



## Impact of COVID-19 Outbreak on Emergency Department Admissions of a Hospital

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### Introduction

Originated and detected for the first time in December 2019 in the city of Wuhan in China, the SARS-CoV-2 virus spread around the world in the following weeks [1,2]. First experienced in Europe in mid-February 2020 with a rapid increase of cases start [3]. Governmental and the hospital reaction by-creating resources by cancelling of elective treatments and operations enabling prioritized the pandemic situation [4,5]. Starting on 16<sup>th</sup> of March the social life was “frozen” -by introducing social distancing to flatten the infection curve as a primary goal [6]. Due to the low amount of new infections a “relaxation” of the strict rules started on mid-May till autumn [7], suddenly Germany experienced a second wave. After a called (breakwater-) “lockdown light” beginning the 1<sup>st</sup> of November a new lockdown comparable with the situation in spring was established in mid-December.

Some publications deal with the change of hospital cases in German Hospitals - priority during the first lockdown [8-10]. The WIdO-Report showed a reduction of cases by 39% in March and April 2020 in relation to 2019. Distinct reduction of case could be observed in hip-replacement (-79%), reconstruction of the female chest (-76%) an intervention on the bowel-system (-70%) [8]. Surprisingly the WIdO-Report determined a loss of cases of heart-attacks (-31%) and strokes (-18%), too [8]. Similar reductions in the number of cases in these groups could be confirmed by university-oriented A&E-Departments [9]. Own data (unpublished yet but accepted) confirmed the reduction of A&E-cases by a rate of 30%. In the first pandemic-wave the reduction of surgical A&E-cases was twice as much as internal cases. In the summer the cases in our A&E-department nearly normalized in relation to 2019. The county Mecklenburg-Vorpommern had very low numbers of COVID-19 cases and the lowest mortality in a national comparison had always been observed in the course of the corona pandemic until July 31<sup>st</sup>, 2020 [11].

Now it should be investigated, how the cases of the A&E-department perform during the period of 01.07.2021 to 31.12.2021. In the context of the pandemic, the beginning of the 2<sup>nd</sup> wave is shown here.

The observed hospital in Güstrow is working as a regional Trauma-Centre including a Chest Pain and Stroke Unit, a rescue helicopter cares for appr. 22,000 patients in the hospital and appr. 25,000 outpatient per year.

### Methods

Beginning in July 2019, emergency admission treatments were digitally documented so using aggregated routine data without case numbers/patient reference became possible and thus could be queried anonymously. A personal reference can no longer be constructed from the aggregations and so an inspection of the treatment documents is not possible.

The type and day of admission, the age, the urgency level in the Manchester-Triage-System (MTS) and, in the case of inpatient course, the main diagnosis of the case based on the German coding guidelines is called up [12]. Upon arrival in the emergency department, patients are assigned to a specialist department (surgery, internal medicine, neurology, pediatrics, etc.) based on the clinical impression of the MTS first assessor. Doctors of this specialist department carry out the diagnostic process in the emergency department until a decision is made as to whether and in which specialist department the patient will be admitted as an inpatient or discharged to home as an outpatient. An own “A&E-specialist” does not exist in Germany.

The period 01.07.2019 to 31.12.2019 and the same period in 2020 are compared here. In the

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Received Date: 08 Mar 2021

Accepted Date: 02 Apr 2021

Published Date: 15 Apr 2021

#### Citation:

Stöwhas M, Lippert H. Impact of COVID-19 Outbreak on Emergency Department Admissions of a Hospital. Clin Surg. 2021; 6: 3136.

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**Table 1:** Reduction of cases per month in the A&E-department.

Month	Emergency Department (all)				Surgery			
	Cases 2019	Cases 2020	Deviation	Deviation %	Cases 2019	Cases 2020	Deviation	Deviation %
<b>Total</b>	<b>12407</b>	<b>10774</b>	<b>-1.633</b>	<b>-13%</b>	<b>4150</b>	<b>3590</b>	<b>-560</b>	<b>-13%</b>
7	1997	2017	20	1%	682	683	1	0%
8	2268	2024	-244	-11%	844	700	-144	-17%
9	2005	1879	-126	-6%	686	692	6	1%
10	2010	1786	-224	-11%	671	585	-86	-13%
11	1945	1474	-471	-24%	597	463	-134	-22%
12	2182	1594	-588	-27%	670	467	-203	-30%

**Table 2:** Type of admission to the A&E Department an alteration in July to December 2020.

Type of admission	Self- Admissions				Ambulant specialist				
	Month	Cases 2019	Cases 2020	Difference	Difference %	Cases 2019	Cases 2020	Difference	Difference %
<b>Total</b>		<b>2855</b>	<b>2136</b>	<b>-719</b>	<b>-25%</b>	<b>629</b>	<b>611</b>	<b>-18</b>	<b>-3%</b>
7		481	425	-56	-12%	78	99	21	27%
8		620	426	-194	-31%	104	118	14	13%
9		476	415	-61	-13%	103	118	15	15%
10		450	340	-110	-24%	126	111	-15	-12%
11		393	272	-121	-31%	112	82	-30	-27%
12		435	258	-177	-41%	106	83	-23	-22%

Type of admission	Recur Service without Emergency Doctor				Resur Service with Emergency Doctor				
	Month	Cases 2019	Cases 2020	Difference	Difference %	Cases 2019	Cases 2020	Difference	Difference %
<b>Total</b>		<b>386</b>	<b>572</b>	<b>186</b>	<b>48%</b>	<b>183</b>	<b>199</b>	<b>16</b>	<b>9%</b>
7		76	103	27	36%	27	43	16	59%
8		64	112	48	75%	42	35	-7	-17%
9		55	101	46	84%	34	44	10	29%
10		55	95	40	73%	25	26	1	4%
11		52	79	27	52%	26	25	-1	-4%
12		84	82	-2	-2%	29	26	-3	-10%

Type of admission	Other				
	Month	Cases 2019	Cases 2020	Difference	Difference %
<b>Total</b>		<b>97</b>	<b>72</b>	<b>-25</b>	<b>-26%</b>
7		20	13	-7	-35%
8		14	9	-5	-36%
9		18	14	-4	-22%
10		15	13	-2	-13%
11		14	5	-9	-64%
12		16	18	2	13%

course of the corona pandemic, the first lockdown began in Germany on March 16<sup>th</sup>, 2020 and the first easing in Mecklenburg-Vorpommern on May 6<sup>th</sup>, 2020. The summer months can be viewed as a kind of “interpandemic phase” with low incidence values in Mecklenburg. The response to the 2<sup>nd</sup> wave of pandemics was on November 2<sup>nd</sup>, 2020 with the so-called lockdown “light” and on December 16<sup>th</sup>, 2020 with a tightened lockdown - comparable to spring.

## Results

In the periods compared, 12,407 (2019) and 10,774 (2020; -1633

cases; -13%) were treated. It turns out that from October to December in 2020 the number of patients presenting to the emergency department steadily reduced. The surgical patients in the emergency department contain appr. 33% of all cases (same in 2019 and 2020) and also show a reduction in cases in the months of October to December (Table 1).

Analyzing the surgical patients more closely with regard to the type of admission, it becomes apparent that approx. 60% of all cases come to the emergency department “by themselves” (without having seen a doctor before), approx. 15% after seeing an ambulant

specialist outside the hospital and the rest *via* the rescue services (with and without an emergency doctor). The group of self-admissions decreased by 25% in the period under review. This began in the summer months and increased again from October to December. The admissions of ambulant Specialists were higher in July through September and in roughly equal parts in October through December lower than in the previous year. The number of cases admitted by the rescue service with emergency doctor is relatively constant, the rescue service without emergency doctor admitted significantly more patients (+48%) (Table 2).

For reasons of data protection, the patient file could not be used, so that it is not possible to provide a diagnosis for outpatient emergency department patients. For the patients who were admitted as inpatients from the emergency department, the main diagnosis of the case could be determined according to the International Classification of Diseases (ICD-10-GM 2020) valid for Germany and using the German coding guidelines [12]. An ICD-10-GM 2020 code contains up to 5 digits (example: I10.00 - Benign essential hypertension without indication of a hypertensive crisis). For a better overview, the coded main diagnoses have been summarized in the form of three-digit codes (in the above example I10). Typical and frequent main diagnoses from the field of surgery that are typical for the hospital are now evaluated.

The cases of "intestinal infections", "Gastritis and Duodenitis" even more clearly the cases of "Cholelithiasis/Cholecystitis" and "Hernia" show an increasingly reduction in the number of cases in the 4<sup>th</sup> quarter of 2020 compared to the previous year. Cases such as ulcers in the stomach and duodenum and pancreatitis occur in the emergency department at about the same frequency as in the previous year and appendicitis with an increasing rate in the fourth quarter (Table 3).

## Discussion

The present work describes a decrease in the number of surgical patients in the emergency department of a specialist provider in the state of Mecklenburg-Vorpommern by approx. 13% in the period from July 1<sup>st</sup>, 2020 to December 31<sup>st</sup>, 2020 compared to the previous year. In the 4<sup>th</sup> quarter of 2020 under the impact of the lockdown measures, the decline in the number of cases increased noticeably - leading here is the cases of self-admissions.

An ill patient in Germany can consult his family doctor or specialist outside the hospital, call the emergency services or go directly to the emergency department of a hospital. Although there are recommended "pathways", the patient does not face any sanctions if he deviates from these. A Health insurance is ubiquitous available for everyone, income of a person does not matter the person is treated or not inside or outside the hospital.

The literature describes an increased rate of "stay-at-home" recording to rescue missions with a consecutive decrease in the number of admissions caused by the emergency doctor during the first wave of the pandemic [10,13]. This could not be ensured in the data available for the second half of the year-on the contrary: The admissions *via* the rescue service increased noticeably compared to the previous year. However, it must remain open whether there were primarily more calls to rescue hotline or whether the clinical pictures presented to the emergency services were more severe.

The constant reduction in the number of cases intestinal infections

**Table 3:** Presentation of different surgical diseases an alteration in July to December 2020.

A09-A08 - "intestinal infections"				
Month	Cases 2019	Cases 2020	Difference	Difference %
7	18	8	-10	-56%
8	19	10	-9	-47%
9	11	10	-1	-9%
10	25	14	-11	-44%
11	21	12	-9	-43%
12	23	16	-7	-30%

K29 - "Gastritis und Duodenitis"				
Month	Cases 2019	Cases 2020	Difference	Difference %
7	14	19	5	36%
8	25	19	-6	-24%
9	17	20	3	18%
10	17	15	-2	-12%
11	24	17	-7	-29%
12	15	12	-3	-20%

K56&K59 "Paralytic ileus/intestinal obstruction & functional disorders"				
Month	Cases 2019	Cases 2020	Difference	Difference %
7	10	6	-4	-40%
8	9	7	-2	-22%
9	6	6	0	0%
10	8	10	2	25%
11	9	6	-3	-33%
12	16	9	-7	-44%

K80-K81 - "Cholelithiasis/Cholecystitis"				
Month	Cases 2019	Cases 2020	Difference	Difference %
7	12	25	13	108%
8	14	24	10	71%
9	19	16	-3	-16%
10	26	17	-9	-35%
11	23	10	-13	-57%
12	29	13	-16	-55%

K40 - K44 - "Hernia"				
Month	Cases 2019	Cases 2020	Difference	Difference %
7	3	6	3	100%
8	5	7	2	40%
9	1	4	3	300%
10	2	1	-1	-50%
11	7	2	-5	-71%
12	3	1	-2	-67%

can be explained by the pandemic-related hygiene measures (social distance, hygiene measures). You describes comparable lifestyle influences in the reduction of "metabolically associated" diseases, which he also includes (alcohol-induced) pancreatitis [14]. Although

K25-K26 "Gastric and Duodenal ulcer"				
Month	Cases 2019	Cases 2020	Difference	Difference %
7	6	2	-4	-67%
8	5	3	-2	-40%
9	4	2	-2	-50%
10	4	3	-1	-25%
11	3	3	0	0%
12	4	0	-4	-100%

K85 - "Acute Pancreatitis"				
Month	Cases 2019	Cases 2020	Difference	Difference %
7	6	7	1	17%
8	9	7	-2	-22%
9	6	9	3	50%
10	9	2	-7	-78%
11	7	7	0	0%
12	7	7	0	0%

K35 - "Acute Appendicitis"				
Month	Cases 2019	Cases 2020	Difference	Difference %
7	6	8	2	33%
8	7	7	0	0%
9	5	5	0	0%
10	5	9	4	80%
11	4	7	3	75%
12	2	11	9	450%

alcohol could be called causal for a large number of pancreatitis in our hospital, we see values that are identical to the previous year, especially in the lockdown phase. Other authors also see lifestyle modifications in the pandemic as a possible cause of the reduction in acute cholecystitis [15].

In relation to the appendicitis-cases there are sometimes contradicting findings in the literature. In a Spanish study, the proportion of surgically treated appendicitis patients in the pandemic group and the control group was the same [15].

A working group from Austria was also able to ensure a comparable increase in emergency appendectomies (+157%) during the lockdown period (1<sup>st</sup> wave) [16]. In agreement with other working groups, the authors described an increase in the number of complicated forms of appendicitis (free perforation, peritonitis) [15-17]. In Germany, it can currently be considered certain that the current data are not sufficient to provide an advantage for conservative therapeutic approaches to the acute uncomplicated appendicitis, so the surgical treatment of acute uncomplicated and complicated appendicitis in childhood and adulthood is the default treatment [18]. Even if our data were evaluated with regard to the diagnoses, this corresponds to cases treated surgically. In contrast to previous findings a reduction of 62.2% in appendicitis cases with a higher complication rate (5.4% vs. 42.8%) with a simultaneous reduction in cholecystitis (39.2%) in the lockdown group is described in a New Zealand study [19]. With regard to the Spanish work already cited, we again see contradicting results for cases of Cholelithiasis/Cholecystitis and Hernias - this



patient group increased there (acute cholecystitis/obstruction and hernias increase from 12.28% to 22.22%) [15].

Patients must perceive a symptom to be noticeably threatening to seek medical help. Being tempted to determine the increase of complicated forms of appendicitis is an expression of delayed presentation and subsequent therapy [15-17]. Intestinal infections but also the cases of paralysis/obstruction may heal spontaneously at some point even beyond medical help. This does not seem to apply to appendicitis and pancreatitis, so that here-apparently with a delay - professional help is sought.

This delay may be due to concerns about getting infected with SARS-CoV-2 in hospital also out of concern that the health system is overloaded [20,21]. Objectively, the incidence of SARS-CoV-2 infections in the region of the hospital was notably low during the second wave of the pandemic (Figure 1). The - more politically generated - target of 50 new infections/100,000 inhabitants within 7 days was exceeded only on a few days and then also slightly. The number of vacant intensive care beds increased steadily at this time.

It is also conceivable that the pandemic measures taken by politicians and hospitals have led to a reduction in the number of cases in the emergency department. The general decrees issued significantly reduced public life in the lockdown phases (strict contact/visit restrictions, including in hospitals, shops being closed, events being canceled) [6,22]. In the state of Mecklenburg-Vorpommern, the ban on entering the state as non-residents also applied in phases [23-25].

It is conceivable that older people will only be motivated to seek medical help through contact with relatives or other persons -

these incentives are lacking due to contact restrictions or entry bans [13]. However, there were no clear changes in the age structure of our patients. A similar observation was made near the city Leipzig [10]. Another working group showed different distributions of the patient groups younger/older than 60 years [9]. It is also conceivable that patients have been prevented going to the hospitals as a possible patient because of the pronounced visiting bans [26-31].

## Conclusion

In the temporally context of the corona pandemic, there was also a significant reduction in surgical emergency patients and inpatient admissions in the second half of the year. We could show differences in the reduction in the number of cases between individual clinical pictures - however, both nationally and internationally, there is a common trend that the reduction cannot be definitively and plausibly explained pathophysiologically. The state of Mecklenburg-Vorpommern had the lowest number of cases and the lowest mortality in Germany during the first wave of pandemics. Images like those from northern Italy in spring generally did not exist in Germany and in Mecklenburg-Western Pomerania in particular. The second wave of pandemics in the region of the hospital was also rather mild in 2020, too - although the number reduced cases was noticeable and comparable to the first wave. The data only shows the data of one hospital - if one generalizes the data shown to the state of Mecklenburg-Vorpommern or the Federal Republic of Germany, it would mean that there has been an actual undersupply in various medical areas-not because medical resources were not available, but because patients no longer used the health system to the same extent as they did before the pandemic. This effect is not only limited to emergencies but can also be seen in the field of oncology. There are indications that both (pandemic and pandemic measures) can be the cause of this. Further research is necessary in order to have to accept less "non-pandemic-related" morbidity - possibly also mortality.

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