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Impact of the first COVID-19 shutdown on traumatological patient volumes in Switzerland

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ABSTRACT

Background: The coronavirus has caused a worldwide pandemic with serious impacts on our healthcare systems. Many countries experienced a decline in traumatological patient volume. The aim of this study is to evaluate the impact of the first lockdown on traumatological patient volume in Switzerland.

Methods: We retrospectively used a prospective national quality measurement database. We compared the period of the first lockdown in Switzerland from March 17 to April 26, 2020 to the same period in the years 2018 and 2019. Included were all adult patients with any S-code (trauma) according to the International Classification of Diseases.

Results: In total, we assessed 3874 patients (1779 in the year 2018, 1303 in the year 2019, and 792 in the year 2020) with a mean age of 61 ± 21 years. The patients during the lockdown period had significantly more injuries to the hip and forearm, had more comorbidities, and were more likely to have statutory insurance. During the lockdown period, more thromboembolism prophylaxis or anticoagulation was applied, and more patients needed antibiotic treatment.

Conclusions: The present study demonstrated a 40–55% reduction in patient volume during the lockdown period in Switzerland compared to the previous years. The in-hospital mortality and complication rate during the lockdown period remained stable. This study suggests that in-hospital care for trauma patients in Switzerland was not substantially affected by the first lockdown.

Introduction

On March 11, 2020, the World Health Organization (WHO) declared the Coronavirus Disease 2019 (COVID-19) caused by the Severe Acute Respiratory Syndrome Coronavirus-type 2 (SARS-CoV-2) to be a pandemic [1]. COVID-19 had a serious impact on healthcare systems, including workforce issues, procedural prioritization, and the constant risk of viral transmission [2]. Many authors identified issues to address surgical practice to improve safety for patients and medical personnel [3–5].

In many countries, a decrease in elective and non-elective trauma cases was noticed [6]. Earp et al [6]. found that surgical cases had decreased by 88%. Possible reasons for this decline could be due to

governmental restrictions or patients choosing to delay (elective) surgeries because of fear of a COVID-19-transmission.

At the peak of the pandemic, many governments withheld elective surgeries to save resources [7]. Limitations to public life and social distancing measures via national lockdowns were implemented in many countries to reduce the spread of COVID-19. Non-urgent operations were postponed, preserving resources in the hospitals. These actions caused a slowdown in public life, and many hospitals noticed a decrease in medical emergencies such as strokes and cardiac events, most likely because patients were avoiding hospitals because of fear of an infection with COVID-19 [8–10].

In Switzerland, the government announced a temporary lockdown from March 17 to April 26, 2020. To achieve control over COVID-19, the

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government restricted public life. All shops, markets, restaurants, and entertainment and leisure facilities were closed. This also included museums, libraries, cinemas, concert halls and theaters, sports centers, swimming pools, and ski areas. Businesses such as hairdressing salons were also closed. The government banned class lessons in school buildings and ordered home lessons. Shops, compulsory schools and museums, libraries, restaurants, and fitness centers were only allowed to gradually reopen under protective conditions [11]. From mid-March to the end of April, elective cases, such as nonunions or hardware removals, were postponed due to the federal regulations. However, acute fracture care was continued.

Prior work has shown a deferral of care for serious non-COVID-19 conditions, such as myocardial infarction and stroke [12]. Based on this, we hypothesized that a slowdown in public life would result in a decreased number of trauma cases and a change in the frequency of the most common diagnoses. The aim of this study is to evaluate the impact of the first lockdown on traumatological patient volume in Switzerland.

Material and methods

Patients

We used the database of the Swiss Working Group for Quality Assurance in Surgery (Arbeitsgemeinschaft für Qualitätssicherung in der Chirurgie (AQC)) [13] to identify inpatients with an S-Code (S00 to S99 with all subcategories) according to the World Health Organization's International Statistical Classification of Diseases and Related Health Problems (ICD-10) [14]. Inclusion criteria were age over 17 years and a complete dataset in the AQC database. Exclusion criteria were missing data and patients 17 years or younger. From 3959 cases a total of 3874 patients met our in- and exclusion criteria and were further analysed.

We compared the time period of the first lockdown in Switzerland from March 17 to April 26, 2020 to the same time period in the years 2018 and 2019. For this study, 40 Swiss hospitals provided data on in-hospital traumatological patients to the AQC. The AQC database contained more than 1.7 million cases, and the dataset contained information on inpatient treatment, patient characteristics, and operation(s).

Statistical analysis

Data were downloaded via an online tool (AdjumedAnalyze,

Adjumed Services AG, Zurich, Switzerland) and analyzed using SPSS Version 26 (IBM, Armonk, New York, USA). Data are presented as frequencies (n) and means with standard deviations (SDs). To assess differences between groups, a Chi-squared test was used for categorical data. Student's t-test was used to assess differences in means between groups for numerical data. Statistical significance was set at $p < 0.01$ due to the large sample size.

Results

Epidemiology

A total of 3874 patients were examined in this study; 1779 patients from 2018, 1303 from 2019, and 792 from 2020. This equals a reduction of 55% compared to the year 2018 and 40% compared to the year 2019.

The overall mean age was 61 ± 21 years. Patients in the lockdown group were slightly (2 years), but not significantly, older than their counterparts from 2018 and 2019. Fifty percent of the patients were female. Eighty percent of the examined patients had an American Society of Anesthesiologists (ASA score) [15] of I or II (healthy person or mild systemic disease). There were no significant differences in the ASA scores between the assessed years. During the lockdown period, a higher number of injuries to the elbow and forearm as well as more injuries to the hip and thigh were registered, but less injuries to the knee and lower leg were observed (Fig. 1).

On average, 35% of all patients had at least one comorbidity. In the lockdown cohort, significantly more patients (45%) had one or more comorbidities. The relative frequency of distinct comorbidities was similar over the years. The most common comorbidities were chronic lung disease, neurologic disorder, coronary artery disease, moderate-severe kidney disease and heart failure. Moderate-severe kidney disease was less common in the lockdown-period but there were more malignant diseases as comorbidity in the lockdown-period.

Patients were significantly less likely to be privately insured in the lockdown group (Table 1).

Most operations were performed by senior attendings followed by junior attendings. This ratio remained roughly the same over the observed periods. The most common operations were open reduction of a distal radius fracture with internal fixation, closed reduction of a femoral fracture with internal bone fixation, open reduction of a fracture of the clavicle with internal fixation and implantation of a mono-head

Relative change in frequency of injury characteristics; control period versus lockdown

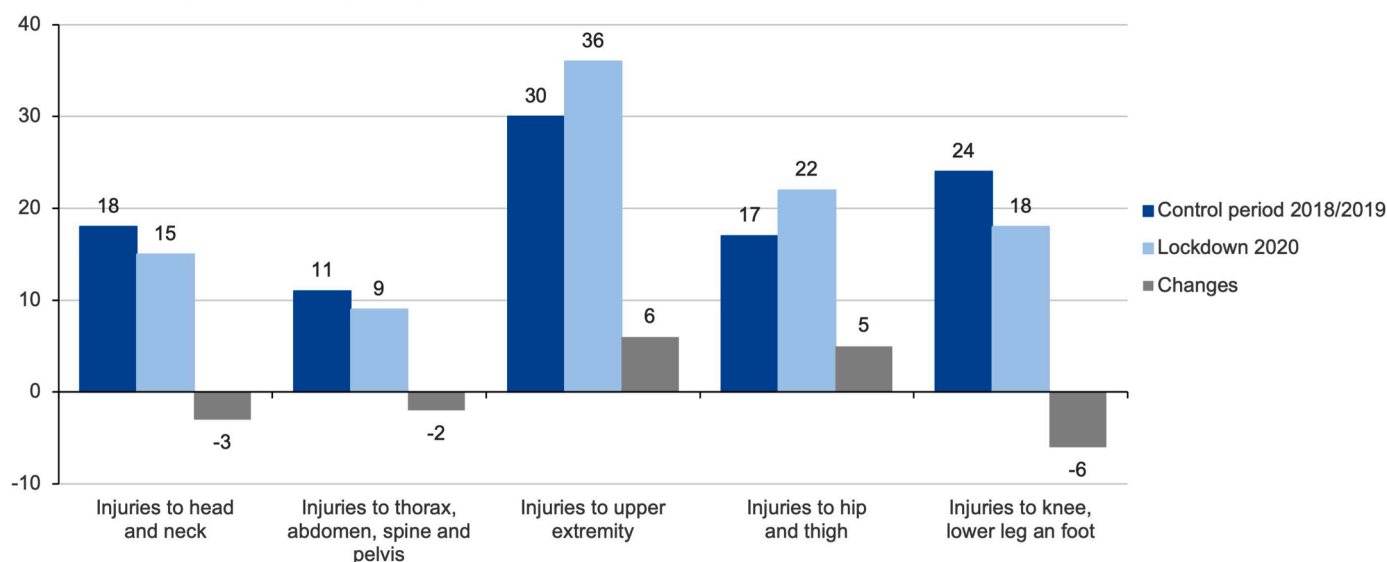


Fig. 1. Relative change in frequency of injury characteristic; control period versus lockdown.

Table 1
Overview over yers; Patient characteristics.

Parameter		Total (n= 3874)		2018 (n=1779)		2019 (n=1303)		2020 (n=792)		p value
		n	%	n	%	n			%	
Age (years)	mean ± SD	61±21		60±21		61±22		62±21		n.s.
Gender	male	1953	50	920	52	639	49	394	50	n.s.
	female	1921	50	859	48	664	51	398	50	
ASA	I (healthy person)	1349	35	658	37	443	34	248	31	n.s.
	II (mild systemic disease)	1759	45	773	43	604	46	382	48	
	III (severe systemic disease)	708	18	329	18	228	17	151	19	
	IV (severe systemic disease that is a constant threat to life)	47	1.2	18	1.0	18	1.4	11	1.4	
	V (moribund person who is not expected to survive without the operation)	11	0.28	1	0.056	10	0.77	0	0	
Insurance	statutory	2826	73	1272	72	943	72	611	77	0.003
	private	1048	27	507	29	360	28	181	23	
Length of stay (days)	mean ± SD	5.9±5.9		5.9 ±5.9		6.0 ±6.0		5.8±5.7		n.s.
Length of stay preoperative (days)	mean ± SD	1.3±2.4		1.4 ±2.5		1.2 ±2.2		1.3±2.5		n.s.
Length of stay postoperative (days)	mean ± SD	5.5 ±6.25.4		5.6 ±5.5		5.5 ±5.5		5.2±5.1		n.s.
Duration ICU (hours)	mean ± SD	2.0±13		1.5 ±8.8		2.9 ±17		1.7±11		n.s.
Comorbidity	yes	1364	35	530	30	480	37	354	45	<0.001
Intubation	yes	72	1.9	34	1.9	29	2.2	9	1.1	n.s.
Discharge	deceased	48	1.2	22	1.2	18	1.4	8	1.0	n.s.
	at home	2975	77	1377	77	1018	78	580	73	
	rehabilitation clinic	424	11	184	10	127	9.7	113	14	
	nursing home	202	5.2	94	5.3	66	5.1	42	5.3	
	old people's home	135	3.5	59	3.3	48	3.7	28	3.5	
other hospital	90	2.3	43	2.4	26	2.0	21	2.7		

SD: Standard Deviation, ASA: American Society of Anesthesiologists classification system, n.s.: not significant

prosthesis.

We observed a significantly higher rate of in-hospital thromboembolism prophylaxis or anticoagulation during the lockdown period. Furthermore, antibiotic therapy was applied to the patients significantly more often (Table 2).

Outcome

We found no significant differences in the mortality rate. Complications arose in 5.4% of all patients and were somewhat more commonly observed in the lockdown cohort, but significance was not reached. The

most common complications were urinary tract infection, pneumonia, delirium, cardiac arrhythmia, and pulmonary embolism. The most common intraoperative complications reported were lesions of the tendons and nerves, thermal lesion, and fracture. We found no significant differences between the lockdown and the control periods. No differences were found in terms of the length of stay or stay in the intensive care unit (2018: mean 1.5, median 0 and standard deviation ±8.8, 2019: mean 2.9, median 0 and standard deviation ±17, 2020: mean 1.7 median 0 and standard deviation ±11).

Table 2
Overview over yeras; Procedure characteristics.

Parameter		Total (n= 3874)		2018 (n=1779)		2019 (n=1303)		2020 (n=792)		p value
		n	%	n	%	n			%	
Surgeon class	senior attending	1358	35	587	33	486	37	285	36	n.s.
	junior attending	820	21	330	19	292	22	198	25	
	resident	419	11	172	9.7	152	12	95	12	
Duration surgery (minutes)	mean ± SD	80±48		81±50		80±48		78±45		n.s.
Complications	yes	208	5.4	80	4.5	74	5.7	54	6.8	n.s.
Thromboembolism prophylaxis	no thromboembolism prophylaxis	896	23	493	28	307	24	96	12	<0.001
	thromboembolism prophylaxis	2269	59	1019	57	747	57	503	64	
	anticoagulation	97	2.5	51	2.9	21	1.6	25	3.2	
Antibiotics	no antibiotics	1194	31	649	37	356	27	189	24	<0.001
	prophylactic antibiotics	2439	63	1045	59	867	67	527	67	
	antibiotic therapy	241	6.2	85	4.8	80	6.1	76	9.6	

SD: Standard Deviation

Discussion

We found a 55% decrease in patient volume compared to the year 2018 and 40% compared to the year 2019. This is in accordance with several studies conducted in different countries [16]. Shermann et al [17]. found a 70% reduction in traumatic injuries at a Level I trauma center in New Orleans. Ishii et al [18]. found a decrease of 45% for surgical cases in Japan. Interestingly, that study also found an increase in hip fractures, similar to the findings of the present study. This was also observed in a study conducted in Spain [19]. Some other studies found a general decrease not only in trauma patients but also in many other different medical disciplines [20]. It is conceivable that complaints could be endured longer because of the fear of a COVID-19 infection.

Popp et al [21]. found a 39% decrease in recreational accidents in a German hospital. We found a decrease in injuries to the knee and lower leg, which often occur due to leisure accidents. We believe that a decrease in mobility and sporting activities during the lockdown period led to fewer trauma cases and a different pattern of injuries. In part this may be explained because of an avoidance of risky outdoor activities and less work-related accidents due to the lockdown. Probably more falls occurred in the home environment. All these points together partially explain the variation in patients' injury characteristics. Similar to this, Pinggera et al [22]. found a decrease in traumatic brain injuries during the lockdown in Austria. Compared to the year 2018, we also found a decrease in injuries to the head during the lockdown period.

Interestingly, we found that preoperative waiting times during the lockdown period were not any longer than before. One explanation may be that non-urgent operations were not allowed and because of the less busy theater schedules there was a shorter waiting time. This is contrary to the study by Meng et al [23]., which found that patients waited on average 2 days longer for their operation and that patients waited longer at home before seeking medical care due to COVID-19. A multicenter study in Finland found an average increase of 8% in preoperative waiting times in 2020 because of laboratory delay except for cardiovascular and musculoskeletal procedures. Similar, a study in Portugal found no longer waiting time in emergency surgery [24].

We found no differences in the mortality rate during the lockdown period. In contrast, a meta-analysis by Brown et al [25]. found an almost eight times increased risk of perioperative death in patients diagnosed with COVID-19 at the time of surgery or within 30 days of surgery. In our data, we could not assess how many patients were infected with COVID-19. The reason is that there was no separate ICD code at that time to record the COVID-19 status in the registration sheet of the AQC. Nowadays, new ICD codes are available. It is of paramount importance to record the COVID-Status - Hall et al [26]. showed that this danger is real; COVID-19 was associated with a three times higher 30-day mortality in patients with hip fractures. Postoperative pulmonary complications in particular are more frequent in patients with perioperative COVID-19 infection and are associated with a higher mortality [27, 28].

In the present study, we found a significantly higher use of thromboembolism prophylaxis during the lockdown period compared to before (64% vs. 57%). Also, antibiotic therapy was prescribed more often. Doctors may have been especially alert to the issue of thromboembolism because COVID-19 increases the risk of thrombotic disease due to excessive inflammation, platelet activation, endothelial dysfunction, and stasis [29].

Treatment in trauma patients is often initiated promptly without the patient's insurance status being known. Nevertheless, studies have shown a higher mortality rate for uninsured patients [30, 31]. In our study, we found that more patients had statutory insurance during the lockdown period. This is contrary to a study performed at the Hospital of the University of Pennsylvania, which found that a higher proportion of patients undergoing medically necessary surgeries during the pandemic had private insurance instead of statutory insurance [32]. The reasons may lie in the very different insurance systems. In Switzerland, health insurance is compulsory for everyone. Additional services can be

acquired through an additional private insurance top up. Such services include, among others, free choice of treating hospital, hospital stays in single rooms, and exclusive treatment from senior physicians. In Switzerland, casualty insurance is usually covered by the employer [33].

Sercy et al [34]. showed a clear trend of increasing rates of uninsured patients during the pandemic. However, the rates of individuals covered by private insurance did not decline during the pandemic.

The COVID-19 pandemic presented a challenge to surgical education. Around the world, including in Switzerland, elective surgeries were cancelled, and surgical residents were asked to make drastic changes to their daily routines [35, 36]. Interestingly we found no changes in the rate of performed operations by residents in the lockdown period.

One of the limitations of our large study was the use of de-identified data, which made it impossible to obtain missing information. Furthermore, we had no information on the long-term outcomes. Lastly, registry data are highly dependent on the diligence of the doctors and nurses who submit the data and therefore can be prone to error [37].

Conclusion

Our study provides an important insight into the epidemiology and management of trauma patients during the 2020 COVID-19 pandemic in Switzerland. We found a 40–55% reduction in patient volume during the lockdown period in Switzerland compared to the previous years. The in-hospital mortality and complication rate during the lockdown period remained stable. We found significantly more injuries to the hip and forearm. Therefore, given the risk of future pandemics, it is vital that stakeholders understand the impact of the pandemic on major public health concerns, such as falls in older adults and hip fractures, and adapt treatment protocols accordingly.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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