



# Ostomy closure rate during COVID-19 pandemic: an Italian multicentre observational study

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Received: 21 January 2022 / Accepted: 4 March 2022 / Published online: 24 March 2022  
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## Abstract

During the corona virus disease 2019 (COVID-19) pandemic, most of the surgical procedures were performed for emergencies or oncologic reasons to the detriment of the remaining elective procedures for benign conditions. Ileostomy or colostomy creation are sequelae of oncologic or emergency colorectal surgery, but their closure does not fall within the definition of oncologic or emergency surgery. The aim of this retrospective multicentre observational study is to report the impact of COVID-19 pandemic on the ostomy closure rate in Italy. Data regarding ileostomy and colostomy creation and closure from 24 Italian centres, during the study period (March 2020–February 2021) and during the control period (March 2019–February 2020) were collected. Three hospitals (12.5%) were COVID free. The number of colostomies and ileostomies created and closed in the same period was lower (-18.8% and -30%, respectively) in the study period in comparison to the control period ( $p=0.1915$  and  $p=0.0001$ , respectively), such as the ostomies closed in the analysed periods but created before (colostomy -36.2% and ileostomy -7.4%,  $p=0.2211$  and  $p=0.1319$ , respectively). Overall, a 19.5% reduction in ostomies closed occurred in the study period. Based on the present study, a reduction in ostomy closure rate occurred in Italy between March 2020 and February 2021. During the pandemic, the need to change the clinical practice probably prolonged deterioration of quality of life in patients with ostomies, increasing number of stomas that will never be closed, and related management costs, even if these issues have not been investigated in this study.

**Keywords** Ileostomy · Colostomy · Ostomy · Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) · Corona virus disease 2019 (COVID-19) · Quality of life (QoL) · Cost

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Andrea Balla and Federica Saraceno share first authorship.

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Delayed Ostomy Closure Collaborative Group presented in acknowledgements section.

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## Introduction

The COroNa VIRus Disease 2019 (COVID-19) pandemic, caused by the “Severe Acute Respiratory Syndrome CoronaVirus 2” (SARS-CoV-2), has dramatically modified the usual clinical practice [1–4]. Healthcare systems worldwide must face the pandemic and, at the same time, offering primary care [1–4]. Hence, to optimize the limited hospital resources, and to reduce the risk of contagion, unnecessary medical services have been postponed or suspended [5–7].

General surgery was one of the specialties affected the most by this situation [1–3]. Scientific surgical guidelines reported a general agreement to perform mainly emergency and oncologic surgery to the detriment of elective surgery for benign disease [8–12]. Ileostomy or colostomy are sequelae of oncologic or emergency colorectal surgery, but their closure does not fall within the definition of either oncologic or emergency surgery. The pandemic may have caused a delay in ostomy closure or a reduction in ostomy closure rate especially in case of patients candidates to adjuvant chemotherapy.

As reported in literature, temporary ileostomy or colostomy may be cause of morbidity and hospital readmission [13–15]. The most frequent complications after ostomy creation are fluid and electrolyte imbalances and dehydration that reduce patients’ quality of life (QoL) and increased healthcare costs [13–18].

The aim of the present retrospective multicentre study is to report on the impact of COVID-19 pandemic on ostomy closure rate in Italy.

## Methods

This is a retrospective observational multicentre study conducted according to the ethical guidelines for good research and practice by World Health Organization [19] and according to the checklist Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) [20].

Thirty-one surgeons from different Italian hospitals were identified and invited by email to participate in the present study. Surgeons received the first invitation on July 16th, 2021, and reminders on September 1st, 2021, October 28th, 2021, and November 9th, 2021. The deadline was December 1st, 2021.

Each surgeon submitted data regarding ileostomy and colostomy creation and closure from their centres, during the period from March 2019 to February 2021. The study period of one year (March 2020 to February 2021) was

chosen because the Italian Government approved the first restrictive measures for the pandemic (lock-down) for the whole country in March 2020 [21]. Data retrieved from the study period were recorded and compared to data obtained from the previous year (from March 2019 to February 2020—control period).

## Study design

Hospital setting during study period (COVID free or not), indication for surgery (elective or emergency surgery), number of ileostomies and colostomies performed, number of ileostomies or colostomies closure and number of patients on the waiting list for both ileostomy and colostomy closure at the time of data collection were collected in a Microsoft Excel program (Microsoft Corporation, Redmond, Washington, USA) (Fig. 1).

## Statistical analysis

Categorical variables are expressed such as frequencies and percentages. The Fisher’s exact test were used for the comparison between groups. A *p* value lower than 0.05 was considered statistically significant. Statistical analysis was carried out with SPSS software 22.0 (SPSS Inc., Chicago, Illinois, USA).

## Results

Twenty-four surgeons answered (response rate: 77.4%), and data retrieved from 24 Italian centres were analysed.

Figure 2 shows distribution of contributing centres per Italian regions. Five centres were in Campania (20.8%), four in Lazio, Lombardia and Emilia-Romagna (16.7%), respectively, three in Marche (12.5%), two in Veneto (8.3%), and one in Puglia and Sardegna (4.2%). Three hospitals (12.5%) were COVID free during the study period.

Table 1 reports data regarding colostomies and ileostomies creation and closure from all included centres. Analysing data about ostomies creation, important differences

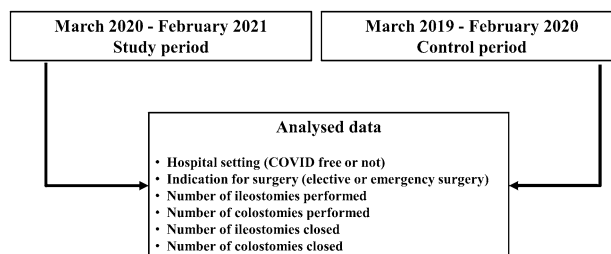
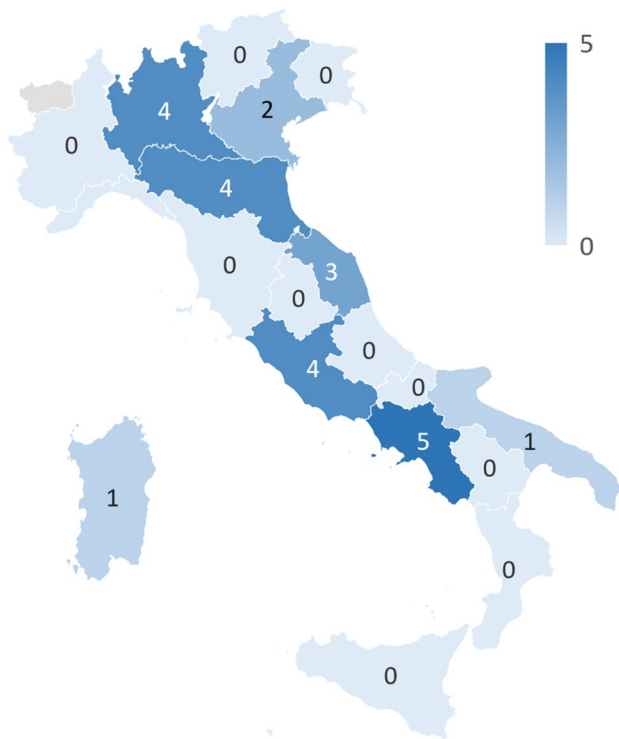


Fig. 1 Patient inclusion criteria. COVID: COroNa VIRus Disease



**Fig. 2** Distribution of contributing centres per Italian regions

were not observed concerning the emergency procedures between the study and control period, being the difference rate between colostomies and ileostomies of + 5.1% and + 1.5%, respectively. Conversely, during the elective procedures in comparison to the emergency procedures an important reduction of colostomies (-17.5%) and ileostomies (-17.2%) creation occurred in the study period.

About the number of ostomies created and closed in the same period, the number of both colostomies and ileostomies closed was lower (-18.8% and -30%, respectively) during the study period compared to the control period ( $p=0.1915$  and  $p=0.0001$ , respectively), such as the ostomies closed in the analysed periods but created before (colostomy -36.2% and ileostomy -7.4%,  $p=0.2211$  and  $p=0.1319$ , respectively). Overall, a 19.5% reduction in ostomies closed was observed in the study period.

Similar results were obtained analysing data retrieved from the 21 COVID centres alone, excluding the COVID-free centres (Table 2). In fact, a slight increase in colostomies and ileostomies creation (+6.8% and +6.7%, respectively) during the emergency procedures occurred, with a reduction in ostomies closure in all the other settings evaluated during the study period. Overall, a reduction in ostomies closed of 28% was observed in the study period.

Contrariwise, data reported from the three COVID free centres shown an increase in the ileostomies creation during elective procedures in the study period (+6.6%) and a

reduction of ostomies creation in the other cases (Table 3). Despite the number of colostomies and ileostomies performed and closed in the same period was lower (-30.6% and -9.8%, respectively) in the study period in comparison to the control period ( $p=0.3349$  and  $p=0.6216$ , respectively), the number of ostomies closed in the analysed periods but created before (colostomy +50% and ileostomy +187.5%,  $p=0.5478$  and  $p=0.0002$ , respectively) and the overall ostomies closed increased in the study period (+28.8%).

Statistically significant differences between the study and the control period are reported in Table 4. Analysing data retrieved from all included hospitals, the total number of ostomies performed and closed in the same period were statistically significant lower during the study period in comparison to the control period ( $p=0.0319$ ). Considering only the 21 COVID centres, the number of colostomies closed in the analysed periods but created before was the only statistically significant reduction observed in the study period ( $p=0.0336$ ). Finally, analysing only the data retrieved from the COVID free centres, a statistically significant increase regarding the total number of ostomies closed but performed before the analysed period ( $p=0.0001$ ) were observed in the study period in comparison to the control period.

## Discussion

The present study was conducted with the aim to assess the impact of COVID-19 pandemic on ostomy closure rate in Italy. Overall, the initial hypothesis of a numerical reduction of ostomy reversal procedures during the pandemic, compared to the previous year, is confirmed.

Analysing only data retrieved from 21 COVID centres, a slight increase of ostomies creation occurred during the emergency procedures even if the overall number of ostomies created was lower in the study period in comparison to the control period. Moreover, a reduction in colostomies and ileostomies closure was observed both regarding the ostomies created in the study period and in the ostomies created before the study period in comparison to the control period.

In the three COVID-free centres, it is interesting that the overall number of ostomies created was slightly reduced, as the COVID centres, but an important increase of ostomies closed but performed the year preceding the study period occurred during pandemic. About the ostomy created and closed in the same study period, a reduction was observed as well as in the COVID hospitals.

As known the ostomy creation is responsible for several postoperative morbidities such as high output syndrome, renal impairment, intestinal atrophy, bowel obstruction, enterocutaneous fistula, leakage from the stoma appliance, skin irritation or retraction, parastomal hernia or prolapse, and hospital readmission [22–27]. A possible reason behind

**Table 1** Results considering data from all included centres

	March 2020–February 2021 (Study period)	March 2019–February 2020 (Control period)	Difference, <i>n</i> (%)
<b>Overall ostomies performed in the analysed periods, <i>n</i></b>			
Colostomies performed during emergency procedures	332	316	+ 16 (5.1)
Colostomies performed during elective procedures	283	343	– 60 (17.5)
Total of colostomies performed	615	659	– 44 (6.7)
Ileostomies performed during emergency procedures	197	194	+ 3 (1.5)
Ileostomies performed during elective procedures	576	696	– 120 (17.2)
Total of ileostomies performed	773	890	– 117 (13.1)
Total	1388	1549	– 161 (10.4)
<b>Ostomies performed and closed in the same period, <i>n</i></b>			
Colostomies closed (excluding colostomies performed before the control period)	–	128	– 24 (18.8)
Colostomies closed (excluding colostomies performed before the study period)	104	–	
Ileostomies closed (excluding ileostomies performed before the control period)	–	303	– 70 (30)
Ileostomies closed (excluding ileostomies performed before the study period)	233	–	
Total	337	431	– 94 (21.8)
<b>Ostomies closed in the analysed periods but created before, <i>n</i></b>			
Colostomies closed, performed before March 2019	–	141	– 51 (36.2)
Colostomies closed, performed before March 2020	90	–	
Ileostomies closed, performed before March 2019	–	272	– 20 (7.4)
Ileostomies closed, performed before March 2020	252	–	
Total	342	413	– 71 (17.2)
<b>Overall ostomies closed in the analysed periods, <i>n</i></b>			
Colostomies	194	269	– 78 (27.9)
Ileostomies	485	575	– 90 (15.7)
Total	679	844	– 165 (19.5)
<b>Patients on the waiting list for ostomy closure at the time of entering the requested data, <i>n</i></b>			
Colostomies	247		
Ileostomies	329		

the decision to reduce the number of ostomies created may be related to the need of reducing patient outpatient care or hospital readmissions, with the aim to reduce the hospital inflow. Other reasons may be the presumed risk of aerosolization, and viral transmission due to ostomy manipulation [28, 29], and the forecast of the expected delay in stoma closure, which prevented surgeons from creating an ostomy, when possible, to avoid the risk of a permanent ostomy and consequent poor patient's QoL [30–33]. In fact, the most frequent risk factors for ostomy reversal failure are oncologic disease progression and poor patient's performance status

that are time-dependent conditions [30, 31]. On the other hand, even if the real impact of ostomy on the reduction of anastomotic leakage rate is still debated in literature [22, 34–38], it is also known as ostomy reduces the symptomatic dehiscence rate, and, consequently, the postoperative morbidity and mortality rate [34, 35, 39–41].

As mentioned above, the number of ostomies closed during the study period was lower in comparison to the control period in the COVID hospitals, and this management in some cases may determine an increased risk of ostomies that will never be closed, due to the delay caused by the

**Table 2** Results considering data only from twenty-one COVID centres

	March 2020–February 2021 (Study period)	March 2019–February 2020 (Control period)	Difference, <i>n</i> (%)
Overall ostomies performed in the analysed periods, <i>n</i>			
Colostomies performed during emergency procedures	312	292	+ 20 (6.8)
Colostomies performed during elective procedures	228	279	– 51 (18.3)
Total of colostomies performed	540	571	– 31 (5.4)
Ileostomies performed during emergency procedures	176	165	+ 11 (6.7)
Ileostomies performed during elective procedures	447	575	– 128 (22.3)
Total of ileostomies performed	623	740	– 117 (15.8)
Total	1163	1311	– 148 (11.3)
Ostomies performed and closed in the same period, <i>n</i>			
Colostomies closed (excluding colostomies performed before the control period)	–	92	– 13 (14.1)
Colostomies closed (excluding colostomies performed before the study period)	79	–	
Ileostomies closed (excluding ileostomies performed before the control period)	–	252	– 65 (25.8)
Ileostomies closed (excluding ileostomies performed before the study period)	187	–	
Total	266	344	– 78 (22.7)
Ostomies closed in the analysed periods but created before, <i>n</i>			
Colostomies closed, performed before March 2019	–	127	– 58 (45.7)
Colostomies closed, performed before March 2020	69	–	
Ileostomies closed, performed before March 2019	–	248	– 65 (26.2)
Ileostomies closed, performed before March 2020	183	–	
Total	252	375	– 123 (32.8)
Overall ostomies closed in the analysed periods, <i>n</i>			
Colostomies	148	219	– 71 (32.4)
Ileostomies	370	500	– 130 (26)
Total	518	719	– 201 (28)
Patients on the waiting list for ostomy closure at the time of entering the requested data, <i>n</i>			
Colostomies	229		
Ileostomies	270		

pandemic. The optimal timing of ostomy closure is not yet clearly defined in literature; however, it seems that the early closure does not increase the postoperative complication rate [22, 42–49]. Probably, the prolonged presence of ostomy is responsible for a worsening of patient's QoL and for an increased related costs and possible complications [18, 33]. Moreover, the delay in ostomy closure facilitates the worsening of the patient's clinical conditions which could lead for ostomy reversal failure [30, 31].

Finally, the present study reports an increased number of closed ostomies in COVID-free hospitals during the study

period. In our opinion, this could be related to the fact the hospital resources have been redistributed during the pandemic, with the aim to enhance services that have been suppressed in other COVID hospitals. Anyway, a decrease in number of ostomies closure was observed concerning the ostomies performed and closed in the same study period, showing a delay in ostomies closure.

The present study assumes that surgical oncologic and emergency procedures were not suppressed during the

**Table 3** Results considering data only from three COVID free centres

	March 2020–February 2021 (Study period)	March 2019–February 2020 (Control period)	Difference, <i>n</i> (%)
Overall ostomies performed in the analysed periods, <i>n</i>			
Colostomies performed during emergency procedures	20	24	– 4 (16.7)
Colostomies performed during elective procedures	55	64	– 9 (14.1)
Total of colostomies performed	75	88	– 13 (14.8)
Ileostomies performed during emergency procedures	21	29	– 8 (27.6)
Ileostomies performed during elective procedures	129	121	+ 8 (6.6)
Total of ileostomies performed	150	150	0
Total	225	238	– 13 (5.5)
Ostomies performed and closed in the same period, <i>n</i>			
Colostomies closed (excluding colostomies performed before the control period)	–	36	– 11 (30.6)
Colostomies closed (excluding colostomies performed before the study period)	25	–	–
Ileostomies closed (excluding ileostomies performed before the control period)	–	51	– 5 (9.8)
Ileostomies closed (excluding ileostomies performed before the study period)	46	–	–
Total	71	87	– 16 (18.4)
Ostomies closed in the analysed periods but created before, <i>n</i>			
Colostomies closed, performed before March 2019	–	14	+ 7 (50)
Colostomies closed, performed before March 2020	21	–	–
Ileostomies closed, performed before March 2019	–	24	+ 45 (187.5)
Ileostomies closed, performed before March 2020	69	–	–
Total	90	38	+ 52 (136.8)
Overall ostomies closed in the analysed periods, <i>n</i>			
Colostomies	46	50	– 4 (8)
Ileostomies	115	75	+ 40 (53.3)
Total	161	125	+ 36 (28.8)
Patients on the waiting list for ostomy closure at the time of entering the requested data, <i>n</i>			
Colostomies	18		
Ileostomies	59		

study period, so the number of ostomies performed is probably comparable between the analysed periods. However, the lack of the exact number of oncologic and emergency procedures performed during the two study periods may be a limitation of the present study. Other limitations are the response rate of less than 85%, the retrospective nature of the study, the small sample of patients and centres, particularly in case of COVID-free hospitals and the non-homogeneous distribution of the enrolled centres in Italy.

## Conclusions

Based on the present study, a reduction in ostomy closure rate occurred in Italy between March 2020 and February 2021. During the pandemic, the need to change the clinical practice probably prolonged deterioration of QoL in patients with ostomies, increasing number of stomas that will never be closed, and related management costs. Dedicated regional recovery programs for these patients may be a solution to this problem. Further studies, with larger sample of patients and involving other countries are required to better investigate this problem.

**Table 4** Statistically analysis between study and control period

	March 2020–February 2021 (Study period)	March 2019–February 2020 (Control period)	<i>p</i> value
Comparison considering data from all included centres			
Colostomies performed and closed in the same period, <i>n</i> (%)	104 (16.9)	128 (14.4)	0.1915
Ileotomies performed and closed in the same period, <i>n</i> (%)	233 (30.1)	303 (46)	0.0001*
Total, <i>n</i> (%)	337 (24.3)	431 (27.8)	0.0319*
Colostomies closed in the analysed period but created before, <i>n</i> (%)	90 (46.4)	141 (52.4)	0.2211
Ileostomies closed in the analysed period but created before, <i>n</i> (%)	252 (52)	272 (47.3)	0.1319
Total, <i>n</i> (%)	342 (50.4)	413 (48.9)	0.6062
Comparison considering data only from twenty-one COVID centres			
Colostomies performed and closed in the same period, <i>n</i> (%)	79 (14.6)	92 (16.1)	0.5068
Ileotomies performed and closed in the same period, <i>n</i> (%)	187 (30)	252 (34)	0.1164
Total, <i>n</i> (%)	266 (22.9)	344 (26.2)	0.0554
Colostomies closed in the analysed period but created before, <i>n</i> (%)	69 (46.6)	127 (58)	0.0336*
Ileostomies closed in the analysed period but created before, <i>n</i> (%)	183 (49.5)	248 (49.6)	1.0000
Total, <i>n</i> (%)	252 (48.6)	375 (52.5)	0.2267
Comparison considering data only from three COVID free centres			
Colostomies performed and closed in the same period, <i>n</i> (%)	25 (33.3)	36 (40.9)	0.3349
Ileotomies performed and closed in the same period, <i>n</i> (%)	46 (30.7)	51 (34)	0.6216
Total, <i>n</i> (%)	71 (31.6)	87 (36.6)	0.2812
Colostomies closed in the analysed period but created before, <i>n</i> (%)	21 (45.7)	14 (28)	0.5478
Ileostomies closed in the analysed period but created before, <i>n</i> (%)	69 (60)	24 (32)	0.0002*
Total, <i>n</i> (%)	90 (55.9)	38 (30.4)	0.0001*

\*Statistically significant differences

**Acknowledgements** Delayed Ostomy Closure Collaborative Group: Laura Agostinelli, Ferdinando Agresta, Gabriele Anania, Laura Antolino, Pietro Anoldo, Emanuele Botteri, Umberto Bracale, Fabio Carbone, Massimo Carlini, Francesco Maria Carrano, Giorgia Casadei, Diego Coletta, Francesco Crafa, Nicola de'Angelis, Paolo Delrio, Giovanni Domenico De Palma, Marcello Di Martino, Ugo Elmore, Lorenzo Gozzini, Michele Grieco, Giovanni Battista Levi Sandri, Edelweiss Licitra, Andrea Lucchi, Marco Massani, Riccardo Memeo, Marco Milone, Dario Oppici, Monica Orteni, Alberto Patrini, Francesca Pecchini, Roberto Peltrini, Micaela Piccoli, Adolfo Pisanu, Mauro Podda, Gilberto Poggioli, Maria Chiara Ranucci, Daniela Rega, Riccardo Rosati, Francesco Roscio, Matteo Rottoli, Roberto Santoro, Alberto Sartori, Antonino Spinelli, Serafino Vanella, Giovanni Vennarecci, Nereo Vettoreto.

**Author contributions** AB: study conception and design, acquisition of data, analysis and interpretation of data, drafting of manuscript, critical revision of manuscript and final approval. FS: study conception and design, acquisition of data, analysis and interpretation of data, drafting of manuscript, critical revision of manuscript and final approval. SDS: study conception and design, acquisition of data, analysis and interpretation of data, drafting of manuscript, critical revision of manuscript and final approval. NDL: study conception and design, acquisition of data, analysis and interpretation of data, drafting of manuscript, critical revision of manuscript and final approval. PL: study conception and design, acquisition of data, analysis and interpretation of data, drafting of manuscript, critical revision of manuscript and final approval. MG: study conception and design, acquisition of data, analysis and interpretation of data, drafting of manuscript, critical revision of manuscript and final approval. PS: study conception and design, acquisition of

data, analysis and interpretation of data, drafting of manuscript, critical revision of manuscript and final approval.

**Funding** The authors received no financial support for the research, authorship, and/or publication of this article.

**Availability of data and material** All raw data are available if required.

**Code availability (software application or custom code)** Not applicable.

## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards

**Research involving human participants and/or animals** All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

**Consent to participate** Informed consent from all participants was obtained.



**Consent for publication** All authors approved the publication of the manuscript in the journal.

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