

### Long term Implications in Surgical re-Assisting (L.I.S.A. study) during the Covid-19 outbreak.

#### A retrospective observational cohort study on a rural population



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#### Long term Implications in Surgical re-Assisting (LISA study) during the Covid-19 outbreak. A retrospective observational cohort study on a rural population

**BACKGROUND:** COVID-19 is having a worldwide impact on surgical treatment. Our aim was to investigate the impact of the pandemic in a rural hospital serving a low densely populated area.

**METHODS:** We investigated the volume and type of surgical performed operations during both the pandemic (March 2020 - February 2021) and pre-pandemic periods (March 2019 - February 2020) as well as during the first and second pandemic waves compared to the pre-pandemic period.

We compared the volume and timing of emergency appendectomy and cholecystectomy performed during the pandemic with those of the pre-pandemic period, doing the same with the volume, timing and stages of elective gastric and colorectal resections for cancer.

**RESULTS:** In the pre-pandemic period a higher number of appendectomies (42 vs. 24) and urgent and elective cholecystectomies (174 vs. 126) was performed. The patients operated during the pandemic period (both for appendectomy and cholecystectomy) were on average older (58 vs. 52 years old,  $p=0.006$ ), including for cholecystectomy (73 vs. 66 years old,  $p=0.01$ ) and appendectomy (43 vs. 30 years old,  $p=0.04$ ).

The logistic regression analysis with regard to the cholecystectomies and appendectomies performed in emergency showed that male sex and age were associated with gangrenous type histology, both in the pandemic and pre-pandemic period. Finally, we found a reduction in the stage I and IIA colorectal cancers operated during the pandemic compared to those of the pre-pandemic period, with no increase of the advanced stages.

**CONCLUSIONS:** The reduction in services imposed by governments during the first months of total lock down could not justify the whole decrease in surgical interventions in the year of the pandemic. Data suggest that greater "non-operative management" for appendicitis and acute cholecystitis does not lead to an increase of cases operated over time, nor to an increase in the "gangrenous" pattern, this seems to depend on age advanced and male population.

**KEY WORDS:** COVID-19, Emergency Surgery, General Surgery, Pandemics

#### Introduction

The rapid spread of the new Coronavirus causing the COVID19 disease has had a worldwide impact on the remodelling of surgical treatment<sup>1-4</sup>. Before the pandemic declaration by the WHO, it was already clear that postponing elective activities was a fundamental step to preserve patients' safety and to limit the viral diffusion. This measure is theoretically bound to increase the

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resources for COVID-19 patients, clearing ward and intensive care unit (ICU) beds. Moreover, it avoids unnecessary patient traffic in the hospital and reduces the risk of cross-infection between elective patients hospital visitors, and COVID-19 patients, preventing spread of infection from the hospital to the community<sup>5</sup>. To conserve resources and to limit the spread of the virus, many hospitals were forced to delay elective surgical operations. Nearly 38% of cancer surgeries are estimated to have been postponed worldwide during the 12-week peak of the pandemic<sup>6</sup>. Recent studies suggest that postponing elective colorectal cancer (CRC) surgery by more than four weeks after diagnosis is associated with poorer outcomes<sup>6,7</sup>. However, the lack of evidence-based standards for what is considered a delay in cancer surgery has led to inconsistent study designs and few attempts at meta-analysis<sup>6</sup>. A meta-analysis published in 2007 found delays in surgery for CRC did not worsen the overall survival; but it should be noticed that the interpretation of these results is limited since colon and rectal cancers were not evaluated separately<sup>8</sup>. The state of the art and most triage guidelines discourage delaying curative-intent surgery for colon cancer<sup>9,10</sup>. For resectable colon cancer, curative intent surgery should be carried out, while preoperative chemotherapy could be considered for locally advanced colon cancer. For rectal cancer, all preoperative treatment options should be considered<sup>5</sup>. As for gastric cancer, instead, priority should be given to surgical resection of tumour stage cT1b and patients with ongoing perioperative treatment, while patients with cT2 cancer or higher should undergo preoperative therapy<sup>5</sup>). Other aspects involve emergency surgery during COVID-19 pandemic. Based on recent published literature, urgent surgery should be performed for: obstructive or nearly obstructive CRC (prefer diversion in rectal cancer), acutely transfusion-dependent tumours, cancers with pending evidence of local perforation and sepsis, and post-surgical and post-colonoscopy complication<sup>5</sup>. Non-operative or conservative management of acutely ill patients should be considered when feasible and safe, and it is strongly encouraged with COVID-19 patients<sup>5</sup>. As the rate of new COVID-19 cases decrease, a progressive reopening of elective procedures will be necessary. To date, the information on the long-term effects of the reorganization during the COVID-19 pandemic of the surgical units serving a rural population is scant. However, such information may contribute to improve the management of health care resources during new COVID-19 pandemic waves as well as other pandemics. Our research group has already analyzed the first effects of the COVID-19 pandemic on surgical activities in a University Hospital serving mainly an urban area and in the emerging setting<sup>1,11</sup>. Our aim was now to investigate the impact of the Pandemic on general surgery operations, including emergency and cancer surgeries, in a district hospital serving a wide, low densely populated rural area.

## Methods and Materials

This is an observational, retrospective cohort study conducted in a hospital serving a wide low densely populated rural area in the Province of Ferrara, in North-eastern Italy. To investigate the impact of the Pandemic on general surgery operations we specifically evaluated: The volume and type of surgical operations during the pandemic and the pre-pandemic periods as well as during the first and second waves compared to the pre-pandemic period;

- 1) The volume and timing of emergency appendectomy and cholecystectomy performed during the pandemic versus pre-pandemic period;
- 2) The volume and timing of elective gastric and colorectal resections for cancer during the pandemic versus the pre-pandemic period.

We considered as “pre-pandemic” the period between March 2019 and February 2020 while with “pandemic” it is intended the period between March 2020 and February 2021.

We also focused on all surgical operations performed in the first quarter (January-April) of the year 2019 (pre-pandemic), 2020 (first pandemic wave), and 2021 (second pandemic wave).

We collected data on all adult patients who underwent elective or emergency surgery for the pandemic period (March 2020–February 2021), from a prospective database, and pre-pandemic period (March 2019–February 2020), retrospectively.

To evaluate the impact of the COVID-19 pandemic on emergency surgery we elected cholecystectomies and appendectomies for the possibility of “non-operative-management” of cholecystitis and appendicitis as compared to other diseases. In particular, we evaluated patients’ age, surgical approach (i.e., open or laparoscopic technique), and final pathology to detect gangrenous cholecystitis and appendicitis. As far as cancer surgery is concerned, we evaluated the patients’ age, the use of preoperative chemotherapy, and TNM tumour stage (AJCC 8<sup>th</sup> edition) of both colorectal and gastric cancers. We also evaluated the need of neoadjuvant and adjuvant therapies in the two periods (pre-pandemic and pandemic).

Finally, in order to detect any delay attributable to the pandemic burden, we reviewed the data of the multidisciplinary colorectal cancer team to detect the time elapsed between endoscopic cancer diagnosis and the preoperative computerized tomography (CT) staging, surgery, and final pathology reporting.

## STATISTICAL ANALYSIS

The normal distribution of the continuous variables was analyzed using Kolmogorov-Smirnov and Shapiro-Wilk tests, while not normally distributed variables were log-transformed before entering the parametric statistical

analysis. Categorical variables were summarized by using frequencies and percentages, while continuous data were presented as both mean± standard deviation (SD) and median. The Mann-Whitney U test was used for continuous variables, and the  $\chi^2$  test or the Fisher exact test was used for categorical variables.

The Wilcoxon signed-Rank test was used in case of comparison of two related matched samples, while the analysis of variance (ANOVA) was performed to compare two or more groups of data by analyzing the intrinsic variability and comparing it among groups.

In order to evaluate the predictive role of each variable toward the outcome chose, all variables with a  $p < 0.05$  in the univariate analyses were entered into multivariate logistic regression analyses. All  $p < 0.05$  were considered statistically significant. Data analyses were performed by using SPSS 26.0 software (IBM SPSS Statistics, IBM Corporation).

#### ETHICAL APPROVAL

The local Ethics Committee approved the protocol of this study (65/2021/Oss/AUSLFe). STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) and STROCCS (Strengthening the reporting of cohort, cross-sectional and case-control studies in surgery) guidelines for reporting observational studies were followed as for the compilation of this manuscript.

This study was conducted according to the Declaration of Helsinki (93/42/EECart.15) developed for the medical community by the World Medical Association (WMA).

#### Results

Between March 2019 and February 2020 (pre-pandemic period), a total of 663 surgical operations were performed at our institution as opposed to 493 between March 2020 and February 2021 (pandemic period) (Fig. 1). Summarizes the number of surgical procedures performed in the two periods, detailing the type of surgical operations. In the pre-pandemic we performed more appendectomies (42 vs. 24) and cholecystectomies, both urgent and elective (174 vs. 126). In the first quarters of 2019, 2020, and 2021 the total number of elective surgical operations was 137, 116, and 130, respectively ( $p=0.79$ ) (Fig. 2). There was no statistical difference in the total number of procedures performed in the first quarters of 2019 versus 2020 ( $p=0.21$ ) and 2020 versus 2021 ( $p=0.21$ ), although a reduction in lower gastrointestinal surgery (13 vs.18) and cholecystectomies (28vs.46) were observed in 2020 compared to the year 2019, while total inguinal hernia repair and haemorrhoidectomies increased in 2021 compared with 2020. Regarding emergency appendectomies and cholecystectomies, 93 operations were performed in the pre-pandemic period compared to 63 in the pandemic period (Table I). The patients operated in the pre-pandemic period were on average older (58 vs. 52 years,  $p=0.006$ ), also when considering the single operation:73 vs. 66 years for cholecystectomy,  $p=0.01$  (Table II) and 43 vs. 30 years,  $p=0.04$  for appendectomy) (Table III). In the pre-pandemic period, the rate of gangrenous cholecystitis was 37.3% (19 out of 51), similar to that of the pandemic period, 35.9% (14 out of 39), while for gangrenous

TABLE I - Median age and emergency surgery. Prepandemic (2019, N=93), pandemic (2020, N=63) and total of cases (N=156).

Prepandemic 2019 (N=93)		Pandemic 2020 (N=63)		Total of patients (N=156)		P value between groups
Age, mean±SD (median)	Min-max	Age, mean±SD (median)	Min-max	Age, mean±SD (median)	Min-max	
56±22 (58)	18-91	52±22 (52)	17-86	55±22 (55)	17-91	0.006

TABLE II - Median age and urgent cholecystectomies. Prepandemic (2019, N=51), pandemic (2020, N=39) and total of cases (N=90).

Prepandemic 2019 (N=51)		Pandemic 2020 (N=39)		Total of patients (N=90)		P value between groups
Age, mean±SD (median)	Min-max	Age, mean±SD (median)	Min-max	Age, mean±SD (median)	Min-max	
67±19 (73)	21-89	63±17 (66)	25-86	65±18 (71)	21-89	0.01

TABLE III - Median age and urgent appendectomy. Prepandemic (2019, N=42), pandemic (2020, N=24) and total of cases (N=66).

Prepandemic 2019 (N=42)		Pandemic 2020 (N=24)		Total of patients (N=66)		P value between groups
Age, mean±SD (median)	Min-max	Age, mean±SD (median)	Min-max	Age, mean±SD (median)	Min-max	
43±19 (43)	18-91	35±17 (30)	17-78	40±18 (37)	17-91	0.04

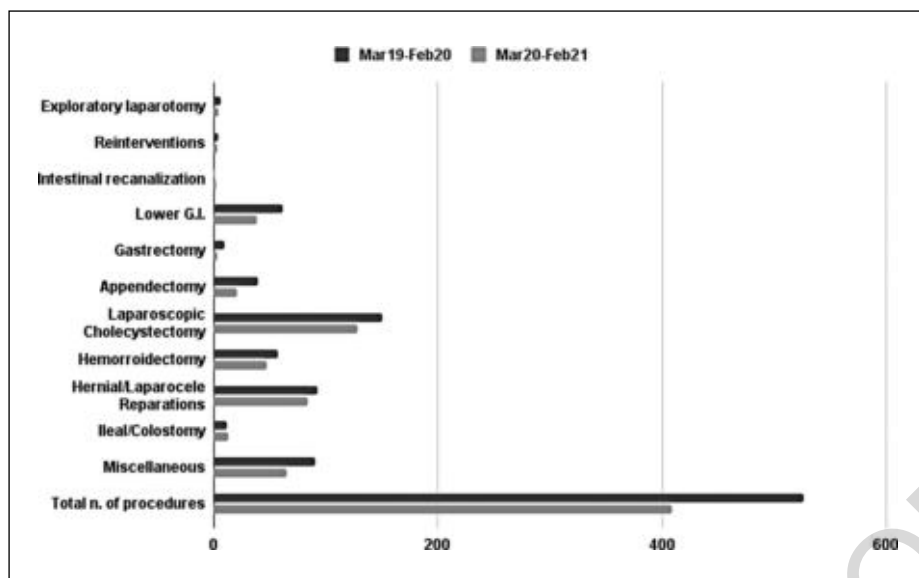


Fig. 1: Surgical operations performed by the Department of General Surgery of the Delta hospital, stratified by type of surgeries (Up: pre-pandemic; Down pandemic).

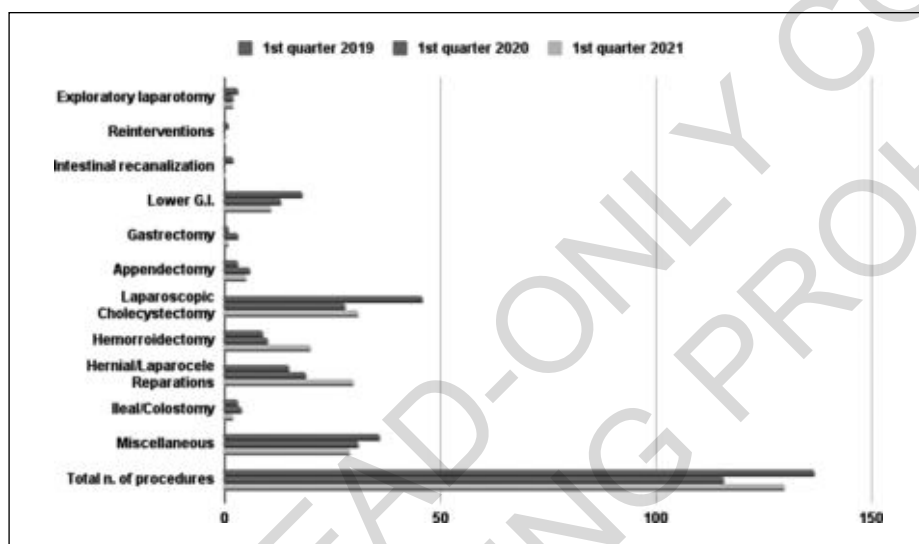


Fig. 2: Surgical activity, Delta hospital, January-March quarter compared (Up: 2019; Middle: 2020; Down: 2021).

TABLE IV - Logistic regression analyses of gangrenous histologic patterns among surgical urgencies. Variables in relation to gangrenous histology.

Variable	OR	95% CI(lower-upper)	p value
Sex (Male)	3.14	1.47-6.70	0.008
Age	1.02	1.01-1.04	0.003
Year of surgery(2020)	1.05	0.50-2.20	0.89

OR=Odds Ratio; 95%, CI= 5%; Confidential Interval.

TABLE V - Logistic regression analyses of gangrenous histologic patterns among urgent cholecystectomies. Variables in relation to gangrenous cholecystectomies.

Variable	OR	95% CI (lower-upper)	p value
Sex(M)	4.30	1.61-11.50	0.004
Age	1.03	1.02 -1.06	0.04

OR=Odds Ratio; 95%, CI= 5%; Confidential Interval.

TABLE VI - Logistic regression analyses of gangrenous histologic patterns among urgent appendectomies. Variables in relation to gangrenous appendectomies.

Variable	OR	95% CI(lower-upper)	p value
Sex(M)	2.00	0.59-6.74	0.26
Age	1.01	0.98-1.04	0.50
Year of surgery(2020)	0.96	0.27-3.39	0.95

OR=Odds Ratio; 95%, CI= 5%; Confidential Interval.

appendicitis it was 23.8% (10 out of 42) and 20.8% (5 out of 24), respectively (p=0.78). There were no substantial differences in the number of laparotomic appendectomy operations performed during the period 2019-2020 (3 out of 42; 7,1%) versus 2020-2021(2 out of 24; 8,3%).

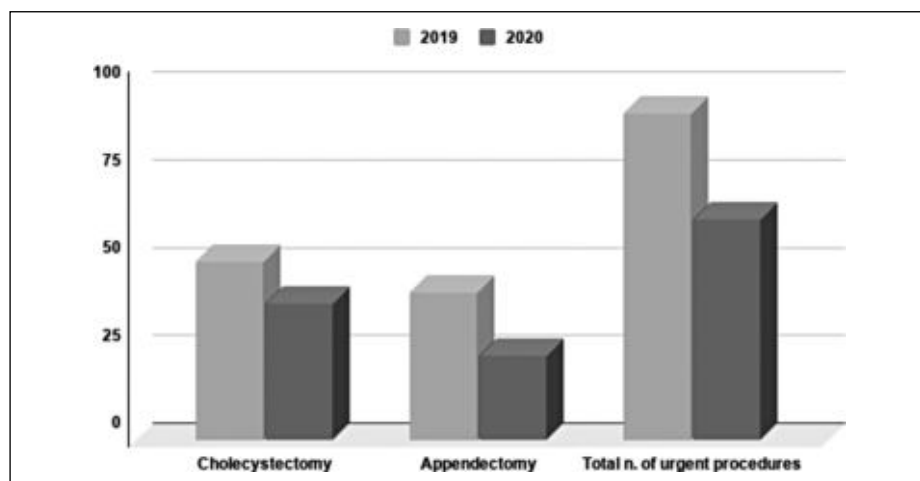


Fig. 3: Urgent cholecystectomies and appendectomies (Left column: year 2019; Right column: year 2020).

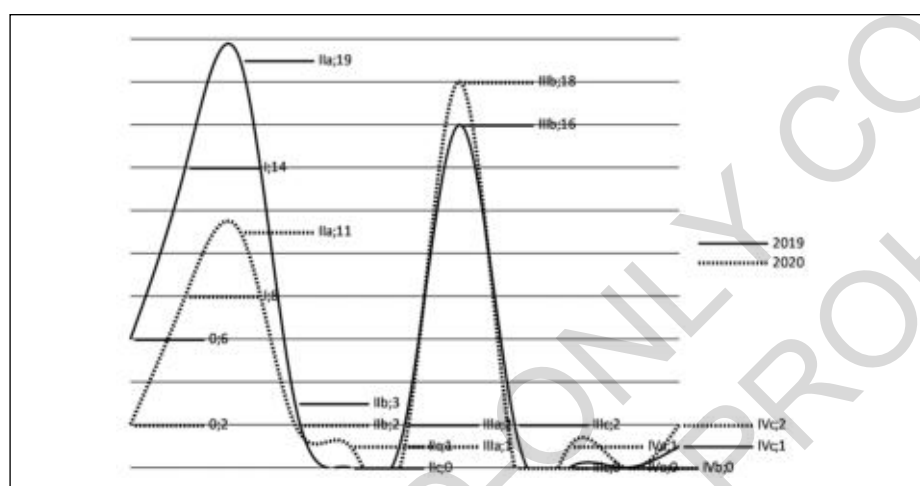


Fig. 4 Colorectal cancer: comparison between histologicals prepandemic 2019 vs pandemic 2020 (AJCC 8th edition).

In pre-pandemic period, 6 out of 51 laparotomic cholecystectomies were performed (11,7%) compared to 3 out of 39 (7,7 %) during the pandemic period.

The logistic regression analysis, performed to evaluate factors associated to gangrenous pattern in emergency cholecystectomy and the appendectomy, showed that the male sex (OR 3.14, 95% CI1.47-6.10;  $p=0.008$ ) and age (OR 1.02, 95% CI1.01-1.04;  $p=0.003$ ) were associated to a gangrenous type histology both in the pandemic and pre-pandemic period (Table IV).

Similar results were obtained in a subanalysis considering cholecystectomies (Table V) and appendectomies (Table VI) separately (Fig. 3). Reports the total volumes of urgent procedures performed in the pre-pandemic (2019) and pandemic (2020), differentiated by type of surgery (cholecystectomies and appendectomies).

10 patients underwent gastric resection for cancer in the pre-pandemic period compared to 9 in the pandemic period, with no difference between groups in terms of age, co morbidities, and tumour size (Table VII).

We also evaluated the need of neoadjuvant and adjuvant therapies in the two periods and from the analysis of these subgroups, no significant differences emerged

(Table VIII). 65 patients underwent colorectal cancer surgery in the pre-pandemic period compared to 46 in the pandemic period.

For patients who underwent to colorectal resection for colonic cancer, the time elapsed between endoscopic diagnosis, preoperative staging (contrast enhanced CT of the thorax, abdomen and pelvis), surgery and final pathology during the pre-pandemic and pandemic period did not show a significant difference (Table IX). Finally, we considered any differences between the groups in terms of the need for neoadjuvant therapy.

## Discussion

This study shows that Covid-19 pandemic has change our activity in emergency surgery, while elective surgery did not significantly change. As the COVID-19 pandemic has put the Italian national health care system under pressure, we hypothesized three possible scenarios after the reopening of surgical activities at the end of the total lockdown between March and May 2020 (first pandemic period):

TABLE VII - Partial gastrectomies (median age, tumor diameter). Prepandemic (2019, N=10), pandemic (2020, N=9) and total of cases (N=19).

Prepandemic 2019 (N=10)		Pandemic 2020 (N=9)		Total of patients (N=19)		P value between groups
Age, mean±SD (median)	Min-max	Age, mean±SD (median)	Min-max	Age, mean±SD (median)	Min-max	
77±5 (79)	64-82	74±6 (73)	62-81	75±6 (78)	62-82	0.25
Tumor diameter (mm±SD)						
47.2±27.3		52.1±27.1		49.4±26.5		0.71

TABLE VIII - Comparison of neoadjuvant and adjuvant therapy and partial gastrectomies. Prepandemic (2019, N=10), pandemic (2020, N=9)

Prepandemic 2019 (N=10)		Pandemic 2020 (N=9)		P value between groups
Neoadjuvant therapy (yes, %)	Neoadjuvant therapy (no, %)	Neoadjuvant therapy (yes, %)	Neoadjuvant therapy (no, %)	
1 (10.0)	9 (90.0)	2 (22.2)	7 (77.8)	0.47
Adjuvant therapy (yes, %)	Adjuvant therapy (no, %)	Adjuvant therapy (yes, %)	Adjuvant therapy (no, %)	0.85
4 (40.0)	6 (60.0)	4 (44.4)	5 (55.6)	

- 1) A rapid increase in hospital admission of surgical patients compared to the same period in 2019;
- 2) A progressive increase in surgical patients' admission distributed over a several months period of time;
- 3) A non-recovery of unoperated surgical patients' admission, compared to the same period in 2019.

The data analyzed shows a reduction in operating volumes in the first quarter of 2020 (first pandemic wave), as a consequence of government restrictions (Fig. 1), which was not followed by an increase in cases in the following months, until the interruption of the observation period in April 2021 (Fig. 1-2).

With the reopening of the main activities in Italy, starting from May 2020, separate diagnostic-therapeutic paths for positive Covid-19 patients and negative Covid-19 patients were instituted.

Comparing the first quarters of the three consecutive years (i.e., 2019, 2020 and 2021), there was an overall recovery in terms of volumes of surgical interventions during the second pandemic wave (2021) as compared to the pre-pandemic period (2019) (Fig. 2).

Regarding emergency surgery, we focused on emergency appendectomy and cholecystectomy. Data shows that patients operated on during the pandemic (March - May 2020) were younger as compared to the pre-pandemic period (March-May 2019) (Table I-III).

In pandemic versus pre-pandemic period, both urgent cholecystectomies (51 vs. 39, p) and appendectomies (42.24,p) decreased, but there were no significant changes in the age of colon and stomach cancer patients (Table VII,VIII). We did not detect a greater number of histological exams with a "gangrenous" pattern.

We identified, however, an association between gangrenous pattern of the gallbladder and older age and

male sex (Table V). This data has not been identified in the appendices. The decline in emergency operated patients for appendectomy and cholecystectomy is in accordance with other district hospitals in the Province of Ferrara.

The number of cases of stomach cancer who had surgery remained constant in between periods. *Interestingly*, the number of patients who underwent preoperative chemotherapy in the pre-pandemic period compares well with the pre-pandemic period.

The curative treatment of colon cancer did not show a delay in the diagnostic-therapeutic path during pandemic when compared with pre-pandemic period (Table IX). In particular, there were no statistically significant differences in time intervals between endoscopic diagnosis, preoperative contrast enhanced CT, surgery, and definitive histological report.

In pre-pandemic period, 62 patients had surgery, compared to 44 cases in pandemic. Four patients in pandemic underwent neoadjuvant chemotherapy, while in pre-pandemic we did not register any cases.

Of note, looking at the stages of colonic tumours of patients undergoing surgery, there was a clear reduction in stage I and IIA in the pandemic versus pre-pandemic period (Fig. 4).

The presence of a pre-established multidisciplinary team and a perioperative pathway for colorectal cancer patients may have helped to preserve the diagnostic and treatment steps during the Pandemic.

A possible explanation for the drop in surgical admissions in the pandemic period may rely on the advanced age of Covid-19 patients, who is the population with highest incidence of colon cancer and cholelithiasis. The increase in mortality and morbidity in the elderly dur-

TABLE IX - Diagnostic and therapeutic pathway for colon cancer. Pre-pandemic period (2019, N=65) versus pandemic (2020, N=46). Total of cases (N=111). Ages (mean±SD; median), time interval between: CT and intervention (mean±SD; median), histology and intervention (mean±SD; median), colonoscopy and CT (mean±SD; median), colonoscopy and intervention (mean±SD; median).

Prepandemic 2019 (N=65)		Pandemic 2020 (N=46)		Total of patients (N=111)		Pvalue between groups
Age	Min-Max	Age	Min-Max	Age	Min-Max	
76±12 (80)	41-102	73±10 (73)	46-95	75±11 (76)	41-102	0.27
Days from CT scans to surgery	Min-Max	Days from CT scans to surgery	Min-Max	Days from CT scans to surgery	Min-Max	0.85
26±25 (22)	1-164	25±17 (22)	1-82	26±22 (22)	1-164	
Days from histologic analysis to surgery	Min-Max	Days from histologic analysis to surgery	Min-Max	Days from histologic analysis to surgery	Min-Max	0.23
36±25 (33)	4-121	30±18 (27)	1-84	33±23 (30)	1-121	
Days from colonoscopy to CT scans	Min-Max	Days from colonoscopy to CT scans	Min-Max	Days from colonoscopy to CT scans	Min-Max	0.43
14±19 (7)	1-96	12±9 (10)	1-49	13±16 (8)	1-96	
Days from colonoscopy to surgery	Min-Max	Days from colonoscopy to surgery	Min-Max	Days from colonoscopy to surgery	Min-Max	0.43
42±29 (36)	1-160	37±19 (36)	2-88	40±26 (36)	1-160	

ing the Pandemic, could explain the decline in surgical admission as well as the reduction in the age of patients who underwent emergency surgery during the Pandemic. Another possible explanation could be the population's fear of hospital contagion and this was particularly true for the elderly population: this would be the basis for the decline in terms of overall hospitalization for acute events (such as acute appendicitis) and would explain the younger age of the patients, since younger people with a minor burden of comorbidities normally tend to have less fear of SARS-CoV-2 contagion and consequences.

Considering that the decrease of surgical activity in the first quarter of 2020 was not regained subsequently (and this was true also for urgent appendectomies and cholecystectomies), and that the "unintentional" non-operational management has not led to a general worsening in terms of clinical conditions, our data would theoretically suggest that the "simple" medical approach or the non-operational management of some acute illnesses could be sufficient.

Such conclusions would obviously deserve to be confirmed by larger and prospective studies as the limitations of our findings are related to the small size of the sample considered and to the retrospective nature of the study with all that this entails.

## Conclusion

The decrease in surgical interventions in the Pandemic due to the reduction in services imposed by the health reorganization to face the Covid-19 spread was not recuperated in the following months, although the subsequent reopening with Covid-free pathways. Our data suggest that, despite major non operative-management for acute diseases such as appendicitis and cholecystitis, no increase in terms of "gangrenous" pattern was detected. pre-pandemic.

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## Riassunto

La diffusione del COVID-19 sta avendo un impatto mondiale sui trattamenti chirurgici ed attualmente mancano dati pubblicati sulle attività di chirurgia degli ospedali rurali.

Il nostro obiettivo è stato indagare l'impatto della pandemia nel contesto di un ospedale rurale, in una zona a bassa densità di popolazione, nel nord Italia.

Abbiamo analizzato il volume e il tipo di interventi chirurgici eseguiti nei 12 mesi di pandemia (dal marzo 2020 al febbraio 2021) rispetto al periodo pre-pandemico di medesima durata (dal marzo 2019 al febbraio 2020). Inoltre, abbiamo analizzato i dati della prima e seconda ondata pandemica (intesi come trimestri) rispetto al medesimo periodo pre-pandemico nel 2019.

Infine, abbiamo confrontato il numero degli interventi di appendicectomia e colecistectomia durante la pandemia rispetto al periodo pre-pandemico ed il volume e i tempi di attesa degli interventi elettivi per cancro di resezioni gastriche e di colon durante la pandemia rispetto al periodo pre-pandemico.

Nel periodo pre-pandemico, rispetto a quello pandemico, sono state eseguite complessivamente 42 appendicectomie contro 24 e 174 colecistectomie contro 126. I pazienti operati nel periodo pre-pandemico erano complessivamente più anziani (58 anni rispetto a 52 anni,  $p=0,006$ ) e tale dato si manteneva costante anche quando erano distinti i tipi di intervento: colecistectomia (73 contro 66 anni,  $p=0,01$ ) e appendicectomia (43 contro 30 anni,  $p=0,04$ ).

L'analisi di regressione logistica relativa alla colecistectomia e all'appendicectomia eseguita in emergenza ha mostrato che il sesso maschile e l'età erano entrambi correlati all'istologia di tipo gangrenoso, sia in periodo pre-pandemico che in quello pandemico. Infine, abbiamo riscontrato una riduzione degli stadi I e IIA per cancro del colon in periodo pandemico rispetto al periodo pre-pandemico, senza che vi fosse a tutt'oggi un aumento degli stadi più avanzati.

**CONCLUSIONI:** la riduzione dei servizi imposta dai governi nei primi mesi del lock down totale non ha giustificato complessivamente la diminuzione degli interventi chirurgici eseguiti nell'anno della pandemia. I dati suggeriscono che una maggiore "gestione non operatoria" per i casi di appendicite e colecistite acuta non comporti un aumento successivo dei casi operati, né un aumento del pattern istologico "gangrenoso", che sembra invece dipendere dall'età avanzata e dalla popolazione maschile.

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