



# Are you using the third definition to diagnose sepsis in clinic?—A survey among Chinese intensivists

Li-Hua Dong<sup>1^</sup>, Qi-Yu Zhang<sup>2</sup>, Ning-Ning Di<sup>3</sup>, Qiu-Li Xue<sup>1</sup>, Ya-Jie Liu<sup>1</sup>

<sup>1</sup>Department of Intensive Care Unit, The First Hospital of Jilin University, Changchun, China; <sup>2</sup>Department of Computed Tomography,

<sup>3</sup>Department of Intensive Care Unit, General Hospital of Jilin Oil Field, Songyuan, China

**Contributions:** (I) Conception and design: LH Dong; (II) Administrative support: LH Dong, QY Zhang; (III) Provision of study materials or patients: All authors; (IV) Collection and assembly of data: NN Di, QL Xue, YJ Liu; (V) Data analysis and interpretation: LH Dong, QY Zhang, NN Di; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

**Correspondence to:** Li-Hua Dong, Department of Intensive Care Unit, The First Hospital of Jilin University, 71 Xinmin Street, Changchun 130021, China. Email: dongleehua@163.com.

**Background:** Since sepsis-3 definition is more accurate and sensitive than previous sepsis definition, implementation the newest diagnosis criteria could definitely bring more benefit to sepsis patients. This study was done to identify the level of current intensivists' knowledge regarding the third international consensus definitions for sepsis and septic shock and its implementation for the diagnosis of sepsis among Chinese adult intensive care units (ICUs).

**Methods:** A nationwide survey amongst critical care physicians was designed. The questionnaires measured the understanding and the frequency of diagnosis of sepsis and septic shock according to the third international consensus definitions for sepsis and septic shock. One thousand random physician members of Chinese Society of Critical Care Medicine were involved in the survey. A 5-point Likert scale (totally understand, partially understand, understand, hardly understand, do not understand) was used to elicit answers about the degree of understanding the sepsis-3 definition. The other 5-point Likert scale (always, often, sometimes, rarely, never) was used to elicit answers about the frequency of diagnosing sepsis according to the sepsis-3 definition.

**Results:** There were 59 (16.1%) intensivists who could completely understand the sepsis-3 definition. Less practiced intensivists could understand the sepsis-3 definition better than more practiced intensivists ( $P<0.001$ ). Intensivists from university teaching hospitals understand the sepsis-3 definition better than the intensivists from the community hospitals ( $P<0.001$ ). Intensivists from small-sized ICUs understand the sepsis-3 definition better than intensivists from big-sized ICUs ( $P<0.001$ ). There were 60 (16.4%) intensivists who always diagnose sepsis according to the sepsis-3 definition since sepsis-3 published. Less practiced intensivists prefer using the sepsis-3 definition to diagnose sepsis compared with more practiced intensivists ( $P<0.001$ ). Intensivists from university teaching hospitals prefer using the sepsis-3 definition to diagnose sepsis compared with the intensivists from the community hospitals ( $P<0.001$ ). Intensivists from small-sized ICUs prefer adapting sepsis-3 definition to diagnosis sepsis compared with intensivists from big-sized ICUs ( $P<0.001$ ).

**Conclusions:** In current China, the sepsis-3 definition is well understood and accepted by intensivists.

**Keywords:** Sepsis definition; diagnosis; survey; intensive care unit (ICU)

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<sup>^</sup> ORCID: 0000-0002-8861-9056.

## Introduction

Sepsis is frequently diagnosed in intensive care units (ICUs). Although sepsis has attracted the attention of physicians and researchers because it is the leading cause of mortality and a major health burden world-widely, the definition remains debatable (1-10). The third international consensus Task Force convened by the European Society of Intensive Care Medicine and the society of Critical Care Medicine redefined sepsis as “life-threatening organ dysfunction due to a dysregulated host response to infection” (1,11,12). According to the sepsis-3 definition, clinical criteria of sepsis are suspected or documented infection and an acute increase of  $\geq 2$  SOFA points (a proxy for organ dysfunction); septic shock can be defined as sepsis with persisting hypotension, which requiring vasopressor therapy to elevate MAP, and lactate  $>2$  mmol/L (18 mg/dL), despite adequate fluid resuscitation (12). Thus, it revised and validated the new clinical criteria for sepsis (sepsis-3). Despite the sepsis-3 definition has been published for more than 3 years, the 1991 and 2001 consensus terminology are still in use in current clinical and research work among intensivists all over the world (13,14). Studies have investigated the first-hour basic care tasks of sepsis, the 6-hour resuscitation bundle or the 24 h resuscitation bundle implementation (15,16). Early diagnosis is always the key for good prognosis for sepsis patients. Since the sepsis-3 definition is more accurate and sensitive than the previous sepsis definition, implementation the newest diagnosis criteria could definitely bring more benefit to sepsis patients. No studies have investigated the sepsis-3 definition implementation among intensivists in China. This study was done to determine the level of current intensivists’ knowledge regarding the third international consensus definitions for sepsis and septic shock and its implementation for the diagnosis of sepsis and septic shock among Chinese adult intensive care unit (ICU).

We present the following article in accordance with the SURGE report checklist (available at <http://dx.doi.org/10.21037/apm-20-412>).

## Methods

### *Study population and definitions*

The pilot survey was mailed to 1,000 physician members of Chinese Society of Critical Care Medicine (CSCCM) practicing within China, who were randomly selected

from the CSCCM database in April 2018. Standardized survey procedures were used throughout the study. Intensivists received individualized cover letters describing the study and self-addressed stamped envelopes for return of the completed survey via first class mail. A facsimile number was also provided for those who wished to return the survey by facsimile. A reminder mail was sent 3 weeks after the initial mailing. The study was granted approval with exempt status by Jilin University Committee on Human Research.

The survey was composed of 5 questions. Clinically relevant information included years of critical care practice, type of hospital, which included university teaching hospital or community hospital, No. of ICU beds within institution, the degree of understanding the sepsis-3 definition, and the frequency of diagnosing sepsis according to sepsis-3 definition since sepsis-3 published. A 5-point Likert scale (totally understand, partially understand, understand, hardly understand, do not understand) was used to elicit answers about the degree of understanding the sepsis-3 definition. The other 5-point Likert scale (always, often, sometimes, rarely, never) was used to elicit answers about the frequency of diagnosing sepsis according to sepsis-3 definition.

### *Survey validation*

Surveys of the third international consensus definitions for sepsis and septic shock and the diagnosis of sepsis and septic shock were distributed to randomly selected participants in May, 2018. One thousand physician members of the Chinese Society of Critical Care Medicine (CSCCM) were involved in the survey. Intensivist received a survey mail and a reminder mobile text message at the same time. A second mail was sent 3 weeks after the initial mail. The questionnaires were mailed to 50 adult ICUs from June to September in 2018.

### *Statistical analysis*

Survey results were coded and entered into a database for statistical analysis (SPSS software, version 17.0, Chicago, IL, USA). Descriptive statistics were used to compare differences in intensive demographic variables to survey responses. The chi-squared methodology was used to analyze the significance of observed differences between nominal variables in relation to survey responses. Statistical significance was defined as  $P < 0.05$ .

## Results

The survey achieved 519 responses of 1,000 (response rate was 51.9%). Among the 519 responses, 153 were not actually practicing in ICU and were excluded from further analysis, 366 responses were usable surveys (70.5%). Among the intensivists, 63.7% of respondents have worked in clinical practice for at least 6 years. Both university and community hospitals were adequately represented. Among the surveys, 75.9% of replying participants were from middle-sized ICU, with 10–40 beds within institution (*Table 1*).

Relevant data pertaining to the degree of understanding the sepsis-3 definition in Chinese intensivists is included in *Table 2*. Altogether there were 59 (16.1%) intensivists could completely understand the sepsis-3 definition. There were 16 (4.4%) intensivists do not understand the sepsis-3 definition. Regarding years of critical care practice, 53.9% of the intensivists with more than 12 years of critical care practice and 61.1% of the intensivists with 6–12 years of critical care practice understand the sepsis-3 definition. While, 87.2% of the intensivists with less than 3 years of critical care practice totally understand or understand the sepsis-3 definition. Regarding types of hospital, intensivists from university teaching hospitals understand the sepsis-3 definition (53.9% understand, 17.4% totally understand) better ( $P<0.001$ ) than the intensivists from community hospitals (33.3% understand, 13.0% totally understand). Regarding to the number of ICU beds within institution, the intensivists from small-sized ICUs (less than 10 beds) understand the sepsis-3 definition (45.5% totally understand, 27.3% understand) better ( $P<0.001$ ) than the intensivists from big-sized (more than 50 beds) ICUs (50.0% partially understand, 20.0% do not understand). *Table 2* suggests that less practiced intensivists could understand the sepsis-3 definition better than more practiced intensivists ( $P<0.001$ ). Intensivists from university teaching hospitals understand the sepsis-3 definition better than the intensivists from the community hospitals ( $P<0.001$ ). Intensivists from small-sized ICUs understand the sepsis-3 definition better than intensivists from big-sized ICU ( $P<0.001$ ).

Relevant data pertaining to the frequency of diagnosing sepsis according to the sepsis-3 definition since sepsis-3 published is included in *Table 3*. There were 60 (16.4%) intensivists who always diagnosis sepsis according to the sepsis-3 definition since sepsis-3 published, but 21 (5.7%) intensivists never diagnosis sepsis according to the sepsis-3 definition. Among the intensivists with more than 12 years

**Table 1** Critical care physician demographics

Demographic question	No. of respondent (%) <sup>a</sup>
Years of critical care practice	366
>12	102 (27.9)
6–12	131 (35.8)
3–5	98 (26.8)
<3	35 (9.6)
Type of hospital	
University teaching	258 (70.5)
Community	108 (29.5)
No. of ICU beds within institution	
<10	22 (6.0)
10–20	88 (24.0)
21–30	103 (28.1)
31–40	87 (23.8)
41–50	34 (9.3)
>50	32 (8.7)

ICU, intensive care unit. <sup>a</sup>Percent data based on the number of respondents to each question.

of critical practice, 73.6% intensivists often or always diagnosis sepsis according to the sepsis-3 definition. Among the intensivists with 6–12 years of critical care practice, 65.4% of the intensivists often or always diagnosis sepsis according to sepsis-3 definition. But 40% of the intensivists with less than 3 years of critical care practice often or always diagnosis sepsis according to sepsis-3 definition. Regarding types of hospital, intensivists from university teaching hospitals diagnosis sepsis according to the sepsis-3 definition (18.6% always *vs.* 50.0% often) more frequently ( $P<0.001$ ) than the intensivists from community hospitals (11.1% always *vs.* 1.9% often). Regarding to the number of ICU beds within institution, the intensivists from small-sized ICUs (less than 10 beds) diagnosis sepsis according to the sepsis-3 definition (9.1% always *vs.* 27.3% understand) more frequently ( $P<0.001$ ) than the intensivists from big-sized (more than 50 beds) ICUs (3.1% always *vs.* 25.0% often). *Table 3* suggests that less practiced intensivists prefer using the sepsis-3 definition to diagnosis sepsis compared with more practiced intensivists ( $P<0.001$ ). Intensivists from the university teaching hospitals prefer using sepsis-3 definition to diagnosis sepsis compared with the intensivists from the community hospitals ( $P<0.001$ ). Intensivists

**Table 2** The degree of understanding the sepsis-3 definition in Chinese intensivists

Demographic group	Totally understand, n (%) <sup>a</sup>	Understand, n (%) <sup>a</sup>	Partially understand, n (%) <sup>a</sup>	Hardly understand, n (%) <sup>a</sup>	Do not understand, n (%) <sup>a</sup>	P value
Total	59 (16.1)	175 (47.8)	91 (24.9)	25 (6.8)	16 (4.4)	
Years of practice						<0.001
>12	14 (13.7)	55 (53.9)	26 (25.5)	5 (4.9)	2 (2.0)	
6–12	12 (9.2)	80 (61.1)	19 (14.5)	12 (9.2)	8 (6.1)	
3–5	11 (11.2)	35 (35.7)	44 (44.9)	6 (6.1)	2 (2.0)	
<3	22 (62.9)	5 (14.3)	2 (5.7)	2 (5.7)	4 (11.4)	
Type of hospital						<0.001
University teaching	45 (17.4)	139 (53.9)	55 (21.3)	15 (5.8)	4 (1.6)	
Community	14 (13.0)	36 (33.3)	36 (33.3)	10 (9.3)	12 (11.1)	
No. of ICU beds within institution						<0.001
<10	10 (45.5)	6 (27.3)	1 (4.5)	5 (22.7)	0 (0.0)	
10–20	15 (17.0)	51 (58.0)	18 (20.5)	4 (4.5)	0 (0.0)	
21–30	11 (10.7)	59 (57.3)	25 (24.3)	5 (4.9)	3 (2.9)	
31–40	8 (9.2)	52 (59.8)	21 (24.1)	5 (5.7)	1 (1.1)	
41–50	13 (38.2)	5 (14.7)	10 (29.4)	2 (5.9)	4 (11.8)	
>50	2 (6.3)	2 (6.3)	16 (50.0)	4 (12.5)	8 (25.0)	

ICU, intensive care unit. <sup>a</sup>Percent data based on the number of respondents to each question.

from small-sized ICUs prefer adapt sepsis-3 definition to diagnosis sepsis compared with intensivists from big-sized ICUs ( $P<0.001$ ).

## Discussion

The third international consensus Task Force convened by the European Society of Intensive Care Medicine and the Society of Critical Care Medicine redefined sepsis as “life-threatening organ dysfunction due to a dysregulated host response to infection” (1,11,12). Sepsis-3 definition revised and validated the new clinical criteria for sepsis. Though sepsis-3 definition is still in debate as the criteria for sepsis (17), the sepsis-3 definition is currently the most accurate and sensitive criteria for sepsis diagnosis (13,14). This study was the first survey to determine the level of current intensivists’ knowledge regarding the sepsis-3 definition and its implementation for the diagnosis and management of sepsis and septic shock among Chinese adult ICUs.

The survey suggests that in current China, the majority

of intensivists understand the sepsis-3 definition, and diagnosis sepsis according to the sepsis-3 definition. Since the morbidity and mortality of sepsis in China is relatively high (18–21), Chinese physicians have always been taking emphasize on the diagnosis and treatment of sepsis. In 2007, Chinese Society of Critical Care Medicine have published “Guidelines for emergency management of sepsis/septic shock in China”, and updated in 2014 and 2018 (22). The “Guidelines for emergency management of sepsis/septic shock in China of 2018” is almost consistent with the sepsis-3 definition. Since the sepsis-3 definition is more accurate and sensitive than previous sepsis definition, and early diagnosis is always the key for good prognosis for sepsis patients, it is possible to anticipate that the morbidity of sepsis is increasing and the mortality of sepsis is decreasing in current China.

This survey also suggests the following three characters regarding the implementation of the sepsis-3 definition in current China. Firstly, less practiced intensivists understand the sepsis-3 definition better than more practiced intensivists. The possible reason is the more

**Table 3** The frequency of diagnosing sepsis according to sepsis-3 definition since sepsis-3 published

Demographic group	Always, n (%) <sup>a</sup>	Often, n (%) <sup>a</sup>	Sometimes, n (%) <sup>a</sup>	Rarely, n (%) <sup>a</sup>	Never, n (%) <sup>a</sup>	P value
Total	60 (16.4)	131 (35.8)	111 (30.3)	43 (11.7)	21 (5.7)	
Years of critical care practice						<0.001
>12	33 (32.4)	42 (41.2)	22 (21.6)	3 (2.9)	2 (2.0)	
6–12	8 (6.1)	75 (57.3)	30 (22.9)	14 (10.7)	4 (3.1)	
3–5	9 (9.2)	10 (10.2)	48 (49.0)	18 (18.4)	13 (13.3)	
<3	10 (28.6)	4 (11.4)	11 (31.4)	8 (22.9)	2 (5.7)	
Type of hospital						<0.001
University teaching	48 (18.6)	129 (50.0)	59 (22.9)	10 (3.9)	12 (4.7)	
Community	12 (11.1)	2 (1.9)	52 (48.1)	33 (30.6)	9 (8.3)	
No. of ICU beds within institution						<0.001
<10	2 (9.1)	6 (27.3)	5 (22.7)	4 (18.2)	5 (22.7)	
10–20	35 (39.8)	22 (25.0)	25 (28.4)	4 (4.5)	2 (2.3)	
21–30	8 (7.8)	59 (57.3)	26 (25.2)	6 (5.8)	4 (3.9)	
31–40	12 (13.8)	30 (34.5)	37 (42.5)	5 (5.7)	3 (3.4)	
41–50	2 (5.8)	6 (17.6)	12 (35.3)	10 (29.4)	4 (11.8)	
>50	1 (3.1)	8 (25.0)	6 (18.8)	14 (3.1)	3 (9.4)	

ICU, intensive care unit. <sup>a</sup>Percent data based on the number of respondents to each question.

practiced intensivists get used to diagnosis sepsis according the first or second definition of sepsis. It is very common that a practiced physician makes diagnosis according to his practice, instead of the documented criteria. But the definition of sepsis is changing with people's acknowledgement about the pathological mechanism of sepsis. Secondly, intensivists from the university teaching hospitals understand the sepsis-3 definition better than the intensivists from the community hospitals. The reason is there are more chances to attend academic conferences for intensivists who work in the university teaching hospitals. Thirdly, intensivists from small-sized ICU understand the sepsis-3 definition better than intensivists from big-size ICU. In China, the size of ICU is different between different types of hospitals. In very advanced hospital, the beds number is usually 8–20 beds. The big-sized ICU does not mean an advanced ICU. So, this suggests that the intensivists in more advanced ICU master the definition of sepsis-3 better, and diagnosis sepsis according to the more accurate and sensitive criteria.

This study was not without limitations and included only the CSCCM physician members. The survey achieved 519

responses of 1,000. Among the 519 responses, 153 were not actually practicing in ICUs and were excluded from further analysis, 366 responses were usable surveys (70.5%). This is the specific population we intended to survey, the sample is small, and the response rate (51.9%) is not high. The variability in response may be related to those mentioned factors. This investigation has led to further questioning of current mortality of sepsis in China using the sepsis-3 definition to diagnosis sepsis. In the absence of large trials, Epidemiology of the sepsis 3.0 guideline implementation in Chinese intensivists from a multidisciplinary critical care viewpoint is necessary in future.

## Conclusions

In current China, the sepsis-3 definition is well understood and applied in clinical practice by intensivists. However, practice periods, hospital types and ICU size affect the implementation of the sepsis 3.0 guideline. Sepsis-3 definition are implemented better among intensivists with less practiced, from small-sized ICUs, and from university teaching hospitals.



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## Footnote

*Reporting Checklist:* The authors have completed the SURGE Reporting checklist. Available at <http://dx.doi.org/10.21037/apm-20-412>

*Data Sharing Statement:* Available at <http://dx.doi.org/10.21037/apm-20-412>

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*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/apm-20-412>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The experiment is not involved in the animal experiments or human studies, so Ethical Approval and Informed consent is not applicable in this study.

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