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Main page:

Title:

ATENCIÓN Y COORDINACIÓN DEL TRASLADO DEL PACIENTE CRÍTICO DURANTE LA PANDEMIA COVID-19 POR UN CENTRO DE MANDO REGIONAL

TRANSFER SUPPORT AND COORDINATION OF CRITICAL PATIENTS DURING THE COVID-19 PANDEMIC BY A REGIONAL COMMAND CENTER

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Palabras clave: centro de mando, coordinación, crítico, COVID-19, ECMO

Key words: command center, coordination, critical care, COVID-19, ECMO

Sir,

The recently published recommendations on the transfer of patients subjected to extracorporeal membrane oxygenation (ECMO) provide criteria for unifying this type of transfer of critical and complex patients, as extensively justified in the annexes to the article (1). A particularly important aspect of these recommendations is the creation of regional networks intended to guarantee the correct indication and execution of the patient transfer, as well as the optimum logistics to ensure the best possible healthcare outcomes. In our opinion, it is important to emphasize the concept of networking as contemplated in recommendation number 5. In this respect, coordinated and multidisciplinary structures are required, integrated into a regional team with the capacity to make decisions complementary to the skills and knowledge of those that directly deal with the affected individuals.

Close coordination is needed among the different healthcare levels, including public administration representatives, references belonging to centers with different levels of complexity, and a pre-hospital emergencies system with access to the information of all the centers, in order to optimize decision-making in the regional setting, based on consensus among all the intervening parties. The COVID-19 pandemic resulted in great tension within the healthcare system, mainly due to overburdening of the Intensive Care Units (ICUs). Distributing critical patients among different hospitals within a territory or even among different territories is the best way to prevent excessive care pressure in a hospital, thereby avoiding alterations in the routine care of its patients. A recent publication explains how a regional command center integrated within an emergencies coordination center has been able to manage the care and transfer of one-third of the ICU admissions during the pandemic (2).

In Catalonia, with a population of 7.7 million, a prospective observational study was carried out involving severe COVID-19 patients transferred by an advanced life support unit between March 2020 and June 2021. This study was approved by the Ethics Committee of *l'Institut d'Investigació Sanitària Pere i Virgili (107/2020).*

During the study period, a total of 2697 transfers of severe COVID-19 patients were made. Table 1 describes the characteristics of the transfers performed and managed by the regional command center during the peaks of the first four waves of the pandemic. A total of 354 patients could not be transferred, due to the reasons described in Table 2. The majority of the patients were males (70.1%), and the mean patient age was 60.6 ± 12.5 years. Of note were the low comorbidity and scant frailty of the transferred individuals. The overall mortality rate was 29.2%, with a gradual decrease being observed over the successive waves of the pandemic. During the same study period, the regional command

center managed and facilitated the transfer logistics of 164 COVID-19 patients subjected to ECMO. For every 16 severe COVID-19 patients transferred, one patient subjected to ECMO was transferred.

Three of every four severe COVID-19 patients transferred came from a hospital without an ICU. The regional command center facilitated prioritization and organization of the flow of admissions to the ICU, with real-time monitoring of the peaks in healthcare system overburdening over time. It proved essential to have real-time information on the status of the healthcare teams and the number of beds available in the ICUs on a continuous basis, in both the public and the private care centers that form part of the critical patient care network. The regional command center also balanced the territory, ensuring that all patients received the same care independently of where they came from. The strategy to keep this balance was to monitor the clinical needs of those patients that required treatment in centers of greater complexity (diagnostic and therapeutic escalation), as well as the opposite (de-escalation), facilitating the transfer logistics in order to secure the maximum possible resources and habilitate operation as a single regional ICU.

The existence of a command center makes it possible to optimize patient transfer beyond the assigned administrative geographical flows and to focus on the actual clinical needs. A tool was developed and prospectively validated to assess patient severity during the demands for transfer: the TIHCOVID scale (3). The use of a prioritization scale makes it possible to improve the patient management timelines, from the moment of alert by the issuing hospital to arrival in the final destination center – particularly in the more serious cases (4).

The main limitations of the system included human factors, a lack of expert professionals, physical problems such as the number of ICU beds and technological resources, including the limited availability of respirators.

A growing number of strategies are implemented by the emergencies coordination centers to predict patient severity and the probability of the need for admission to the hospital and the ICU (5,6). The application of predictive models of care demands in the emergency service allows us to restructure responses in emergency care and the ICU (7). In the case of Catalonia, the greatest patient flow was centered on the metropolitan area of Barcelona, which has the hospitals with the greatest ICU resources and probably also has the best capacity to cope with the increased demands observed during the pandemic peaks (2).

This regional command center composed of mixed teams of physicians, nurses and technicians allows the real-time monitoring of the demand and resources available in all the ICUs effectively, offering clear information for the health authorities and improving communication among all the intervening parties. Multidisciplinary teams are essential for improving coordination efforts and patient care (8). This strategy has worked as a patient transfer center that is effective and able to balance overburdening of the healthcare system during the different waves of the pandemic. Beyond this situation, it should serve as an organizational model to better address the challenges facing the inter-hospital

transfer of patients subjected to ECMO (9), and facilitate the application of the recommendations published by working groups specifically dedicated to the management of these patients (10,11).

References

Bibliografía

1. Argudo E, Hernández-Tejedor A, Belda Hofheinz S, Fuset MP, Sanchez Galindo A, Burgueño P, Ballcels J, et al. Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC) and the Spanish Society of Pediatric Intensive Care (SECIP) consensus recommendations for ECMO transport. Med Intensiva (Engl Ed). 2022 Aug;46(8):446-454. https://doi.org/10.1016/j.medine.2022.06.005

2. Azeli Y, Solà S, Soto MA, Morales-Alvarez J, Lopez A, Trenado J et al.A Regional Command Center for Pandemic Surge. Chest. 2022 Jun 25:S0012-3692(22)01194-1. https://doi.org/10.1016/j.chest.2022.06.022

3. Solà S, Jacob J, Azeli Y, Trenado J, Morales-Álvarez J, Jiménez-Fàbrega FX. Priority in interhospital transfers of patients with severe COVID-19: development and prospective validation of a triage tool. Emergencias. 2022 Feb;34(1):29-37

4. Solà-Muñoz S, Azeli Y, Trenado J, Jiménez X, Bisbal R, López À et al.Effect of a prioritization score on the inter-hospital transfer time management of severe COVID-19 patients: a quasi-experimental intervention study. Int J Qual Health Care. 2022 Mar 28;34(1):mzac011. https://doi.org/10.1093/intqhc/mzac011

5. Martín-Rodríguez F, Sanz-García A, Alberdi Iglesias A, Ortega Rabbione G, Del Pozo Vegas C, de la Torre-Díez I et al. Mortality risk model for patients with suspected COVID-19 based on information available from an emergency dispatch center. Emergencias. 2021 Aug;33(4):265-272.

6. Castro Delgado R, Delgado Sánchez R, Duque Del Río MDC, Arcos González P. Potential capacity of an emergency dispatch center to predict COVID-19-related hospital and intensive care unit admissions. Emergencias. 2021 Oct;33(5):368-373.

7. Centers for Disease Control and Prevention. FluSurge 2.0. Reviewed August 22, 2016. (Consultado 19 julio 2022). Disponible en: https://www.cdc.gov/flu/pandemic-resources/tools/flusurge.htm

8. Lourenco García S, Arcos González P, Cuartas Álvarez T, Lagunas Pardos D, Castro Delgado R. Nurses' roles in emergency response coordination centers in Spain: a resource to consider. Emergencias. 2020 Nov;32(6):409-412.

9. Burgueño P, González C, Sarralde A, Gordo F. Issues to resolve with the use of extracorporeal membrane oxygenation during interfacility transportation. Med Intensiva (Engl Ed). 2019 Mar;43(2):90-102. https://doi.org/10.1016/j.medin.2018.01.004

10. Vidal-Cortés P, Díaz Santos E, Aguilar Alonso E, Amezaga Menéndez R, Ballesteros MÁ, Bodí MA et al Recomendaciones para el manejo de los pacientes críticos con COVID-19 en las Unidades de Cuidados Intensivos [Recommendations for the management of critically ill patients with COVID-19 in Intensive Care Units]. Med Intensiva. 2022 Feb;46(2):81-89. https://doi.org/10.1016/j.medin.2021.08.011.

11. Ballesteros Sanz MÁ, Hernández-Tejedor A, Estella Á, Jiménez Rivera JJ, González de Molina Ortiz FJ, Sandiumenge Camps A et al. Recommendations of the Working Groups from the Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC) for the management of adult critically ill patients in the coronavirus disease (COVID-19). Med Intensiva (Engl Ed). 2020 Aug-Sep;44(6):371-388. https://doi.org/10.1016/j.medin.2020.04.001

Table 1. Clinical-epidemiological characteristics and severity factors of the patient attended by the regional command center of the Medical Emergencies System (*Sistema d'Emergències Mèdiques*, SEM).

	1st wave[3] (n=450)	2nd wave[4] (n=450)	3rd wave[5] (n=336)	4th wave[6] (n=232)
Age (years) [mean (SD)]	60.1 (12.3)	59.8 (13.1)	62.9 (12.6)	60.7 (13.3)
Male gender	311 (69.1)	329 (73.1)	230 (68.5)	159 (68.5)
Arterial hypertension	218 (51.2)	237 (52.9)	189 (56.3)	112 (48.3)
Diabetes	113 (25.2)	124 (27.7)	91 (27.1)	64 (27.6)
Obesity (BMI ≥ 30 kg/m^2)	116 (26.0)	105 (23.3)	90 (26.8)	72 (31.0)
Active smoking	22 (4.9)	43 (9.6)	28 (8.3)	13 (5.6)
History of respiratory disease[1]	91 (20.1)	124 (27.5)	83 (24.4)	54 (23.3)
Presence of comorbidities[2]	82 (18.0)	100 (22.6)	38 (11.3)	27 (11.6)
Clinical Frailty Scale (CFS)				
1	75 (16.7)	61 (13.6)	21 (6.3)	27 (11.5)
2	209 (46.4)	197 (43.7)	175 (52.1)	135 (58.0)
3	147 (32.7)	169 (37.6)	131 (39.0)	67 (29.3)
≥ 4	19 (4.2)	23 (5.1)	9 (2.7)	3 (1.2)
No need for IMV	66 (14.7)	157 (34.9)	134 (39.9)	91 (39.2)
Need for IMV	384 (85.3)	293 (65.1)	202 (60.1)	141 (60.8)
PaO_2/FiO_2 ratio [mean (SD)]	113.2 (55.1)	124.2 (59.5)	108.6 (37.8)	125.3 (54.2)
Need for pronation before transfer	112 (24.9)	100 (22.3)	24 (7.1)	12 (5.2)
Acidosis or shock	67 (14.9)	140 (31.3)	56 (16.7)	21 (9.1)
Acute renal failure	108 (24.0)	143 (31.8)	85 (25.3)	51 (22.0)
Issuing hospital with ICU	129 (28.7)	133 (29.6)	90 (26.8)	65 (28.0)
Patient location				
ICU	57 (12.7)	33 (7.3)	22 (6.5)	16 (6.9)
Emergency or semicritical	393 (87.3)	417 (92.7)	314 (93.5)	216 (93.1)
Days of ICU or semicritical unit stay [mean (SD)]	19.3 (16.7)	18.5 (15.6)	18.2 (12.0)	17.8 (11.3)

High mortality risk according to the TIHCOVID scale	102 (22.7)	113 (25.1)	63 (18.8)	27 (11.6)
Mortality during admission	152 (33.8)	145 (32.2)	91 (27.1)	31 (17.8)

1. The history of respiratory diseases is defined by COPD GOLD A-B, asthma under treatment and obstructive sleep apnea syndrome. 2. The presence of comorbidities is defined by COPD GOLD C-D, lung fibrosis, stroke with residual paresis, heart failure (New York Heart Association class > II), neurodegenerative disease, active cancer, and liver cirrhosis Child B-C. 3. From 14 March to 30 April 2020. 4. From 17 October to 11 December 2020. 5. From 1 January to 7 February 2021. 6. From 20 March to 30 April 2021.

Abbreviations: SD: standard deviation; BMI: body mass index; IMV: invasive mechanical ventilation; ICU: Intensive Care Unit.

Table 2. Description of the reasons for non-transfer during the study period.

REASON FOR NON-TRANSFER	N	%
Change in patient condition: improvement	17	4.8
Change in patient condition: worsening	9	2.5
Death	9	2.5
Admission to the same hospital: emergencies	21	5.9
Admission to the same hospital: ICU	57	16.1
Admission to the same hospital: pending bed	5	1.4
Change in the opinion of requesting party	70	19.8
Not applicable according to the reference hospital	37	10.5
Not applicable according to the coordinating center	43	12.2
Patient rejection of transfer	1	0.3
Logistic reasons	8	2.2
Lack of treatment means	19	5.4
Only bed requested	10	2.8
Non-urgent and unscheduled inter-hospital transfer	37	10.5
Others	11	3.1
TOTAL	354	100%