ORIGINAL RESEARCH

Management of the COVID-19 Pandemic: Analysis of the Perception of Professionals of Emergency Medical Systems in Spain after the First Wave

Rafael Castro Delgado;[1,2] José Antonio Cernuda Martínez;[1] Rodolfo Romero Pareja;[1,3,4] Tatiana Cuartas Álvarez;[1,2] Pedro Arcos González[1]

1. Emergency and Disaster Research Unit, Oviedo University, Oviedo, Asturias, Spain
2. SAMU-Asturias, Oviedo, Asturias, Spain
3. Getafe University Hospital, Getafe, Madrid, Spain
4. European University of Madrid, Madrid, Spain

Correspondence:
Prof. Dr. Rafael Castro Delgado
School of Medicine
Preventive Medicine and Public Health Area
C/Julián Clavería, 6 33006 Oviedo, Spain
E-mail: castrorafael@uniovi.es

Conflicts of interest/funding: None declared. The authors have no financial or other interest that should be known to readers related to this document.

Keywords: COVID-19; Emergency Medical Services; health care workers; perception

Abbreviations:
BLS: Basic Life Support
COVID-19: coronavirus disease 2019
EMS: Emergency Medical Services
EMT: emergency medical technician
HED: hospital emergency department
PCR: protein chain reaction
PPE: personal protective equipment

Received: October 28, 2021
Revised: December 22, 2021
Accepted: January 4, 2022

doi:10.1017/S1049023X22000462

Abstract

Objective: The objective of this study was to identify the perceived problems by medical and nursing professionals that have arisen in the Spanish Emergency Medical Services (EMS) as a consequence of the first wave of the severe acute respiratory syndrome-coronavirus-2/SARS-CoV-2 pandemic, as well as the measures or solutions adopted to manage those problems and improve response.

Method: This was a cross-sectional study of quantitative and qualitative methodology ("mixed methods") using a self-administered questionnaire in 23 key informants of EMS of Spain selected by purposeful sampling, followed by the statistical analysis of both types of variables and an integration of the results in the discussion.

Results: Common problems had been identified in many EMS, as well as similar solutions in some of them. Among the former, the following had been found: lack of leadership and support from managers, initial shortage of personal protective equipment (PPE), lack of participation in decision making, initial lack of clinical protocols, and slowness and/or lack of adaptability of the system, among others. Among the solutions adopted: reinforcement of emergency call centers, development of specific coronavirus disease 2019 (COVID-19) telephone lines and new resources, personal effort of professionals, new functions of EMS, support to other structures, and reinforcement of the role of nursing.

Conclusion: The general perception among the respondents was that there was a lack of support and communication with health care managers and that the staff expertise was not used by policy makers to make decisions adapted to reality, also expressing the need to improve the capacity for analysis of the EMS response. Few respondents reported good overall satisfaction with their EMS response. The EMS adopted different types of measures to adapt to the COVID-19 pandemic.

Castro Delgado R, Cernuda Martínez JA, Romero Pareja R, Cuartas Álvarez T, Arcos González P. Management of the COVID-19 pandemic: analysis of the perception of professionals of Emergency Medical Systems in Spain after the first wave. *Prehosp Disaster Med.* 2022;37(3):314–320.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has had an intense impact on public health, health systems, and their response capacity on a global and national scale.[1,2] Emergency Medical Services (EMS),[3] hospital emergency departments (HEDs),[4] and primary health care systems[5,6] have been significantly affected.[7] Therefore, an emergency of these characteristics should demand reflection on the problems that have arisen and the solutions adopted by the health structures to create an opportunity to improve the adaptability of the health system to these situations.

Traditionally, EMS provides out-of-hospital care to critically ill patients through a network of mobile care resources and a coordinating center for emergencies that manages urgent health care demand and mobilizes resources, but these care dynamics changed during the pandemic.[8] Before the pandemic, factors such as the aging of the population and the

evolution of health care had already led to EMS integrating new functions and expanding its range of care programs (ie, care for time-dependent pathologies, care for chronic patients, and health information). This ability to adapt to changing environments, prior to COVID-19, has been able to facilitate EMS to adopt different roles during the pandemic,[9] such as complementing surveillance systems and prediction of epidemiological trends.[10,11] On the opposite side, lack of planning and the absence of contingency plans in the EMS have revealed the lack of foresight in the face of problems that were already aware of,[12] and before which different measures had been adopted by the EMS.[13]

In Spain, there is an EMS in each autonomous community (in some of them, two) and the high degree of decentralization of the National Health System has meant that the problems that have arisen and their approaches have been different in each of them. It is a public financed EMS with no fee for the patient, as it is paid by national taxes. The aim of this study is to identify the problems perceived by medical and nursing professionals of EMS arising as a result of the first wave of the severe acute respiratory syndrome-coronavirus-2/SARS-CoV-2 pandemic in Spain, as well as the measures or actions taken to manage these problems and improve response capacity.

Methods

This was an observational and cross-sectional epidemiological design study after the first wave of the pandemic using quantitative and qualitative methodology (mixed methods).[14] In this way, one method provides support to the other and allows identifying subjective elements and combining them with objective data to provide a more complete general idea of the phenomenon studied, which is especially useful for studying more complex phenomena.[15]

A self-administered questionnaire was designed, divided into three sections (Annex 1; available online only) that contained: (1) participant data (professional category, gender, years of experience in EMS, and current or previous management position); (2) 11 open-ended questions on aspects related to the pandemic; and (3) 15 questions on a five-point Likert scale (from one "Not at all" to five "Maximum") on the management of the pandemic in their respective autonomous communities.

Using purposeful sampling, a questionnaire was sent and completed by 23 medical and nursing professionals, belonging to 13 EMS in Spain, previously identified as key informants and selected for having been linked to disaster response working groups or scientific societies. It was not possible to identify key informants with these characteristics in five of the EMS in the country.

In the descriptive statistics, absolute and relative frequencies were used for the qualitative variables, as well as means or medians (with 95% confidence intervals) based on the Shapiro-Wilk normality test for the quantitative variables. In the variables with a Likert scale, the median and IQR (interquartile range), error of the median, and coefficient of dispersion were calculated. The median test was used to compare medians with a significance level of $P < .05$. Stata v. 15.0. (StataCorp; College Station, Texas USA) was used for statistical analysis. Responses to the open-field questions were recorded and coded for further analysis. The study was approved by the Ethical Research Committee of the Principality of Asturias (Oviedo, Asturias, Spain; Ref.: 2021.570).

Results

Of the 23 participants, 12 (52.2%) were doctors and 11 (47.8%) nurses, with 16.3 years of mean experience (SD = 4.9) in EMS. Seven held management positions in the past, two did so at the time of the study, and another two both in the past and at present. The rest had no connection with EMS management responsibilities.

The variables corresponding to the 15 management items had normal distributions (0.914; $P = .05$ in the Shapiro-Wilk test). The mean score of the responses to the total of the 15 items referring to the management of the pandemic was 41.96 (95% CI, 35.9 - 47.9) out of a maximum of 75 points. Table 1 shows the median with its IQR, error of the median, and coefficient of dispersion of the scores for each of the 15 items on pandemic management. Table 2 shows the same data for each professional category and the comparison between both, with only one item with statistically significant differences ($P = .039$), the one related to their perception about EMS capacity to perform analysis to identify improvements in the event of pandemics, in which nurses scored higher.

Table 3 collects the main comments on each of the items whose most relevant results are indicated below, grouped by items about problems detected and actions taken.

Problems in the Management of Material Resources and Supplies

The main problem detected had been a shortage of personal protective equipment (PPE) or their poor quality, especially at the beginning of the pandemic. Only one interviewee stated that there had been no lack of PPE. Likewise, problems with vehicle disinfection procedures or changing protocols in the use of material resources were common in some EMS, the reuse of PPE had been raised as a problem, as well as the centralization of the purchase of PPE at a national level.

Problems in Human Resource Management

Lack of professionals, training deficiencies, and the hiring of professionals without EMS experience had been described by those interviewed. Other problems that had been repeated in different EMS had been the lack of communication with the direction and lack of interest of the management for their professionals; the excessive extensions of the working day had also been repeated in different EMS, as well as emotional exhaustion.

Interlevel Coordination Problems

A very operative problem described in inter-level coordination had been the problem of patient transfer in hospitals, as well as the lack of information to EMS professionals about changes in the different hospital procedures. The de-structuring of primary health care had also been an element expressed by several interviewees, which led to the EMS having to assume functions that were not their own, together with a lack of uniformity of criteria. Two interviewees stated that there had been no problems in inter-level coordination. Some interviewees also highlighted the politicization of technical decisions.

Difficulties in the Relationship with Medical Transport Companies

The main problem manifested by a large number of those interviewed had been a lack of specific training for Basic emergency technicians by their company, as well as a significant lack of material, especially PPE, and excessive decontamination times or lack of knowledge about cleaning protocols. Two interviewees stated that there had been no difficulties thanks to the excellent collaboration due to the exceptional situation that had been experienced.

https://doi.org/10.1017/S1049023X22000462 Published online by Cambridge University Press

ITEM	Median	Error of Median	IQR	COD
Directors' Leadership	3	0.08251	3	0.43478
Participation of Health Staff in Organizational Decision Making	2	0.06022	2	0.41304
Participation of Health Staff in Design of Clinical Decision Procedures	2	0.06552	2	0.46739
Perceived Support from EMS Management Structure	3	0.07607	3	0.3913
Reorganization of EMS Structure On-Time	3	0.07243	3	0.36232
Ability of Staff to Adapt to the New Situation	4	0.04638	1	0.16848
Quick EMS to Develop Clinical Procedures Adapted to the Pandemic	3	0.07566	3	0.39855
Quality of EMS Care Procedures to Face the Pandemic	3	0.06412	2	0.31884
Training Actions and Dissemination of Protocols Carried Out in the EMS	2	0.07837	3	0.55435
Personal Protective Equipment Availability On-Time	4	0.07277	2.5	0.26087
Adequacy of the Personal Protective Equipment Supplied	4	0.06254	2	0.23913
To What Extent the Actions Developed Responded to the Problems for Which They Were Designed	3	0.05892	2	0.28261
Collaboration between EMS and Ambulance Private Companies	3	0.07338	2	0.34127
Implementation of Information Gathering Measures for Adequate Information After the Crisis	1	0.06669	2	1.04348
EMS Capacity to Perform Analysis to Identify Improvements in the Event of Pandemics	2	0.07013	2	0.56522

Table 1. Score of the 15 Items Related to Pandemic Management
Abbreviations: COD, coefficient of dispersion; EMS, Emergency Medical Services.

Decisions Not Made in the EMS That Should Have Been Made
A large number of interviewees stated that it would have been necessary to work together with the working groups of mass-casualty incidents (MCIs) and disasters already established in many EMS. The lack of scheduled meetings was also a fact repeated by several interviewees. The initial absence of specific procedures and guidelines for their EMS, the need to improve the training received, and the lack of regular information to workers about the epidemiological situation and changes in procedures had been frequent perceptions, as well as the difficulty in making decisions. The establishment of epidemiological measures to control possible cases in the EMS had also been described by the interviewees, as well as the need to start to analyze the response to find improvement measures.

Decisions Made in the EMS that Should Not Have Been Made
In this case, the responses of the different interviewees were very heterogeneous. Among them, the rapid de-escalation of the actions undertaken by its EMS stood out. The reuse of PPE, the lack of adaptation of the protocols of the central health services to the reality of EMS, or the lack of reinforcement of logistical resources were also described.

EMS Structure Modification Actions
The main action to modify the structure of the EMS had been the expansion and reinforcement of the emergency call center, either by reinforcing the existing one or by creating specific centers for the management of COVID-19 calls. In some EMS, the figure of the epidemiologist had been implemented. Several EMS had created specific COVID-19 units, mainly Basil Life Support units (BLS), and some (few) had implemented measures to reduce the turnover of professionals through the different health care facilities or resources, and thus improved the control of occupational infections, while others had provided specific training about the call center to make professionals more versatile. Improving the cleanliness of the stations had also been a measure that was repeated in several EMS. The implementation of psychological assistance programs had been a measure of little general implementation, although specific programs had been developed in some EMS.

New Functions Assigned to the EMS
Among the new functions assigned to the EMS were performing protein chain reaction tests (PCR) at home or in nursing homes, support to the different field hospitals and alternate care sites for COVID patients,[16] logistical support, and the implementation of specific COVID-19 information telephones lines for the population.

Measures to Increase Responsiveness
Different measures were designed to increase response capacity, highlighting the reinforcement of the call center and the establishment of specific COVID-19 lines, the increase in BLS units, as well as the incorporation of nursing staff to the coordinating center and the creation of new Advanced Life Support units (ALS) and of specific BLS COVID-19 units. Other measures taken in few EMS were the establishment of a briefing meeting at the beginning of each shift or the improvement in the payment of overtime.

Actions to Improve Coordination between Health Care Levels
These actions were very heterogeneous among the different EMS. In some autonomous communities, inter-level committees were created and meetings of the station medical coordinators were convened with their counterparts from their reference HED. Some interviewees stated that they did not know of any specific action at this level.

https://doi.org/10.1017/S1049023X22000462 Published online by Cambridge University Press

ITEM	MEDICINE			NURSING			
	Median	*IQR*	*COD*	*Median*	*IQR*	*COD*	*P Value*
Directors' Leadership	2	3	0.43478	3	3	0.43478	.359
Participation of Health Staff in Organizational Decision Making	2	2	0.41304	2	1	0.41304	1.000
Participation of Health Staff in Design of Clinical Decision Procedures	2	2.25	0.46739	2	2	0.46739	1.000
Perceived Support from EMS Management Structure	3	3	0.3913	3	3	0.3913	1.000
Reorganization of EMS Structure on Time	3	2.5	0.36232	3	3	0.36232	1.000
Ability of Staff to Adapt to New Situation	4.25	1	0.16848	4	2	0.16848	.674
Quick EMS to Develop Clinical Procedures Adapted to the Pandemic	2	2.5	0.39855	3	2	0.39855	.270
Quality of EMS Care Procedures to Face the Pandemic	2.75	2	0.31884	3	2	0.31884	.731
Training Actions and Dissemination of Protocols Carried Out in the EMS	2	2.25	0.55435	2	2	0.55435	1.000
Personal Protective Equipment Availability On-Time	4	2	0.26087	4	3	0.26087	1.000
Adequacy of the Personal Protective Equipment Supplied	3.5	1.25	0.23913	4	2	0.23913	.444
To What Extent the Actions Developed Responded to the Problems for Which They Were Designed	3	1.5	0.28261	4	2	0.28261	.169
Collaboration between EMS and Ambulance Private Companies	2	2	0.34127	3	2	0.34127	.239
Implementation of Information Gathering Measures for Adequate Information After the Crisis	1	2	1.04348	2	2	1.04348	.169
EMS Capacity to Perform Analysis to Identify Improvements in the Event of Pandemics	1.5	2	0,56522	3	2	0,56522	**.039**

Table 2. Comparison of Scores of 15 Items According to Professional Category
Note: Bold p-value = statistically significant.
Abbreviations: COD, coefficient of dispersion; EMS, Emergency Medical Services.

Strengths in the Relationship with Medical Transport Companies
The main response had been the excellent personal relationship among staff and the teamwork of the different professional categories involved in emergency health care. Several interviewees emphasized the attitude of the emergency medical technicians (EMTs), which despite the shortcomings, had always been willing, collaborative, and professional.

Table 4 shows the main strengths and weaknesses identified based on the qualitative results.

Discussion

The results of this study are similar to those obtained in the qualitative study carried out among emergency personnel in Iran.[17] The initial shortage of PPE, the lack of procedures, and the lack of emotional support from those in charge are common elements that were found in the qualitative and quantitative data. The fact of the lack of PPE and the fear of contagion among EMS personnel has been found in other studies in Germany,[18] as well as the training deficiencies in its use,[19] which increase stress among EMS professionals.[20] It is worth highlighting the important heterogeneity when it comes to raising weaknesses or actions for improvement, since aspects expressed by some interviewees as positive (for example, taking PCR samples)[21] are negative for others. This allows the affirmation that the COVID-19 pandemic has impacted the EMS without having previously established action procedures and a defined portfolio of services, which made it necessary for each EMS to make different management decisions, probably based on their professional background and personal experience of its directors, managers, and staff.

Analyzing both types of results together, the qualitative ones show a generalized dissatisfaction among staff with the way of tackling the first wave of the pandemic in the different EMS, something that is confirmed by the low scores in the quantitative results, mainly in the items that try to measure the integration of professionals in decision making, the lack of leadership from the directors, or the scant support perceived by the EMS directive structure, which coincides with what is stated in the qualitative items. Professionals perceive a lack of common lines of action, agreed and adapted to the prehospital environment, with little speed in the elaboration of procedures, little consensus, with little participation of professionals, and with a training program that could have been improved, in line with the results from other similar European studies.[22] They believe that it is interesting to "undertake the extraction of lessons learned and prepare contingency plans," but in the quantitative analysis, it was found that they

https://doi.org/10.1017/S1049023X22000462 Published online by Cambridge University Press

Problems in the Management of Material Resources and Supplies	*Initially, there was a lack of PPE, with problems with medical direction for considering it as inappropriate use.*
	The main problem has been the lack of material, especially protection, and constant changes in protocols (practically one every two days).
	By centralizing purchases by the Ministry of Health, we have been given inadequate clinical and protection material, without being able to claim our own management.
	Structural deficiencies have been increased with the crisis.
Problems in Human Resource Management	*The lack of vertical information from the Manager and Medical Direction has become general, producing instability in human resources by not feeling protected by the Service.*
	There have been neither protocols for action nor trust in the actions that the medical direction department was improvising. We have worked as we learnt from our colleagues, and when the protocols appeared, they were always one step behind the health care needs.
Interlevel Coordination Problems	*The information has not reached all levels. There has been a lack of communication with the workers.*
	Many changes in the recommendations and very few or none specific for EMS.
	Each direction has been managed with different criteria and actions.
	In hospitals, they changed COVID circuits and we found out when taking the patient. The procedures were short-lived and we were constantly changing. There were even opposite procedures between some hospitals and others.
	Centralization of decision-making with political interests without taking into account technical data.
Difficulties in the Relationship with Medical Transport Companies	*Many difficulties for the workers of the private ambulance companies to get information, training, and adequate PPE and insufficient quantity.*
	Lack of PPE to the EMT of non-urgent ambulances and BLS. Sometimes, it was necessary to provide them with PPE, to be able to carry out their work safely and under equal conditions.
Decisions Not Made in the EMS that Should Have Been Made	*Call for an internal crisis committee or group to have the collaboration of personnel who have been leading working groups for years directly involved in the management of crisis.*
	I think that out of all possible options, the most appropriate ones were taken.
	Organize fixed staff in each station, so that connection between the different stations to be low, avoiding the possibility of spreading infections, especially trying not to mix health care personnel and emergency call center personnel.
	Undertake the extraction of lessons learned and prepare contingency plans.
Decisions Made in the EMS that Should Not Have Been Made	*Assuming the protocols of the central health services as they came without adapting them to our reality.*
	Cleaning with products without knowing very well their possible harmful effects for humans.
	Reuse of PPE.
	Continue with the working schedules without adapting them to the new reality.
	I believe that the primary health care emergency department should not have been closed, they are a fundamental structure that made many people go to the hospital, unnecessarily, and others didn´t get medical care, or were delayed, or even stayed at home for fear.
EMS Structure Modification Actions	*Incorporation of nursing staff in call center, increase in the number of call operators per shift in call center, increase in physicians per shift in call center, and new specific information lines for responding to COVID.*
	A special unit for care and interhospital transfer of COVID positive patients was created, composed of EMT, nurse and doctor, 6 ambulances with a nurse were implemented to take PCR at home and transfer and discharge of COVID positive patients, and staff at the call center was reinforced, mainly nurses.
	Psychological care has been enhanced for both staff and patients.
	In some stations, the number of temporary staff working was limited to minimize changes.
New Functions Assigned to the EMS	*Assembly and management of field hospitals.*
	Management of the logistics of emergency materials and their distribution in the different health centers.
	Health support to another autonomous communities in Spain.
	Visit and evaluation in nursing homes, convents, etc.
	Collection of samples for PCR.
Measures to Increase Responsiveness	*Daily briefing before starting each shift to present current situation.*
	From the first day, the company decided to consider overtime as overtime (paid at 175%) has meant that there have been no major problems in covering the units.
Actions to Improve Coordination between Health Care Levels	*It was created in . . . . a crisis team, with representatives from all levels of care to coordinate actions.*
	The strategic information on the decisions taken did not reach the call center in a timely manner.
	The Medical Coordinators of stations close to hospital centers contacted the Hospital Emergency Medical Coordinators to find out about the Circuits within the Service and where and how to make the transfers.

Table 3. Relevant Comments Made by the Interviewees (*continued*)

https://doi.org/10.1017/S1049023X22000462 Published online by Cambridge University Press

Strengths in the Relationship with Medical Transport Companies	*Above all, I would highlight that the staff have made a pineapple, we have removed the company logo from the shirt (figuratively), and we have made a team, we were all on the same battlefield, we have shared the PPE, the materials, the resources, without our companies having knowledge of it, in our bases we have faced professionals from a work team against COVID, with what we had regardless of the company that paid us and regardless of where the material came from.*
	Highlight the availability for work of the EMT of the different urgent medical transport units.
Additional Comments	*I have never needed applause, not an extra or anything like that. I have been preparing for these circumstances all my life, but I feel enormous and deep shame for the service in which I work. When people are grateful for what they suppose we've done, I can only hang my head and think 'if you only knew.' I have felt that they have thrown me into danger without the slightest concern about my safety.*

Table 3. *(continued).* Relevant Comments Made by the Interviewees
Abbreviations: BLS, Basic Life Support; COVID, coronavirus disease 2019; EMS, Emergency Medical Services; EMT, emergency medical technician; PCR, polymerase chain reaction; PPE, personal protective equipment.

STRENGTHS	WEAKNESS
Reinforcement of the Call Center	Lack of Leadership and Support from Directions
Specific COVID-19 Call Lines	Initial Shortage of PPE
Creation of New Resources	Lack of Participation of Professionals
Teamwork	Excessive Rotation of Professionals
Personal Effort of Professionals	Lack of Health Care Protocols
New EMS Features	Slowness in the Adaptability of the System
Support to Other Structures	Lack of Communication and Transmission of Information with the Headquarters
Nursing Role	Closure of Certain Health Facilities

Table 4. Main Strengths and Weaknesses Identified through Qualitative Results
Abbreviations: COVID-19, coronavirus disease 2019; EMS, Emergency Medical Services; PPE, personal protective equipment.

doubt the ability to collect and analyze information to improve EMS adaptability. Other countries do carry out periodic analyses and recommendations on the adaptability of their emergency and emergency systems.[23] Some exceptions are found in some EMS, in which the direction developed adequate leadership and the professionals participated in technical decision making. The score above four was only obtained in the ability of professionals to adapt to the new situation. The explanation for this fact is found in the qualitative results, mainly in the item related to actions to modify the structure of the EMS, where different approaches are revealed, but also showing the personal effort made by health professionals. Other studies have also found an important implication of professionals in their daily work, even in pandemic conditions.[24,25]

Clearly there was an initial lack of PPE, as stated in the interviews; this was solved and probably explains that the score on the Likert scale is above three. Among the decisions not taken, the one that draws the most attention is the low participation of health professionals in working groups, which coincides with the low score in the corresponding quantitative items. Few interviewees report the implementation of specific programs to monitor staff mental health in their EMS, despite the importance of proactively addressing this problem.[26] No interviewee has expressed ethical conflicts in the management of patients, something that has been found in other studies.[27] The fact that significant differences were not found between medical and nursing staff in any of the study items could be interpreted as the results are very congruent.

Limitations

The main limitations of this article are those of qualitative studies, since it is not intended to make a statistical inference of the results, but to show a reality experienced by the professionals, together with the subjectivity of the interviewees, which is another limitation of these studies. The mixed-method methodology allows the qualitative results to be compared with the quantitative ones and thus minimizes the limitations, a fact that has been achieved in this study.

Conclusions

The conclusions that the study allows to be drawn are, on the one hand, that there is a general perception among respondents of a lack of support and communication from health care departments, and that staff experience has not been taken into consideration to make decisions adapted to reality, also expressing the need to improve the ability to analyze the EMS response. And on the other hand, that the EMS have adopted different measures to adapt to the pandemic, among which stand out the reinforcement of the call center, the creation of new resources, and the implementation of new functions. Finally, few respondents expressed general satisfaction with their EMS response during the first wave of the pandemic in Spain.

Acknowledgement

To RINVEMER (Red de Investigación de Emergencias Prehospitalarias - Network for Research in Prehospital Emergencies, Spain) for their support.

Supplementary Materials

To view supplementary material for this article, please visit https://doi.org/10.1017/S1049023X22000462

References

1. Organization for Economic Co-operation and Development (OECD). The impact of COVID-19 on health and health systems. https://www.oecd.org/health/covid-19.htm. Accessed October 2, 2021.
2. Castro Delgado R, Arcos González P. The analysis of health response capacity as a key element in planning for epidemic emergencies. *Emergencies.* 2020;32(5):157–159.
3. Jaffe E, Strugo R, Bin E, et al. The role of emergency medical services in containing COVID-19. *Am J Emerg Med.* 2020;38(7):1526–1527.
4. Alquézar-Arbé A, Piñera P, Jacob J, et al. Impact of the COVID-19 pandemic on hospital emergency departments: results of a survey of departments in 2020 - the Spanish ENCOVUR study. *Emergencies.* 2020;32(5):320–331.
5. Rawaf S, Allen LN, Stigler FL, et al; Global Forum on Universal Health Coverage and Primary Health Care. Lessons on the COVID-19 pandemic, for and by primary care professionals worldwide. *Eur J Gen Pract.* 2020;26(1):129–133.
6. Muñoz MA, López-Grau M. Lessons learned from the approach to the COVID-19 pandemic in urban primary health care centers in Barcelona, Spain. *Eur J Gen Pract.* 2020;26(1):106–107.
7. Prezant DJ, Lancet EA, Zeig-Owens R, et al. System impacts of the COVID-19 pandemic on New York City's emergency medical services. *J Am Coll Emerg Physicians Open.* 2020;1(6):1205–1213.
8. Handberry M, Bull-Otterson L, Dai M, et al. Changes in Emergency Medical Services before and during the COVID-19 pandemic in the United States, January 2018-December 2020. *Clin Infect Dis.* 2021;73(Suppl 1):S84–S91.
9. Dami F, Berthoz V. Lausanne medical dispatch center's response to COVID-19. *Scand J Trauma Resusc Emerg Med.* 2020;28(1):37.
10. Castro Delgado R, Delgado Sánchez R, Duque del Río MFC, Arcos González P. Potential capacity of an emergency and emergency coordinating center to predict hospital admissions and intensive care units due to COVID-19. *Emergencies.* 2021;33(5):368–373.
11. Levy MJ, Klein E, Chizmar TP, et al. Correlation between Emergency Medical Services suspected COVID-19 patients and daily hospitalizations. *Prehosp Emerg Care.* 2021;25(6):785–789.
12. Castro Delgado R, Arcos Gonzalez P, Rodriguez Soler A. Health system and triage in the face of a flu pandemic: a public health approach. *Emergencies.* 2009;21(5):376–381.
13. Cabañas JG, Williams JG, Gallagher JM, Brice JH. COVID-19 pandemic: the role of EMS physicians in a community response effort. *Prehosp Emerg Care.* 2021;25(1):8–15.
14. Creswell JW, Plano Clark VL. *Designing and Conducting Mixed Methods Research.* 3rd ed. Thousand Oaks, California USA: SAGE Publications; 2017.
15. Taylor SJ, Bogdan R. *Introduction to Qualitative Research Methods.* Ed. Paidós Basic. 1st ed. Hoboken, New Jersey USA: John Wiley and Sons, Inc.; 1984.
16. Castro Delgado R, Pérez Quesada P, Pintado García E, et al. Alternate care sites for COVID-19 patients: experience from the H144 hospital of the health service of the principality of Asturias, Spain. *Prehosp Disaster Med.* 2021;36(6):774–781.
17. Mohammadi F, Tehranineshat B, Bijani M, Khaleghi AA. Management of COVID-19-related challenges faced by EMS personnel: a qualitative study. *BMC Emerg Med.* 2021;21(1):95.
18. Dreher A, Flake F, Pietrowsky R, Loerbroks A. Attitudes and stressors related to the SARS-CoV-2 pandemic among emergency medical services workers in Germany: a cross-sectional study. *BMC Health Serv Res.* 2021;21(1):851.
19. Cash RE, Rivard MK, Camargo CA Jr, Powell JR, Panchal AR. Emergency Medical Services personnel awareness and training about personal protective equipment during the COVID-19 pandemic. *Prehosp Emerg Care.* 2021;25(6):777–784.
20. Ilczak T, Rak M, Ćwiertnia M, et al. Predictors of stress among emergency medical personnel during the COVID-19 pandemic. *Int J Occup Med Environ Health.* 2021;34(2):139–149.
21. Goldberg SA, Bonacci RA, Carlson LC, Pu CT, Ritchie CS. Home-based testing for SARS-CoV-2: leveraging prehospital resources for vulnerable populations. *West J Emerg Med.* 2020;21(4):813–816.
22. Rees N, Smythe L, Hogan C, Williams J. Paramedic experiences of providing care in Wales (UK) during the 2020 COVID-19 pandemic (PECC-19): a qualitative study using evolved grounded theory. *BMJ Open.* 2021;11(6):e048677.
23. National Health Service. Transformation of urgent and emergency care: models of care and measurement. December 2020. Publications approval reference: PAR122. https://www.england.nhs.uk/wp-content/uploads/2020/12/transformation-of-urgent-and-emergency-care-models-of-care-and-measurement.pdf. Accessed September 23, 2021.
24. Eftekhar Ardebili M, Naserbakht M, Bernstein C, Alazmani-Noodeh F, Hakimi H, Ranjbar H. Healthcare providers experience of working during the COVID-19 pandemic: a qualitative study. *Am J Infect Control.* 2021;49(5):547–554.
25. Alwidyan MT, Oteir AO, Trainor J. Working during pandemic disasters: views and predictors of EMS providers. *Disaster Med Public Health Prep.* 2020. Epub ahead of print.
26. Xiong Y, Peng L. Focusing on health-care providers' experiences in the COVID-19 crisis. *Lancet Glob Health.* 2020;8:e740–e741.
27. Torabi M, Borhani F, Abbaszadeh A, Atashzadeh-Shoorideh F. Experiences of prehospital emergency medical personnel in ethical decision-making: a qualitative study. *BMC Med Ethics.* 2018;19(1):95.