PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Core competencies in neurocritical care training in China: consensus developed by a national Delphi consensus survey combined with nominal group technique
AUTHORS	Cui, Zhen; Gao, Liang; Huang, Qi Bing; Li, Li Hong; Qiu, Bing Hui; Shi, Guang Zhi; Yu, Xiang You; Wang, Yan; Zhang, Li; Wang, Yumei; Zhang, Linlin; Zhou, Jian-Xin

VERSION 1 – REVIEW

REVIEWER	Ivan Da Silva, MD, PhD, FNCS Rush University Medical Center Chicago, IL, USA
REVIEW RETURNED	03-Sep-2019

GENERAL COMMENTS	Excellent work. The authors displayed a high knowledge of the Delphi approach and conducted a great manuscript. It definitely involves a great amount of work to develop a consensus like the one presented.

REVIEWER	Stephen Miranda University of Pennsylvania, USA
REVIEW RETURNED	24-Sep-2019

GENERAL COMMENTS	The authors successfully used modified Delphi method and nominal group technique to define a list of competencies for neurocritical care training, tailored toward their population and the cultural context in which they practice. The attention to methodology is laudable. The manuscript clearly outlines the way in which they were able to identify and compile core competencies, while allowing for individual responses from practitioners throughout the country. There is clear acknowledgement of limitations. I do not have major changes to suggest

REVIEWER	Ericka Fink UPMC Children's Hospital of Pittsburgh
REVIEW RETURNED	27-Oct-2019

GENERAL COMMENTS	Cui et al submit recommendations for core competencies for Chinese neurocritical care training, an objective of a national organization. A Delphi approach was used in addition to a core group of select experts. The list appears exhaustive and has some overlap with other international group recommendations. Methods 1. Your readership may not fully be familiar with WeChat or 'website links' used in this study - please provide more detail.

	2. There did not appear to be information on ethics and consent to participate in a survey. Was this necessary or not based on local regulations. 3. While Phase 1 included a large number of stakeholders, especially critical care/nsurg physicians, the number of respondents for the next Delphi was much smaller. Do you know the 'denominator' for the number of stakeholders invited to participate in either round of the delphi? This would give a response rate. How do you explain the dramatic decrease in respondents between rounds? Did you ask the exact same people to participate? These should be discussed and potentially mentioned in limitations. 3. Did all people in the nominal group participate? 4. A major limitation appears to be the lack of graduate medical education, residency/fellowship directors, and other administrators having to do with the training of clinicians and care of patients. 5. Please define four levels of minimal expertise a-d in the methods. Results 1. More description of which consensus topics overlapped or did not overlap with international bodies would be interesting to know in thinking about what is valued by your stakeholders. 2. There were a surprisingly high number of general critical care recommendations. Does your critical care governing body have guidelines for critical care that overlap here? If they do, your group may benefit from a focus on NCC elements. Discussion 1. It is not clear how centers/programs in China (or elsewhere) would be implemented and how they would be implemented, especially in tertiary care vs. smaller centers.

REVIEWER	Nicholas Morris University of Maryland School of Medicine, USA
REVIEW RETURNED	29-Oct-2019

GENERAL COMMENTS	Thank you for the opportunity to review this paper outlining the process and results of developing a consensus regarding the core competencies of neurocritical care in China. The paper, in my opinion, is worthy of publication but could be enhanced with mild revisions. In the abstract, I believe the Participants section should include the 1094 respondents, not just the 11 members of the nominal group. The 11 member of the nominal group and the 1094 respondents should be characterized in this section as well to help the reader quickly understand this process. In the main paper, the introduction is clear In the Methods section, Phase 1, please comment on why phase one was open to respondents who may not understand the practice of neurocritical care such as medical students. On Page 5 line 42: please clarify what is meant by “five items referring to the scoring system were added. On Page 6 line 5: Please describe WeChat. I am unfamiliar with this technology. Results: I think that the paper itself (not just the supplementary tables) should include at least some of the core competencies. I would expect to find them in a paper of this type as the are actually the major result of the work. Limiting the major result to the supplementary tables seems inappropriate to me.

	Discussion: The core competencies are quite interesting and do indeed vary from those put forth by UCNS. I am wondering if the authors have not missed an opportunity to discuss some of the differences between their list and others in terms of why those differences might exist. This could be helpful to others – for instance, as the ABPN takes over accreditation of fellowship program in the United States. I also found the delineation of items that could be done independently or under supervision to be surprising. For instance, Competency 3.7 reads “the trainee should be able to interpret saturation and jugular venous oxygenation and brain tissue oxygen data under supervision”. If a neurointensivist is not expected to interpret brain tissue oxygen data independently, then who would supervise them? Similarly, who would supervise a neurointensivist in the diagnosis of brain death? As neurointensivist the world over attempt to standardize this practice, I am concerned about abdicating its governance. Who else would do this? I understand that there was consensus about these competencies, but some discussion of the most relevant or controversial examples (like brain death) would greatly improve the manuscript. In the Limitations section of the Discussion, I would add limitations to the Delphi method in which the number of participants in the second round was significantly less than in the first round. Indeed the response rate in the second round was overall poor. Figure 1 would benefit from an expansion of Phase 3 to explain the various rounds of NG meetings.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Excellent work. The authors displayed a high knowledge of the Delphi approach and conducted a great manuscript. It definitely involves a great amount of work to develop a consensus like the one presented.
Response: Thank you for your work on this manuscript.

Reviewer: 2
The authors successfully used modified Delphi method and nominal group technique to define a list of competencies for neurocritical care training, tailored toward their population and the cultural context in which they practice. The attention to methodology is laudable. The manuscript clearly outlines the way in which they were able to identify and compile core competencies, while allowing for individual responses from practitioners throughout the country. There is clear acknowledgement of limitations. I do not have major changes to suggest
Response: Thank you for your work on this manuscript.

Reviewer: 3
Cui et al submit recommendations for core competencies for Chinese neurocritical care training, an objective of a national organization. A Delphi approach was used in addition to a core group of select experts. The list appears exhaustive and has some overlap with other international group recommendations.
Methods
1. Your readership may not fully be familiar with WeChat or 'website links' used in this study - please provide more detail.
Response: Yes, people outside China may not be familiar with WeChat. We added the following

details to the revised manuscript as: “We used WeChat as the primary disseminating means because it is the most popular social media not only in China but in the entire Chinese community. WeChat integrates the functions of WhatsApp, Instagram and Facebook.”. (please see page 6, line 120–122, in the file with track changes).

2. There did not appear to be information on ethics and consent to participate in a survey. Was this necessary or not based on local regulations.
Response: Thanks for your kind reminder. We have added information about ethics and consent in the first paragraph of the Methods section as follows: “The study protocol was approved by the IRB of Beijing Tiantan Hospital, Capital Medical University (No. KY2017-034-02). Since no patients were involved in the study, our local IRB approved a waiver of informed consent.” (page 5, line 81–83)

3. While Phase 1 included a large number of stakeholders, especially critical care/nsurg physicians, the number of respondents for the next Delphi was much smaller. Do you know the 'denominator' for the number of stakeholders invited to participate in either round of the delphi? This would give a response rate. How do you explain the dramatic decrease in respondents between rounds? Did you ask the exact same people to participate? These should be discussed and potentially mentioned in limitations.
Response: Thank you for your question. Yes, the number of respondents dramatically decreased in the second round of the Delphi. We think this may be due to the different questionnaire design of the two Delphi rounds. In the first round, respondents who participated in the survey had to select options one by one. However, during the second round, we present the competencies with only one open question “Do you have any other proposal for the competencies?”. If the participants agreed with the entire set of the competencies and have no other suggestions, they might not make additional replies. This can be reflected in the respondent numbers of the open question in the two rounds of Delphi, 100 and 111 in the first and second round, respectively.
In the both rounds of Delphi, we used WeChat to deliver our questionnaires. Although WeChat is powerful and highly efficient, we have to admit that by this way, we are unable to obtain the exact number of participants who the questionnaires were sent to. Therefore, we cannot tell the 'denominator' for the number of stakeholders invited to participate in either round of the Delphi.
We added this discussion to the limitation section: “Additionally, in both rounds of Delphi, we used WeChat to deliver our questionnaires. Although WeChat is powerful and highly efficient, we have to admit that by this way, we are unable to obtain the exact number of participants who the questionnaires were sent to. Therefore, we cannot tell the 'denominator' for the number of stakeholders invited to participate in either round of the Delphi. Thus, the response rate cannot be identified.” (page 13, line 290–294)

3. Did all people in the nominal group participate?
Response: Yes, all people of the nominal group participated in the five rounds of NG meetings. We added a description to the part of phase 2, NG ratings of Methods section: “All NG members participated in all of the five rounds NG meetings.” (page 8, line 175)

4. A major limitation appears to be the lack of graduate medical education, residency/fellowship directors, and other administrators having to do with the training of clinicians and care of patients.
Response: Thank you for your reminder.
In the both rounds of Delphi, our questionnaires were delivered via WeChat, website and emails. We are unable to tell the exact ID of the participants, but we believe there might be graduate medical educators, residency/fellowship directors, and other administrators in charge of physician training program. During the survey, some friends with these titles discussed the questionnaires with us. Moreover, the four neuro-intensivists and three general intensivists are all engaged in graduate, postgraduate medical education and in charge of physician training program, the three general intensivists in the nominal group are specialist (similar with fellowship in U.S.) directors of critical care

medicine, and the four neuro-intensivists are residency directors on neurology or neurosurgery. We're sorry that we did not describe this in the Methods section. We added a description in the revised manuscript: "The four neuro-intensivists and three general intensivists were all engaged in graduate, postgraduate medical education and in charge of physician training program. The three general intensivists in the nominal group were specialist training (similar with fellowship training in U.S.) directors of critical care medicine and the four neuro-intensivists were residency training directors on neurology or neurosurgery." (page 6, line 134–138)

5. Please define four levels of minimal expertise a-d in the methods.
Response: Thank you for your reminder. We added the definition to the
Methods section as follows: "We used the CoBaTrICE approach [6] to describe the level of expertise in the competence statements: a = has knowledge of or describes … ; b = performs, manages, conducts, demonstrates, assesses or interprets … under supervision; c = performs, manages, conducts, demonstrates, assesses, interprets … independently; d = teaches or supervises others to perform". (page 7–8, line 167–170)

Results
1. More description of which consensus topics overlapped or did not overlap with international bodies would be interesting to know in thinking about what is valued by your stakeholders.
Response: Thank you for your reminder. We added a new online supplementary appendix file to compare the overlapped consensus topics. (page 9, line 217–218, and new online supplementary appendix 2)

2. There were a surprisingly high number of general critical care recommendations. Does your critical care governing body have guidelines for critical care that overlap here? If they do, your group may benefit from a focus on NCC elements.
Response: Yes, there are some general critical care recommendations in our core competencies. Our list of competencies is a result of the two rounds of Delphi and NG meetings based on the current situation of medical education and training programs. Nowadays in China, many doctors with neurology and neurosurgery backgrounds participate in neurocritical care training programs. Some of these trainees have little knowledge of general intensive care and might have no opportunity to learn from general critical care medicine. Therefore, our list covers some competencies on general critical care in order to provide the basic knowledge and skills for these trainees.
There is a list of core competencies established by the Chinese College of Intensive and Critical Care Medicine (CCICCM) for general critical care training in China that might overlap with ours. In the present study, we provided a competency list for NCC training. Training program directors may reorganize this list by adding core competencies for any particular local training. Those items that had been excluded from the NG process might serve as optional competencies. In Addition, directors may also use the core competencies developed by CCICCM for their NCC training programs. We revised this in the manuscript by adding the following: "For those trainees after neurological and neurosurgical training, general critical care training items may be added according to our core competencies list and those from CCICCM [9]." (page 12–13, line 279–280).

Discussion
1. It is not clear how centers/programs in China (or elsewhere) would be implemented and how they would be implemented, especially in tertiary care vs. smaller centers.
Response: Specialist training in China is similar to fellowship training in U.S.. Trainees who have completed residency training will receive specialist training at qualified training centers. Since the training centers are usually tertiary hospitals, trainees who work in smaller centers have to go to tertiary hospitals to complete the training program. Besides specialist training, there is a healthcare quality management system managed by National Health Commission of the People's Republic of China. National Center of Healthcare Quality Management in Neurological System Diseases is one

branch of the system. Our Working Group is on behalf of the National Center for Healthcare Quality Management in Neurological Diseases (please see the Title page, authors). Our core competencies in neurocritical care will be implemented through this system and the implementation of the core competencies will be one of the indicators of NCC quality management. The National Health Commission of the People's Republic of China is an administrative agency with the power to develop rules to disseminate the core competencies and to perform the quality improvement.
We made the following changes in the first paragraph of discussion as follows: "On behalf of the Working Group of the National Center of Healthcare Quality Management in Neurological System Diseases, we will implement this document of core competencies through this administration organization, and the implementation of this consensus will be one of the indicators for quality management of neurocritical care." (page 11, line 225–229)

Reviewer: 4
Thank you for the opportunity to review this paper outlining the process and results of developing a consensus regarding the core competencies of neurocritical care in China. The paper, in my opinion, is worthy of publication but could be enhanced with mild revisions.
In the abstract, I believe the Participants section should include the 1094 respondents, not just the 11 members of the nominal group. The 11 member of the nominal group and the 1094 respondents should be characterized in this section as well to help the reader quickly understand this process.
Response: Thank you very much. According to your advice, we added the following to the Abstract as: "Participants: A total of 1094 respondents from 33 provinces in China participated in the online questionnaire survey." (please see page 2, line 33–34 in the file with track changes)

In the main paper, the introduction is clear.
In the Methods section, Phase 1, please comment on why phase one was open to respondents who may not understand the practice of neurocritical care such as medical students.
Response: Thank you for your consideration. We do discuss this when we were designing the present study. The main purpose of phase 1 is to collect ideas as much as possible. Even those with no expertise in neurocritical care may bring some valuable prospective to NCC and provide some valuable suggestions on ethics and professionalism. The ideas collected from phase 1 will be rigorously screened during the NG meeting. We added a sentence in the Discussion section: "In phase 1 Delphi, our survey was open to respondents with different backgrounds to collect ideas and suggestions as much as possible on topics such as ethics and professionalism." (page 11, line 237–238)

On Page 5 line 42: please clarify what is meant by "five items referring to the scoring system were added.
Response: Thank you for your advice. Based on your suggestion, we did the following modification in the first paragraph of Phase 1 in the Methods section as follows: "Furthermore, since there were very few items in the published guidelines relevant to scoring system for patient assessment, we added five new items related to the scoring system." (page 5, line 103–104)

On Page 6 line 5: Please describe WeChat. I am unfamiliar with this technology.
Response: Thank you for your kind reminder. Yes, people outside China may not be familiar with WeChat. We added the following details to the revised manuscript as: "We used WeChat as the primary disseminating means because it is the most popular social media not only in China but in the entire Chinese community. WeChat integrates the functions of WhatsApp, Instagram and Facebook.". (please see page 6, line 120–122).

Results: I think that the paper itself (not just the supplementary tables) should include at least some of the core competencies. I would expect to find them in a paper of this type as the are actually the

major result of the work. Limiting the major result to the supplementary tables seems inappropriate to me.
Response: Thank you for your suggestion. However, the BMJ Open Editorial Office recommended that the list the core competencies ought to be separately uploaded as a supplementary File in PDF Format (new online supplementary appendix 2).

Discussion: The core competencies are quite interesting and do indeed vary from those put forth by UCNS. I am wondering if the authors have not missed an opportunity to discuss some of the differences between their list and others in terms of why those differences might exist. This could be helpful to others – for instance, as the ABPN takes over accreditation of fellowship program in the United States.
Response: Thank you. We have added a new online supplemental appendix file to compare the overlapped consensus topics. (new online supplementary appendix 2). In the paragraph discussing the difference between our competencies and others, we added: “The comparison of our core competences with those from CoBaTrICE, CCICCM, AAN and UCNS (Online supplementary appendix 2) might help these international organizations to modify and enhance their core competencies.” (page 12, line 266–269)

I also found the delineation of items that could be done independently or under supervision to be surprising. For instance, Competency 3.7 reads “the trainee should be able to interpret saturation and jugular venous oxygenation and brain tissue oxygen data under supervision”. If a neurointensivist is not expected to interpret brain tissue oxygen data independently, then who would supervise them? Similarly, who would supervise a neurointensivist in the diagnosis of brain death? As neurointensivist the world over attempt to standardize this practice, I am concerned about abdicating its governance. Who else would do this? I understand that there was consensus about these competencies, but some discussion of the most relevant or controversial examples (like brain death) would greatly improve the manuscript.
Response: Thank you for your valuable suggestion. We made the following modification in the discussion section as follows: “Although all of the items have reached consensus after the NG rating, the content and minimum level of expertise on some items may be controversial. In addition, some clinically relevant conditions, such as brain death, were not included in the final lists. However, we must report according to the results of the vote. Readers and training program directors should be aware of potential disputes and make adjustment as needed.” (page 13, line 281–285)

In the Limitations section of the Discussion, I would add limitations to the Delphi method in which the number of participants in the second round was significantly less than in the first round. Indeed the response rate in the second round was overall poor.
Response: Thank you for your question. Yes, the number of participants in the second round was significantly less than in the first round of the Delphi. We think this may be due to the different questionnaire design of the two Delphi rounds. In the first round, respondents who participated in the survey had to select options one by one. However, during the second round, we present the competencies with only one open question “Do you have any other proposal for the competencies?”. If the participants agreed with the entire set of the competencies and have no other suggestions, they might not make additional replies. This can be reflected in the respondent numbers of the open question in the two rounds of Delphi, 100 in the first round and and 111 in the second, respectively. In the both rounds of Delphi, we used the WeChat to deliver our questionnaires. Although WeChat is powerful and highly efficient, we have to admit that by this way, we are unable to obtain the exact number of participants who the questionnaires were sent to. Therefore, we cannot tell the 'denominator' for the number of stakeholders invited to participate in either round of the Delphi.
We added this discussion to the limitation section: “Additionally, in both rounds of Delphi, we used WeChat to deliver our questionnaires. Although WeChat is powerful and highly efficient, we have to admit that by this way, we are unable to obtain the exact number of participants who the

questionnaires were sent to. Therefore, we cannot tell the 'denominator' for the number of stakeholders invited to participate in either round of the Delphi. Thus, the response rate cannot be identified." (page 13, line 290–294)

Figure 1 would benefit from an expansion of Phase 3 to explain the various rounds of NG meetings.
Response: Thank you for your kind reminder. We have done modifications on Figure 1.

VERSION 2 – REVIEW

REVIEWER	Ericka L Fink, MD, MS UPMC Children's Hospital of Pittsburgh USA
REVIEW RETURNED	18-Nov-2019

GENERAL COMMENTS	The authors have satisfactorily responded to this reviewer's comments.

REVIEWER	NICHOLAS A MORRIS University of Maryland School of Medicine
REVIEW RETURNED	18-Nov-2019

GENERAL COMMENTS	I am satisfied with the authors' responses to the review. I feel now that the manuscript is suitable for publication.