

Different Strategical Lines in Clinical Safety for Surgical Patients during the Two COVID-19 Pandemic Waves in a Tertiary Level Hospital

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Received: December 02, 2020; **Published:** January 22, 2021

Abstract

Introduction: The measures taken from the first pandemic wave, caused by the SARS-CoV-2 virus in March'20, were continued until the arrival of the second wave from October'20.

Objective: The objective is to review both the strategic approach and the different organizational aspects, focusing on security for patients who required surgical intervention at our hospital, during the second wave in relation to the first pandemic wave.

Methods: It's a retrospective and descriptive study of consecutive cases in our health area, which studies surgical activity during October '20, contrasting with activity during the first pandemic wave in April '20.

Results: 1) The preoperative circuits, both the triple screening by anamnesis, and by the analytical antigen detection in smears, were maintained, but in addition, safety was implemented by controlling access to the users. 2) The surgical activity carried out was higher compared to the first wave, despite higher rates of pandemic incidence. 3) Incidences in the surgical check-lists continued to be anecdotal, with similar profiles. 4) A higher hospital occupancy was observed in this second wave. 5) Donation and transplantation activity was maintained under normal conditions in both waves. 6) In our hospitals, we could follow the recommendations given by authors, regarding safety, in both pandemic waves. 7) Higher levels of care pressure and workload were noted in relation to the first pandemic wave.

Conclusion: Despite the limitations of our study, we can prudently deduce the follow: The incidence rates in our environment were higher in this second pandemic wave, along which a change in the strategic approach was observed. These strategic lines made it possible to improve surgical activity, ensuring the safety of surgical patients, but required a higher levels of adaptation and workloads from the professionals in the organization.

Keywords: COVID-19 Pandemic; SARS-CoV-2 Infection; Safety Management; Surgery

Abbreviations

COVID-19: SARS-CoV-2 Virus; in reference to patients infected with COVID-19; PCR: Viral antigen detection for COVID-19 by polymerase chain reaction test in nasopharyngeal smear

Background

The pandemic caused by the SARS-CoV-2 virus (hereinafter, COVID-19) since its declaration in March '20, triggered the postponement of all programmed surgical activity [1]. This delay lasted until June 21 [2].

Our center is a tertiary level hospital (991 beds installed for hospitalization). It provides health care to the metropolitan area of its capital, as well as to its municipality (Health Care Area IV, within the Regional Health Service). Furthermore, it is the reference center for the surgical pathology of certain specialties, which are absent in the rest of the hospitals of the Region [3].

There is another primary level center in the same municipality (195 beds installed), which has another section of Orthopedic Surgery and Traumatology, and Geriatric and Internal Medicine Services, among others. The maximum capacity, once all the available spaces had been conditioned, were 128 beds both in Intensive Care Units and Surgical Resuscitation Units (critical beds) and 1135 beds in the hospitalization units (conventional beds), between the two hospitals in the area [4,5].

The reference population includes 219,686 inhabitants of the municipality and as a reference center 1,022,800 users from the entire Region [6]. On the other hand, this population is one of the oldest in the country, with about 25% over 65 years old [7].

On September 27, 2020 [4] an average of 5 patients COVID-19's admissions per day in conventional bed was recorded, which was offset by daily discharges. That day the occupancy was 36 patients in a conventional bed, and 11 patients in critical beds (8.6% of the maximum occupancy). In our health care area, the progressive increase in the ratio of income (or admitted patients)/discharge balance caused that other hospitalization units were enabled weekly for these patients COVID-19, as in the previous wave. This balance began to be significant on October 12.

On October 14, 2020 [8] the accumulated incidence rate per 100,000 inhabitants in the last 14 days registered was 151.0 cases in our healthcare area. The average incidence in the rest of the country Regions [9] was 263.1 cases, and a range between 88.5 and 746.1 cases. On October 21 [10], this incidence was 259.6 cases in our Region, while the rest of the country's Regions presented an average incidence of 322.9 cases and a range between 38.4 and 1002.7 cases.

On October 25, the national State of Alarm documented 18 out of the 19 Regions at a high or very high risk level [11] and a national average hospital occupancy for COVID-19 patients in conventional beds of 12% (with a maximum of 20%), and a critical beds occupancy of 22.5% (with a maximum of 60%). On October 28, 2020 the occupancy was 149 patients in a conventional bed (13.1%) and 35 patients admitted in a critical bed (27.3%) in our healthcare area [4].

This national law [11] delegated to the Presidents of each Region, the authority for health matters, in addition to: a) restricting circulation on public roads in specified night time zones, except for justified reasons, b) restricting circulation between the different regions, except for justified reasons, c) limit private meetings indoors to a maximum of 6 people, and d) force the establishment of maximum capacity in the different public establishments (schools, churches, cultural centers, sport centers, among others).

On October 25, 2020 [11] the 3 cities in our Region with more than 100,000 inhabitants were closed on the perimeter (except for justified causes). And, on October 27, 2020 the perimeter closure of the Region was decreed [12].

On October 30, 2020 the hospital occupancy for COVID-19 patients in conventional beds was 187 (16.5% of the maximum occupancy) and reached 251 patients on November 3 (22.1%) in our healthcare area. Regarding the occupancy for COVID-19 patients in critical beds, it was 11 patients (8.6%) on September 27, and reached 73 patients on November 3 (57.0% of the maximum capacity) in the healthcare area [4].

On November 4 [13], the Regional Government proposed, to the Council for Coordination between Regions (depending on the Ministry of Health), the home confinement of the population. Meanwhile, some measures were decreed by Regional Authorities [14] consisting of: a) further limiting the night time zones of circulation (except for justified reasons), b) decreeing the closure of sports centers, c) suspend-

ing recreational activities and public shows (cultural, or sporting activities), d) closure of commercial activities in large areas (except shops with essential needs), e) suspend all non-essential retail commercial activity (bars, pubs, restaurants, casinos, parks, playgrounds, or aquariums, among others), f) suspension of university attendance activities (except essential cases), g) together with the suspension of seminars, congresses and other meetings, h) as well as tourism activities, among others.

In our area [4], on November 4, 2020 the hospital occupancy for COVID-19 patients in conventional beds was 275 (24.2% of the maximum occupancy) and the 73 intensive care patients remained (57.0%). On November 9, it reached 341 conventional beds (30.0%), and 84 critical beds (65.6%). On November 10, it was 351 (30.9%) and 86 (67.2%) respectively. And, on November 12, 2020 it was 366 (32.2%) and 87 (68.0%) respectively.

Aim of the Study

Having observed the progressive increase in hospital occupancies in this second wave [4], the aim of this work is to review the strategical lines and the different organizational aspects [15], regarding the care of patients operated on in our hospital center [16,17], at the time of beginning of this second wave in October '20, 2020, in relation to those observed during the first pandemic wave.

Methods

Statistical analysis

This is a retrospective, descriptive study of consecutive cases, which studies surgical activity both in quantity and quality. In particular, it focuses on patient safety [16,17], regarding the maintenance and adaptation of the measures taken in strategical and organizational aspects during the second wave of the pandemic.

For this purpose, the activity and measures carried out in the first wave in April '20 [15] are studied and contrasted with those at the beginning of the second wave (October '20). In both months, various references were included in terms of activity, clinical safety indicators, as well as accumulated incidence rates, and percentages of hospital occupancy in our healthcare area.

Scope

The hospital has 33 operating rooms installed, divided into 5 surgical blocks, whose distribution and structure have already been detailed previously [15]. Between the two hospitals in the healthcare area [4,5], a maximum occupancy of 128 beds both in Intensive Care Units and Surgical Resuscitation Units (critical beds), and 1135 beds in the hospitalization units (conventional beds) were established, once all the available spaces had been conditioned.

Care circuits

Within the preoperative circuit (both programmed and urgent patients), the triple triage of the 3 questions was maintained [15], as well as the accomplishment of the test for the viral antigen detection for COVID-19 by virus polymerase chain reaction in nasopharyngeal smear (hereinafter, PCR), prior to the operation [18]. Its validity was established by the Department of Anesthesia in 48 hours. This period was verified as an effective period in the first wave [15]. If any test result was obtained prior to the established 48 hours preoperative, and in selected cases, it was repeated urgently before anesthetic induction.

In addition, mandatory measures were established to access the facilities, and universally for all users (including patients, companions and workers). These restrictions for access to hospital centers included: taking temperature and washing hands with hydroalcoholic solution at the time of entry, as well as the mandatory use of a mask during their stay in the centers. If any temperature was higher than 37.5

degrees Celsius, the user was referred to a nursing access control post, for PCR triage, and telephone assessment by the different specialists involved. According to the individual conditions of the users/patients, the access and assistance were decided, or they were referred to their home with the supervision of the Public Health Services, and Primary Care professionals.

Along this second wave, the use of rapid tests and other serological tests, whose sensitivity is different from PCR [19] has been sporadic.

Also, the usual pre-surgical checklist was maintained, which was performed in the hospitalization unit upon being admitted, as well as the surgical verification checklist in the surgical block. Both checklists were evaluated by the Quality Department.

The spaces and locations already established, the use of high safety individual protection equipment, and the rest of the instructions and protocols, documented in the first wave [15], were also maintained.

The rooms where COVID-19 patients (both operating rooms and in resuscitation or critical care units) were located had a negative pressure of -5 to -15 Pascals, provided by the staff from the Department of Engineering and Maintenance [20]. The cleaning, both in the operating rooms and in the critical and resuscitation rooms, was carried out as previously [21].

Exclusion criteria

Patients with a non-surgical profile (coinfected or not) who have been treated in the critical care units are excluded from this review. The description of the activity or status of non-surgical or non-hospital device-directorates is not part of the scope of this study. Furthermore, other strictly clinical safety criteria, previously defined [15,16], were not reviewed.

Results

The compliance with the items established in safety is reviewed [16,17].

Ethical issues

Differentiated admission protocols between urgent and programmed admission were maintained. Thus, four different subpopulations of admitted patients, according to their PCR test and clinical conditions [15] were maintained and implemented.

As in the first pandemic wave, the pager has been kept open 24 hours a day, 7 days a week, advising and supporting the figure of the Chief of the Guard. The advice of the Director of Internal Medicine and Coordinator of the COVID group (and his team), as well as the Director of Emergencies (and his team) has been counted on. Pagers have also been enabled for the Service of Preventive Medicine, Public Health and Hygiene, and for the Service of Occupational Risk Prevention, along with the rest of the usual duty station of the hospital.

The appropriate training of the teams [15,22] was maintained as a strategic line. Continuing education programs, so online and as face-to-face, in the handling of individual protection equipment, hygiene measures, or access to official sources related to pandemic were performed [7]. Some mandatory measures were established to guarantee access to the facilities, *ut supra* mentioned.

All the documentation, instructions and protocols elaborated by the Health Service were distributed during the first wave to all the Surgical Services and Intensive Care Units, as well as these ones elaborated by Healthcare Area's teams, and was also updated and disseminated, including the recommendations of the Healthcare Area Ethics Committee [15]. Likewise, they were re-edited in case of new evidence.

Until the arrival of the second pandemic wave, normal functioning was maintained for the surgical programming of the patients, following the criterion of their seniority in surgical waiting list registry, the patient’s priority registration and other technical criteria, depending on the aggravation of the patient’s clinical situation [23].

Unlike the first wave, in which the State of Alarm was declared with the consequent postponement of the delayable activity, in this second wave, the citizen’s guarantee regarding their situation on the surgical waiting list was not modified [2]. In the second fortnight in October and by means of a preliminary technical document [5], the Health Service included other criteria for surgical scheduling, such as hospital occupancy, and expected hospital stay, and in particular of those patients whose planned admission was expected as a short-stay one (less than 72 hours) [24].

Protocol of action in the surgical area

Some documents had been disseminated for the knowledge of the specific surgical services during the first wave, such as: precaution in the use of the pneumoperitoneum, caution in the use of electric scalpel, discouraging minimally invasive endoanal or transanal interventions or caution during stoma care; as well as the closing of guillotines and doors of the operating rooms to ensure the central negative pressure systems [15].

In the month of April ‘20, out of 612 records collected, 100% of the cases reported compliance in pre-surgical checklists, while in October ‘20 compliance was reported in 1926 records (99.8%). Just like it happened in the first wave, two new incidence profiles were detected in pre-surgical checklists [15]. Moreover, 7 incidents out of 483 complete records (1.4%) were observed in April ‘20, while 9 incidents out of 1626 complete records (0.6%) were observed in October ‘20.

Four specific operating rooms were designated for patients infected with COVID-19 during the first wave, while only two operating rooms were designated in this second pandemic wave: 1 in the mother-child block, and another one for the rest of departments. In both waves, 2 emergency operating rooms were maintained daily.

The recommended measure consisting of resuscitating the patient in the same operating room has not been necessary in our center, since the maximum installed occupancy of critical beds (both intensive and resuscitation ones) was not reached. In addition, some provisional critical units were set up in our center, beyond the studied period.

Care indicators

The programmed activity carried out in the month of April ‘20 was performed in 22 working days, while the month of October ‘20 had 21 working days. So, surgical activity in absolute terms was conditioned by this fact, and therefore averages per working day are also presented to allow comparison between both months. The activity data are described below (Table 1).

	April’20	October’20
Number of working days per month	22	21
Hospital occupancy peak day	April 2, 2020	October 31, 2020 (raising)
Average of accumulated incidence rate per 100.000 inhabitants in the last 14 days (first fortnight).	87.9	151.0
Number of conventional beds occupied (% of maximum occupancy, first fortnight)	226 (19.9%, peak)	54 (4.8%, raising)
Number of critical beds occupied (first fortnight)	5 8 (45.3%, peak)	14 (10.9%, raising)

Hospital occupancy (%)	58,3%	81.6%
Number of working beds	984	940
Average of overall hospital stay per patient (in days)	9.3	8.3
Median of stay per patients in Surgical Services (in days)	6.4	4.4
Hospital mortality index	5,6%	5.3%
Index of deaths in surgical services out of number of discharges (%)	1,6%	0.8%
Total number of available operating rooms per day	23	31
Number of specific operating rooms available for COVID-19 patients per day	4	2
Number of available emergency operating rooms per day	4	2
Number of available programmed operating rooms per day	15	27
Surgical sessions performed	320	625
Number of operating rooms scheduled morning (average)	14.1	24.1
Number of operating rooms scheduled afternoon (average)	2.2	7.4
Number of total surgical procedures	610	1615
Number of urgent surgical procedures	230	297
Number of scheduled surgical procedures	380	1318
Number of scheduled patients operated on per working day (average)	17.3	62.8
Ratio of scheduled ambulatory / admitted interventions (%)	7.6%	47.5%
Number of total transplants performed (including renal, hepatic and cardiac)	8	17
Scheduled surgical performance (morning and afternoon, %)	81.3%	74.1%
Surgical suspensions (%)	2.3%	3.9%
Number of births	167	146
Cesarean index (%)	21,60%	15.8%
Index complete records pre-surgical checklist (%)	100%	99.82%
Incidences registered in surgical verification checklist (%)	1.4%	0.6%
Number of patients registered in Surgical Waiting List registry (last day of the month)	7849	7456
Average of delay to be operated on (last day of the month, in days)	90.1	106.6
Number of patients waiting for operation more than 180 days (last day of the month)	925	1123
Ratio of patients registered as Priority type 1+2 / total patients as outputs in Surgical Waiting List registry	100%	46.6%

As for the surgical activity carried out, in October '20 [25], there were 29 operating rooms installed for programmed surgery for uninfected patients, 2 operating rooms installed for urgent pathology and the 2 COVID-19 operating rooms per working day. There were 625 surgical sessions, with an accumulated programmed surgical performance of 74.1% (October '19: 73.9%). An average of 24.1 working operating theatres per working day in the morning and 7.4 in the afternoon (calculated with a duration of 7 hours per morning session; and 4 hours per afternoon session from Monday to Thursday) was obtained, based on the available staff in the different professional categories. The accumulated suspension rate was 3.9%, including causes attributable to patients, organization or clinical situation (October '19: 3.8%).

Throughout April '20 [25], 14.1 scheduled sessions were carried out in the morning per working day (+10.0 sessions per working day compared to October '20, +70.9%), and 2.2 in the afternoon (+5.2 sessions per working day compared to October '20, +236.4%), obtaining a total number of 320 sessions (+305 monthly surgical sessions compared to October '20, +95.3%) with a programmed surgical performance of 81.3% (April '19: 74.0%). The number of surgical suspensions amounted to 2.3% (April'19: 3.4%).

Moreover, in October '20, there were an average of 27.9 scheduled sessions per working day in the morning from the 1st to 9th, 25.6 from the 13rd to 27th, and 9.7 from the 28th to 31st. In the afternoon, these averages were 8.4 from October 1 to 27, and 1.0 from October 28 to 31.

During April '20, 380 total programmed interventions were carried out (April '19: 1350), while in October '20 there were 1318 interventions, which represents +938 patients operated on compared to April (+246.8%). In April '20 the number of patients operated on was 17.3 per working day, while there were 62,8 patients operated on per working day in October '20 (+45.5 patients operated on per working day, +263.0%).

In April '20, 230 total urgent interventions were performed (April' 19: 340); while in October '20 there were 297 patients (with respect to April '20 this represents +67 urgent interventions, +29.1%). Therefore, the total number of interventions made were respectively 610 in April '20 and 1615 in October '20 (+1005 interventions, +164.8%).

The ratio of scheduled ambulatory/inpatient interventions was respectively 7.6% in April '20 (41.0% in Apr'19) and 47.5% in October '20 (with respect to April '20 represents +39.9%).

In that month of April '20, 167 births were carried out, with a caesarean rate of 21.6%; in October '20, 146 births were carried out, with a caesarean rate of 15.8%. The number of births along 2020 presented a range between 142 (in February '20) and 182 (in August '20).

As for the activity of transplants, in October '20 9 renal, 1 heart, and 3 liver were performed (October '19: 4, 1 and 1 respectively), and 4 corneal transplants were performed (October '19: 6). In April'20, 7 renal transplants were performed (April '19: 5), and 1 heart transplant (April '19: 2).

The overall hospital occupancy in April '20 was 58.3%% of the 984 beds in operation at the center (April '19: 85.2% and 983 respectively), while in October '20 it was 81.6% and 940 beds in operation. The average occupancy in terms of the number of patients admitted per day was 573.7 patients in April '20, and 767.0 patients in October '20 (+193.3 patients per day, + 33.7%).

In our healthcare area, in the first wave the peak of hospitalization occupancy was reached on April 1, with 45.3% (58 patients) of critical beds occupied [15,26], while on October 30, 48 critical patients were admitted to Intensive Care Units, which represented 37.5% of our maximum critical beds occupancy.

The overall accumulated hospital mortality rate was 5.3% in October '20, and 5.6% in April '20. The total of hospital deaths in the 14 surgical departments was 0.8% (22 deaths out of 2859 discharges) in October '20, and 1.6% (12 out of 738) in April '20.

When surgical waiting list registry were retrospectively analyzed, the output of all patients operated on in April '20 were 100% registered as priority 2 or less (preferential and urgent patients) [27], while in October '20, 927 out of the 1737 patients registered as outputs in this registry (53.4%) had a priority 3 (patients that allow delay, or delayable) [25]. Regarding the surgical scheduling of patients with short-stay criteria, the hospital average of days of stay per patient (mean stay) was 9.3 days in April '20 (April '19, 8.7), while in October '20 it was 8.3 days (October '19: 8.1 days). But nevertheless, into the Surgical Services, the median value of their mean stay per patient admitted was 6.4 days in April '20, and 4.4 days in October '20 (with respect to April '20, it represented -2 days of stay per patient, or -31.3%, or -125.5 free beds per working day).

Regarding the registry of patients on the last day of the month waiting on the surgical waiting list to undergo surgery, in April '20 7849 patients were registered, while in October '20 there were 7456 patients (with respect to April '20, it represented -393 patients, -5.0%) [25].

Issues related to professionals

According to the second seroprevalence survey of IgG-type immunoglobulins in our Region [28], the prevalence proportion in active healthcare professionals was 3.2%, while in the overall population was 1.6%, without the existence of any screening programs based on PCR tests. In this second wave, there were periodic screening PCR tests among professionals and users [20], in addition to performing them on suspected cases, as in the first wave.

On October 31, 2020, the proportion of positives in the PCR tests performed was 7.9% in our Region [29], this proportion was 9.4% on November 1, and 10.5% on November 9. In our healthcare area, the proportion of PCR positivity was 4.3% on October 31, and 17.9% (of the 1138 samples analyzed) on November 9. As an intriguing detail, on November 4, there was registered 10.4% in the age group under 15 years (coinciding with 13.8% in another health area in this age group), while 4.3% was registered in the total samples analyzed in our area.

Discussion

This is a retrospective, descriptive study of consecutive cases, that studies our surgical activity both in quantity and quality aspects, related to patient safety [16,17], regarding the maintenance [15] and adaptation of the measures taken, in terms of strategical and organizational aspects during the second pandemic wave.

On April 10 [7,30], within the first wave and after 9 days of the peak of hospital occupancy, the accumulated incidence rate per 100,000 inhabitants in the last 14 days was 87.9 cases in our Region. On October 14 [8], the incidence rate was double compared to the peak within the first wave, and on October 21 [10], it was triple compared to that peak of April '20.

The physical theorems that govern the behavior of Tsunamis explain that the speed of the wave decreases when it approaches the shore, but when this wave hits the seabed, it causes the volume of water contained in that wave to raise to a very higher height to that which it had in its oceanic spread [31]. Our second wave seems to have raised on October 12; until then, the incidence rate remained stable in the Region, with low hospital occupancies in the healthcare area [4]. In this occasion, our first infectious outbreaks were located in the western and eastern wings of the Region, coinciding with the fact that October 12, wasn't a working day (and allowed a 3 day week-end), it seems possible that this *ex abrupto* growth of incidence rate could have been as a consequence of the movement of people between Regions, due to both our tourist attraction and our low levels of contagion until then either. In fact, our geographical accessibility is better from the East or West than from the North (*Cantabric Sea*) or South (mountain range *Picos de Europa*).

In our role as referral center [3,6], the hospital was the first in the Region to take on COVID-19 patients. Coordinated by the Health Service, other centers in the Region began to house critical COVID-19 patients from October 15, until their maximum occupancy was exhausted on October 23 (24 patients). On the other hand, the demand for conventional beds in our area began to be significant from October 12, increasing rapidly, *ut supra* commented [4].

On October 16, it was decided to decrease two surgical sessions per day to reduce hospital pressure in resuscitation beds, which was verified in our results. The patient registered with a priority type 3 (delayable, not oncological), and with a type of medium/long hospital bed occupancy [24] was selected to be postponed. Our results did prove that this last criterion was followed by the Heads of Surgical Services, which managed to reduce 2 days of stay per patient operated on, compared to April '20, which implied to provide an average of 125.5 free beds per working day in October '20, for the incoming COVID-19 patients.

On October 30, [4] in our healthcare area, both situations caused a doubling in critical bed occupancy per week, reaching 37.5% of our maximum occupancy.

The increase in hospital occupancy [4], together with the saturation of the maximum occupancy of the rest of the Regional hospitals, and the progressive growth of the incidence rate in the Region as well as in the healthcare area [10], made predictable the arrival of a greater number of critical patients to our center. On the other hand, the measures decreed by both National [11] and Regional Authorities [12] would take at least some weeks to demonstrate their effectiveness. On October 28, the occupancy of COVID-19 patients in critical units placed the healthcare area in Phase III of Medium Alert (hospital conventional occupancy between 25 - 50% and critical occupancy between 30 - 50%), so it was decided initiating the postponement of all surgical activity, except that whose priority was “emergent” or “oncological” [5]. In addition, on October 28, another intensive care unit (with 4 beds) was set up as a multipurpose critics unit, and thanks to the commendable effort during the first wave of the Engineering Service.

In the following days, the Engineering Service, together with the Department of Anesthesia and the different Intensive Care Services, enabled both the Resuscitation Units, the boxes of the Short-stay Post-anesthetic Recovery Units, and the Major Ambulatory Surgery Unit as several Intensive Care Units. The Pediatric Critics Unit began to assist adult patients. Also, Engineering Service, together with the Department of Cardiology and the Cardiology Critical Section, enabled the Coronary Unit as an Intensive Care Unit. And, together with the Ophthalmology and Maxillofacial Services, the Recovery Unit of the Ophthalmology Surgical Block was set up for the location of critical patients.

At that time, and with the adaptation efforts commented, the maximum occupancy of 128 critical beds in the healthcare area was achieved (both for COVID-19 patients and for the rest), which was fully operational on November 5, 2020.

Later, the occupancy continued raising to 73 critical COVID-19 patients on November 4 (57.0% of our maximum occupancy). This implied being in the High Alert Phase (occupancy in critical units between 50-75%), and therefore, in terms of surgical activity, only the “emergencies” had to be operated on [5]. On the other hand, another 24-bed critical unit came into operation, at the location of a locker room.

With the support of the Regional Health Authorities, it was decided to increase the maximum occupancy of critical beds in our hospital, for which the Rehabilitation Service gym facilities were enabled, which led to an increase in occupancy of 19 critical beds. They were operational as of November 15. Analysis of this period is not part of the scope of this study.

Throughout the month of April '20, home confinement and the postponement of any delayable surgical activity was in force [2]. This fact led to a substantial decrease in hospital occupancy in the first wave in almost one out of every three beds [15]. In this second wave, these circumstances only occurred during the last 3 days in October '20. In fact, the average of occupancy has been higher, as expected, based on the increase in hospital admissions, due to COVID-19 patients, added to a greater surgical activity. The lower number of working beds used (despite this higher demand) was decided to have prepared hospitalization units waiting to receive COVID-19 patients throughout the month. This fact, translated to the resource “free beds”, meant +44 beds available per day [25]. This decision generated greater healthcare pressure and a greater demand for coordination in the management of spaces, locations, resources, and professionals, but it turned out to be effective throughout the following month (data not shown).

In the month of April '20 the occupancy of critical units would have corresponded to the Medium Alert level, taking into account the technical document mentioned [5], which established the surgical programming of preferential patients type 1 and 2 [27], as it was [15].

In October '20, the scheduled activity was more than double than in April '20 (despite one less working day in October '20). Since the decision to postpone the surgical activity started on October 13, by means of the reduction of two surgical sessions per day, it was

only comparable to April '20 the last three days on October, from 28th to 31st. This increase in the scheduled surgical activity (although in absolute terms it is biased data, because October '20 had one less working day than April '20) occurred both in admitted and ambulatory patients, maintaining under normal conditions both the donation and transplantation Program, and Major Ambulatory Surgery Unit activities. On November 5, this Major Ambulatory Surgery Unit became a Resuscitation Unit with critical beds, as *ut supra* commented.

The use and compliance of the checklists is another relevant indicator of surgical safety. These were optimized during the two pandemic waves, with a lower proportion of incidents in the second wave, which, although anecdotal, maintained the profiles of the first wave [15].

The hospital mortality rate of surgical services was similar comparing to previous months to pandemic [15], but an improvement compared to April '20 was observed [25], as expected, which we attribute to the fact that COVID-19 circuits, protocols and measures were more systematized, and above all, in the authors' opinion, to the lag of a few weeks between the impact in hospital occupancy and the incidence rate growth in population, from the second fortnight October '20.

In July '20, in our country, the proportion of contagion in workers was 22%, the highest in the world, while the second country in this ranking presented less than a half of ours [20]. In October '20, the maintenance of the scheduled activity did not allow the establishment of checkpoints with teleworking, or having teams of reserve people, unlike in the first wave [15].

Seroprevalence rates among health workers in the first wave were low compared to the general population [28]. These data are not yet available in this second wave.

With clear methodological limitations (very heterogeneous samples, and biased by the appearance of infectious outbreaks), the proportion of PCR positivity on October 31, 2020, including health workers, reached 7.9% in the Region, while in the healthcare area it was 4.3%, although these proportions grew throughout November '20 [29]. This increase could be related to the proportion found in the population under 15 years of age, for which no specific measures had been established at that moment, such as school closings or home confinement [11,12], unlike in the previous wave [1], although recent studies may suggest that pediatric patients appear to be less viral transmitters [32,33]. However, these two indicators (seroprevalence and proportion of PCR) cannot be comparable, and this hypothesis must be studied and contrasted in the coming months *sine die*.

Regarding issues related to the work environment, the increase in sick leave in workers reached up to 12%, including infections by COVID-19 and quarantines of workers (close contacts of infected people) during this second wave pandemic [34]. In general, the stock of applicants for public employment was exhausted, due to their hiring for both the increasing demand for assistance, as well as the coverage of the new structures opened. In this way, the available professionals had to bear a greater workload in the morning, and an increase in paid hours in the afternoon, already started months ago [35], as well as in the night shift. Furthermore, unlike in the first wave, the greater pressure from the patients registered in the surgical waiting list hindered the administrative and organizational work at the Surgical Services. A nationwide strike was called by the medical establishment, on October 27 [34].

Analyzing the surgical waiting list outputs, the reduction of -5% of patients was the fortitude of this strategic approach along the month of October '20. Even more than half of these patients operated on had a priority type 3, or delayable [27].

Despite the limitations of our study, we can prudently deduce the follow: The incidence rates in our environment were higher in this second pandemic wave, along which a change in the strategical approach was observed [5]. These strategic lines made it possible to improve surgical activity, ensuring the safety of surgical patients, which required a higher level of adaptation and workloads from the professionals in the organization.

We want to thank the Department of Citizen (including Admission Unit), Quality Department, and Department of Management Control. All of them have provided data and information used in this work. Secondly, authors want to thank to all the Clinical, Surgical and Critical Services mentioned throughout this work, and to many others not mentioned, who have allowed the aforementioned results to be achieved; in particular to Mr. Jose Maria Diaz and his team, currently serving as device-director of Nursing Cares for Surgical and Critical Units, for his facilitating role to achieve them.

An honorable mention is made to both the Heads of Service (Dr Félix Fernández) and Section (Dr Cristina Iglesias) of Anesthesia and Resuscitation, as well as the Heads of Intensive Pediatrics Section (Dr Corsino Rey) and Cardiology Critical Section (Dr Guillermo Muñoz), for their daily efforts in coordinating the surgical block and post-surgical resuscitation, and critical units, both in infected or not infected patients.

Finally, authors wish to thank Ms. Gloria Simmons, Managing Editor at ECGDS, for her support, improvement and motivation to write this manuscript.

The authors want to dedicate this work to Dr. Lola Escudero, Head of the Intensive Medicine Service and Regional Coordinator of the Transplantation Program, as well as Mr. Josu Jiménez Idoeta, Head of Department of Engineering and Maintenance, whose spirit and dedication respectively remembered to Mr Worsley and to Mr MacNeish [36], who, without prejudice to any other worker in the Region, were, in the authors' opinion, the two pillars on which the decisions and works undertaken in the center [37] were based, during "*the terrible storms that we suffered*" in the approach to the care of the critical and surgical patients in this second pandemic wave.

Conflict of Interests

The authors declare that they have no conflict of interest.

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