has been observed by the Italian Society of Cardiology that in a survey comprising 50 centers across the country reports a 50% reduction of hospital admissions for acute myocardial infarction in the period 12-19 March 2020¹⁵.

Conclusions

Altogether, herein we provide the first direct assessment of the effects of a national quarantine (i.e., national lockdown) on the volumes and surgical emergency epidemiology in a large tertiary referral center in Rome, Italy. However, reduction was not symmetrical among different pathologies.

Our study has some limitations. This was a cross-sectional retrospective study, although data were collected prospectively through our ED database.

Probably, further data will be needed in order to assess how long these trends will last in the next few weeks or months.

Finally, it must be noted that Italy has a public health care systems. Access to ED is free of charge for patients and no referral is needed in order for the patients to access ED services.

These are important aspects to be considered when trying to generalize our results to other health care systems.

Conflict of Interests

The Authors declare that they have no conflict of interests.

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Informed Consent

For this type of study, formal consent is not required.

Human and Animal Rights Statement

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions.

Authors Contributions

Study conception and design: Rosa, Covino, Sganga, Gasbarrini, Franceschi, Alfieri. Acquisition of data: Covino, Rosa, Sabia, Cozza, Quero, Fiorillo. Analysis and interpretation of data: Covino, Rosa, Sabia, Quero, Fiorillo, Sganga, Gasbarrini, Franceschi, Alfieri. Drafting of manuscript: Covino, Rosa, Cozza, Quero, Fiorillo. Critical revision: Sganga, Franceschi, Gasbarrini, Alfieri.

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