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Telemedicine in surgery during COVID-19 pandemic. Are we doing enough? Systematic literature review.

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Telemedicine in surgery during COVID-19 pandemic: are we doing enough?

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ABSTRACT

INTRODUCTION: The aim of this systematic review was to report and to analyze if there is and what is the impact of telemedicine in the surgical practice during COVID-19 pandemic. Many authors have posited that the pandemic urged a high implementation of the telemedicine service even in surgical specialties, however, the impact of this change of the clinical practice has been variably reported and its utilization in general surgery is uncertain.

EVIDENCE ACQUISITION: All articles from any country written in English, Italian, Spanish, or French, about the use of telemedicine for indication to surgical treatment or for 30-day postoperative follow-up in general surgery during the COVID 19 outbreak, from the March 1, 2020, to December 1, 2020, were included.

EVIDENCE SYNTHESIS: Two hundred nine articles were fully analyzed, and 207 further articles were excluded. Finally, 2 articles, both published in October 2020, were included in the present systematic review.

CONCLUSIONS: In conclusion, the rapid spread of SARS-CoV-2 pandemic has forced to review the traditional methods to deliver surgical assistance and urged surgeons to find alternative methods to continue their practice. The literature about this topic is yet scarce and many questions regarding its efficacy in improving patients' health, cost-effectiveness and user satisfaction remain unsolved
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Key words: Telemedicine; General surgery; SARS-CoV-2; COVID-19; Pandemics.

Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for the COrona Virus Disease 2019 (COVID-19) pandemic, has brought great challenges to the management of patients.[1-5] Critical questions for every physician in this difficult time have been how should the best of care be offered to patients? Which is the safest choice between the inpatient or outpatient setting? Is any alternative to in-person visit even possible in medicine? Is it possible to offer the same standard of care?[4] In this scenario, the COVID-19 pandemic requires an urgent reassessment of the clinical practice and surgery is not an exception since many of the traditional methods of practicing surgery have been questioned or suspended.[6] This exceptional and rapidly developing situation has been regarded as the opportunity for the faster implementation of what was already slowly emerging such as the utility of telemedicine.[7] The potential for employing telehealth for emergencies and disasters has been previously described.[8] In order to reduce the risk of SARS-CoV-2 contagion, the access to hospital was restricted to guarantee both physicians' and patients' safety, and telemedicine has been proposed to reduce physical contact without suspending the healthcare provision.[9] Telemedicine can be described as a remote control of the patient using digital technologies to deliver medical care, health education and public health.[10] It has been advocated as a useful tool even in surgical specialties.[7] However, the introduction of telemedicine in surgery may be hard to realize in comparison to other specialties, due to the need of contact between surgeons and patients.[11] Anyway, a part of the intervention, telemedicine could be a useful tool to establish indication for surgery or other medical or conservative treatment, both in emergency and elective setting, such as during follow-up period after surgery.[11, 12] The aim of this systematic review was to report and to analyze what is the impact of telemedicine in the surgical practice during COVID-19 pandemic.

Evidence acquisition

Institutional review board approval and informed consent from participants are no need for this systematic review.

Inclusion and exclusion criteria

All articles from any country written in English, Italian, Spanish, or French, about the use of telemedicine for indication to surgical treatment or for 30-day postoperative follow-up in general surgery during the COVID 19 outbreak, from March 1, 2020, to December 1, 2020, were included. Articles from the same group or institution of an already included article, about medium or long-term follow-up, reviews, systematic reviews, meta-analysis, studies with data retrieved from registries, comments, case reports, correspondence and letters to authors or editors, editorials, conference articles and imaging studies were excluded.

Search strategy

A systematic review was conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement[13] and AMSTAR guidelines.[14] The search was carried out in the PubMed, Embase, Cochrane and Web of Science databases using the keywords reported in Table I. A total of 69,932 articles were found until November 2020. Of these, 34,092 were

eliminated because were duplicates between the searches. Of the remaining 4999 papers, 4790 were excluded after screening the title and abstract because did not meet the inclusion criteria.

Study design

The modified Newcastle-Ottawa Scale (NOS) for cohort studies was used to assess the quality of the included articles,[15] while the Risk of Bias In Non-randomized Studies – of Interventions (ROBIN-I) tool was used to assess the risk of bias of the included.[16] Each article was read independently by each author and then discussed among all authors.

Evidence acquisition

Two hundred nine articles were fully analyzed, and 207 further articles were excluded (Figure 1). Finally, 2 articles, both published in October 2020, were included in the present systematic review[17, 18] as shown in the Preferred PRISMA flow diagram (Figure 1). Table II, III[14, 15, 17, 18] show the assessment of articles quality based on the NOS and the of risk of bias of the included articles based on the ROBIN-I. Brown *et al.* in their retrospective study compared the use of telemedicine from February 19 to April 16,2020 and from March 19 to April 16, 2019, in the bariatric surgery practice. Authors identified the pretelemedicine period between February 19, to March 18, 2020, and the post-telehealth period between March 19 to April 16, 2020.[17] Telemedicine was employed for both preoperative and postoperative multidisciplinary evaluation.[17] Evaluating only the surgeon volume, a decrease in volume was observed between pre- and post-telehealth period for both new visits and follow-up visits.[17] In comparison to 2019, an important volume reduction was observed in the post-telehealth period.[17] Moreover, the surgeon volume for both new and follow-up visits was stark reduced in comparison to the other providers (bariatrician, psychologist, advanced practitioners, registered dietician).[17] Statistically significant difference in the absenteeism rate between pre- and post-telehealth period about the surgeon volume was not observed.[17] Campennì *et al.* in their prospective study assessed the impact of COVID-19 lockdown on hemorrhoidal disease symptoms and consequences on waiting time in their center, analyzing the role of telemedicine in the management of these patients.[18] Authors reported a high patients' satisfaction rate (80%) in relation to the use of telemedicine.[18] Telemedicine allowed to evaluate hemorrhoidal disease symptoms and to move patients with worsened symptoms in a priority waiting list for surgery.[18]

Discussion

The present systematic review was conducted with the aim to evaluate the impact of telemedicine in surgery during COVID-19 pandemic and if an improvement in telemedicine utilization was achieved during pandemic in comparison to previous years. Based on data obtained, the impact of telemedicine is very poor in current clinical surgical practice, and it was employed in elective surgery (bariatric and proctology). This finding may be controversial, considering that many authors declared that the COVID-19 pandemic urged an unprecedented need to deliver care remotely, and, consequently, a rapid expansion of telemedicine services across specialties.[11, 18-24] As a promising mode of delivering care, telemedicine has been advocated as a virtually perfect to continue to deliver healthcare and meet patients' ambulatory care needs in time when physical contacts, that traditionally distinguish every physician activity, must be avoided or utterly limited.[20] There were different levels of adoption of telemedicine in different medical subspecialties, but it was generally slow before the COVID-19 pandemic. However, the rapid virus spread, made its utilization sometimes mandatory in order to

avoid further disruption in the delivering of healthcare. In March 2020, at the very beginning of the pandemic spread, when unprepared surgeons worldwide sought urgent and shared guidance, the first published guidelines recommended to decrease outpatient clinic activity,[4] while according to the new clinic guidelines, patients should have been triaged, with as many as possible offered telephone consultations, and to postpone routine referrals that require in-person examination.[4] Other recommendation followed by EAES and SAGES always recommending cancelling or postpone all non-urgent in-person clinic/office visits and to remotely handle all patients visits when possible.[5] In our opinion, the results of a recently published survey reporting on a large-scale public attitude toward obtaining an initial surgical consultation via telemedicine must be considered.[11] According to the author experience 60% of all the reported virtual encounters evaluated in the survey occurred during the pandemic, required because of the necessary social distancing.[4] Furthermore, a vast majority (86%) of respondents reported being satisfied (either extremely or somewhat) with their telemedicine encounter.[4] However, interestingly, preference for in-person *versus* virtual surgical consultation reflected access to care, with preference for telemedicine decreasing from 72% to 33% when COVID-related social distancing ends.[4] Telemedicine was viewed more favorably for postoperative visits than for surgical consultations, with a further decline in preferences for virtual visits with increasing complexity of surgical intervention, even during the pandemic.[4] We can consequently infer that although many have posited that telemedicine will have an enduring presence even as in-person visits are reinstated; surgical consultations require special consideration. The telemedicine model is not new[25-27] and, if originally born as a tool to service remote or underserved areas, its potential employing to deliver medical healthcare during emergency and disasters has been previously described.[28] As it was becoming more popular among many medical specialties, there have been efforts to adapt it to general surgery,[29, 30] few studies have been conducted before the pandemic outbreak, analyzing the application of telemedicine in general surgery.[29, 30] There are randomized clinical trials (RCTs) in surgical specialties,[31] mainly orthopedic surgery, which have demonstrated the feasibility of implementing telemedicine services with promising outcomes if applied in the follow-up period.[32-34]A prospective RCT was conducted to compare conventional *versus* telemedicine follow-up in the outpatient clinics.[12] The primary outcome was the feasibility of telemedicine follow-up, and the secondary outcomes were its clinical impact and patient satisfaction.[12] The authors proved the usefulness of telemedicine as a complementary tool to facilitate postoperative management in selected general surgery patients, with good satisfaction rates and maintains clinical outcomes.[12] In our opinion, however, the study has two main drawbacks: the heterogeneity of interventions included and therefore the related uncertainty of the application of the results to more complex surgeries. Furthermore, the authors themselves declared some issue in the enrolment process that could have biased the results.[12] Another retrospective study has been recently published to evaluate the impact of the implementation of virtual postoperative visits for laparoscopic cholecystectomy patients, proved that e-health service improved efficiency by increasing new patient encounters, decreasing postoperative volume, and trending towards increased operations scheduled, without compromising patients' safety.[12] There are some subspecialties that more than others could be prone and take advantage from the introduction of telemedicine.[17, 18] In bariatric surgery, the COVID-19 pandemic seems to have speed up what was already slowly happening.[17] Currently, during the first outbreak there was unanimous consent on the suspension of most bariatric and metabolic operations for several reasons including infection risks among patients and staff, factors inherent to the operations, and increased hazards of severe COVID-19 complications among patients with obesity or type 2 diabetes.[35] However, telemedicine was recommended in the management of patients already

underwent surgery, supervised by specialist bariatric and metabolic surgeons.[35] Brown *et al.* concluded that although new patient visit volume decreased across the board, follow-up visits increased for certain nonsurgical providers, providing a template for adoption of a postpandemic multidisciplinary telehealth.[17] Even in proctology, during the COVID-19 crisis, a shift towards telemedicine was documented[36] and Campennì *et al.* showed the feasibility of the telemedicine model in the management of patients with hemorrhoidal disease.[18] However, skepticism about telemedicine may still exist, and many surgeons could look warily to the adoption and if telemedicine could constitute the new normality after pandemic.[8] Following these observations two questions arise: why although telemedicine was often recommended as a valid tool against pandemic only two studies at the present time could be found in the literature about general surgery? And is telemedicine here to stay? The answer we try to give to the first question is that as any new technology, telemedicine will have to face several challenges before becoming widely accepting. First, it must demonstrate the possibility to improve or at least maintain the quality of the service already existent without affecting patients' safety and, at the actual state of the art, it is not possible to confirm that. Secondly, guidelines are needed to make the new technology as universally usable as possible, it has of course to prove a cost-benefit balance and then it must win the natural skepticism of the most radical surgeons. In case of telemedicine, other factors must be considered mainly connected to communication barriers both on a technology and age basis. Barriers to telemedicine technology include the cost of the hardware and software; regulatory requirements from local, state, and national institutions; billing and coding uncertainties; licensing requirements for the health care providers and institution; and the need to safeguard patient confidentiality. Additionally, the medicolegal implications of long-distance health care are not always evident and may not be covered by the liability insurance of the physician and hospital.[37] Specifically referring to the COVID 19 situation, the low rate of adoption of telemedicine could be also caused by the reduction or suspension of elective surgery activities and the documented high rate of redeployment of surgical staff in newly arranged wards to assist COVID 19 patients needing hospitalization. In a rapidly aging world, it is not unsurprising that many of the patients that will need to have access to these technologies will be elderly and not capable to use it. However, even this possible obstacle is largely overcome. Some works have demonstrated the use and validity even in the elderly population for primary and urgent care.[38, 39] Abelson *et al*. have shown that this technology is applicable with equal results in the elderly and young people on a large population.[40] Given these considerations it is not a case, that many surgeons may still look at it warningly. The last, yet not secondary point is patients' perception and satisfaction of the model. Both Brown *et al*. and Campennì *et al*. reported good results in terms of patients' satisfaction,[17, 18] however, in a recent article, the authors reported disappointing results before pandemic deriving from home monitoring.[38] In fact, not all patients were able to use the application and poor compliance was observed.[38] This suggested the need of further refinement of the home monitoring tool to increase the compliance and its utility.[38] The former cited survey respondents placed great importance in meeting their surgeon in person before the day of surgery.[11] This suggests that if the initial consultation were done virtually, an unperson visit may need to be scheduled before surgery or, at the very least, extra time may need to be built in for discussions on the day of surgery. As such, practical considerations around reimbursement for services (related to multiple and duplicative visits) and health care utilization (efficiency and workflow around surgical schedules) will need to be resolved if telemedicine visits will continue to be used in high volumes. Moreover, concern for the depersonalization of care with telemedicine has been described both before and during the COVID-19 pandemic, and the ability to establish a virtually relation is understudied across settings.[17] In the United States, the Connect Care

Pilot Program has been activated with a total investment of 100 million to promote telemedicine services.[41] During the pandemic there was sometimes a massive organization to implement this kind of technology mainly due to local initiatives that however seemed unlikely to be on a federal level. There have been modifications of the payment policy during the pandemic to readapt to the new situation. Reimbursement is achieving parity to in-person visits due to the recent pandemic with specialized considerations for licensure due to a rapid response from the Centers for Medicare and Medicaid Services.[20] Regardless of the type of national healthcare system, it is clear that the state's commitment is fundamental in quantifying and guaranteeing the payment of telemedicine service.

Limitations of the study

The main limitation of the present systematic review is the small number of articles included. In conclusion, the rapid spread of SARS-CoV-2 pandemic has forced to review the traditional methods to deliver surgical assistance and urged surgeons to find alternative methods to continue their practice. The literature about this topic is yet scarce and many questions regarding its efficacy in improving patients' health, cost-effectiveness and user satisfaction remain unsolved.

Conclusions

In conclusion, telemedicine should be largely adopted, starting from the experience of pandemic, and improved over time, in order to offer better quality of care in the future. However, the models that emerged during the pandemic could be used as a start point to develop a new model of e-health and specifically in surgery on more solid basis in the future. Further studies are required to define better e-health solution, and guidelines are necessary for the clinical practice.

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Table I.—Keywords used for research in the PubMed, Embase, Cochrane and Web of Science databases.

Keywords
Telemedicine AND COVID-19
Telemedicine AND SARS-CoV-2
Telemedicine AND surgery
Telemedicine AND follow-up
Telemedicine AND surgical
Telemedicine AND monitoring

Table II.—Assessment of the articles quality based on Newcastle-Ottawa Scale (NOS).[14]

Author, year, type of study	Selection	Comparability	Outcomes	Total Score	Assessment
	1 2 3 4	5	6 7 8		
Brown *et al.*[17]	* * * *	- *	* * *	8	Good
Campennì *et al.*[18]	* - * *	- -	* * *	6	Poor

Table III.—Assessment of risk of bias of the included articles based on Risk Of Bias In Non-randomized Studies – of Interventions (ROBIN-I).[15]

Author, year, type of study	Bias due to confounding	Bias in selection participants	Bias in classification of interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of reported result	Overall
Brown *et al.*[17]	Moderate	Moderate	Low	Low	Moderate	Low	Low	Moderate
Campennì *et al.*[18]	Moderate	Moderate	Low	Low	Moderate	Low	Low	Moderate

Low: low risk of bias (the study is comparable to a randomized trial); moderate: moderate risk of bias (the study provides sound evidence for a non-randomized study but cannot be considered comparable to a randomized trial); serious: serious risk of bias (the study has important problems).

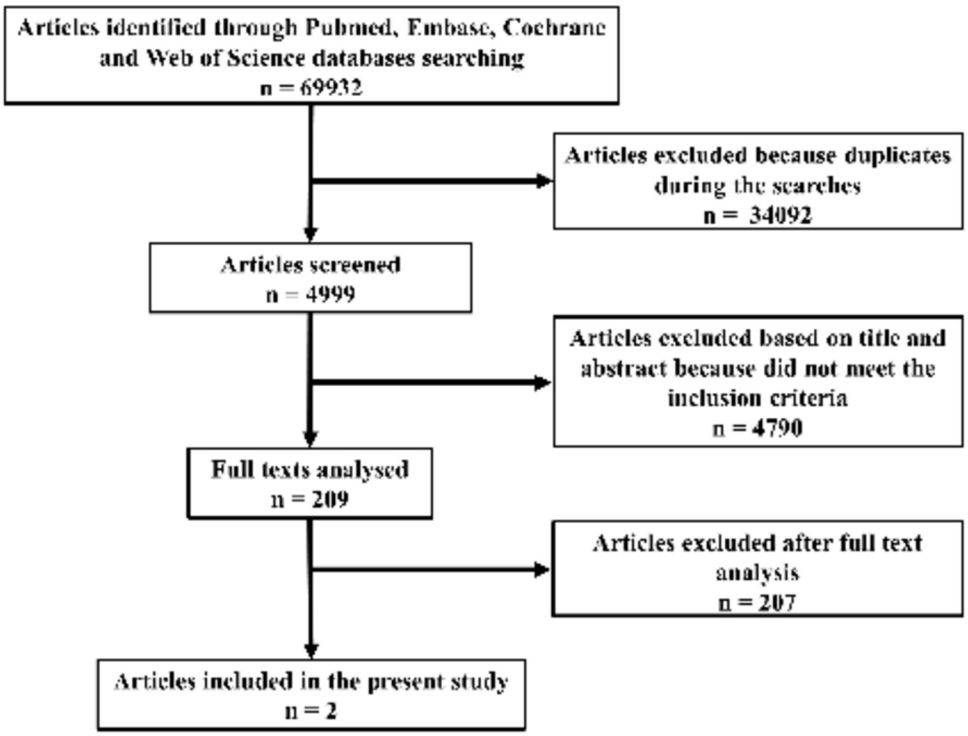

Figure 1. Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) flow diagram.