Dramatic decrease of surgical emergencies during COVID-19 outbreak

Stefano Rausei, MD, PhD, Francesco Ferrara, MD, Tommaso Zurleni, MD, Francesco Frattini, MD, Osvaldo Chiara, MD, Andrea Pietrabissa, MD, Giuliano Sarro, MD, for Italian Association of Hospital Surgeons, and Collected Data Contributors

CONTINUING MEDICAL EDUCATION CREDIT INFORMATION

Accreditation

The American College of Surgeons is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™

The American College of Surgeons designates this journal-based CME activity for a maximum of 1 AMA PRA Category 1 Credit™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Of the AMA PRA Category 1 Credit™ listed above, a maximum of 1 credit meets the requirements for self-assessment.

AMERICAN COLLEGE OF SURGEONS
Inspiring Quality:
Highest Standards, Better Outcomes
100+years

ACCME ACCREDITED WITH COMMENDATION

AMERICAN COLLEGE OF SURGEONS DIVISION OF EDUCATION

Objectives

After reading the featured articles published in the *Journal of Trauma and Acute Care Surgery*, participants should be able to demonstrate increased understanding of the material specific to the article. Objectives for each article are featured at the beginning of each article and online. Test questions are at the end of the article, with a critique and specific location in the article referencing the question topic.

Disclosure Information

In accordance with the ACCME Accreditation Criteria, the American College of Surgeons must ensure that anyone in a position to control the content of the educational activity (planners and speakers/authors) has disclosed all relevant financial relationships with any commercial interest. For additional information, please visit the ACCME website (see below for definitions).

Commercial Interest: The ACCME defines a "commercial interest" as any entity producing, marketing, re-selling, or distributing health care goods or services used on or consumed by patients. Providers of clinical services directly to patients are NOT included in this definition.

Financial Relationships: Relationships in which the individual benefits by receiving a salary, royalty, intellectual property rights, consulting fee, honoraria, ownership interest (e.g., stocks, stock options or other ownership interest, excluding diversified mutual funds), or other financial benefit. Financial benefits are usually associated with roles such as employment, management position, independent contractor (including contracted research), consulting, speaking and teaching, membership on advisory committees or review panels, board membership, and other activities from which remuneration is received, or expected. ACCME considers relationships of the person involved in the CME activity to include financial relationships of a spouse or partner.

Conflict of Interest: Circumstances create a conflict of interest when an individual has an opportunity to affect CME content about products or services of a commercial interest with which he/she has a financial relationship.

The ACCME also requires that ACS manage any reported conflict and eliminate the potential for bias during the session. Any conflicts noted below have been managed to our satisfaction. The disclosure information is intended to identify any commercial relationships and allow learners to form their own judgments. However, if you perceive a bias during the educational activity, please report it on the evaluation.

Authors/ Contributors	Nothing to Disclose	Disclosure		
		Company	Role	Received
All authors	*X*			

Planning Committee / Editorial Committee	Nothing to Disclose	Disclosure		
		Company	Role	Received
Ernest E. Moore, Editor		*Haemonetics*	*PI*	*Shared U.S. Patents*
		Instrumentation Laboratory	*PI*	*Research Support*
		Stago, Humacyte, Prytime	*PI*	*Research Support*
		Thrombo Therapeutics	*Co-founder*	*Stock*
Associate Editors Ronald V. Maier and Steven Shackford	*X*			
Editorial Staff and Angela Sauaia	*X*			

Claiming Credit

To claim credit, please visit the AAST website at http://www.aast.org/ and click on the "e-Learning/MOC" tab. You must read the article, successfully complete the post-test and evaluation. Your CME certificate will be available immediately upon receiving a passing score of 75% or higher on the post-test. Post-tests receiving a score of below 75% will require a retake of the test to receive credit.

Credits can only be claimed online

Cost

For AAST members and Journal of Trauma and Acute Care Surgery subscribers there is no charge to participate in this activity. For those who are not a member or subscriber, the cost for each credit is $25.

Questions

If you have any questions, please contact AAST at 800-789-4006. Paper test and evaluations will not be accepted.

BACKGROUND: During the coronavirus disease 2019 (COVID-19) outbreak, a general decrease in surgical activity was observed. There is perception that this phenomenon has involved also surgical emergency, but no extensive data have been presented to date. The aim of this study was to analyze the real number of admissions and procedures for emergency surgical disease during COVID-19 pandemic.

METHODS: This is a multicenter study including 18 general surgery units performing emergency surgery in hospitals of the "Red Zone" in Lombardy. Data about admissions from emergency department and surgical emergency procedures performed during March 2019 and March 2020 were collected in an online database. Additional data were collected according to the different indications for surgical treatment. The primary outcomes were the overall rate of admissions for emergent surgical disease and the overall rate of emergency surgical procedures in the study periods. The secondary outcome was the overall surgical rates (among all the diagnosed surgical diseases).

RESULTS: Emergency surgical admissions and surgical operations significantly decreased with a fall in value of 45% ($p < 0.001$) and 41% ($p = 0.001$), respectively. This reduction was confirmed by the analysis according to different surgical indications, with the exceptions of admissions and operations for gastrointestinal bleeding and operations for abdominal trauma. The overall ratio between surgical procedures and diseases was not significantly different (54% vs. 63%; $p = 0.619$). This ratio was significantly different only for bowel obstruction and for gastrointestinal perforation.

CONCLUSIONS: It seems correct to consider "true" the dramatic decrease of surgical problems during COVID-19 outbreak, despite any therapeutic strategies and logistic difficulties. (*J Trauma Acute Care Surg.* 2020;89: 1085–1091. Copyright © 2020 Wolters Kluwer Health, Inc. All rights reserved.)

LEVEL OF EVIDENCE: Epidemiological, level III.

KEY WORDS: COVID-19 outbreak; emergency department; surgical emergencies.

Coronavirus disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 is currently changing the health, social, and economic world landscape.[1–3]

Italy was the first European country that suffered a strong impact, in particular in two Northern regions, Lombardy and Veneto. On March 8, 2020, the government decided to extend quarantine measures to all of Lombardy, strict restrictions of people's movements, and the temporary closure of schools, shops, and industrial activities.[4]

On March 31, 2020, the number of deaths reached 11,591 with 101,739 positive cases in Italy, and 7.199 deaths and 44.585 positive cases in Lombardy, corresponding to 62.1% and 43.8% of the total number of deaths and positive cases of Italy.[5,6] Because of a day-by-day increasing number of affected subjects, a reorganization and dynamic distribution of national and regional health care resources were necessary to define algorithms for the management of patients requiring nonelective surgical procedures. In fact, the massive overload of patients with respiratory symptoms needed a reshaping of emergency departments (EDs), intensive care units (ICUs), and medical wards to improve hospital capacity and increase ICUs and COVID-19 dedicated beds.[7,8]

In every ED, specific pathways for suspected or confirmed COVID-19 patients have been set up. Consequently, personnel health training, application of infection control measures, and mandatory limitations of surgical activities were implemented. In Lombardy, the purpose of redistribution was to create COVID-free hospitals with dedicated pathways to treat tumors and major traumas.[9] Consistently, several national surgical scientific societies and regional health organizations tried to develop protocols and recommendations based on common sense for surgical practice.[10–14] Unexpectedly, during the COVID-19 outbreak, also a general decrease in surgical emergency procedures was observed, and some opinions were advanced about this perception.[15,16] Nevertheless, no extensive data have been presented to date.

The aim of the present multicenter study, based on the experience of 18 centers of the "Red Zone" in Lombardy, was to analyze the real number of hospitalizations and surgical procedures for emergency surgical disease during COVID-19 pandemic.

PATIENTS AND METHODS

Study Design, Population, and Settings

This is a multicenter observational study including 18 general surgery units performing emergency surgery in hospitals of Lombardy region, Italy. Emergency departments were classified according to the Italian Ministry of Health criteria.[17] The recruiting hospitals of this study were homogeneously distributed in the region (Fig. 1) and included four university centers and the most experienced regional trauma centers.

Between April 1 and 30, 2020, data about hospitalizations in surgical units from EDs and surgical emergency procedures performed during March 2019 and March 2020 were collected in an online database through Google Forms platform. Data included the number of surgical beds and ICU beds (without COVID-19), elective oncologic and nononcologic surgical procedures, admissions in surgical units from ED and emergency surgical procedures, and the median age of patients admitted from ED and treated by emergency surgery during the considered periods. Additional data were collected according to the different indications for surgical treatment: appendicitis,

Submitted: June 9, 2020, Revised: July 28, 2020, Accepted: July 29, 2020, Published online: August 28, 2020.

From the General Surgery Unit (S.R.), ASST Valle Olona, Gallarate, Varese; General Surgery Unit (F. Ferrara), San Carlo Borromeo Hospital, ASST Santi Paolo e Carlo, Milan; General Surgery Unit (T.Z.), ASST Valle Olona, Busto Arsizio; General Surgery Unit (F. Frattini), ASST Settelaghi, Tradate, Varese; General Surgery and Trauma Team (O.C.), ASST Niguarda, Milan; General Surgery Unit (A.P.), IRCCS Policlinico San Matteo, Pavia; and General Surgery Unit (G.S.), ASST Ovest Milanese, Magenta, Milan, Italy.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text, and links to the digital files are provided in the HTML text of this article on the journal's Web site (www.jtrauma.com).

A full list of contributors is provided in Supplementary Note online.

Address for reprints: Stefano Rausei, MD, PhD, General Surgery Unit, ASST Valle Olona, via Pastori 4, 21013, Gallarate, Varese, Italy; email: stefano.rausei@gmail.com.

DOI: 10.1097/TA.0000000000002923

cholecystitis, bowel obstruction, gastrointestinal (GI) perforation, GI bleeding, urgent proctological disease, (nonperforated) diverticulitis, and abdominal trauma. Patients younger than 18 years were excluded.

According to the Lombardy region rules for the COVID-19 pandemic emergency, in particular for surgery, some hospitals were referred to as hub centers for treating trauma and oncologic patients, but all the institutions were authorized to admit and treat nontraumatic surgical emergencies.

At the end of the recruitment period, the online database was downloaded and elaborated for statistical analysis.

Outcome Measures

The primary outcomes were the overall rate of admissions for emergent surgical disease and the overall rate of emergency surgical procedures in the study periods. The secondary outcome was the overall surgical rates (among all the diagnosed surgical diseases) in the two considered months.

Statistical Analysis

The variables were reported as median and range. The percentage value of the difference between the admissions and procedures of March 2019 (X) and the admissions and procedures of March 2020 (Y) was calculated by this formula: $X - Y/X$.

The surgical rate (among all the diagnosed surgical diseases) was the ratio between procedures and diseases calculated for each study period.

To compare the variables, this analysis assumed that the data come from two dependent samples, following the same surgical unit through time and the rank sum test (Wilcoxon) was used.

The statistical significance level was set at the conventional $p < 0.05$. The results were analyzed using the SPSS 20 statistical software for Windows (SPSS Inc., Chicago, IL).

RESULTS

The total number of beds available in the general surgery units was significantly lower in March 2020 than in March 2019 (10 [4–24] vs. 26 [14–76]) for a median decrease of up to 55% (Table 1). Similarly, a significant reduction of elective surgery was observed during the study periods: a 95% decrease for nononcologic procedures (0 [0–18] vs. 34.5 [0–90]) and a 46% decrease for oncologic cases (6 [0–27] vs. 14.5 [0–42]) were documented (Table 1). The ICU beds availability for non–COVID-19 patients was very variable among institutions and did not significantly decrease (4 [0–37] vs. 6.5 [0–43]; $p = 0.407$).

Concerning the topic of this analysis, emergency surgical admissions and surgical operations significantly decreased from March 2019 to March 2020 with a fall in the value of 45% (22 [3–72] vs. 46.5 [10–87]) and 41% (12.5 [5–69] vs. 25.5 [14–61]), respectively (Table 2). This reduction was confirmed by the analysis according to different surgical indications, with the exceptions of admissions and operations for GI bleeding and operations for abdominal trauma (Fig. 2; Supplemental Digital Content, Supplementary Table, http://links.lww.com/TA/B797).

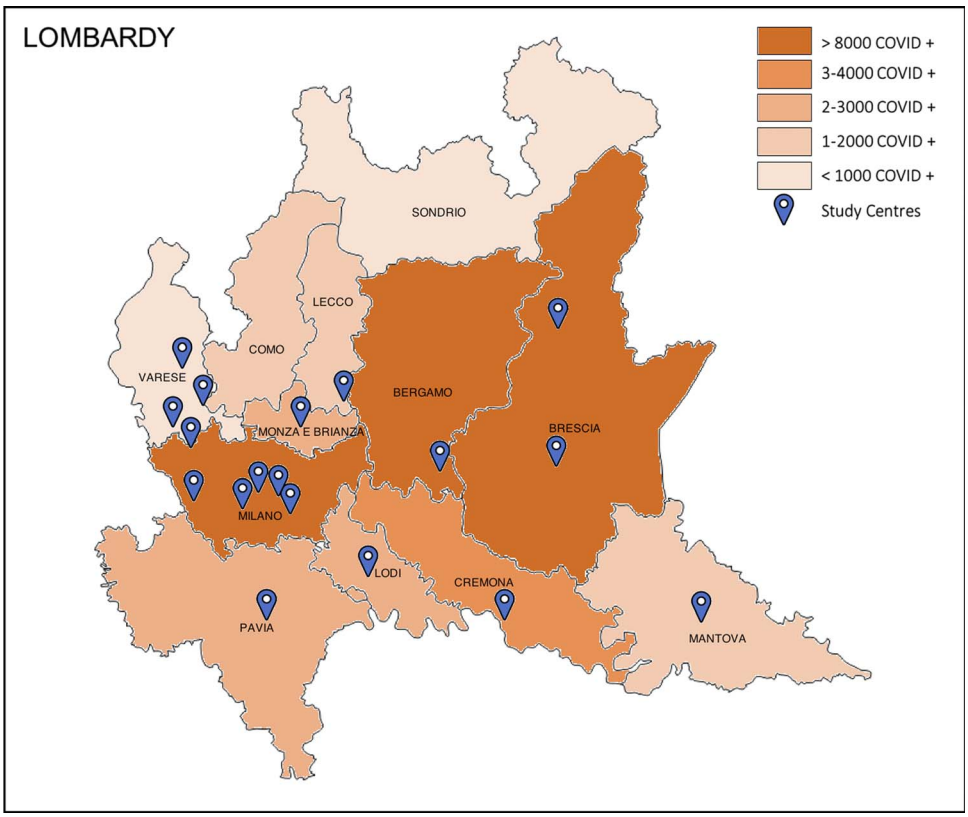

Figure 1. Map of Lombardy region with the 18 study centers according to the diffusion of COVID-19 (updated March 31, 2020).

The statistical significance verified for the difference of admissions for GI perforation was not so relevant (Fig. 2; Supplemental Digital Content, Supplementary Table, http://links.lww.com/TA/B797). Moreover, no significant difference of median age of patients admitted and operated in the two study periods was detected (61.5 [53–79] vs. 63 [52–76]; $p = 0.959$ and 58.5 [38–82] vs. 60.5 [42–80]; $p = 0.887$).

The overall ratio between surgical procedures and diseases was not significantly different in the two observation months (54% in March 2020 vs. 63% in March 2019; $p = 0.619$). This ratio was significantly different only for bowel obstruction (with a median increase of 30%) and for GI perforation (with a median decrease of 46%) (Table 3).

DISCUSSION

Since the first Italian case of a patient tested positive for severe acute respiratory syndrome coronavirus 2 has been reported (February 21, 2020), the Lombardy region had the highest burdens in Italy.[18] Last March, the public health care system and governmental offices deployed containment measures to all Italian regions to limit COVID-19 spread with a progressive and dramatic impact on hospitals and health care resources.[19]

This challenging necessity to redesign hospital services and to shift medical personnel in the ED and medical wards dedicated to COVID-19 patients implied a stringent reduction of elective surgical activities and an organization of hub centers for tumors and major trauma.[20,21] Nonetheless, since the beginning of the outbreak, an unexpected decrease in surgical emergencies and admissions for surgical disease to ED was commonly perceived among surgeons working in the Red Zones.

TABLE 2. Surgical Volume for Emergency Surgery in March 2020 (Compared With March 2019)

	Surgical Patients Admitted in ED			Emergency Surgical Procedures		
Center ID	March 2019	March 2020	% Difference	March 2019	March 2020	% Difference
1	87	52	0.40	31	19	0.39
2	65	35	0.46	26	19	0.27
3	30	19	0.37	40	11	0.73
4	38	3	0.92	14	5	0.64
5	68	72	−0.06	61	69	−0.13
6	62	42	0.32	44	38	0.14
7	48	25	0.48	28	20	0.29
8	62	34	0.45	19	16	0.16
9	36	26	0.28	20	8	0.60
10	10	10	0.00	15	10	0.33
11	32	20	0.38	22	11	0.50
12	60	29	0.52	40	14	0.65
13	56	24	0.57	34	10	0.71
14	43	17	0.60	40	16	0.60
15	63	20	0.68	16	10	0.38
16	32	19	0.41	25	20	0.20
17	45	18	0.60	17	9	0.47
18	32	20	0.38	23	7	0.70
Total	869	475	0.45	515	302	0.41
		$p < 0.001$			$p = 0.001$	

This multicenter study, collecting data related to March 2019 and March 2020 from 18 Lombardy centers, confirms the

TABLE 1. Classification of EDs, Number of Beds of the Surgical Units, and Surgical Volume for Elective Surgery in March 2020 (Compared With March 2019)

		General Surgery Unit Beds			Elective Nononcologic Surgery			Elective Oncologic Surgery		
Center ID	ED Level	March 2019	March 2020	% Difference	March 2019	March 2020	% Difference	March 2019	March 2020	% Difference
1	2nd	76	16	0.79	90	0	1.00	42	27	0.36
2	2nd	24	8	0.67	16	0	1.00	20	12	0.40
3	2nd	16	12	0.25	34	5	0.85	11	4	0.64
4	1st	24	10	0.58	51	0	1.00	14	4	0.71
5	2nd	18	24	−0.33	2	0	1.00	0	0	0.00
6	1st	45	14	0.69	69	3	0.96	25	8	0.68
7	1st	32	10	0.69	40	0	1.00	15	4	0.73
8	1st	31	20	0.35	35	0	1.00	17	1	0.94
9	1st	32	10	0.69	15	0	1.00	14	1	0.93
10	First aid	24	24	0.00	0	0	0.00	3	1	0.67
11	1st	28	10	0.64	15	1	0.93	41	27	0.34
12	1st	22	10	0.55	47	2	0.96	21	7	0.67
13	1st	23	16	0.30	26	2	0.92	10	9	0.10
14	1st	28	7	0.75	38	2	0.95	25	14	0.44
15	First aid	14	10	0.29	40	0	1.00	13	13	0.00
16	1st	20	20	0.00	29	1	0.97	20	25	−0.25
17	1st	30	4	0.87	14	0	1.00	5	5	0.00
18	1st	28	8	0.71	82	18	0.78	10	4	0.60
Total		515	233	0.55	643	34	0.95	306	166	0.46
			$p = 0.001$			$p < 0.001$			$p = 0.001$	

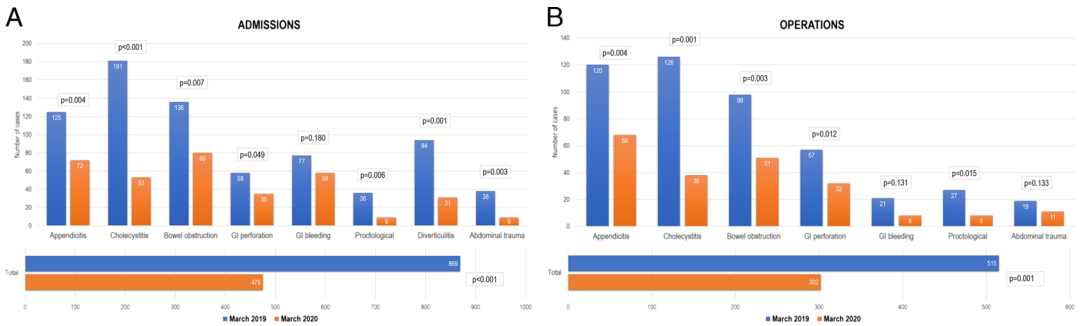

Figure 2. Bar graphs for emergency surgery volume of the 18 study centers in March 2020 (compared with March 2019) according to the different surgical diagnoses. *A*, Admissions. *B*, Operations.

efficacy of solutions in reducing elective surgical activity (up to 95% for nononcologic and 46% for oncologic diseases; Table 1) and demonstrates the overall decreasing in the demand for surgical care in ED during the COVID-19 outbreak: a fall in the value of more than 40% for ED admissions and emergency surgical procedures (45% and 41%, respectively; Table 2) was calculated for March 2020, compared with March 2019. Particularly, a statistically significant reduction involved all the surgical diseases counting a drop at least 40% (Fig. 2; Supplemental Digital Content, Supplementary Table, http://links.lww.com/TA/B797), with the exceptions of admissions and operations for GI bleeding and operations for abdominal trauma. Even the cases of GI perforation decreased, but not in a statistically relevant way (58 admissions in March 2019 vs. 35 in March 2020; $p = 0.049$). However, unlike the hospital reorganization imposed by the region, in some centers, there was no expected reduction in oncologic surgical operations (Table 1); just as in others, emergency surgical admissions and procedures could appear slightly different (i.e., abdominal trauma in the center 5; Supplemental Digital Content, Supplementary Table, http://links.lww.com/TA/B797).

Nevertheless, this evident lowering of impact on emergency services by surgical diseases needs to be explained. The lockdown measures adopted in Italy and in particular in Lombardy, to flatten the contagion curve of the COVID-19, have undoubtedly forced people to stay at home and to use emergency services only if strictly indispensable for serious reasons. On the other hand, most likely, patients were reluctant to reach the ED to avoid being infected. Similarly, common sense and literature suggestions induced surgeons to modulate surgical timing in case of non–life-threatening conditions and to stress for at-home management of mild-moderate patterns of disease.[22–25] Hence,

TABLE 3. Surgical Rates Among All the Emergency Surgical Diseases Diagnosed in March 2020 (Compared With March 2019)

	% Surgical Procedures/Diagnoses															
	Appendicitis		Cholecystitis		Bowel Obstruction		Bowel Perforation		GI Bleeding		Proctologic Disease		Abdominal Trauma		Total	
Center ID	March 2019	March 2020	March 2019	March 2020	March 2019	March 2020	March 2019	March 2020	March 2019	March 2020	March 2019	March 2020	March 2019	March 2020	March 2019	March 2020
1	0.88	0.80	0.23	0.50	0.89	0.80	1.00	0.80	0.00	0.00	—	—	0.60	0.00	0.36	0.37
2	0.91	1.00	0.71	1.00	1.00	1.00	1.00	0.67	0.00	0.25	1.00	—	0.50	1.00	0.40	0.54
3	0.90	1.00	0.64	0.00	0.78	1.00	0.88	0.25	0.89	0.50	1.00	0.00	0.57	0.50	1.33	0.58
4	1.00	—	0.33	0.00	0.50	—	0.67	—	0.00	0.00	0.50	—	—	—	0.37	1.67
5	0.90	0.50	0.89	0.40	0.50	0.50	1.00	0.57	0.00	0.50	—	—	1.00	2.67	0.90	0.96
6	1.00	1.00	0.13	0.86	0.67	1.00	1.00	0.70	1.00	0.00	0.00	—	0.25	—	0.71	0.90
7	1.00	1.00	1.00	1.40	1.00	1.00	1.00	1.33	0.00	0.00	1.00	1.00	0.75	—	0.58	0.80
8	1.00	1.00	0.80	0.60	0.33	1.00	1.00	0.00	0.14	0.00	1.00	—	0.50	—	0.31	0.47
9	1.00	1.00	0.90	1.00	0.00	1.00	—	0.50	—	0.20	—	0.00	—	—	0.56	0.31
10	1.00	1.00	0.80	0.83	0.80	0.50	1.00	—	0.00	0.00	1.00	1.00	0.00	—	1.50	—
11	0.75	0.67	0.86	—	0.67	0.67	—	0.50	1.00	—	—	—	0.50	—	0.69	0.55
12	1.22	1.00	1.14	0.33	1.00	1.00	1.00	0.50	0.10	0.00	0.00	—	0.50	—	0.67	0.48
13	1.00	1.00	0.40	0.20	0.69	1.00	1.00	1.00	0.67	1.00	1.00	—	0.67	—	0.61	0.42
14	1.00	1.00	1.00	—	0.71	1.00	1.00	1.00	0.33	0.00	1.00	0.50	—	1.00	0.93	0.94
15	1.00	1.00	0.25	1.00	1.00	1.00	1.50	0.43	1.00	—	0.20	—	—	—	0.25	0.50
16	1.00	1.00	1.50	2.00	0.67	1.00	—	0.60	—	0.00	2.00	1.00	0.00	—	0.78	1.05
17	0.67	1.00	1.00	1.00	0.33	1.00	1.00	0.50	0.13	0.33	0.00	—	—	—	0.38	0.50
18	1.00	1.00	0.42	1.00	1.00	1.00	1.00	0.50	0.25	0.00	0.60	—	0.00	—	0.72	0.35
Median	1.00	1.00	0.80	0.86	0.70	1.00	1.00	0.54	0.13	0.00	1.00	0.50	0.50	1.00	0.63	0.54
	$p = 0.866$		$p = 0.594$		$p = 0.011$		$p = 0.009$		$p = 0.646$		$p = 0.102$		$p = 0.715$		$p = 0.619$	

the results of this study confirm that regional rules and people and surgeons' attitudes negatively affected the number of hospital admissions. What is more, it is not possible to exclude (and to measure) the intriguing phenomenon for which changes in lifestyle during confinement, with particular regard to diet (i.e., low-fat, less convenience food), hygiene (i.e., handwashing and personal hygiene, environmental sanitation), and habits (i.e., less stressing activities), may have contributed to lower the incidence of some surgical diseases. Finally, it cannot be excluded that COVID-19 itself with specific effects on GI tract may have affected incidence of surgical diseases and/or altered their clinical presentation.

In this context, as expected, two results did not seem so consistent and have to be clarified: the statistical decrease of cases of GI perforation and bleeding was only slightly or not significant.

About the first category, it is really surprising even to detect any lowering trend (confirmed by its operations rates), but it could be interesting to discuss it along with the very significant reduction of admissions for diverticulitis (>65%; Fig. 2; Supplemental Digital Content, Supplementary Table, http://links.lww.com/TA/B797). The decrease of complicated diverticular diseases can recognize all the aforementioned causes, but an additional factor, strongly related to GI perforation, might have influenced this figure. The initial warnings about the possible role of nonsteroidal anti-inflammatory drugs and corticosteroids in worsening the severity of COVID-19[26,27] and, consequently, their minor use may partially explain the decreased incidence of diverticulitis and GI perforation (for demonstrated cause-effect relationships).[28]

Similarly, the decreasing rates of diverticulitis may have implied a reduction of the cases of closed perforation of the colon, included in the multifaceted definition of GI perforation.

With specific regard to GI bleeding (and its nonsignificant fall in value), its clinical presentation generally induces patients to ED, independently from any restriction. Moreover, despite the reduced probability of drug-induced gastric injuries, the diffusion of low molecular weight heparin used at an anticoagulant dose in the treatment of COVID-19 may have affected this result.[29,30]

Once adjusted for the number of emergency admissions, this analysis confirmed the more immediate perception about the dramatic decrease of emergency surgical procedures. In particular, it tried to measure the conservative approach of surgeons by calculating the ratio between surgical procedures and diseases in March 2020 compared with March 2019 (Table 3). The overall ratio was not significantly different in the two observation months (54% vs. 63%; $p = 0.619$): this general result was not consistent with more conservative management of surgical diseases. However, the disease-specific analysis provided conflicting data: this ratio was significantly increased for bowel obstruction (about 30%) and decreased for GI perforation (about 45%) (Table 3).

Literature specifically addressed to the COVID-19 pandemic underlined that indications for emergency surgery must be considered to be the same as before, although a more conservative approach for some diseases could be reasonable to avoid hospital resources overload.[22,31] Furthermore, in the case of deferrable treatment, delays due to the achievement of swab test finding and to patients' hospitalization may contribute to exceeding the optimal timing for surgery. Again, in this situation, the concerns about the use of laparoscopy related to the potential risk of viral dissemination with the pneumoperitoneum more often induce a conservative approach without the drawbacks of an open surgery.[24,32–34]

With these assumptions, the more aggressive attitude of surgeons toward bowel obstruction observed in this study could be justified from more severe clinical presentations (likely related to a late referral to ED). Contrarily, it seems paradoxical to attribute the reduction of procedures for GI perforation to conservative management by surgeons. More probably, this is a result even due to the aforementioned multifaceted definition of GI perforation.

To provide an accurate interpretation of the results of this study, it seems correct to consider "true" the dramatic decrease of surgical problems during COVID-19 outbreak, despite any therapeutic strategies and logistic difficulties. Other reports have supposed a general decrease in non-COVID emergency activities,[15,16,35–37] but this is the first multicenter study conducted in a high-incidence country evaluating this suggestive aspect of COVID-19 pandemic.

However, this study has several limitations. First of all, data about COVID-19 status of patients have not been reported, and its consequences in terms of incidence, clinical presentation, and management of surgical diseases have not been evaluated. Second, there were no data about the outcome of operated patients. Similarly, it remains unknown what happened next, if untreated or undertreated, diseases may break out or a higher number of complications may be registered during the subsequent months. This can be an interesting starting point for further studies analyzing follow-up. Third, it was not always easy to discriminate the patients admitted to ED vs. those transferred from another hospital and then underwent surgery: therefore, in some calculations, the operated patients resulted to be more than the admitted ones. Finally, no comparison was made with other areas affected by the COVID-19 outbreak.

In conclusion, the study aimed to confirm the dramatic decrease in surgical emergencies during this unusual period and looking for its reason. Now, it offers some simple tools to understand this particular, nonsecondary, epidemiologic aspect of this pandemic. After follow-up data collection, it will probably help to think over nonsurgical alternative treatment of certain emergencies and face the near future.

AUTHORSHIP

S.R. contributed in the study design, data analysis, data interpretation, and writing. F. Ferrara contributed in the study design, data collection, literature search, and writing. T.Z. contributed in the data collection, literature search, data interpretation, and writing. F. Frattini contributed in the data interpretation and writing. O.C. contributed in the study design and critical revision. A.P. contributed in the study design, data interpretation, and critical revision. G.S. contributed in the study design and critical revision.

ACKNOWLEDGMENTS

We acknowledge Matteo Marconi for English editing, Claudia Gasparini (Lodi), Michela Monteleone, Gaia Coletti, Colomba Frattaruolo (Merate), and Emanuele Di Fratta (Desio) for access to data systems.

DISCLOSURE

The authors declare no conflicts of interest.

REFERENCES

1. World Health Organization. Coronavirus disease (COVID-2019) situation reports. Published 2020. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports. Accessed May 15, 2020.
2. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*. 2020;382(8):727–733.
3. Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, Agha M, Agha R. The socio-economic implications of the coronavirus pandemic (COVID-19): a review. *Int J Surg*. 2020;78:185–193.
4. Presidenza del Consiglio dei Ministri. Decreto del Presidente del Consiglio dei Ministri 8 Marzo 2020. Ulteriori disposizioni attuative del decreto-legge 23 febbraio 2020, n. 6, recante misure urgenti in materia di contenimento e gestione dell'emergenza epidemiologica da COVID-19. 2020. Available at: http://www.governo.it/it/articolo/coronavirus-firmato-il-dpcm-8-marzo-2020/14266.
5. World Health Organization. Coronavirus disease 2019 (COVID-19). Situation Report — 71. Published 2020. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200331-sitrep-71-covid-19.pdf?sfvrsn=4360e92b_8. Accessed May 18, 2020.
6. Regione Lombardia. COVID-19 Situazione Regione Lombardia. Available at: https://experience.arcgis.com/experience/0a5dfcc103d0468bbb6b14e713ec1e30/. Published 2020. Accessed May 18, 2020.
7. Rosenbaum L. Facing Covid-19 in Italy — ethics, logistics, and therapeutics on the epidemic's front line. *N Engl J Med*. 2020;382(20):1873–1875.
8. Fagiuoli S, Lorini FL, Remuzzi G. Adaptations and lessons in the province of Bergamo. *N Engl J Med*. 2020;382(21):e71.
9. Spina S, Marrazzo F, Migliari M, Stucchi R, Sforza A, Fumagalli R. The response of Milan's emergency medical system to the COVID-19 outbreak in Italy. *Lancet*. 2020;395(10227):e49–e50.
10. Italian Association of Hospital Surgeons (ACOI) and Italian Society of Surgery (SIC). ACOI-SIC recommendations during COVID-19 pandemic. Published 2020. Available at: https://www.sicitalia.org/wp-content/uploads/2020/04/20200330_Covid-19-Acoi_Sic.pdf. Accessed May 18, 2020.
11. Italian Society of Surgical Oncology (SICO). Raccomandazioni pratiche della società italiana di chirurgia oncologica sulla gestione chirurgica del paziente oncologico durante la pandemia COVID-19. April 4, 2020. Published 2020. Available at: https://www.sicoweb.it/raccomandazioni-sico.pdf. Accessed May 18, 2020.
12. Gallo G, La Torre M, Pietroletti R, Bianco F, Altomare DF, Pucciarelli S, Gagliardi G, Perinotti R. Italian society of colorectal surgery recommendations for good clinical practice in colorectal surgery during the novel coronavirus pandemic. *Tech Coloproctol*. 2020;24(6):501–505.
13. Coccolini F, Perrone G, Chiarugi M, et al. Surgery in COVID-19 patients: operational directives. *World J Emerg Surg*. 2020;15(1):25.
14. Regione Lombardia. Measures for the containment and management of COVID-19. Published 2020. Available at: https://www.en.regione.lombardia.it/wps/portal/site/en-regione-lombardia/DettaglioRedazionale/health/covid-19/coronavirus-ordinanza-dpcm-english. Accessed May 18, 2020.
15. Patriti A, Eugeni E, Guerra F. What happened to surgical emergencies in the era of COVID-19 outbreak? Considerations of surgeons working in an Italian COVID-19 red zone. *Updates Surg*. 2020;72(2):309–310.
16. Cano-Valderrama O, Morales X, Ferrigni CJ, et al. Reduction in emergency surgery activity during COVID-19 pandemic in three Spanish hospitals. *Br J Surg*. 2020;107:e239.
17. Ministero della Salute. Elenco strutture della rete dell'emergenza ospedaliera. Published 2019. Available at: http://www.salute.gov.it/portale/documentazione/p6_2_8_1_1.jsp?lingua=italiano&id=17. Accessed May 18, 2020.
18. Carinci F. Covid-19: preparedness, decentralisation, and the hunt for patient zero. *BMJ*. 2020;368:bmj.m799. doi:10.1136/bmj.m79.
19. Presidenza del Consiglio dei Ministri. Decreto del Presidente del Consiglio dei Ministri 11 marzo 2020. Ulteriori disposizioni attuative del decreto-legge 23 febbraio 2020, n. 6, recante misure urgenti in materia di contenimento e gestione dell'emergenza epidemiologica da COVID-19, applicabili. 2020. Available at: https://www.gazzettaufficiale.it/eli/id/2020/03/11/20A01605/sg. Accessed May 18, 2020.
20. Regione Lombardia. Deliberazione n. XI/2906 del 8 Marzo 2020. Ulteriori determinazioni in ordine all'emergenza epidemiologica da covid-19. Published 2020. Available at: https://www.regione.lombardia.it/wps/wcm/connect/5e0deec4-caca-409c-825b-25f781d8756c/DGR+2906+8+marzo+2020.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-5e0deec4-caca-409c-825b-25f781d8756c-n7b4lOB. Accessed May 18, 2020.
21. Direzione Generale Welfare Regione Lombardia. Decreto del direttore generale della DG welfare n. 3351 del 14/03/2020 "Disposizioni integrative in attuazione della DGR n. XI/2906 dell'8/03/2020 per l'organizzazione della rete ospedaliera in ordine all'emergenza epidemiologica da covid-19." Available at: https://www.regione.lombardia.it/wps/wcm/connect/af6d2303-9212-433e-abcb-ac5a77b48fe5/Decreto+3353.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-af6d2303-9212-433e-abcb-ac5a77b48fe5-n3DPlAT. Accessed May 18, 2020.
22. Coimbra R, Edwards S, Kurihara H, et al. European Society of Trauma and Emergency Surgery (ESTES) recommendations for trauma and emergency surgery preparation during times of COVID-19 infection. *Eur J Trauma Emerg Surg*. April 2020. 46:505–510.
23. Di Marzo F, Sartelli M, Cennamo R, Toccafondi G, Coccolini F, La Torre G, Tulli G, Lombardi M, Cardi M. Recommendations for general surgery activities in a pandemic scenario (SARS-CoV-2). *Br J Surg*. 2020;107:1104–1106.
24. De Simone B, Chouillard E, Di Saverio S, et al. Emergency surgery during the COVID-19 pandemic: what you need to know for practice. *Ann R Coll Surg Engl*. 2020;102(5):323–332.
25. COVIDSurg Collaborative. Global guidance for surgical care during the COVID-19 pandemic [published online April 15, 2020]. *Br J Surg*. doi:10.1002/bjs.11646.
26. European Medicines Agency. EMA gives advice on the use of non-steroidal antiinflammatories for COVID-19. Published 2020. Available at: https://www.ema.europa.eu/en/documents/press-release/ema-gives-advice-use-non-steroidal-anti-inflammatories-covid-19_en.pdf. Accessed May 18, 2020.
27. de Girolamo L, Peretti GM, Maffulli N, Brini AT. Covid-19—the real role of NSAIDs in Italy. *J Orthop Surg Res*. 2020;15(1):165.
28. Strate LL, Morris AM. Epidemiology, pathophysiology, and treatment of diverticulitis. *Gastroenterology*. 2019;156(5):1282–1298.e1.
29. Porfidia A, Pola R. Venous thromboembolism and heparin use in COVID-19 patients: juggling between pragmatic choices, suggestions of medical societies [published online May 4, 2020]. *J Thromb Thrombolysis*. doi:10.1007/s11239-020-02125-4.
30. Tang N, Bai H, Chen X, Gong J, Li D, Sun Z. Anticoagulant treatment is associated with decreased mortality in severe coronavirus disease 2019 patients with coagulopathy. *J Thromb Haemost*. 2020;18(5):1094–1099.
31. Gao Y, Xi H, Chen L. Emergency surgery in suspected COVID-19 patients with acute abdomen: case series and perspectives. *Ann Surg*. 2020;272(1):e38–e39.
32. Francis N, Dort J, Cho E, et al. SAGES and EAES recommendations for minimally invasive surgery during COVID-19 pandemic. *Surg Endosc*. 2020;34(6):2327–2331.
33. Veziant J, Bourdel N, Slim K. Risks of viral contamination in healthcare professionals during laparoscopy in the Covid-19 pandemic. *J Visc Surg*. 2020;157(3):S60–S63.
34. Vigneswaran Y, Prachand VN, Posner MC, Matthews JB, Hussain M. What is the appropriate use of laparoscopy over open procedures in the current COVID-19 climate? *J Gastrointest Surg*. 2020;24(7):1686–1691.
35. Madanelo M, Ferreira C, Nunes-Carneiro D, et al. The impact of the COVID-19 pandemic on the utilisation of emergency urological services. *BJU Int*. 2020;126(2):256–258.
36. Novara G, Bartoletti R, Crestani A, et al. Impact of COVID-19 pandemic on the urologic practice in the emergency departments in Italy. *BJU Int*. 2020;126(2):245–247.
37. De Filippo O, D'Ascenzo F, Angelini F, et al. Reduced rate of hospital admissions for ACS during Covid-19 outbreak in Northern Italy. *N Engl J Med*. 2020;383(1):88–89.