

# Concern for Patient Safety Culture of ECMO Team in Emergency Department: A Cross-Sectional Survey

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## Abstract

To evaluate the patient safety culture status of the ECMO team in the emergency department of a tertiary care hospital. A cross-sectional survey was conducted in the emergency department of Xiangya Hospital from September 1st to 30th, 2021. The Chinese version of HSOPSC electronic questionnaire was administered to all staff involved in ECMO management and initiation. A total of 152 ECMO team members completed the survey. Among the 12 dimensions of patient safety culture, 4 dimensions recorded relatively high positive response rates (>50%): organizational learning-continuous improvement (87.1%), teamwork within units (86.8%), feedback and communication about errors (58.5%), and supervisor/manager expectations and actions promoting patient safety (55.6%). 8 dimensions recorded relatively low positive response rates (<50%): nonpunitive responses to errors (24.1%), hospital handoffs and transitions (27.1%), staffing (28.6%), the frequency of event reporting (32.4%), teamwork across units (33.2%), communication openness (39.7%), management support for patient safety (48.7%), and overall perceptions of patient safety (49.3%). The overall level of patient safety culture was measured at 47.6%. The ECMO team should immediately address issues of nonpunitive responses to errors, hospital handoffs and transitions, and staffing to improve the safety of ECMO. Going forward, the head of the ECMO team should regard patient safety culture as a top priority, improve staff satisfaction, standardize the transfer and handover process, and create a blame-free environment to facilitate event reporting.

## Keywords

patient safety, safety culture, emergency department, ECMO, cross-sectional survey

The application of ECMO has been increasing in the emergency department setting because patients with severe illness presenting to the emergency department maybe require further cardiorespiratory support despite vigorous resuscitative efforts.

This is the first time that the HSOPSC tool has been used to investigate the patient safety culture of the ECMO team in the emergency department.

The result of assessment of patient safety culture of the ECMO team in the emergency department will help hospital policy-maker, healthcare manager and providers to understand statue of patient safety culture and take some measures for improve patient safety.

is a complex, high risk and known as the last life-support clinical technique, which requires a multidisciplinary cooperation for initiation and management, and its complications may be severe and fatal.<sup>1</sup> Therefore, the ECMO team (ET) members must prioritize patient safety.

From 2019 to now, the novel coronavirus infected thousands of people in China and spread rapidly around the world. Approximately 33% of hospitalized patients with Coronavirus disease 2019 (COVID-19) develop acute respiratory distress syndrome (ARDS), and many with refractory hypoxemia require extracorporeal life support.<sup>2</sup> Under such circumstances, ECMO in China has developed rapidly.<sup>3</sup> Emergency department (ED) is the main place for the rescue

## Introductions

Extracorporeal membrane oxygenation (ECMO) is a form of extracorporeal life support. Its principle is to use an artificial pump to transport the patient's nonoxygenated blood to a gas exchange device (oxygenator), where the blood is fully oxygenated and carbon dioxide is removed, and then the blood is reinfused back into the patient's circulation system. ECMO

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of severe cardiopulmonary diseases in the hospital, and many patients presenting to the ED may require immediate ECMO support. The number of patients undergoing ECMO therapy in the ED is increasing as a number of recent studies show that the use of ECMO can improve outcomes in patients with cardiac arrests—mainly survival without neurologic deficit.<sup>4,5</sup> However, the ET in most EDs is still at the preliminary stage, and ECMO-induced complications are common, the success rate of weaning from ECMO is not relatively high. Patient safety issues remain a serious challenge for the ET of ED.

Patient safety culture (PSC) is an integral part of organizational culture, including the shared beliefs, attitudes, values, norms, and behavioral characteristics of employees and affects employees' attitudes and behaviors toward organizational patient safety issues.<sup>6</sup> Establishing a safety culture is a core element of many efforts to improve patient safety and the quality of care. Increasing evidence shows that the incidence of medical errors and adverse events is related to the attitudes of health care professionals toward safety.<sup>7</sup>

In 2004, the Agency for Healthcare Research and Quality (AHRQ) released the Hospital Survey on Patient Safety Culture (HSOPSC) for health care providers and other staff to evaluate the PSC in their hospitals. Since then, hundreds of hospitals in the United States and around the world have implemented this survey.<sup>8</sup> Our study aims to assess the PSC of the ET in the ED of a tertiary care hospital in China to establish a basis for step-by-step improvements to patient safety, ultimately improving the success rate of ECMO and reducing iatrogenic damage.

## Methods

### *Study Design and Setting*

A cross-sectional survey was conducted in the ED of Xiangya Hospital (XYH) located in the city of Changsha in Hunan Province, China from September 1st to 30th 2021. According to the 2019 Population and Housing Census, Changsha has a total population of approximately 8 394 500. XYH is a tertiary-A public comprehensive hospital (the highest level of hospital in China) under the direct supervision of the National Health Commission and is a teaching hospital affiliated with Central South University with a bed capacity of 3500 and 4640 clinical staff. In 2019, there were approximately 3 million outpatient and emergency visits, approximately 152 000 hospital discharges, and 86 000 surgeries. XYH is one of the largest general hospitals in Central and South China.

The ED of XYH is the largest ED in Hunan Province and is responsible for the urgent treatment and referral of critically ill patients in the central and southern regions of China, which consists of consulting rooms, observation rooms, rescue rooms and intensive care units. There are about 150 000 ED visits per year, of which about 30% need to be admitted to intensive care unit. The ED currently owns 2 ECMO machines (1 Rotaflow, Getinge and 1 Sorin, MEDINNOVA).

Since the first ECMO case was launched in 2019, more than 20 ECMO cases have been completed every year. The ET in the ED need to be in charge of the ECMO initiation evaluation, cannulation, circulatory monitoring, and full management of patients in the hospital as well as the ECMO initiation and referral of patients outside the hospital.

### *Sample and Data Collection*

The target population for this study includes all staff directly or indirectly involved in ECMO case management and initiation in the ED, including clinical and nonclinical staff. A total of 178 staff members were surveyed, including 39 physicians, 131 nurses, and 8 support staff members.

Electronic questionnaires were issued and collected from the respondents online. To ensure the privacy of the respondents, the survey was kept strictly anonymous. No patients were involved in the study. This study is an observational, non-interventional research which has not any adverse effects on the subjects. According to Chinese law, this study did not require formal ethical approval.

### *HSOPSC Electrical Questionnaire*

The HSOPSC tool was released in November 2004 by the AHRQ. The tool is designed to measure 12 dimensions of patient safety culture and contains 42 items. These items mainly use a 5-point Likert response scale for agreement (“Strongly disagree” to “Strongly agree”) or frequency (“Never” to “Always”).<sup>9</sup> Twelve dimensions are measured, including: (1) Teamwork Within Units (4 items); (2) Supervisor/Manager Expectations and Actions Promoting Patient Safety (4 items); (3) Organizational Learning-Continuous Improvement (3 items); (4) Management Support for Patient Safety (3 items); (5) Overall perceptions of safety (4 items); (6) Feedback and Communication About Errors (3 items); (7) Communication openness (3 items); (8) Frequency of event reporting (3 items); (9) Teamwork Across Units (4 items); (10) Staffing (4 items); (11) Handoffs and Transitions (4 items); and (12) Nonpunitive Responses to Errors (3 items).<sup>10</sup>

The HSOPSC questionnaire was translated into Chinese by a translator with a background in patient safety research and was made into an electronic questionnaire using the Wenjuanxing App. It has good reliability and validity, and can be used as an effective tool to evaluate the patient safety culture in China's medical institutions.<sup>11-13</sup> We issued an electronic questionnaire to investigate the ET members' perceptions of patient safety and then collected the questionnaires.

### *Data Analysis*

EXCEL for Windows was used to perform a statistical analysis of the status of the PSC of the ET. Descriptive statistics of the demographic characteristics of the respondents were calculated as well as the average percentage of positive

responses to PSC. A positive response was recorded if the respondent selected an option that facilitated patient safety. The average percentage of positive responses (defined as the average percentage of item-level positive responses in the HSOPSC dimension) represents a positive response to PSC.

## Results

A total of 152 respondents completed the survey (a response rate of 85.4%), and 52 (34.2%) were males. The average age of ET members participating in the survey was  $35.2 \pm 5.8$  years of age, and the age range was 26 to 52 years of age. Regarding education levels, 59.2% of the respondents had a college/university degree, and 40.8% had a master's degree or PhD. A total of 21.7% of the respondents were physicians, 73.0% were nurses, and 5.3% were support staff. Most of the respondents had 6 to 20 years of work experience. Nearly 90% of the ET members worked 20 to 59 hours per week. 86.8% of the ET members had been familiar with ECMO technology for more than 6 months. Further details are shown in Table 1.

Table 2 shows the average percentage of positive responses given on each of the 12 dimensions measured by the HSOPSC for the ET data of this study. Among the 12 dimensions of patient safety culture, 4 dimensions recorded relatively high positive response rates (>50%): organizational learning-continuous improvement (87.1%), teamwork within units (86.8%), feedback and communication about errors (58.5%), and supervisor/manager expectations and actions promoting patient safety (55.6%). Eight dimensions recorded relatively low positive response rates (<50%): nonpunitive responses to errors (24.1%), hospital handoffs and transitions (27.1%), staffing (28.6%), the frequency of event reporting (32.4%), teamwork across units (33.2%), communication openness (39.7%), management support for patient safety (48.7%), and overall perceptions of patient safety (49.3%). The overall level of patient safety culture was measured at 47.6%.

The "Organizational learning-continuous improvement" dimension of PSC refers to a learning culture in which errors lead to positive changes and the effectiveness of such changes is evaluated. In the ET, the average percentage of positive responses to "Organizational learning-continuous improvement" was recorded as 87.1%. Most of the respondents agreed that the hospital carries out constructive activities to improve PSC and learn from mistakes to improve patient safety.

For the ET, the average percentage of positive responses to "Teamwork within units" was recorded as 86.8%. This result shows that most of the respondents felt supported and respected in their work units or workplaces and that they were more likely to cooperate and coordinate with colleagues. On the other hand, from the "Teamwork across units" data (33.2%), the ET members did not seem to enjoy cooperation and coordination across different units or departments.

**Table 1.** Demographic Characteristics of the Study Participants.

Demographic characteristics	Respondents (n = 152)	Frequency (%)
Gender		
Male	52	34.2
Female	100	65.8
Age (years)		
20-30	24	15.8
31-40	104	68.4
≥41	24	15.8
Education level		
College/university	90	59.2
Master/PhD	62	40.8
Staff position		
Physician	33	21.7
Nurse	111	73.0
Support Staff	8	5.3
Work experience (years)		
≤5	28	18.4
6-10	46	30.3
11-15	33	21.7
16-20	25	16.4
≥21	20	13.2
Working hours (per week)		
<20	4	2.6
20-39	98	64.5
40-59	38	25.0
60-79	4	2.6
≥80	8	5.3
Period of ECMO awareness (months)		
<6	20	13.2
6-12	37	24.3
13-24	49	32.2
>24	46	30.3

About 58.5% of the respondents felt that they could obtain feedback about changes put in place based on event reports and information about errors occurring in the unit from the data on "Feedback and communication about errors." The "Supervisor/manager expectations and actions promoting patient safety" dimension reflects the expectations and behaviors of team managers regarding patient safety issues. For the ET, the positive response rate of this dimension was recorded as 55.6%.

The "Overall perceptions of patient safety" measure reflects whether respondents believe that their hospital has good procedures and systems in place to prevent errors and address patient safety issues. The percentage of positive responses from the ET on this dimension was recorded as 49.3%. The "Management support for patient safety" dimension indicates whether a team leader provides a working atmosphere that promotes patient safety. In the ET, the positive response rate for this dimension was recorded as 48.7%. Unfortunately, most of the ET members did not believe that

**Table 2.** Frequency Distribution of Perceptions of Patient Safety Culture Among Emergency ECMO Team Members (n = 152).

Characteristic	Strongly disagree	Disagree	Neither	Agree	Strongly agree	% of positive response rate
1. Teamwork within units						86.8
People support one another in this unit.	5	2	10	88	47	88.8
When one area in this unit gets really busy, others help out.	7	7	15	99	24	80.9
When a lot of work needs to be done quickly, we work together as a team to get the work done.	2	3	12	90	45	88.8
In this unit, people treat each other with respect.	2	7	8	96	39	88.8
2. Organizational learning-continuous improvement						87.1
We are actively doing things to improve patient safety.	0	3	14	68	67	88.8
Mistakes have led to positive changes here.	2	5	18	70	57	83.6
After we make changes to improve patient safety, we evaluate their effectiveness.	1	7	9	82	53	88.8
3. Supervisor/manager expectations and actions promoting patient safety						55.6
My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures.	5	15	29	53	50	67.8
My supervisor/manager seriously considers staff suggestions for improving patient safety.	3	17	21	62	49	73.0
Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts. (negatively worded)	26	24	57	21	24	32.9
My supervisor/manager overlooks patient safety problems that happen over and over. (negatively worded)	24	50	49	19	10	48.7
4. Teamwork across units						33.2
Hospital units do not coordinate well with each other. (negatively worded)	8	13	87	24	20	13.8
Hospital units work well together to provide the best care for patients.	18	27	33	42	32	48.7
It is often unpleasant to work with staff from other hospital units. (negatively worded)	6	31	55	36	24	24.3
There is good cooperation among hospital units that need to work together.	12	21	49	47	23	46.1
5. Management support for patient safety						48.7
Hospital management provides a work climate that promotes patient safety.	7	18	28	55	44	65.1
The actions of hospital management show that patient safety is a top priority.	5	22	43	53	29	53.9
Hospital management seems interested in patient safety only after an adverse event happens. (negatively worded)	9	32	67	34	10	27.0
6. Handoffs and transitions						27.1
Things "fall between the cracks" when transferring patients from one unit to another. (negatively worded)	6	19	77	32	18	16.4
Important patient care information is often lost during shift changes. (negatively worded)	21	49	65	9	8	46.1
Problem often occur in the exchange of information across hospital units. (negatively worded)	13	32	55	28	24	29.6
Shift changes are problematic for patients in this hospital. (negatively worded)	7	18	63	48	16	16.4
7. Overall perceptions of patient safety						49.3
It is just by chance that more serious mistakes don't happen around here. (negatively worded)	19	30	72	16	15	32.2
Patient safety is never sacrificed to get more work done.	2	7	32	65	46	73.0
We have patient safety problems in this unit. (negatively worded)	6	11	80	32	23	11.2
Our procedures and systems are good at preventing errors from happening.	0	9	20	69	54	80.9

(continued)

**Table 2.** (continued)

Characteristic	Strongly disagree	Disagree	Neither	Agree	Strongly agree	% of positive response rate
<b>8. Staffing</b>						<b>28.6</b>
We have enough staff to handle the workload.	4	10	39	52	47	65.1
Staff in this unit work longer hours than is best for patient care. (negatively worded)	4	21	68	36	23	16.4
We use more agency/temporary staff than is best for patient care. (negatively worded)	15	18	71	25	23	21.7
We work in “crisis mode” trying to do too much, too quickly. (negatively worded)	8	9	77	38	20	11.2
<b>9. Nonpunitive response to errors</b>						<b>24.1</b>
The staff feel like their mistakes are held against them. (negatively worded)	20	29	50	28	25	32.2
When an event is reported, it feels like the person is being written up, not the problem (negatively worded).	13	32	55	34	18	29.6
Staff worry that mistakes they make are kept in their personnel file. (negatively worded)	8	8	67	54	15	10.5
Characteristic	Never	Rarely	Some-times	Most of the time	Always	% of positive response rate
<b>10. Frequency of events reported</b>						<b>32.4</b>
When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?	17	19	50	50	16	43.4
When a mistake is made, but has no potential to harm the patient, how often is this reported?	19	32	64	19	18	24.3
When a mistake is made that could harm the patient, but does not, how often is this reported?	15	19	73	25	20	29.6
<b>11. Communication openness</b>						<b>39.7</b>
Staff will freely speak up if they see something that may negatively affect patient care.	8	21	36	47	40	57.2
Staff feel free to question the decisions or actions of those with more authority.	17	23	67	23	22	29.6
Staff are afraid to ask questions when something does not seem right. (negatively worded)	16	33	54	34	15	32.2
<b>12. Feedback and communication about errors</b>						<b>58.5</b>
We are given feedback about changes put in place based on events reports.	13	22	35	47	35	53.9
We are informed about errors that happen in this unit.	8	9	40	53	42	62.5
In this unit, we discuss ways to prevent errors from happening again.	10	13	39	45	45	59.2

their team leader supported improved patient safety in terms of actions and awareness.

For the “Frequency of events reported” measure, the positive response rate of the ECMO team was recorded as 32.4%. Some respondents noted rarely reporting adverse events, especially events that did not cause patient harm. For the dimension on “Communication openness,” the positive response rate was recorded as 39.7%. Few team members felt free to question the decisions of those with more authority, and most members reported being afraid to ask questions when practices seem questionable.

Most members of the studied ET felt that XYH was not doing enough for a safe shift, the average percentage of

positive responses to “Handoffs and Transitions” was only 27.1%, and it presented some of the lowest scores of the 12 dimensions of PSC. The “staffing” dimension denotes whether a health care department has enough staff assigned to handle workloads and whether working hours are suitable to provide the best care for patients. In this survey, the percentage of positive responses (28.6%) for this item was very low in terms of PSC. Most of the respondents felt that they worked in “crisis mode” by trying to do too much too quickly. In addition, most of the respondents reported that their working hours exceeded their expectations. When a medical failure or error occurs, it usually results in the punishment of personnel rather than recognition of the problem. The



“Nonpunitive response to error” dimension measures the extent to which hospital employees believe that they are not blamed for errors and that errors are not recorded in their personnel files. In this survey, the percentage of positive responses (24.1%) for this item was the lowest for PSC.

## Discussion

This is the first study to use the HSOPSC tool to investigate the PSC of the ET. A total of 152 ET members in the ED of XYH were surveyed. Overall, the average positive response rate of the 12 PSC dimensions was recorded as 47.6%, which is much lower than that of the HSOPSC in China (about 65%).<sup>14-16</sup> In fact, these patients with ECMO are medically complex, at risk for complications, and resource intensive, which requires the ET to pay more attention to patient safety. The Extracorporeal Life Support Organization (ELSO) provided support for construction of the ET through continuing education and guidelines.<sup>17</sup> The results show that as a transfer center for critically ill patients, the PSC of the studied ET was not enough, further indicating that the level of patient safety practice may be low and revealing many areas requiring urgent improvement.

The conditions under which patients are treated with ECMO are often severe and complex, so multidisciplinary cooperative treatment is needed to achieve the best prognosis. There is a high possibility of medical problems and accidents occurring during shift changes.<sup>18</sup> Therefore, a shift is needed to ensure patient safety in the hospital. Most of the ET members surveyed reported that a lack of cooperation between departments had made it easy to shirk responsibilities. Shifts were not carefully handed over, and shift system procedures were not strictly implemented. The positive response rates obtained on “handoffs and transitions” and “teamwork across units” are thus very low (<35%).

Regarding the “staffing” dimension, the average positive response rate is also too low. It is difficult for an insufficient number of staff to handle the workload because managers had reduced the number of employees to save costs. When the ET members work for a long time, they will try to work too quickly, which may have a negative impact on performance and compromise patient safety.<sup>19</sup>

The average positive response rate of “nonpunitive response to error” was found to be the lowest of the 12 patient safety culture dimensions. Most of the ET members studied believed that their errors and incident reports could be used against them and were recorded in their personal files. Past studies have shown that the purpose of an effective response to errors is to identify system errors rather than to hold individuals accountable, which can promote a positive PSC.<sup>20,21</sup> Therefore, if a medical error occurs, the problem should be addressed in reference to the entire system rather than by assigning blame to the individual who made the error. A “blame-free” environment in which the ET members can identify and communicate their mistakes without fear is ideal for

good patient care. When a medical error is reported, measures can be taken in time to prevent it from happening again.<sup>22</sup>

Based on the average positive response rate for “management support for patient safety” and “overall perceptions of patient safety,” both managers and members of the studied ET should improve patient safety perceptions and view patient safety as their top priority. The ET managers should not pay attention to patient safety after an adverse event occurs. The ET members should strictly follow patient safety procedures to ensure patient safety.

The HSOPSC developed by the AHRQ has been used to meet the growing demand for patient safety culture assessment in Western countries (especially the United States). There are some differences between Western and Eastern countries in the application of HSOPSC measurements.<sup>23</sup> First, when an error happens, most Chinese interviewees are reluctant to openly report them. Chinese people are particularly concerned about the attitudes and behaviors of others, tend to exhibit strong social integration in their opinions or behaviors, and pursue harmony between people. The Chinese believe that harmonious relations can maintain a stable social order while open communication can destroy interpersonal harmony. Second, many Chinese people try to avoid directly discussing adverse events and mistakes that have occurred and often choose to remain silent on such issues. Past cultural studies have found that Chinese society pays more attention to collective ideals than Western societies.<sup>24,25</sup> Chinese people tend to use indirect means to express their views, which prevents them from expressing their views freely. Third, Chinese society is highly hierarchical. The degree of difference between superiors and subordinates in China affects the commitment of subordinates, and most employees tend to obey their leaders. When an employee reports an error to his or her superiors, his or her behavior may be viewed as an action taken against the leader and will be stopped. The dimensions of “Communication openness” and “Frequency of event reporting” included in the assessment of PSC have so different meanings in Eastern and Western countries that the positive response rates are low in this survey.

This study is a cross-sectional survey of all staff involved in ECMO management in the ED of one hospital, and its results only reflect the current PSC status of the ET in the ED. The small survey scope and sample size are the limitations of this study. Therefore, it will be necessary to expand the scope and sample size of investigation in future research. In addition, PSC was evaluated quantitatively, not qualitatively in this study. Qualitative assessments will need also to be conducted in the form of interviews to obtain more accurate PSC information from the ET. Moreover, PSC surveys of the ET in the ED should be conducted on a regular basis to measure improvements to find factors that affect PSC and in turn take timely measures to improve patient safety.

The HSOPSC survey results given in this study indicate that the ET should impose the following measures. (1) Allocate personnel and work time effectively. (2) Develop a

nonpunitive culture, create an atmosphere for open communication, and establish a “blame-free” environment to help employees spontaneously report adverse events. (3) Focus on patient transfer and transitions through different hospital departments. Overall, a positive safety culture will improve the safety performance of patients treated with ECMO, which can help the ET improve the quality of medical care, reduce medical costs, and increase success rates.

## Conclusions

Administrators in many countries are currently striving to improve patient safety and encourage healthcare providers to assess the current status of PSC. The employed patient safety culture assessment tool provided a means to understand what employees believe about and their behavior is toward patient safety. “Nonpunitive responses to errors,” “Hospital Handoffs and transitions” and “Staffing” generated so relatively low positive response scores that the studied ET should focus on solving these problems. Going forward, the leader of the ET should continue to regard PSC as a top priority, improve team member satisfaction, reduce staff burdens, standardize the transfer and handover process, and create a blame-free environment to facilitate event reporting.

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## Author Contributions

Shuiyuan Xiao was responsible for directing the research. Li Li was responsible for data statistics. Liping Zhou was responsible for issuing and collecting the questionnaires. Ning Yang was responsible for research design and manuscript writing.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Ethical Approval

Ethical approval for this study was waived by the Xiangya Medical Ethics Committee of Central South University because the subjects of this survey were medical staff, the survey method involved issuing questionnaires and administering the questionnaires anonymously, no patients were involved, no intervention studies were conducted, and no adverse effects to any participants resulted. This study was completed in accordance with the Helsinki Declaration [include details of relevant legislation where applicable].

## Informed Consent

Verbal informed consent was obtained from all subjects before the study and written informed consent was not obtained because the ECMO team members in the emergency department involved were highly involved and happy to accept such an investigation. The Xiangya Medical Ethics Committee of Central South University confirmed that the present study did not require formal written consent and that only verbal consent was required.

## Availability of Data

The datasets generated and/or analysed during the current study are available from the corresponding author.

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## References

1. Mosier JM, Kelsey M, Raz Y, et al. Extracorporeal membrane oxygenation (ECMO) for critically ill adults in the emergency department: history, current applications, and future directions. *Crit Care*. 2015;19:431. doi:10.1186/s13054-015-1155-7.
2. Aslan A, Aslan C, Zolbanin NM, Jafari R. Acute respiratory distress syndrome in COVID-19: possible mechanisms and therapeutic management. *Pneumonia*. 2021;13(1):14. doi:10.1186/s41479-021-00092-9.
3. MacLaren G, Fisher D, Brodie D. Preparing for the most critically ill patients with COVID-19: the potential role of Extracorporeal Membrane Oxygenation. *JAMA*. 2020;323(13):1245-1246. doi:10.1001/jama.2020.2342
4. Bartos JA, Grunau B, Carlson C, et al. Improved survival with extracorporeal cardiopulmonary resuscitation despite progressive metabolic derangement associated with prolonged resuscitation. *Circulation*. 2020;141(11):877-886. doi:10.1161/CIRCULATIONAHA.119.042173
5. Schurr JW, Noubani M, Santore LA, et al. Survival and outcomes after cardiac arrest with VA-ECMO Rescue Therapy. *Shock*. 2021;56(6):939-947. doi:10.1097/SHK.0000000000001809
6. Reis CT, Paiva SG, Sousa P. The patient safety culture: a systematic review by characteristics of hospital survey on Patient Safety Culture dimensions. *Int J Qual Health Care*. 2018;30(9):660-677. doi:10.1093/intqhc/mzy080
7. Weaver SJ, Lubomksi LH, Wilson RF, Pfoh ER, Martinez KA, Dy SM. Promoting a culture of safety as a patient safety strategy: a systematic review. *Ann Intern Med*. 2013;158(5 Pt 2):369-374. doi:10.7326/0003-4819-158-5-201303051-00002
8. Waterson P, Carman EM, Manser T, Hammer A. Hospital Survey on Patient Safety Culture (HSPSC): a systematic review of the psychometric properties of 62 international studies. *BMJ Open*. 2019;9(9):e026896. doi:10.1136/bmjopen-2018-026896.
9. Chen IC, Li HH. Measuring patient safety culture in Taiwan using the hospital survey on Patient Safety Culture (HSOPSC). *BMC Health Serv Res*. 2010;10:152. doi:10.1186/1472-6963-10-152.
10. Azyabi A, Karwowski W, Davahli MR. Assessing Patient Safety Culture in hospital settings. *Int J Environ Res Public Health*. 2021;18(5):2466. doi:10.3390/ijerph18052466.

11. Palmieri PA, Leyva-Moral JM, Camacho-Rodriguez DE, et al. Hospital survey on patient safety culture (HSOPSC): a multi-method approach for target-language instrument translation, adaptation, and validation to improve the equivalence of meaning for cross-cultural research. *BMC Nurs.* 2020;19:23. doi:10.1186/s12912-020-00419-9.
12. Hu D, Tan J, Ge YJ, Li XC. Evaluation and consideration of the HSOPSC 2.0 version of Patient Safety Culture Questionnaire. *Chinese Health Quality Management.* 2021;28(10):055-058. doi:10.13912/j.cnki.chqm.2021.28.10.15
13. Li Y, Cheng Y, Hu X, Zhang L. Transcultural adaptation and psychometric evaluation of the mainland China version of Nursing Home Survey on Patient Safety Culture Questionnaire: a cross-sectional survey based on 50 nursing homes in China. *BMJ Open.* 2021;11(6):e043994. doi:10.1136/bmjopen-2020-043994.
14. Nie Y, Mao X, Cui H, He S, Li J, Zhang M. Hospital survey on patient safety culture in China. *BMC Health Serv Res.* 2013;13:228. doi:10.1186/1472-6963-13-228.
15. Jiang K, Tian L, Yan C, et al. A cross-sectional survey on patient safety culture in secondary hospitals of Northeast China. *PLoS One.* 2019;14(3):e0213055. doi:10.1371/journal.pone.0213055.
16. Zhou P, Li M, Wei X, Zhu H, Xue D. Patient Safety Climate in general public hospitals in China: A Multiregion Study. *J Patient Saf.* 2021;17(7):522-530. doi:10.1097/PTS.0000000000000427
17. DellaVolpe J, Barbaro RP, Cannon JW, et al. Joint Society of Critical Care Medicine-Extracorporeal Life Support Organization Task Force Position Paper on the role of the intensivist in the initiation and management of Extracorporeal Membrane Oxygenation. *Crit Care Med.* 2020;48(6):838-846. doi:10.1097/CCM.0000000000004330
18. Clark A, Wolgast KA, Mazur N, Mekis A. Leading change in Nurse Bedside Shift Report. *Nurs Clin North Am.* 2020;55(1):21-28. doi:10.1016/j.cnur.2019.10.002
19. Akologo A, Abuosi AA, Anaba EA. A cross-sectional survey on patient safety culture among healthcare providers in the Upper East region of Ghana. *PLoS One.* 2019;14(8):e0221208. doi:10.1371/journal.pone.0221208.
20. Kavanagh C. Medication governance: preventing errors and promoting patient safety. *Br J Nurs.* 2017;26(3):159-165. doi:10.12968/bjon.2017.26.3.159
21. Rodziewicz TL, Houseman B, Hipskind JE. Medical Error Reduction and Prevention. In: StatPearls. Treasure Island (FL): StatPearls Publishing; May 1, 2022.
22. Wami SD, Demssie AF, Wassie MM, Ahmed AN. Patient safety culture and associated factors: A quantitative and qualitative study of healthcare workers' view in Jimma zone Hospitals, Southwest Ethiopia. *BMC Health Serv Res.* 2016;16:495. doi:10.1186/s12913-016-1757-z.
23. Elmontsri M, Almashrafi A, Banarsee R, Majeed A. Status of patient safety culture in Arab countries: a systematic review. *BMJ Open.* 2017;7(2):e013487. doi:10.1136/bmjopen-2016-013487.
24. Zhang QS, Liu QN. A study of the differences between Chinese and Western cultures from the perspective of Hofstede's cultural dimension theory. *East African Scholars J Edu Humanit Lit.* 2020;3(4):125-128. doi:10.36349/EASJEHL.2020.v03i04.006
25. Chen SX, Ng JCK, Buchtel EE, Guan Y, Deng H, Bond MH. The added value of world views over self-views: predicting modest behaviour in eastern and Western cultures. *Br J Soc Psychol.* 2017;56(4):723-749. doi:10.1111/bjso.12196