RAMPEN MANAGEMENT

ACADEMIEJAAR 2020-2021

THE INCIDENT MANAGEMENT RESPONSE OF THE EMERGENCY DEPARTMENTS IN BELGIUM DURING THE FIRST WAVE OF THE SARS-COV-2 PANDEMIC.

STUDENT: Ruben Haesendonck

PROMOTOR: Marc Sabbe

THE INCIDENT MANAGEMENT RESPONSE OF THE EMERGENCY DEPARTMENTS IN BELGIUM DURING THE FIRST WAVE OF THE SARS-COV-2 PANDEMIC.

Ruben M Haesendonck[1*], MD

Tinne Verhoogen[2*], MD

Luc J M Mortelmans[3,4], MD

Didier Desruelles[2], MD

Patrick Van De Voorde[5,6], MD, PhD, FERC

Marc B Sabbe[2], MD, PhD

[1] Emergency department, ZOL Hospital, Genk, Belgium

[2] Emergency department, University Hospital Leuven, Belgium

[3] Emergency department, ZNA Campus Stuivenberg, Antwerp, Belgium

[4] Research group on emergency and disaster medicine, VUB, Brussels, Belgium

[5] Emergency department, University Hospital Ghent, Belgium

[6] Medical Director 112, Federal Department Health Belgium

**equally contributed as first author*

Correspondence: *Ruben Haesendonck*

Emergency department, ZOL Hospital

Schiepse Bos 6, 3600 Genk, Belgium

KEYWORDS

SARS-CoV-2, COVID-19, Pandemic, Surge response, Emergency department, Incident management, Disaster medicine.

ABBREVIATIONS

COVID-19: Coronavirus Disease 2019

ED: Emergency Department

M: Mean

PPE: Personal Protective Equipment

SARS CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

SD: Standard Deviation

WHO: World Health Organization

ABSTRACT

OBJECTIVE

The current SARS-CoV-2 pandemic has demonstrated that emergency departments (EDs) need to reorganize and restructure their operations rapidly. Only few studies have shown the impact of the pandemic on structural and logistical issues at the ED and measures taken.

METHODS

We surveyed all Belgian ED's on the implemented changes at the start of the pandemic in relation to the four S's in disaster medicine: Structure, Staff, Supplies and System. In addition, we asked for quantitative data regarding patient numbers.

RESULTS

Belgian EDs felt largely unprepared for an epidemiological disaster of this magnitude, but nevertheless dynamically restructured their organization. A 46% increase in ED beds was created in both in- and out-hospital modalities. More than half of the ED beds were reserved for COVID-19 suspected patients, who were largely accommodated within the hospitals' structure. 68% indicated they could not provide the same patient care in these modalities. EDs deployed extra personnel and provided additional training and psychological support. More than half reported an acute shortage of personal protective equipment and several reported a shortage of ventilatory equipment and medications.

CONCLUSION

Our retrospective survey demonstrates that EDs were insufficiently prepared, but adequately employed many aspects of the "4S's" theory for surge capacity.

INTRODUCTION

Shortly after the first detection of a Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2) case in Belgium, the current health care crisis was declared as a pandemic by the World Health Organization (WHO) on the 11th of March 2020. At the day of writing, more than 125 million infections and 2.75 million deaths have already been reported worldwide.[1]

As the current pandemic and previous epidemics have shown, emergency departments (EDs) are at the frontline of care for outbreaks of viral diseases.[2,3] As gate keeper of the hospital, they have to reorganize and restructure their operations swiftly in order to cope with a rapidly increasing number of patients while maintaining high quality and efficient care.[3–5]

In disaster medicine, EDs should respond to a surge in patient presentations by rapidly expanding their structure, staff, supplies and adjust their functioning systems tailored to the needs.[6] However, there is insufficient scientific literature on how an ED should deal with sudden onset pandemics.[7] Up to now there are limited studies who assessed the ED's preparedness of the COVID-19 pandemic. An Indian survey based study revealed that there was a high variance in the level of preparedness among EDs.[8]A similar study in France showed that EDs were poorly prepared.[9]

This study performed an assessment of measures taken by the Belgian EDs at the start of the current health care crisis, in the period from the 1st of March until the 31st of May 2020. This assessment must provide more information in order to learn and to better prepare for a next wave or pandemic.

METHODOLOGY

We conducted a retrospective study among Belgian EDs following an approval by the research Ethical Committee UZ/KU Leuven (reference number MP016300).

A survey consisting of 40 questions was sent by mail to all heads of service of Belgian EDs using the online SurveyMonkey platform® (SurveyMonkey Inc., California, US). The questions concerned the four S's in disaster medicine, namely the expansion and reorganization of the ED structure, presence of staff and supplies and actions undertaken to facilitate the extraordinary patient care and flow. The survey covered the time period between the 1st of March until the 31st of May 2020. The extensive survey took 30 to 40 minutes to complete and also required data from the hospital management concerning general hospital information. In a second round, we e-mailed, if necessary, a reminder of our questionnaire. If still no response was provided, we contacted the ED heads by telephone. In a last round we made extra calls to ascertain, or to fill in missing data.

For descriptive statistics Excel® (Microsoft Corp., Washington, US) and Graphpad Prism® (Graphpad Sofware Inc., California, US) were used. Baseline characteristics are expressed as numbers and percentages for categorical variables. Mean and standard deviation or median and interquartile range are used for continuous variables, depending on their distribution.

For comparative statistics, we used the Statistical Package for the Social Sciences program (SPSS version 25, IBM Corp., New York, US). A two-sided p value less than 0.05 was considered statistically significant.

RESULTS

SURVEY RESPONSE RATE

Out of all 114 Belgian EDs questioned, 62 (54%) answered the primary quantitative questions we inquired for. 41% of the ED heads completed 90% or more of the questions in our survey.

Two out of three respondents were non-university teaching hospitals, 19% non-university non-teaching hospitals and 14% university hospitals. The majority of respondents (60%) were small hospitals (<500 beds), 32% were middle-sized hospitals (between 500 and 1000 beds) and 8% were large hospitals (>1000 beds). With a total of 30.990 beds, our respondents represent approximately 60% of all Belgian hospital beds.[10]

STRUCTURE

Sudden onset pandemics require extreme precautions as physicians are not aware of the contingency risks when treating the first patients. Finding the necessary space to treat potentially affected patients, while limiting exposure to staff and other patients, is a fundamental aspect of a proper epidemiological disaster response. In Belgium, the majority of EDs reported that they expanded their capacity. 52 out of 62 respondents (84%) augmented the amount of ED beds. On average, the total number of beds was expanded by 46%. Interestingly, there was no correlation between hospital size and relative upscaling of ED beds.

84% of the responding hospitals used, in addition to their ED, one or several extra modalities to accommodate patients, either COVID-19 suspected or typical ED patients (fig 1a). 40% of hospitals implemented ED care at other wards, 65% utilized their ED garage, 29% utilized extra tents and 29% used containers to ensure ED care. 6% reported the use of additional spaces in the hospital (chapel and dining hall amongst others). There was also no correlation between hospital size and type of extra structure used. Most EDs reserved 50% or more of their beds for COVID-19 suspected patients, with an average of 64% (fig 1b). They were mostly accommodated inside the hospitals' structure, more specifically in the typical ED space (58% of ED beds), other wards (15%) and the makeshift garage structure (19%) (fig 1c). Less than 10% of all beds provided for COVID-19 suspect patients were sheltered in tents or containers. 72% of the ED heads indicated they rather used these types of structures outside of the building for (pre-)triage. Alternatively, care for ambulatory ED patients could be shifted to other locations. 29% of the hospitals provided the urgent care for ambulatory patients like minor trauma outside of the ED (this included the use of consultation spaces from traumatology/orthopedics). 69% of the EDs also indicated that they treated ambulatory patients with mild respiratory symptoms outside of the typical ED space.

When questioning for the quality of patient care during and before the current healthcare crisis, 68% declared that they were able to provide the same level of care as they did before (fig 1d). Our dataset was too small to study any correlation between the type of structure used and

perception of quality of care. However, there was a trend toward a more negative perception of care when out-of-hospital structures were used.

Providing extra rooms for patient care meant sacrificing other spaces in the ED. The most encountered issues concerning space were loss of waiting room (42% of respondents), problems of access to the ambulance garage (38%), loss of storage space (29%), loss of access to toilets (25%) and loss of training and/or coordination space (22%).

Looking to the future, 64% of the EDs reported that there exist plans for a new hospital or renovation of the existing ED. 55% of the questioned EDs have scheduled this within 5 years, the others within 10 years. In the open comments of our survey many EDs indicated they are exploring means of incorporating surge capacity infrastructure into their new plans, or that they will revise existing plans.

STAFF

Increased bed capacity also necessitates additional workforce and demands flexibility of healthcare personnel. Among the participating EDs, the majority deployed extra staff, mainly nurses (90%), logistical staff (82%) and physicians (71%) (fig 2). Most indicated that they needed less than 50% extra personnel. These extra staff members originated mostly from other hospital wards (96%) (fig 2). Furthermore, trainees (38%) and retired staff (8%) were put into service. 60% of respondents reported that more overtime hours were registered for physicians, and 20% for nursing staff. A higher absenteeism rate was observed in 27% of the EDs if compared with the same period of one year earlier.

To support personnel, most of the EDs organized extra training on the correct use of PPE (96%) and the management of COVID-19 (88%). Specific simulation training (44%) and extra coaching on the use of thoracic ultrasound (10%) was implemented in several hospitals. Moreover, 87% of the participating EDs provided additional psychological support for their staff.

SUPPLIES

Pandemics require a sudden need of large amounts of specialized equipment, not only to test and treat infected patients, but also to protect health care staff and regular ED patients. More than half of our respondents (56%) reported an acute shortage (defined as a stock for less than 7 days) of personal protective equipment (PPE) (fig 3). In general, most of the EDs had sufficient medication available. However, several EDs reported an acute shortage of antibiotics (10%), muscle relaxants (36%) and certain sedatives (34%). 17% of the participating EDs also had a shortage of ventilators and/or non-invasive breathing material. The shortage of medication, respiratory equipment or PPE that was encountered in some EDs was not correlated with the number of COVID-19 suspected patients they had admitted.

SYSTEM

The overall hospitals' response to a disaster, such as their preparedness, structural reorganization, logistical planning and personnel management, is critical to maintain a sustainable surge capacity. Most of the participating hospitals (93%) responded that they have prepared a plan for mass casualty incidents. However, only 61% had made specific preparations for an epidemiological disaster (fig 4). At best, 15% felt they were sufficiently prepared for the COVID-19 pandemic. (fig 4)

When reorganizing, hospitals have to anticipate the number of patient presentations. As mentioned before, almost every hospital augmented their ED bed capacity and provided separate spaces for COVID-19 suspected and regular ED patients. Most EDs reserved half or more of their beds for suspect patients (fig 1b). 42 respondents provided information on the actual number of patients that were seen at their ED in the questioned period. In hindsight, only 1 in 3 patients presenting at the ED was considered a suspect and only 7% finally tested positive (fig 5a). On average, the number of patient presentations at the ED dropped by 29% compared to the average number of patients seen in a 3-month period the year before (fig 5b). There were only two hospitals that registered slightly more patients.

LIMITATIONS

This study has some limitations. As for most datasets resulting from surveys, nonresponse error might contribute to our findings. Additionally, the answers and requested data that were provided possessed a certain subjectivity. We did not perform any external validation of the provided quantitative data. Last, our survey was designed diligently but did not undergo a formal content validation process.
Given that the pandemic and our knowledge on it is evolving and forcing us to take up-to-date measures, it would be interesting to conduct a second survey to see if there were dynamic changes to operational and organizational measures in the second wave of the pandemic.

For future research, it would be useful to inquire about the measures the EDs wish they would have taken when reflecting back on this disaster experience. These answers would be an important step toward improved epidemiological preparedness. Besides, it would be interesting to assess measurable health care parameters and outcomes (e.g. waiting times, mortality, etc.) to perform a comparison between hospitals and disaster measures taken, or to examine preparedness as a predictor of disaster outcomes. We did not inquire for these data due to the sensitivity of this subject and the multifactorial variables defining them. Nevertheless, these parameters would also greatly enhance our understanding of disaster preparedness.

DISCUSSION

Since the beginning of the pandemic in 2020, enormous efforts have been made to augment the surge capacity for COVID-19 patients. Most recent literature on this subject considered surge capacity of hospitals in general and intensive care departments.[11,12] EDs, however, act as the main gate to enter this part of our healthcare system. Therefore, this study performed an assessment of the measures taken by the Belgian EDs during the first wave of the pandemic. Our survey demonstrates that EDs reinvented themselves by expanding their structure, staff and supplies, and adjusting their operational systems. With a 54 % response rate and a total of 30.990 hospital beds, our respondents represent 60% of all Belgian hospital beds. This makes our sample representative for Belgium.

Pandemic disasters pose many specific challenges due to the risk of infecting staff and other patients. When uncertain about infection rates and transmission, it is imperative that suspected infected patients do not come in contact with other ED patients. There are a number of possibilities to ensure separation: individual hospitals can restructure their ED space, they can use other (non)medical hospital spaces, or build temporary structures such as tents or containers outside of the hospital building. Alternatively, large, centrally coordinated temporary surge facilities, as were used in the U.S., China and Hong Kong, can be constructed.[13] These possibilities have their own advantages and disadvantages. Large temporary units could be a good scenario for prolonged surges, but they are costly, and finding enough staff and supplies can be a barrier. In Belgium, it was opted to reorganize every ED individually, adapting their individual capabilities to meet the surge in continuation of care for other ED patients. Our survey demonstrated that EDs used various structural approaches to meet the increased spatial demands. Most hospitals provided the majority of COVID-19 suspect patient care within the walls of the hospital structure. Although almost one out of three of the respondents used tents and/or containers, only a minority of COVID-19 suspect patients were accommodated here. The out-of-hospital structures were rather used for triage or ambulatory patient care.

Our assessment on the planning of new hospitals or ED renovations revealed that the majority of Belgian EDs plan to do so within 5 to 10 years. Many EDs indicated that they are exploring means of incorporating surge capacity infrastructure into their new plans, or that they will revise the existing plans. This creates great opportunities for better preparedness for future epidemiological disasters. It is advised to convey new plans with the counsel of hospital disaster management specialists in order to anticipate specific needs. Amongst others, the following modifications are worth considering. The obvious needs include a possibility of double entry and easy makeshift separation walls for cluster isolation. Negative pressure rooms, although not crucial in this pandemic, might be in the light of future pandemics. It would be of interest to opt for out-of-hospital structures rather as pre-triage and for ambulatory patient care.

In addition to structural problems, several Belgian EDs also faced staffing challenges. However, due to the decision of the federal government on 14th of March 2020 to postpone all non-urgent care in the hospitals, there was extra staff available (working previously at the operating theatre, consultation or other departments). Our study demonstrated that the majority of Belgian EDs deployed additional staff (physicians, nursing and logistical staff), most of them normally working on other wards. Furthermore, we also noticed an increased absenteeism rate than

normal. We could not determine whether this was due to an infection with COVID-19, psychological burden or other reasons.

Belgian EDs did not challenge major medication shortages. However, in more than half of the EDs there was an acute shortage of PPE. This shortage was a worldwide problem during the first wave of the pandemic.[14,15] For future reference, it would be wise to stockpile sufficient PPE in a central and/or local stock managed and distributed centrally. Additionally, universal guidelines on the appropriate use and need of PPE could help to optimize the availability of PPE.[16]

EDs had to estimate the number of patient presentations in anticipation of the surge. Nearly all Belgian EDs decided to expand their bed capacity. Nevertheless, it has now become clear that ED patient volumes have decreased across the globe and our study further supports these findings.[17,18] One can speculate that this was due to fewer traffic and/or workplace accidents, or due to fear of exposure to infected patients or concerns of themselves overwhelming the hospitals. It is becoming increasingly clear that these latter impose great risks for so called 'secondary deaths'.[19]

The increased bed capacity and time-consuming workup of patients in the COVID suspect zone forced hospitals to deploy more staff and to increase working hours. Personnel under pressure and afraid to get infected may have lead to psychological disorders.[20] During disasters, it is therefore recommended to guide staff and to provide sufficient psychological support.[21] We observed that the Belgian EDs committed themselves to organize additional training. In addition, the majority of EDs provided additional mental support during the first wave of the pandemic to respond to these challenges and needs.

Although disaster preparedness is an integral part of hospital procedures, this survey is an eye-opener regarding Belgian ED preparation for pandemic disasters. More than one out of three indicated they had not prepared a plan for epidemiological disasters. Almost every Belgian ED reported they felt unprepared for this disruptive pandemic. As this might not be the last pandemic[22,23], it is clear that specific pandemic disaster plans should be established. Hospital pandemic disaster preparedness should involve all aspects of patient care. Having disaster teams that include representatives from all hospital areas is of paramount importance in avoiding fragmentation.[24]

CONCLUSION

Due to the specific nature of pandemics, it is now clear that this type of disasters requires multidisciplinary strategic and operational planning to be appropriately prepared. Based on limited information, EDs had to make difficult decisions regarding hospital management, such as how to restructure their ED to triage and care for both suspect and non-suspect patients, how to manage personnel working schemes and how to guarantee their physical and psychological well-being. Our survey demonstrates that Belgian EDs were unfortunately not well prepared for this type of disaster, but nevertheless adequately employed many aspects of the "4S's" theory for surge capacity (Structure, Staff, Supplies, Systems) to respond to this pandemic. Overall, EDs were able to create more than enough space in their EDs, adjacent departments and in out-hospital structures to accommodate COVID-19 suspect patients. Although the number of patients decreased compared to the year before, the care including donning and doffing clearly required more time per patient. To manage this, Belgian EDs could deploy more personnel, mostly originating from departments in which certain functions were temporarily tapered down. Nearly all EDs provided the much-needed additional support for their personnel (training and psychological).

For future reference, EDs should, in addition to stockpiling sufficient supplies, prepare strategic plans for coming pandemics.

CONFLICT OF INTEREST, ACKNOWLEDGEMENTS

The authors have no conflicts of interest to declare.

We want to express our thanks to Prof. Em. Jaak Billiet for aiding in the setup of the questionnaire for the survey and Elisabeth Rossaert for the invaluable help in statistical and analytical input.

REFERENCES

1. John Hopkins university. https://coronavirus.jhu.edu/map.html. Published 2020. Accessed March 26, 2021.
2. Dugas AF, Morton M, Beard R, et al. Interventions to Mitigate Emergency Department and Hospital Crowding During an Infectious Respiratory Disease Outbreak: Results from an Expert Panel. *PLoS Curr*. 2013;(APR 2013):3644286. doi:10.1371/currents.dis.1f277e0d2bf80f4b2bb1dd5f63a13993
3. Olivia E. Atherton1, Jennifer L, et al. HHS Public Access. *Physiol Behav*. 2018;176(1):139-148. doi:10.1093/cid/ciq035.
4. Scarfone RJ, Coffin S, Fieldston ES, et al. Hospital-based pandemic influenza preparedness and response: Strategies to increase surge capacity. *Pediatr Emerg Care*. 2011;27(6):565-572. doi:10.1097/PEC.0b013e31821dc9d1
5. Möckel M, Bachmann U, Behringer W,et al. How emergency departments prepare for virus disease outbreaks like COVID-19. *Eur J Emerg Med*. 2020;27(3):161-162. doi:10.1097/MEJ.0000000000000703
6. Hick JL, Koenig KL, Barbisch D, et al. Surge capacity concepts for health care facilities: the CO-S-TR Model for initial incident assessment. *Disaster Med Public Health Prep*. 2020:51-57.
7. Paganini M, Conti A, Weinstein E, et al. Translating COVID-19 Pandemic Surge Theory to Practice in the Emergency Department: How to Expand Structure. *Disaster Med Public Health Prep*. 2020;(March). doi:10.1017/dmp.2020.57
8. Gopinathan V, Asanar S, Krishnan S V, et al. Assessment of the Preparedness and Planning of Academic Emergency Departments in India during the COVID-19 Pandemic-A Multicentric Survey. *Disaster Med Public Health Prep*. 2021. doi:10.1017/dmp.2021.73
9. Casalino E, Bouzid D, Ben Hammouda A, et al. COVID-19 preparedness among Emergency Departments: A cross-sectional study in France. *Disaster Med Public Health Prep*. 2020:1-9. doi:10.1017/dmp.2020.331
10. http://gezondheidbelgie.be. Published 2020. Accessed March 13, 2021.
11. Griffin KM, Karas MG, Ivascu NS,et al. Hospital preparedness for COVID-19: A practical guide from a critical care perspective. *Am J Respir Crit Care Med*. 2020;201(11):1337-1344. doi:10.1164/rccm.202004-1037CP
12. Aziz S, Arabi YM, Alhazzani W, et al. Managing ICU surge during the COVID-19 crisis: rapid guidelines. *Intensive Care Med*. 2020;46(7):1303-1325. doi:10.1007/s00134-020-06092-5
13. Chen S, Zhang Z, Yang J, et al. Fangcang shelter hospitals : a novel concept for responding to public health emergencies. *Lancet*. 2020;395(18):1305-1314
14. Bressan S, Buonsenso D, Farrugia R, et al. Prepardness and response to pediatric COVID-19 in European emergency departments : A survey of the REPEM and PERUKI Networks. *Ann Emerg Med*. 2020;76 (6):788-800.

15. WHO. Shortage of personal protective equipment endangering health workers worldwide.Available at: https://www.who.int/news/item/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide. Accessed March 1, 2021.

16. WHO. Rational use of personal protective equipment for coronavirus disease 2019 (COVID-19) - Interim guidance.Available at: https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE_use-2020.1-eng.pdf. Accessed March 1, 2021.

17. Barten DG, Latten GHP, Van Osch FHM. Reduced emergency department utilization during the early phase of the COVID-19 pandemic: Viral fear or lockdown effect. *Disaster Med Public Health Prep*. 2020:1-4. doi:10.1017/dmp.2020.303

18. Man CY, Yeung RSD, Chung JYM, et al. Impact of SARS on an emergency department in Hong Kong. *Emerg Med*. 2003;15(5-6):418-422. doi:10.1046/j.1442-2026.2003.00495.x

19. Giamello JD, Abram S, Bernardi S, et al. The emergency department in the COVID-19 era. Who are we missing? *Eur J Emerg Med*. 2020:305-306. doi:10.1097/MEJ.0000000000000718

20. Walton M, Murray E, Christian MD. Mental health care for medical staff and affiliated healthcare workers during the COVID-19 pandemic. *Eur Hear J Acute Cardiovasc Care*. 2020;9(3):241-247. doi:10.1177/2048872620922795

21. Garcia-Castrillo L, Petrino R, Leach R, et al. European Society for Emergency Medicine position paper on emergency medical systems' response to COVID-19. *Eur J Emerg Med*. 2020;27(3):174-177. doi:10.1097/MEJ.0000000000000701

22. Smith MJ, Silva DS. Ethics for pandemics beyond influenza: Ebola, drug-resistant tuberculosis, and anticipating future ethical challenges in pandemic preparedness and response. *Monash Bioeth Rev*. 2015;33(2-3):130-147. doi:10.1007/s40592-015-0038-7

23. Timmis K, Brüssow H. The COVID-19 pandemic: some lessons learned about crisis preparedness and management, and the need for international benchmarking to reduce deficits. *Environ Microbiol*. 2020;22(6):1986-1996. doi:10.1111/1462-2920.15029

24. Alassaf W. Challenges in Pandemic Disaster Preparedness: Experience of a Saudi Academic Medical Center. *Disaster Med Public Health Prep*. 2020:1-5. doi:10.1017/dmp.2020.268

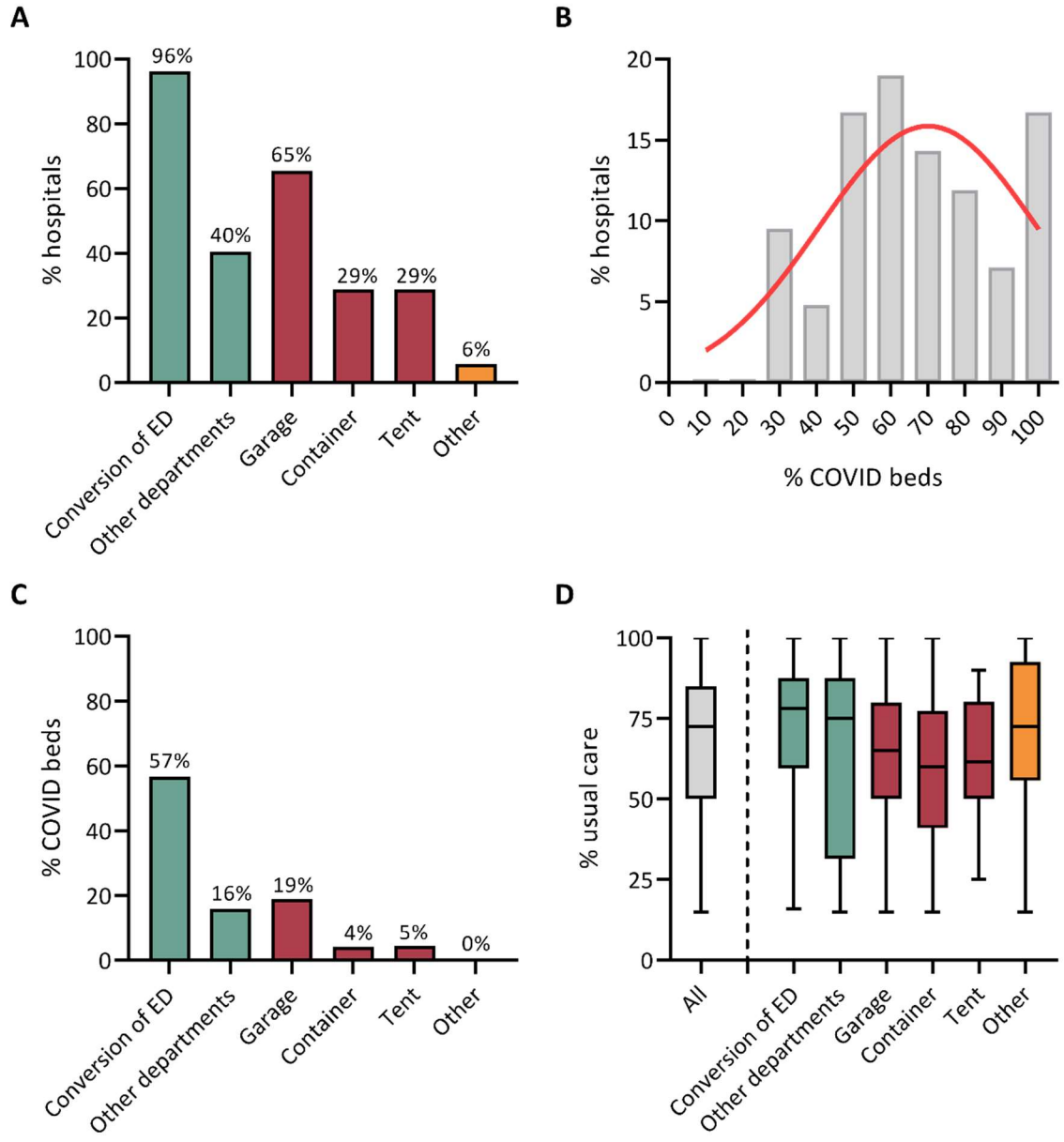

Figure 1: Structural reorganization of emergency departments (ED's) at the start of the COVID-19 pandemic. A. Different modalities were used at the ED's to accommodate patients, both COVID-19 suspected patients and nonsuspected. Data are depicted as % of hospitals that used the different spaces. Bars in green represent in-hospital structures, bars in red are out-of-hospital structures, alternatives are depicted in orange. **B.** A certain amount of beds were reserved for COVID-19 suspect patients. Data are presented as % of hospitals that reserved a certain number of their ED beds of COVID-19 suspect patients. The solid red line represents predicted values modeled with nonlinear regression. **C.** The % of reserved COVID-19 beds per modality. **D.** Perception of quality of care for patients per modality, compared to the usual perception of care. The data are depicted as Tukey boxplots.

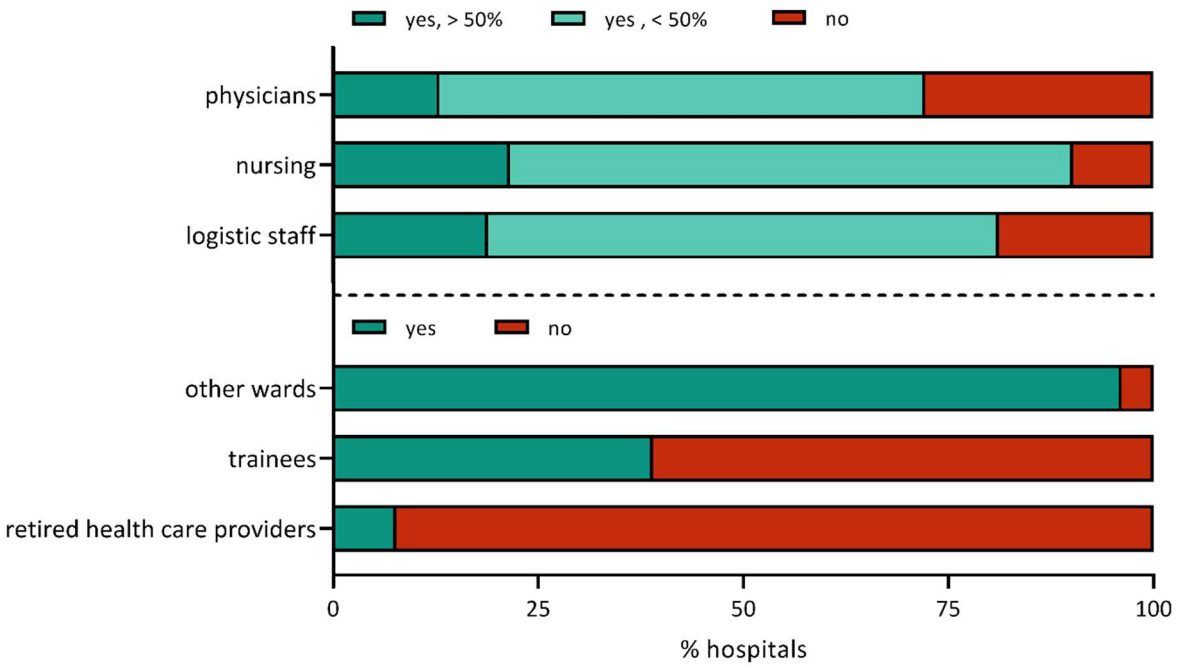

Figure 2: Extra personnel deployment at the ED's during the pandemic. Top: Type of extra personnel; bottom: origin of extra personnel. Data are presented as % of hospitals that either answered 'yes' or 'no'. For the top panel, when answering 'yes', respondents could specify whether they deployed more or less that 50% of their usual staffing.

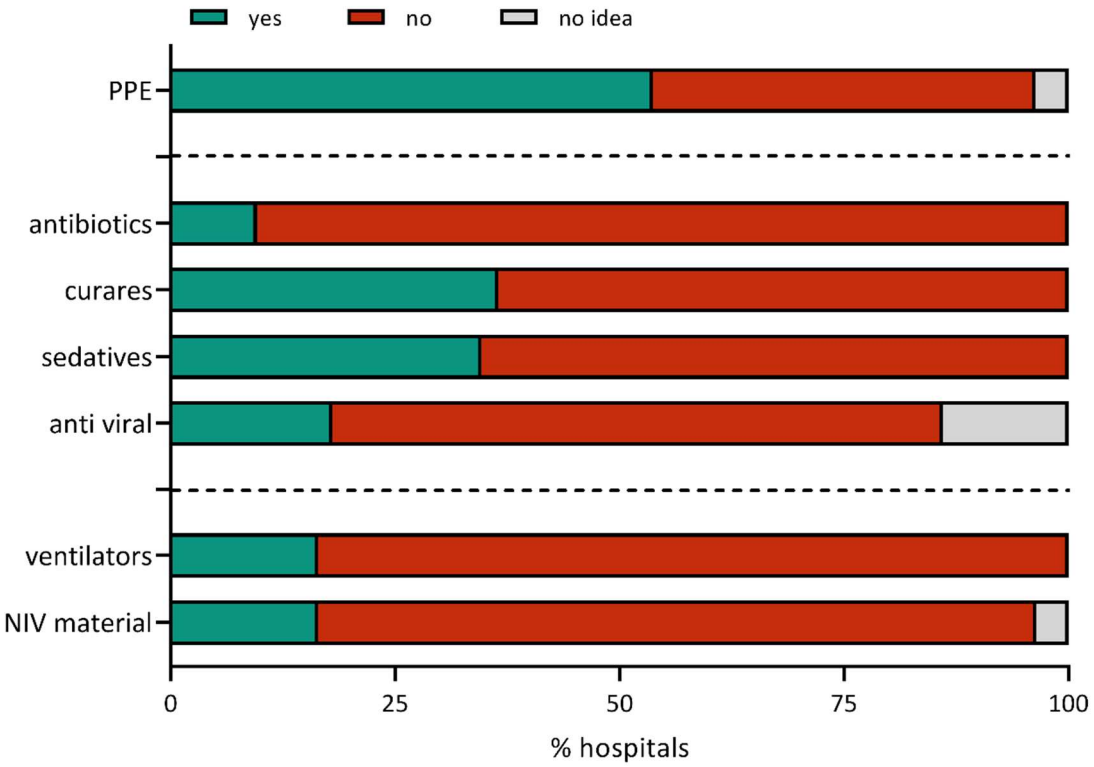

Figure 3. Acute shortage of supplies during the pandemic. Top: personal protection equipment (PPE); middle: medication; bottom: invasive ventilators and non-invasive ventilators (NIV material). Data are presented as % of hospitals that either answered 'yes', 'no' or 'no idea'.

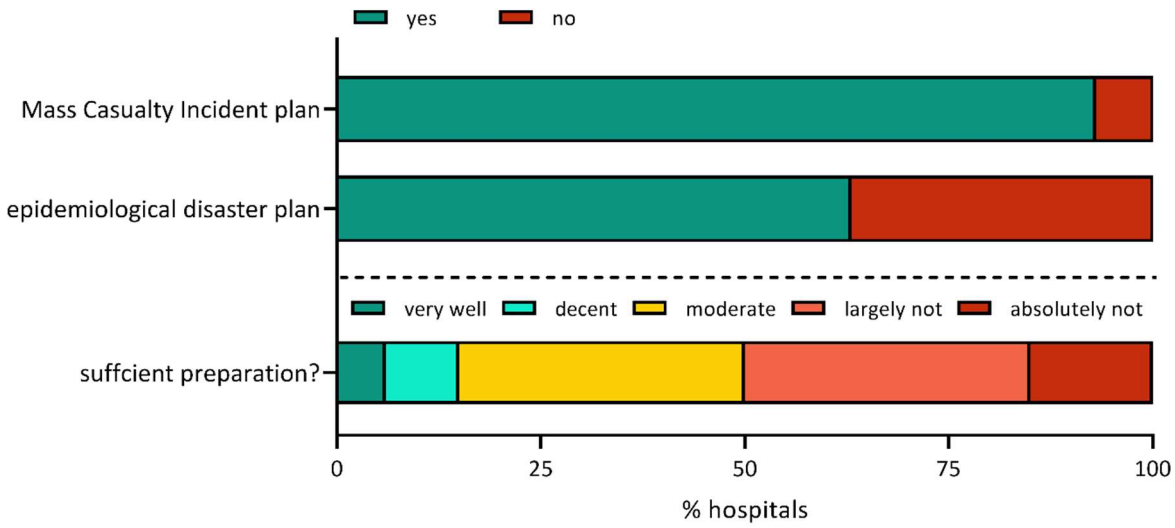

Figure 4: The ED's preparedness for (epidemiological) disasters. Top: The preparation of a general Mass Casuality Incident plan and specific preparation for epidemiological disasters. Data are presented as % of hospitals that either answered 'yes' or 'no'. Bottom: Perception of preparedness during the COVID-19 pandemic. The respondents could choose between answering 'very well', 'decent', 'moderate', 'largely not' and 'absolutely not'.

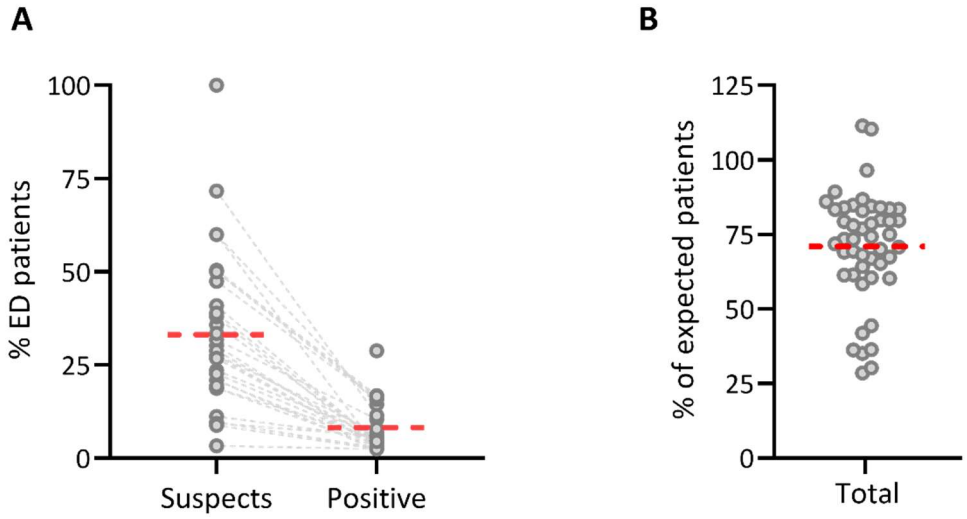

Figure 5: Number of (COVID-19 (suspect)) patients seen at the ED during the first wave of the COVID-19 pandemic in Belgium. A. ED patients that were considered COVID-19 suspect and/or that tested positive. Data are presented as % of ED patients per hospital. Dashed lines represent matched datapoints from the same hospital. **B.** The total number of patients seen at the ED during the first wave of the pandemic, presented as % of the expected number of patients as deduced from the year before.