Original Article

Forced Centralized Allocation of Patients to Temporarily ‘Closed’ Emergency Departments

Data From a German City

Wendelin Rittberg, Patrick Pflüger, Jakob Ledwoch, Juri Katchanov, Dieter Steinbrunner, Viktoria Bogner-Flatz, Christoph D. Spinner, Karl-Georg Kanz, Michael Dommasch

Summary

Background: Because insufficient data are available, the overall number of patients treated in German emergency departments can only be estimated. It is evident, however, that case numbers have been rising steadily in recent years, and that a lack of capacity is now leading with increasing frequency to forced centralized allocation of patients by the emergency medical services (EMS) to emergency departments that are, officially, temporarily “closed”.

Methods: Trends in patient allocation of this type in greater Munich, Germany, over the years 2013–2019 were analyzed for the first time on the basis of data from 904 997 cases treated by the emergency rescue services.

Results: From 2014 to 2019, the number of forced centralized patient allocations rose approximately by a factor of nine, from 70 to 634 per 100 000 persons per year. In the same period, the overall number of cases treated by the emergency rescue services rose by 14.5%. Peak values for forced centralized allocations were reached in the first quarter of each calendar year (2015: 1579, 2017: 2435, 2018: 3161, 2019: 3990). Of all medical specialties, internal medicine was the most heavily affected (more than 59% of the total). Especially in the years 2017–2019, the free availability of internal medicine declined in hospitals participating in the common greater Munich reporting system.

Conclusion: The reasons for the sharp rise in forced centralized allocations are unclear. This observed trend seems likely to persist over the coming years, in view of the current staff shortage, the aging population, and diminishing hospital capacities. The relevant decision-makers must collaborate to create emergency plans that will prevent care bottlenecks so that patients will not be endangered.

Cite this as:

Rittberg W, Pflüger P, Ledwoch J, Katchanov J, Steinbrunner D, Bogner-Flatz V, Spinner CD, Kanz KG, Dommasch M: Forced centralized allocation of patients to temporarily ‘closed’ emergency departments—data from a German city. *Dtsch Arztebl Int* 2020; 117: 465–71. DOI: 10.3238/arztebl.2020.0465

Central Emergency Department, Klinikum rechts der Isar, Technische Universität München: Wendelin Rittberg, Prof. Dr. med. Karl-Georg Kanz, Dr. med. Michael Dommasch

Department of Trauma Surgery, Klinikum rechts der Isar, Technische Universität München: Dr. med. Patrick Pflüger, Prof. Dr. med. Karl-Georg Kanz

Department of Internal Medicine I, Klinikum rechts der Isar, Technische Universität München: Dr. med. Jakob Ledwoch, Dr. med. Michael Dommasch

Department of Medicine III, Munich University Hospital, Ludwig-Maximilians-Universität München: PD Dr. med. Juri Katchanov

EMS Authority of Munich: Dieter Steinbrunner, PD Dr. med. Viktoria Bogner-Flatz

Department of General, Trauma and Reconstructive Surgery, Munich University Hospital, Ludwig-Maximilians-Universität München: PD Dr. med. Viktoria Bogner-Flatz

Department of Internal Medicine II, Klinikum rechts der Isar, Technische Universität München: PD Dr. med. Christoph D. Spinner

Hospital emergency departments in Germany are primarily intended to ensure medical care for persons with serious or life-threatening illness or injury. In the absence of any centralized administrative coding, the total number of emergency patients treated in Germany can only be estimated (1). However, it has been shown that up until 2013, case numbers were continually on the rise (2, 3). One reason for this is that low-urgency patients are presenting as emergencies, leading to overcrowding of emergency departments (4–9). The legally mandated minimum staffing levels has compounded the problem. Because of ongoing staff shortages, capacity is often reached earlier, leading to “exit block” in the emergency department—that is, it is impossible to move patients on from the emergency department in timely fashion because there are no beds available on the wards (10).

Because of the increasing numbers of patients presenting, emergency departments are increasingly having to notify emergency medical services (EMS) control centers that they are unable to accept any further patients for emergency care as they are now at or over capacity. However, since hospitals are legally obliged to accept patients, and hospital medical staff are correspondingly legally obliged to treat them, notifying the EMS in this way does not mean that the hospital is no longer providing emergency care—because refusing to treat an emergency patient violates doctors’ professional obligations under the Hippocratic oath and constitutes a failure to render assistance, which is an offense under § 323c StGB (the German Criminal Code). For this reason, EMS staff and dispatchers may, pursuant to the law governing the EMS, dispatch patients to a “closed” emergency department in a so-called forced or acute allocation. A forced allocation means delivery of a patient to a hospital that at that particular moment has neither the staff nor the structural capacity to treat the patient appropriately and in a timely manner. For patient outcomes, this can sometimes have serious consequences.

There is, however, no obligation to accept a patient if

- The hospital is not suitable
- The treatment required cannot be provided
- Another hospital is available that is able to provide care, or

Referrals and forced allocations of patients by year during the period 1 February 2013 to 31 December 2019 in the area covered by the Munich EMS

- The patient does not require immediate treatment (11).

The frequency of forced allocations of this kind in an urban area such as the city of Munich has not yet been investigated. The aim of this study was to quantify the number of forced allocations in the area covered by the Munich EMS and discuss the resulting problems. The information gained from this study could be used as a basis for the development of emergency planning and prediction.

Methods

Area covered by Munich EMS

The area covered by the Munich EMS is around 1000 km² with currently more than 1.8 million inhabitants. There are 12 emergency physician rapid response cars and 2 air rescue stations, supported by up to 43 emergency ambulances (EAs) and 34 patient transport vehicles (PTVs). Inpatient care is offered by 19 acute hospitals (*eBox*). Apart from the two university hospitals, four other hospitals meet the criteria of level I tertiary care (12, 13).

In the Greater Munich area, around 500 000 emergency patients are treated in the acute hospitals every year; of these, about 140 000 are dispatched to the hospitals by the EMS (14).

Interdisciplinary care capacity notification

Since February 2013, all hospital referrals in Munich originating with the Munich EMS have been coordinated with the EMS control center using the IVENA eHealth IT system (IVENA, Interdisziplinärer Versorgungsnachweis für den Rettungsdienst) (15). Basic information is passed on to the individual hospitals at

the time the arrival of the patient is notified. With this web-based application, the various actors providing prehospital and hospital medical care are advised in real time of care availability in the individual hospitals (16, 17). The application shows the user which department or unit (cardiac cath lab, computed tomography, etc.) in which hospital is either available or “closed.” The hospitals receive a notification when a patient is allocated to them by the EMS control center. This notification includes the following information: medical specialty expected/required, estimated time of arrival, patient age and sex, reason for emergency callout (e.g., heart attack, stroke, sepsis, intoxication, resuscitation), any resources required (e.g., trauma room, cardiac cath lab, intensive care bed), triage category (SK I–III) (*eBox*), mode of emergency transport (EA, PTV, emergency doctor vehicle, emergency rescue helicopter), and the name and station of the emergency transport.

Data collection

For this descriptive epidemiological study, the data recorded in IVENA eHealth in the period from 1 February 2013 to 31 December 2019 were analyzed. In addition to the overall number of patients and the number of forced allocations, the distribution of emergency patients across the various medical specialties was also studied. In a further step, based on their frequency, surgery, internal medicine, neurology, pediatrics, urology, and gynecology and obstetrics were analyzed.

The case data acquired during the data collection period were anonymized before transfer from IVENA eHealth and analysis (Microsoft Excel 2019; Microsoft Office, USA).

Results

Course over time of emergency admissions and forced patient allocations

During the data collection period from 1 February 2013 to 31 December 2019, 904 997 patients were transferred to a hospital in Greater Munich by the EMS. Of these, 25 952 patients had to be notified as forced allocations.

The number of emergency callouts in Munich rose from 123 925 in 2014 to 141 939 in 2019. During the same period—except in 2016—the number of forced allocations rose continuously and disproportionately (*Figure 1*). In 2014 there were only 1045 forced allocations (0.84% of all allocations); by 2019 forced allocations had risen to 9769 (6.88% of all allocations). Allowing for the rise in the population of Munich (1 490 681 in 2014, 1 542 211 in 2019; source: Munich Office of Statistics), the number of forced allocations per 100 000 head of population rose by a factor of about 9, from 70 in 2014 to 634 in 2019.

Seasonal variations

Analysis of the numbers shows that forced allocations occur especially in the first 3 months of the year (*eFigure 1*). The highest quarterly figures for forced allocations—1579, 2435, 3161, and 3990—were seen in 2015, 2017, 2018, and 2019. Here, too, with the exception of 2016, a rise is seen in the number of forced allocations over the period studied. The proportion of forced allocations more than doubled, from 5% of all allocations in the first quarter of 2015 to 11.4% in the first quarter of 2019.

Rates of temporary closure to admissions for internal medical care

Figure 2 shows in the form of a heat map the percentage rates for closure to admissions for internal medical care across all Munich hospitals. Red shows availability in 0 to 12.49% of all hospitals, green availability in 87.5% to 100%. Every year from 2017 to 2019, an increase in the rates of temporary closure is visible—especially during the first quarter of the year.

Analysis of the years 2017 to 2019

Since significantly more forced allocations were seen in the years 2017 to 2019, the further analysis relating to medical specialty, reason for hospital referral, triage category, and receiving hospital is limited to these three years.

Medical specialty and reason for referral

During the data collection period from 2017 to 2019, 13 030 of the 19 457 forced allocations were categorized under the medical specialty “internal medicine”; this equates to a proportion of 67%. Analysis of the reasons for hospital referral also showed that, at 59%, “medical emergency” was by far the commonest reason for a forced patient allocation (*eFigures 2, 3*).

FIGURE 2

Heat map showing availability of inpatient internal medical care in all Munich hospitals. Rows represent individual days during the period from 1 February 2013 to 31 December 2019; columns represent individual hours of a day from 00:00 to 23:00. Color coding represents the percentage of hospitals offering availability: red 0–12.49%, yellow 50–62.49%, green 87.5–100% availability (for detailed color coding and explanatory legend, see *eTable*).

TABLE

Forced patient allocations by medical specialty and urgency per month in the period 1 January 2017 to 31 December 2019

Time period	Internal medicine	Neurology	Pediatrics	Urology	Surgery	Gynecol./obstetrics	Other	Emergency treatment	Hospital treatment	Ambulatory treatment
2017										
01	1 166	45	20	48	12	5	64	177	1166	17
02	689	28	50	27	15	3	65	152	718	7
03	94	14	16	21	7	9	37	61	132	5
04	66	8	9	11	13	2	17	53	70	3
05	93	17	11	24	9	5	31	61	124	5
06	84	12	10	13	13	10	23	71	85	9
07	69	12	3	22	10	5	16	56	80	1
08	56	17	5	20	7	4	15	52	66	6
09	82	19	6	10	18	9	26	61	105	4
10	216	29	10	27	15	3	40	92	244	4
11	90	14	7	38	12	4	34	85	109	5
12	178	30	32	15	17	7	45	133	186	5
2018										
01	640	61	62	18	19	6	50	132	715	9
02	774	61	93	9	24	8	72	189	841	11
03	1006	57	76	14	22	6	83	193	1061	10
04	124	33	15	6	13	5	49	122	119	4
05	115	27	44	23	17	9	38	91	171	11
06	78	13	15	7	19	9	32	53	115	5
07	83	17	26	10	11	8	43	68	122	8
08	85	18	9	23	18	8	25	70	106	10
09	105	20	4	17	16	9	35	78	122	6
10	158	26	7	21	25	18	50	106	192	7
11	164	36	12	49	24	12	36	107	213	13
12	215	31	43	19	24	6	60	128	264	6
2019										
01	744	68	106	61	20	12	20	152	859	20
02	1443	101	194	88	36	7	25	252	1611	31
03	795	64	93	54	21	11	27	208	842	15
04	544	34	25	101	27	6	10	122	594	31
05	613	59	22	77	21	9	19	145	653	22
06	427	42	40	65	33	21	17	147	478	20
07	369	56	144	59	37	16	36	125	564	28
08	161	49	2	31	17	9	17	90	189	7
09	194	44	38	21	18	18	17	102	244	4
10	404	98	52	48	37	19	20	164	504	10
11	493	134	73	76	35	17	21	220	607	22
12	413	76	57	83	24	18	16	174	492	21
Tot	13 030	1470	1431	1256	706	333	1231	4292	14 763	402

Generally, 75% to 80% of forced allocations during the first quarter of each year come into the category of “internal medicine” (Table).

Hospital and triage category

Most forced patient allocations are distributed among six acute hospitals: the Munich University Hospital at Grosshadern, the municipal hospitals in Bogenhausen, Harlaching, Neuperlach, and Schwabing, and the Munich Technical University Klinikum rechts der Isar (eFigure 4).

Triage category SK II is the category into which most forced patient allocations in Munich fall. However, even patients in the highest or most urgent triage category SK I have to be forcibly allocated. Triage category SK III is negligible; not even a seasonal increase can be identified (Table).

Discussion

During the period under study, the number of emergency hospital referrals by the EMS in Munich rose by more than 14.5% (see the EMS Report for Bavaria for 2019 [18]). Against this, during the same period, the number of forced patient allocations went up by a factor of more than 10, from 951 to 9769 (Figure 1). With increasing levels of understaffing, lowering of required minimum levels of nursing staff since 1 January 2020, and reducing hospital capacities, this trend is set to continue, possibly leading to bottlenecks that potentially put patients at risk (19–21). Figure 2 shows clearly the marked increase in temporary closures to admissions in 2017, 2018, and 2019.

Hospital emergency departments, which under this trend are increasingly frequently at the receiving end of forced allocations of patients, are compelled, even if they lack resources, to ensure emergency treatment at specialist level. In such situations, a single doctor and nurse often have to care for several emergency patients in parallel, and on top of that they have to ensure the care of those patients who, due to exit block, remain in the emergency department until they can be transferred to a bed elsewhere (Figure 3).

The majority of forced allocations relate to patients in triage category SK II, that is, those with an urgent problem expected to require admission as an inpatient, who are brought to a hospital which may be assumed to have a reduced treatment capacity and limited ability to provide care. However, patients in triage category SK I are also involved in forced allocations. These are patients who are seriously ill or severely injured and require immediate treatment, including those with heart attack, stroke, multiple trauma, or impairment of vital organs requiring intensive care, e.g., acute respiratory failure or shock. In such cases, a delay in treatment can have serious consequences (Table).

It was further shown that forced allocations especially during the first 3 months of the year can reach critical levels (eFigure 1). This rise in forced allocations during the first quarter is unequivocally

FIGURE 3

Mechanism of forced patient allocations: (1) Increase in referrals leads to (2) increased flow of patients onto wards, leading to (3) exit block in the emergency department, which (4) has to notify temporary closure to new admissions, leads in turn to (5) forced allocation of patients

due to increased demand in the internal medicine specialty. During the first 3 months of the year alone, 75% to 80% of forced allocations are categorized under “internal medicine” (Table). One possible reason for these forced allocations could be the higher rate of patients with influenza or an acute respiratory disease (ARD) during the first 3 months of each year. Comparing data from the Influenza Working Group of the Robert Koch Institute (RKI) with those collected in IVENA eHealth, there seems to be at least a partial association between an elevated practice index (mean relative deviation of observed ARD from a “normal level” calculated for each private practice) and the forced allocations (Figure 4). At this time of year there are several factors that can lead to a lack of resources; besides higher rates of staff sickness, the rate of patient self-referral is also higher (22, 23).

Since it is the inpatient treatment capacity on medical wards that is being increasingly affected during the December to March period, hospital administrators could consider assigning beds from elective surgery to medical wards during this period, or reducing elective schedules in these months, to allow for smoothing of any bottlenecks in emergency care.

Providing care for an emergency patient through forced allocation of that patient requires extra work in terms of organization and bureaucracy. Standard outflow to already full wards is blocked (exit block). “Boarding out” a patient (that is, accommodating an emergency patient in a department belonging to a medical specialty that is not the one the patient needs), retransferring the patient after stabilization, or temporarily keeping the patient in the emergency department, all tie down more resources that are urgently needed. It seems reasonable to assume that, especially during the nighttime period, when fewer staff are on shift, the functioning of the emergency

departments and the welfare of patients are at risk; the latter applies to both the “forcibly allocated” patients and the other patients in the emergency department, since fewer of the limited resources are available for all of them.

Forced allocation of patients in triage category SK I should always be done with close coordination between the emergency physician or paramedics on scene, the EMS control center, and the hospital. If the patient is in a life-threatening condition and insufficient staff are available at the hospital, the doctor and/or paramedics should if possible support the immediate care-giving in the hospital; in some circumstances, it may be better to accept a longer journey to another hospital that has not yet reached capacity.

Similar to preparations for a mass casualty incident, hospitals should develop plans and standard operating procedures (SOP) for a rush of forced patient allocations and keep these as part of their disaster preparation plans. Because of the problems described above, a rise in forced allocation of patients is to be expected, especially during epidemics or pandemics caused by aerogenous and/or aerosol-transmitted pathogens (e.g., coronavirus, influenza virus, or norovirus). Hospitals’ disaster plans should take account of the different patterns of forced allocation of patients for medical care as a function of diagnosis or patient status and the potential options for care when inpatient capacity is lacking.

The trend in temporary closures and the resulting forced allocations is likely to continue for the next few years at least. For this reason, concepts need to be developed, not just at hospital level, but at regional level, that especially during the flu epidemics in the early months of the year will enable patients to be adequately cared for and ensure that emergency departments can function in an orderly manner.

FIGURE 4

Forced patient allocations in Munich (blue line) and acute respiratory disease (ARD) activity in Bavaria (green line);

Medical practice index = mean relative deviation of observed ARD [22] in the period 1 February 2013 to 31 December 2019

IVENA, Interdisciplinary care capacity notification (Interdisziplinärer Versorgungsnachweis für den Rettungsdienst)

Hospitals and emergency departments should take part in syndromic surveillance, in which all cases of influenza-like illness seen across all the emergency departments in a region are recorded, and should use it as an early warning system.

Limitations

Since IVENA eHealth was only introduced in February 2013, there are no data for January 2013 and only partial data for February and March 2013.

Since neighboring emergency dispatch centers do not use IVENA eHealth, data are incomplete. Forced allocations booked in by other dispatch centers outside the Munich EMS area, and conversely those within Munich that were accepted by neighboring dispatch centers, do not appear in IVENA eHealth. It may therefore be assumed that the actual number of forced allocations of patients is higher than represented here.

IVENA eHealth provides no baseline data about patients, and therefore nothing can be said about the severity of illness in the individual cases of forced allocation. Whether patients were exposed to risk in any individual case cannot be ascertained. This would require analysis of internal hospital documentation regarding the care of forcibly allocated patients and other emergency department patients at peak times of forced allocation. The distribution of forced allocations among hospitals can also be only a matter for

speculation. Why those hospitals that treat the largest number of emergency patients should also be the ones that receive the largest number of forced allocations remains unclear (*eFigure 2*).

It is not possible to say with certainty why the number of forced allocations was lower in 2016 than in the previous year. However, the RKI reported that influenza-related hospital admissions were lower in 2016 than in 2017 to 2019 (22).

The exact reasons for temporary closure for individual medical specialties (no available beds, staff shortages, etc.) could not be analyzed. Because of lack of data, it was also impossible to investigate whether some kind of chain reaction was the cause of the rise in temporary closures, i.e., whether a hospital will declare itself temporarily closed to new patients when surrounding hospitals do so, in order not to become overloaded itself. Since temporary closures are one of the reasons for the rise in forced allocations, it would be desirable for data on this to be collected at a supra-hospital level.

Conflict of interest statement

The authors declare that they have no conflict of interest.

Manuscript received on 29 September 2019, revised version accepted on 22 April 2020.

References

- Greiner F, Slagman A, Stallmann C, et al.: Routinedaten aus Notaufnahmen: Unterschiedliche Dokumentationsanforderungen,

- Abrechnungsmodalitäten und Datenhalter bei identischem Ort der Leistungserbringung. *Gesundheitswesen* 2020; 82 (Suppl. 1): S72–82.
2. Schreyögg J, Bäuml M, Krämer J, Dette T, Busse R, Geissler A: Forschungsauftrag zur Mengenentwicklung nach § 17b Abs. 9 KHG, Endbericht Juli 2014, Hamburg: Center for Health Economics (hche); 2014: 9.
 3. Beivers A, Dödt C: Ökonomische Aspekte der ländlichen Notfallversorgung. *Notfall Rettungsmed* 2014; 17: 190–8.
 4. Köster C, Wrede S, Herrmann T, et al.: Ambulante Notfallversorgung. Analyse und Handlungsempfehlungen. Göttingen: AQUA-Institut 2016.
 5. IGES Institut: Ambulantes Potenzial in der stationären Notfallversorgung. Projektphase II. Ergebnisbericht für das Zentralinstitut für die Kassenärztliche Versorgung in Deutschland. Stand: 19. Juli 2016. Berlin: IGES Institut 2016.
 6. Schmiedhofer M, Möckel M, Slagman A, Frick J, Ruhla S, Searle J: Patient motives behind low-acuity visits to the emergency department in Germany: a qualitative study comparing urban and rural sites. *BMJ Open* 2016; 6: e013323.
 7. Pines JM, Mullins PM, Cooper JK, Feng LB, Roth KE: National trends in emergency department use, care patterns, and quality of care of older adults in the United States. *J Am Geriatr Soc* 2013; 61: 12–7.
 8. Carter EJ, Pouch SM, Larson EL: The relationship between emergency department crowding and patient outcomes: a systematic review. *J Nurs Scholarsh* 2014; 46: 106–15.
 9. Scherer M, Lühmann D, Kazek A, Hansen H, Schäfer I: Patients attending emergency departments—a cross-sectional study of subjectively perceived treatment urgency and motivation for attending. *Dtsch Arztebl Int* 2017; 114: 645–52.
 10. Karagiannis C, Kluge S, Riessen R, Krakau M, Bein T, Janssens U: Auswirkungen des Pflegepersonalmanagements auf die intensivmedizinische Versorgungskapazität in Deutschland. *Med Klin Intensivmed Notfmed* 2019; 114: 327–33.
 11. Kanz KG: Umgang mit Zwangsbelegung. In: Strametz R, Bayeff-Filloff M: Risikomanagement in der Notaufnahme. 1. Auflage 2019, Kapitel 2.3.1, 176–80.
 12. Institut für Notfallmedizin und Medizinmanagement (INM), Klinikum der Universität München. Rettungsdienstbericht Bayern 2018.
 13. Bayerisches Staatsministerium für Gesundheit und Pflege. Krankenhausplan des Freistaates Bayern. 1. Januar 2019 (44. Fortschreibung) www.stmgp.bayern.de/gesundheitsversorgung/krankenhaeuser/krankenhaeuser-in-bayern/ (last accessed on 5 June 2020).
 14. Trentzsch H, Dödt C, Gehring C, Vesper A, Jauch KW, Prückner S: Analyse der Behandlungszahlen in den Münchener Notaufnahmen des Jahres 2013/2014. *Gesundheitswesen* 2020; 82: 431–40.
 15. IVENA eHealth – interdisziplinärer Versorgungsnachweis; www.ivena.de/page.php?k1=main&k2=index (last accessed on 5 June 2020).
 16. Auhuber TC, Schweigkofler U, Mangermann T, Hoffmann R: Das Unplanbare planen. Notfallmanagement: Instrumente zur Schnittstellenoptimierung zwischen Präklinik und Klinik. *KU Gesundheitsmanagement* 2012; 81: 26–9.
 17. Jung HG, Schweigkofler U: Interdisziplinärer Versorgungsnachweis „IVENA“ – Erfahrungen aus 2 Jahren Routinebetrieb. Tagungsband notT, 1. Symposium ICT in der Notfallmedizin 2012; 53–7.
 18. Rettungsdienstbericht Bayern 2019; www.inm-online.de/images/stories/pdf/Rettungsdienstbericht_Bayern_2019.pdf (last accessed on 5 June 2020).
 19. Aiken LH, Sloane DM, Bruyneel L, et al.: Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. *Lancet* 2014; 383: 1824–30.
 20. Osterloh F: Pflegemangel im Krankenhaus: Die Situation wird immer dramatischer. *Dtsch Arztebl* 2018; 115: A-1154.
 21. Bundesgesetzblatt Jahrgang 2019 Teil I Nr. 37, Verordnung zur Festlegung von Pflegepersonaluntergrenzen in pflegesensitiven Bereichen in Krankenhäusern (Pflegepersonaluntergrenzen-Verordnung-PpUGV). www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&start=/t/@attr_id=%27bgbl119s1492.pdf%27#_bgbl_

Key messages

- Since February 2013, all hospital referrals in Munich originating with the Munich EMS have been coordinated by the EMS control center through an IT system that is used by all the hospitals.
- From 1 February 2013 to 31 December 2019, 904 997 patients were allocated to a Munich hospital by the EMS control center; 25 952 of these patients had to be forcibly allocated.
- Of all the medical specialties, internal medicine is the one most often involved in forced patient allocations (more than 59% of instances).
- In 2014, forced patient allocations made up 0.84% of all referrals from emergency services; by 2019, the rate had gone up to 6.88%. In 2017, 2018, and 2019, in particular, the rate of temporary closure of emergency departments rose markedly.
- Most forced patient allocations were categorized as triage category SK II, indicating patients with an urgent problem expected to require admission as an inpatient.

[_2F%2F%5B%40attr_id%3D%27bgbl119s1492.pdf%27%5D__1582040047810](https://www.aerzteblatt-international.de/20m0465) (last accessed on 5 June 2020).

22. Robert Koch-Institut: Berichte zur Epidemiologie der Influenza in Deutschland (Saisonberichte 2012/2013–2017/18) der Arbeitsgemeinschaft Influenza des Robert Koch-Instituts. <https://influenza.rki.de> (last accessed on 5 June 2020).
23. Schull MJ, Mamdani MM, Fang J: Influenza and emergency department utilization by elders. *Acad Emerg Med* 2005; 4: 338–44.
24. Morbey RA, Charlett A, Lake I, et al.: Can syndromic surveillance help forecast winter hospital bed pressures in England? *PLoS One* 2020; 15: e0228804.
25. Kanz KG, Hornburger P, Kay MV, Mutschler W, Schäuble W: mStART-Algorithmus für Sichtung, Behandlung und Transport bei einem Massenanfall von Verletzten. *Notfall Rettungsmed* 2006; 9: 264–70.

Corresponding author

Prof. Dr. med. Karl-Georg Kanz
Zentrale interdisziplinäre Notaufnahme
Klinikum rechts der Isar
Ismaninger Str. 22
81675 München, Germany
karl-georg.kanz@mri.tum.de

Cite this as:

Rittberg W, Pflüger P, Ledwoch J, Katchanov J, Steinbrunner D, Bogner-Flatz V, Spinner CD, Kanz KG, Dommasch M: Forced centralized allocation of patients to temporarily 'closed' emergency departments—data from a German city. *Dtsch Arztebl Int* 2020; 117: 465–71.
DOI: 10.3238/arztebl.2020.0465

► Supplementary material

eTable, eFigures, and eBox:
www.aerzteblatt-international.de/20m0465

Supplementary material to:

Forced Centralized Allocation of Patients to Temporarily 'Closed' Emergency Departments

Data From a German City

by Wendelin Rittberg, Patrick Pflüger, Jakob Ledwoch, Juri Katchanov, Dieter Steinbrunner, Viktoria Bogner-Flatz, Christoph D. Spinner, Karl-Georg Kanz, and Michael Dommasch

Dtsch Arztebl Int 2020; 117: 465–471. DOI: 10.3238/arztebl.2020.0465

eTABLE

Supplement to Figure 2 (heat map)

0–12.49%	12.5–24.9%	25–37.49%	37.5–49.9%	50–62.49%	62.5–74.99%	75–87.49%	87.5–100%
----------	------------	-----------	------------	-----------	-------------	-----------	-----------

Availability of inpatient internal medical care (number of available hospitals – number of temporarily closed hospitals / number of available hospitals in the time slot); any time slot in which a hospital was not freely accepting patients for at least 20 minutes is classed as "closed" for that hospital.

eFIGURE 1

Forced patient allocations per quarter (Q) during the period 1 February 2013 to 31 December 2019 in the area covered by the Munich EMS

eFIGURE 2

Forced patient allocations by reason for hospital referral in the period 1 January 2017 to 31 December 2019

eFIGURE 3

Forced patient allocations by medical specialty in the period 1 January 2017 to 31 December 2019

eFIGURE 4

Forced patient allocations by hospital in the period 1 January 2017 to 31 December 2019
 LMU, Ludwig-Maximilians-University; MMH, Munich Municipal Hospital; TUM, Technical University of Munich; UHM, University Hospital of Munich

eBOX

Triage categories (SK I–III)

The triage categories used for documentation in IVENA eHealth follow the mSTaRT categories used for preclinical triage in a mass casualty situation (25).

- **SK I:** Emergency treatment required, equivalent to mSTaRT triage category Red. On arrival at the hospital, patients in this category must be treated immediately (e.g., trauma room, intensive care, intermediate care, stroke unit, chest pain unit, etc.).
- **SK II:** Inpatient treatment required, equivalent to mSTaRT triage category Yellow. Treatment should be started within about 30 min of arrival at the hospital; inpatient admission will probably be necessary.
- **SK III:** Ambulatory treatment required, equivalent to mSTaRT triage category Green. These patients should be seen by a doctor within about 90 min and can normally be discharged after treatment.

Munich hospitals that receive forcibly allocated patients

University Hospital of Munich, Grosshadern and City Center sites; Munich Municipal Hospitals at Bogenhausen, Harlaching, Neuperlach, and Schwabing; Helios-Klinikum München West and Helios-Klinikum München Perlach; Klinikum Dritter Orden; Krankenhaus Barmherzige Brüder; Red Cross Hospital; Chirurgisches Klinikum München Süd and Internistisches Klinikum München Süd; Krankenhaus Neuwittelsbach; Dr. von Hauner Children's Hospital; Krankenhaus Augustinum; Isar-Amper-Klinikum München Ost; the German Heart Centre, Munich; Krankenhaus Martha–Maria; Frauenklinik Dr. Geisenhofer; Schreiber Klinik; Diakoniewerk München–Maxvorstadt; Clinic Dr. Decker; TMU (Technical University of Munich) Klinikum rechts der Isar.