

SUPPLEMENT

Hospitalizations for emergency-sensitive conditions in Germany

during the Covid-19 pandemic

Insights from the German-wide Helios hospital network

Andreas Bollmann,¹ Sven Hohenstein,¹ Vincent Pellissier,¹

Sebastian König,¹ Laura Ueberham,¹ Gerhard Hindricks,¹

Andreas Meier-Hellmann,² Ralf Kuhlen³

on behalf of Helios hospitals, Germany

¹ Heart Center Leipzig at University of Leipzig and Leipzig Heart Institute, Leipzig Germany

² Helios Kliniken, Berlin, Germany

³ Helios Health, Berlin, Germany

Corresponding author:

Andreas Bollmann, MD, PhD

Heart Center Leipzig at University of Leipzig

Strümpellstr. 39

04289 Leipzig

Germany

Phone: ++49 341 865 1410

Fax: ++49 341 865 1460

Email: andreas.bollmann@helios-gesundheit.de

Index

German Diagnosis Related Groups

Table S1. Emergency hospital admissions in the German-wide Helios hospital network during the Covid-19 pandemic.

Table S2. Hospitalizations in emergent bed-based, emergent bed-based for emergency-sensitive conditions and ambulatory care between 2016 and 2020.

Table S3. In-hospital mortality for emergency-sensitive conditions.

Figure S1. Hospitalizations per hospital in 2019 and 2020.

German Diagnosis Related Groups

The German Diagnosis Related Groups (G-DRG) system is used for hospital reimbursement in Germany since 2004 and is subject to encoded diagnoses (International Statistical Classification of Diseases, German Modification; ICD-10 GM) and procedures (German procedure classification; OPS). This obligatory documentation and accounting system is specified and regulated in detail by mandatory coding instructions and requires the coding of a main diagnosis for all in-hospital cases reflecting the underlying cause for hospital admission. Up to 15% of the codes are controlled – and corrected if required – by specialized physicians (“Medizinischer Dienst der Krankenversicherung”) independently from health insurances and hospitals. Administrative data for this study were extracted from QlikView (QlikTech, Radnor, Pennsylvania, USA).

Table S1. Emergency hospital admissions in the German-wide Helios hospital network during the Covid-19 pandemic. ICD-10 codes for the emergency-sensitive conditions are provided in parenthesis.⁷

		Deficit period			Resumption period			
	<i>n</i>	Daily admissions	IRR (95% CI)	<i>P</i> value	<i>n</i>	Daily admissions	IRR (95% CI)	<i>P</i> value
Diabetes mellitus type 2 (E11)								
2019	1,291	13.7			2,147	13.7		
2020	1,102	11.7	0.85 (0.79–0.92)	< 0.01	2,057	13.1	0.96 (0.90–1.02)	0.16
Other disorders of fluid, electrolyte and acid-base balance (E87)								
2019	412	4.4			920	5.9		
2020	357	3.8	0.87 (0.75–1.00)	0.04	919	5.8	1.00 (0.91–1.09)	0.98
Other disorders of brain (G93)								
2019	59	0.6			121	0.8		
2020	49	0.5	0.83 (0.57–1.21)	0.34	122	0.8	1.01 (0.78–1.30)	0.95
Pulmonary embolism (I26)								
2019	660	7.0			1,215	7.7		
2020	660	7.0	1.00 (0.90–1.11)	1.00	1,386	8.8	1.14 (1.06–1.23)	< 0.01
Cardiac arrest (I46)								
2019	143	1.5			238	1.5		
2020	138	1.5	0.97 (0.76–1.22)	0.77	233	1.5	0.98 (0.82–1.17)	0.81
Heart failure (I50)								
2019	6,152	65.4			9,054	57.7		
2020	5,187	55.2	0.84 (0.81–0.87)	< 0.01	9,101	58.0	1.01 (0.98–1.03)	0.73
Subarachnoid haemorrhage (I60)								

2019	67	0.7			110	0.7		
2020	62	0.7	0.93 (0.66–1.31)	0.66	112	0.7	1.02 (0.78–1.32)	0.89
Intracerebral haemorrhage (I61)								
2019	320	3.4			546	3.5		
2020	331	3.5	1.03 (0.89–1.21)	0.67	498	3.2	0.91 (0.81–1.03)	0.13
Other non traumatic intracranial haemorrhage (I62)								
2019	57	0.6			102	0.6		
2020	43	0.5	0.75 (0.51–1.12)	0.16	102	0.6	1.00 (0.76–1.32)	1.00
Cerebral infarction (I63) and unspecified stroke (I64)*								
2019	3,018	32.1			4,960	31.6		
2020	2,824	30.0	0.94 (0.89–0.98)	0.01	5,035	32.1	1.02 (0.98–1.06)	0.45
Aortic aneurism and dissection (I71)								
2019	131	1.4			224	1.4		
2020	138	1.5	1.05 (0.83–1.34)	0.67	271	1.7	1.21 (1.02–1.44)	0.03
Adult respiratory distress syndrome (J80)								
2019	11	0.1			16	0.1		
2020	34	0.4	3.09 (1.57–6.09)	< 0.01	25	0.2	1.56 (0.84–2.92)	0.16
Respiratory failure, not elsewhere classified (J96)								
2019	184	2.0			277	1.8		
2020	131	1.4	0.71 (0.57–0.88)	< 0.01	305	1.9	1.10 (0.94–1.29)	0.23
Duodenal ulcer (K26)								
2019	329	3.5			577	3.7		
2020	306	3.3	0.93 (0.80–1.08)	0.35	598	3.8	1.04 (0.93–1.16)	0.53

Vascular disorders of intestine (K55)								
2019	288	3.1			440	2.8		
2020	287	3.0	1.00 (0.85–1.17)	0.97	471	3.0	1.07 (0.94–1.22)	0.30
Diverticular disease of intestine (K57)								
2019	1,225	13.0			2,190	14.0		
2020	1,101	11.7	0.90 (0.83–0.97)	< 0.01	2,166	13.8	0.99 (0.93–1.05)	0.71
Peritonitis (K65)								
2019	122	1.3			220	1.4		
2020	122	1.3	1.00 (0.78–1.29)	1.00	233	1.5	1.06 (0.89–1.27)	0.53
Hepatic failure (K72)								
2019	75	0.8			103	0.7		
2020	50	0.5	0.67 (0.47–0.95)	0.03	95	0.6	0.92 (0.70–1.22)	0.57
Acute pancreatitis (K85)								
2019	745	7.9			1,221	7.8		
2020	651	6.9	0.87 (0.79–0.97)	0.01	1,195	7.6	0.98 (0.90–1.06)	0.59
Other diseases of digestive system (K92)								
2019	548	5.8			916	5.8		
2020	467	5.0	0.85 (0.75–0.96)	< 0.01	865	5.5	0.94 (0.86–1.04)	0.22
Shock, not elsewhere classified (R57)								
2019	54	0.6			101	0.6		
2020	61	0.7	1.13 (0.78–1.63)	0.51	122	0.8	1.21 (0.93–1.57)	0.16
Fracture of lumbar spine and pelvis (S32)								
2019	1,065	11.3			1,796	11.4		

2020	1,013	10.8	0.95 (0.87–1.04)	0.25	1,711	10.9	0.95 (0.89–1.02)	0.15
Fracture of femur (S72)								
2019	2,322	24.7			3,787	24.1		
2020	2,398	25.5	1.03 (0.98–1.09)	0.27	4,097	26.1	1.08 (1.04–1.13)	< 0.01
Complications of cardiac and vascular prosthetic devices, implants and grafts (T82)								
2019	382	4.1			677	4.3		
2020	357	3.8	0.93 (0.81–1.08)	0.35	658	4.2	0.97 (0.87–1.08)	0.60

Table S2. Hospitalizations in emergent bed-based, emergent bed-based for emergency-sensitive conditions and ambulatory care between 2016 and 2020. Please note, that the reduction is also apparent when comparing IRR of 2020 with previous years.

Year	n	Daily admissions	IRR (95% CI)	P value
Inpatient cases				
2016	462,204	1435.4	0.95 (0.95–0.96)	< 0.01
2017	476,534	1479.9	0.98 (0.98–0.99)	< 0.01
2018	479,388	1488.8	0.99 (0.99–0.99)	< 0.01
2019	484,368	1504.2	Reference	
2020	453,082	1407.1	0.94 (0.93–0.94)	< 0.01
2020*	435,793	1353.4	0.90 (0.90–0.90)	< 0.01
Inpatient cases, emergency-sensitive conditions				
2016	123,449	383.4	0.92 (0.91–0.93)	< 0.01
2017	130,573	405.5	0.97 (0.96–0.98)	< 0.01
2018	133,942	416.0	1.00 (0.99–1.00)	< 0.37
2019	134,409	417.4	Reference	
2020	124,559	386.8	0.93 (0.92–0.93)	< 0.01
2020*	119,802	372.1	0.89 (0.88–0.90)	< 0.01
Outpatient cases				
2016	35,896	111.5	1.15 (1.13–1.16)	< 0.01
2017	31,757	98.6	1.01 (1.00–1.03)	0.07
2018	29,892	92.8	0.95 (0.94–0.97)	< 0.01
2019	31,306	97.2	Reference	
2020	17,813	55.3	0.57 (0.56–0.58)	< 0.01
2020*	17,356	53.9	0.55 (0.54–0.56)	< 0.01

* Exclusion of hospitals with inconsistent data availability.

Table S3. In-hospital mortality for emergency-sensitive conditions.

		Deficit period			Resumption period		
Year	Proportion (n)	Odds ratio (95% CI)	P value	Proportion (n)	Odds ratio (95% CI)	P value	
Diabetes Mellitus type 2							
2019	2.9% (36)			2.4% (50)			
2020	3.9% (41)	1.33 (0.85– 2.11)	0.21	2.6% (52)	1.08 (0.73– 1.60)	0.70	
Volume depletion							
2019	4.3% (67)			3.6% (111)			
2020	5.1% (62)	1.21 (0.85– 1.73)	0.29	3.0% (85)	0.82 (0.61– 1.09)	0.16	
Delirium, not induced by alcohol and other psychoactive substances							
2019	4.8% (16)			4.0% (23)			
2020	5.0% (12)	1.04 (0.47– 2.23)	0.92	4.0% (19)	0.98 (0.52– 1.83)	0.96	
Other disorders of brain							
2019	18.2% (10)			8.8% (10)			
2020	6.7% (3)	0.32 (0.07– 1.13)	0.10	16.1% (18)	1.99 (0.89– 4.69)	0.10	
Acute Myocardial Infarction (AMI) or Other acute ischemic heart disease							
2019	6.4% (158)			5.5% (216)			
2020	7.1% (165)	1.10 (0.88– 1.38)	0.40	6.2% (261)	1.13 (0.94– 1.36)	0.19	
Pulmonary embolism							
2019	10.5% (67)			10.8% (126)			
2020	8.7% (55)	0.81 (0.55– 1.17)	0.27	8.8% (117)	0.80 (0.61– 1.04)	0.10	
Cardiac arrest							
2019	96.3% (129)			94.4% (219)			
2020	92.7% (127)	0.49 (0.15– 1.43)	0.21	91.2% (206)	0.61 (0.29– 1.25)	0.18	
Subarachnoid haemorrhage							
2019	28.8% (15)			23.3% (20)			

2020	28.6% (14)	0.99 (0.41– 2.35)	0.98	31.5% (29)	1.52 (0.78– 2.99)	0.22
Intracerebral haemorrhage						
2019	37.4% (102)			38.5% (174)		
2020	37.8% (104)	1.02 (0.72– 1.44)	0.91	39.2% (162)	1.03 (0.78– 1.36)	0.83
Other non traumatic intracranial haemorrhage						
2019	8.7% (4)			9.4% (8)		
2020	22.2% (8)	3.00 (0.86–12.13)	0.10	16.5% (15)	1.90 (0.78– 4.96)	0.17
Cerebral infarction or Stroke, not specified as haemorrhage or infarction						
2019	6.1% (168)			6.3% (283)		
2020	6.9% (178)	1.13 (0.91– 1.41)	0.26	5.6% (254)	0.88 (0.74– 1.04)	0.14
Aortic aneurism and dissection						
2019	26.7% (31)			24.0% (44)		
2020	23.9% (27)	0.86 (0.47– 1.56)	0.62	26.6% (61)	1.15 (0.73– 1.80)	0.55
Pneumonitis due to solids and liquids						
2019	29.2% (115)			29.6% (187)		
2020	32.3% (109)	1.16 (0.85– 1.59)	0.36	26.4% (187)	0.85 (0.67– 1.08)	0.20
Adult respiratory distress syndrome						
2019	57.1% (4)			87.5% (7)		
2020	76.0% (19)	2.37 (0.38–14.13)	0.33	82.4% (14)	0.67 (0.03– 6.38)	0.74
Duodenal ulcer						
2019	7.3% (23)			6.6% (37)		
2020	6.3% (18)	0.86 (0.45– 1.62)	0.63	7.4% (43)	1.13 (0.71– 1.78)	0.61
Paralytic ileus and intestinal obstruction without hernia						
2019	5.6% (63)			5.6% (103)		
2020	5.1% (52)	0.92 (0.63– 1.34)	0.67	5.0% (99)	0.89 (0.67– 1.18)	0.42

Diverticular disease of intestine						
2019	1.7% (20)			1.2% (26)		
2020	1.6% (17)	0.95 (0.49– 1.82)	0.87	1.3% (28)	1.09 (0.64– 1.88)	0.75
Peritonitis						
2019	14.5% (16)			9.6% (20)		
2020	13.3% (15)	0.90 (0.42– 1.93)	0.78	8.3% (18)	0.86 (0.44– 1.68)	0.66
Hepatic failure						
2019	35.9% (23)			42.2% (38)		
2020	26.8% (11)	0.65 (0.27– 1.52)	0.33	46.2% (37)	1.18 (0.64– 2.16)	0.60
Acute pancreatitis						
2019	2.1% (15)			1.6% (19)		
2020	2.2% (14)	1.06 (0.50– 2.23)	0.87	1.5% (17)	0.91 (0.47– 1.77)	0.79
Cellulitis						
2019	1.2% (8)			1.3% (16)		
2020	1.4% (7)	1.13 (0.39– 3.16)	0.82	0.6% (7)	0.48 (0.18– 1.13)	0.11
Acute renal failure						
2019	15.5% (173)			13.4% (236)		
2020	17.1% (148)	1.12 (0.88– 1.42)	0.36	14.4% (235)	1.09 (0.90– 1.32)	0.39
Shock, not elsewhere classified						
2019	55.1% (27)			58.8% (57)		
2020	69.5% (41)	1.86 (0.85– 4.13)	0.12	69.0% (80)	1.56 (0.89– 2.75)	0.12
Intracranial injury						
2019	2.5% (82)			2.1% (124)		
2020	2.7% (72)	1.11 (0.80– 1.53)	0.52	2.6% (125)	1.21 (0.94– 1.55)	0.14
Fracture of lumbar spine and pelvis						

2019	1.7% (17)			2.5% (41)		
2020	2.5% (23)	1.43 (0.76– 2.73)	0.27	2.8% (43)	1.12 (0.73– 1.74)	0.60
Fracture of femur						
2019	4.8% (96)			5.9% (195)		
2020	4.9% (103)	1.03 (0.77– 1.37)	0.84	5.1% (178)	0.85 (0.69– 1.05)	0.14
Complications of cardiac and vascular prosthetic devices, implants and grafts						
2019	1.9% (7)			2.5% (16)		
2020	1.8% (6)	0.91 (0.29– 2.77)	0.87	1.6% (10)	0.64 (0.28– 1.40)	0.27

Based on 183,803 cases (93.8%). We excluded cases with discharge due to hospital transfer or unspecified reason. Proportion of excluded cases was stable ranging between 5.9 and 6.5% per year and period.

Figure S1. Hospitalizations per hospital in 2019 (red) and 2020 (green). Case numbers are displayed per hospital with 2019 bars below 2020 bars for every hospital.

