PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Educational needs in the COVID-19 pandemic: A Delphi study among doctors and nurses in Wuhan, China
AUTHORS	Hou, Xun; Hu, Wenjie;Russell, Lene; Kuang, Ming; Konge, Lars; Nayahangan, Leizl Joy

VERSION 1 – REVIEW

REVIEWER	Traci Wolbrink Boston Children's Hospital United States
REVIEW RETURNED	12-Nov-2020

GENERAL COMMENTS	"Educational needs in the COVID-19 pandemic: A Delphi study among doctors and nurses in Wuhan, China" by Hou and colleagues aims describe a needs assessment that identifies theoretical and technical aspects of the treatment of patients, prevention of spread and protection of staff related to the COVID-19 pandemic relevant to doctors and nurses practicing in Wuhan, China. This manuscript is well-written and describes the results of a Delphi survey sent to doctors and nurses practicing in Wuhan, China. As described by the authors, this is the first step in Kern's Six Step model of curriculum development. Although the survey was based on responses from clinicians in China, the content identified is likely applicable worldwide. This manuscript provides a valuable roadmap for educators looking to develop a comprehensive curriculum for COVID-19 for their staff. With the second wave, this could be a valuable addition to the literature. In addition to the limitations described by the authors, the major limitation to the study is the lack of description of study participants (i.e. their specialty), as this would influence who would be the appropriate learners for any proposed curricula. An intensive care physician, would likely need some of the knowledge-based content, but a primary care physician might need other content. There are several points for the authors to consider: 1. It is unclear how the 74 doctors and 60 nurses were selected to participate. Was the survey sent out more broadly and these responded initially, or were these participants selected because of any characteristics? 2. It would have been useful to understand the participants' demographics as above for the results to me most useful to educators.

	3. The content analysis methodology following Round one should be more detailed. 4. Table 2, line 44 page 9 has a typo with the number 14 being listed before the topic. This is different than all other topics in the table.

REVIEWER	Simon Brake University of Warwick Medical School United Kingdom
REVIEW RETURNED	24-Nov-2020

GENERAL COMMENTS	The Paper is an excellent and thoughtful study, making a positive contribution towards the corpus of knowledge for training curriculum development for COVID-19 management.

REVIEWER	Prof Colin Macdougall Warwick Medical School, University of Warwick. UK.
REVIEW RETURNED	22-Dec-2020

GENERAL COMMENTS	Thank you for submitting this paper on such a key subject. I am afraid that I have significant misgivings as to whether this should be published at this time in this form. Some issues can be better explained (such as context), others are more fundamental (such as the wording, level and detail of the items). The following comments relate to the order that issues appear in the text and do not imply an order of importance. Also, please note that I have not undertaken a detailed proof read. Pg 1 Line 16, 'deployed to Wuhan' – you should note briefly what this means as the study population is only made clear later in the full text. Deployed could, for example, be national or international. I also wonder whether there was a specific reason that only deployed professionals were included as perhaps local professionals would also have had valid insights. Pg 1 Line 20, "knowledge, technical and nontechnical skills" – most competency frameworks that use this language also include attributes or sometimes behaviours. You need to make it clear why these were not considered necessary or appropriate to study. Pg 1 Line 29 , "Knowledge, technical and nontechnical skills to be included in the training curriculum for COVID-19 management" you later (pg 4 line 10) note, "The experiences, skills and resources in China might be different from other countries." Your outcome measure needs to note that you are studying COVID-19 management in a context at a time. To say this is a curriculum for COVID-19 management implies that it is applicable in whole or in part to all contexts which is not the case. Pg 1 Line 34, Throughout your study, you separate doctors and nurses absolutely. This means you may miss issues where each group thinks the other is responsible, you may miss join or shared responsibilities and you presume that doctors do not have valid insight into the knowledge and skills required of nurses and vice versa. More profoundly, it would be almost unknown now in some countries (I speak from a UK perspective) to consider roles as so completely siloed and not to take a multidisciplinary approach to curriculum development. This needs fully explained in terms of reasoning, context and impact on results and interpretation Pg 8, Line 2, The point of patient or public involvement is around ensuring key input from stakeholders. There should have been

	proper consideration of public involvement (most likely at an oversight level) for work that has such obvious public impact. Pg 9, line 12, (Applies to many of the items), “Understanding and using mechanical ventilation”. This is an example of an item that is not educationally helpful. There are, I’m afraid, many other examples. To be useful as a curriculum item, a clear statement of level/ ceiling/ end point is needed. Understand to what level? For what type of patient? What range of ages? In all or just specific contexts? Also, understanding and using could be covered in anything from an afternoon course to years of a career, depending on the parameters set and the level of performance required. Pg 11, line 16, “Perform airway suction”, this is an example of an item on both lists. Having so clearly divided this process by professional role (inadvisable in my opinion), you need to clarify whether this item is identical for the two groups.

VERSION 1 – AUTHOR RESPONSE

Replies to Reviewer: 1

Dr. Traci A Wolbrink, Boston Children's Hospital Comments to the Author:

“Educational needs in the COVID-19 pandemic: A Delphi study among doctors and nurses in Wuhan, China” by Hou and colleagues aims to describe a needs assessment that identifies theoretical and technical aspects of the treatment of patients, prevention of spread and protection of staff related to the COVID-19 pandemic relevant to doctors and nurses practicing in Wuhan, China.

This manuscript is well-written and describes the results of a Delphi survey sent to doctors and nurses practicing in Wuhan, China. As described by the authors, this is the first step in Kern’s Six Step model of curriculum development. Although the survey was based on responses from clinicians in China, the content identified is likely applicable worldwide. This manuscript provides a valuable roadmap for educators looking to develop a comprehensive curriculum for COVID-19 for their staff. With the second wave, this could be a valuable addition to the literature.

Thank you to the reviewer for the kind commendation.

In addition to the limitations described by the authors, the major limitation to the study is the lack of description of study participants (i.e. their specialty), as this would influence who would be the appropriate learners for any proposed curricula. An intensive care physician would likely need some of the knowledge-based content, but a primary care physician might need other content.

R1.1. Thank you. We agree with the reviewer that the specialty of the participants would have influenced their answers and should have been included. We initially did not include this question in the first round and only focus on job roles as a doctor or a nurse, however we realized the importance of this when we received the responses in round 1. We gathered this data in round 2 and have indicated this in the Methods section; and in the results section as an addition to Table 1, please also see below. The doctors were specific regarding their specialties, however the nurses mainly put “nursing” as their specialty.

Methods

Round 2

In round 2, the participants were initially asked to indicate their specialties followed by rating of the different items from round 1. They were asked to rate each item according to importance of including it in a course in COVID-19 management, where 1= not at all important, 2=slightly important, 3=important and 4= very important.

Results

Table 1 presents the demographic characteristics of the participants, including specialties, place of assignment and number of days working in Wuhan.

Specialty of participating doctors	**n***
Cardiovascular surgery	1
Emergency and critical care	1
Gastrointestinal surgery	1
Geriatrics and Endocrinology	1
Hematology	1
Nephrology	1
Neurology and neurointervention	1
Oncology	1
Othopedics	1
Pediatrics	1
Radiation oncology	1
Rheumatology	1
Surgery	1
Vascular surgery	1
Doctor (*Not specified*)	2
Neurology	2
Otorhinolaryngology	2
Infectious diseases	3
Thoracic surgery	3
Cardiology	4
Pulmonary and critical care medicine	4
Anesthesiology	5
Respiratory medicine	5
Gastroenterology	6
Critical care medicine	11
Specialty of participating nurses	**n***
Cardiology	1

Critical care medicine	1
Infectious disease	2
Internal medicine	1
Nursing management	1
OR nursing	2
Nursing (N*ot specified*)	48

*Data regarding specialty gathered from round 2 (n=61 doctors; n=56 nurses)

There are several points for the authors to consider:

1. It is unclear how the 74 doctors and 60 nurses were selected to participate. Was the survey sent out more broadly and these responded initially, or were these participants selected because of any characteristics?

R1.2. Thank you for pointing this out. The target participants were identified from the list of deployed healthcare workers from the Health Commission of Guangdong Province. Firstly, we contacted the medical team leaders in the different hospitals, informed them of the aim of the study and when agreed, they were asked to send the survey link to all doctors and nurses in their team through WeChat or email. We added this information in the Methods which now reads:

The participants were doctors and nurses from different cities who were deployed into clinical work in response to the sudden surge of COVID-19 cases in Wuhan, China. They were identified through the list of deployed medical personnel from the Health Commission of Guangdong Province. Initially, medical team leaders in nine different hospitals in Wuhan were contacted and informed of the aim of the study. They were then asked to send the survey link to all the healthcare workers within their team with the aim of including a representative sample large enough to reach saturation. Invitations were sent through email or the mobile messaging app, WeChat (Tencent, Shenzhen, China), detailing the objectives of the study, the importance of participation, and the link to the survey. The survey questionnaires were in Chinese and were developed and sent using the online survey platform Wen Juang Xing (Ranxing Information Technology Co., Ltd., Changsha, China).

2. It would have been useful to understand the participants' demographics as above for the results to me most useful to educators.

R1.3. We agree. we have added this in a table in the results section, please refer to our answer above in R1.1. and in Table 1 in the revised manuscript.

3. The content analysis methodology following Round one should be more detailed.

R1.4. Thank you. We have revised this section (content analysis after round 1) as suggested. This now reads as:

In round 1, the steering group performed content analysis by removing duplicates and counting frequency of occurrence. After which, similar items or procedures were grouped together (i.e. can be

implemented in one training program) and were allocated into different categories that were defined during content analysis.

4. Table 2, line 44 page 9 has a typo with the number 14 being listed before the topic. This is different than all other topics in the table.

R1.5. This has now been changed, thank you.

Replies to Reviewer: 2

Prof. Simon Brake, NHS Walsall Clinical Commissioning Group, University of Warwick Comments to the Author:

The Paper is an excellent and thoughtful study, making a positive contribution towards the corpus of knowledge for training curriculum development for COVID-19 managememt.

We thank the reviewer for recognizing the importance of this study. We hope this paper will provide a resource for educators around the world on what educational interventions to focus on in response to COVID-19 pandemic.

Replies to Reviewer: 3

Prof. Colin Macdougall, University of Warwick Comments to the Author:

Thank you for submitting this paper on such a key subject.

I am afraid that I have significant misgivings as to whether this should be published at this time in this form. Some issues can be better explained (such as context), others are more fundamental (such as the wording, level and detail of the items).The following comments relate to the order that issues appear in the text and do not imply an order of importance. Also, please note that I have not undertaken a detailed proof read.

Pg 1 Line 16, 'deployed to Wuhan' – you should note briefly what this means as the study population is only made clear later in the full text. Deployed could, for example, be national or international. I also wonder whether there was a specific reason that only deployed professionals were included as perhaps local professionals would also have had valid insights.

R3.1. Thank you. Since China has not taken in international medical workers during the COVID-19 epidemic, we only focused on Chinese medical personnel that were deployed to Wuhan (we have mentioned that the 134 participants were all Chinese healthcare professionals in the revised Abstract). Moreover, these group of doctors and nurses were from various specialties and hospitals all over China. We focused on the deployed personnel as this is a context more generalizable for other international educators who are charged with the task of educating doctors and nurses from different departments to take care of this new patient category. Also, we have expanded the description of deployed medical personnel. Please see above answer R1.1. and R1.2.

Pg 1 Line 20, “knowledge, technical and nontechnical skills” – most competency frameworks that use this language also include attributes or sometimes behaviours. You need to make it clear why these were not considered necessary or appropriate to study.

R3.2. Thank you for your comment. We agree with the reviewer the importance of behaviors especially when considering competency frameworks in healthcare professions education. In this context, the nontechnical skills that were included in the list of items would also refer to behavioral skills such as communication and working with different members of the team. We have now changed this to read in the abstract as well as across the main text:

In the first round, the participants identified knowledge, technical and behavioural (i.e. nontechnical) skills that are needed to treat patients, prevent spread of the virus, and protect healthcare workers.

Primary outcome measures Knowledge, technical and behavioral (i.e. nontechnical) skills that could form the basis of a training curriculum for COVID-19 management.

Pg 1 Line 29 , “Knowledge, technical and nontechnical skills to be included in the training curriculum for COVID-19 management” you later (pg 4 line 10) note, “The experiences, skills and resources in China might be different from other countries.” Your outcome measure needs to note that you are studying COVID-19 management in a context at a time. To say this is a curriculum for COVID-19 management implies that it is applicable in whole or in part to all contexts which is not the case.

R3.3. Thank you. we acknowledge that the context in China might be different from other countries. However, our Delphi study focused on the core knowledge, technical and behavioral skills that are needed in fighting COVID-19, which would be important to be included in as the basis of a curriculum for COVID-19 management. There could be reasonable adjustments about the contents when applying to different context. We have revised this statement which now reads:

Primary outcome measures Knowledge, technical and behavioral (i.e. nontechnical) skills that could form the basis of a training curriculum for COVID-19 management.

Pg 1 Line 34, Throughout your study, you separate doctors and nurses absolutely. This means you may miss issues where each group thinks the other is responsible, you may miss join or shared responsibilities and you presume that doctors do not have valid insight into the knowledge and skills required of nurses and vice versa. More profoundly, it would be almost unknown now in some countries (I speak from a UK perspective) to consider roles as so completely siloed and not to take a multidisciplinary approach to curriculum development. This needs fully explained in terms of reasoning, context and impact on results and interpretation

R3.4. Thank you- doctors and nurses work closely and collaboratively together, and as pointed out by the reviewer, must also train together. While there are similar or shared roles and responsibilities between the two groups, there are many tasks that are specific for each. We separated these procedures between doctors and nurses in this needs assessment process to recognize similarities and differences. Consequently, this list informs medical educators to develop training programs not only specifically for doctor or nurses, but most importantly training programs that provide both groups a platform to work together towards shared skills and behaviors. We have revised this in the

Implications section where simulation-based training could be an educational strategy for team training:

Based on the identified skills for doctors and nurses in this study, simulation-based training can be utilized to fast-train healthcare workers on specific technical skills (i.e. performing clinical procedures while wearing PPE), on working closely and collaboratively with a team composed of different professional roles and responsibilities, and on optimizing workflows and systems.[16,24]

Pg 8, Line 2, The point of patient or public involvement is around ensuring key input from stakeholders. There should have been proper consideration of public involvement (most likely at an oversight level) for work that has such obvious public impact.

R3.5. Thank you. While we recognize that the public or patients might have valuable contribution as well, our aim in this study was to gather information regarding skills and competences needed to ensure proper care and treatment of COVID-19 patients as well as prevention of infection mainly to inform development of training programs that aligned to the current needs. We therefore focused only on doctors and nurses who were deployed to Wuhan, China. Nevertheless, the findings of this study will be made public through social media, press releases, and on the institutional websites upon publication by our media relation departments.

Pg 9, line 12, (Applies to many of the items), “Understanding and using mechanical ventilation”. This is an example of an item that is not educationally helpful. There are, I’m afraid, many other examples. To be useful as a curriculum item, a clear statement of level/ ceiling/ end point is needed. Understand to what level? For what type of patient? What range of ages? In all or just specific contexts? Also, understanding and using could be covered in anything from an afternoon course to years of a career, depending on the parameters set and the level of performance required.

R3.6. Thank you. As medical educators, we agree with the reviewer about setting clear goals and objectives when developing a curriculum and deciding what educational strategies to use (i.e. simulation using phantoms or computer-based equipment, number of hours or days etc). Assessment is also imperative to ensure that these objectives are met by setting a pass/fail criterion. All these are the next steps after performing a needs assessment, which is the first step in curriculum development, and which is the focus of this study. To highlight the other steps following a needs assessment, this was included in the Implications section. This is now revised to further expand on setting of a pass/fail criterion to ensure learning. Please see below:

This needs assessment is an important first step to ensure that training programs are aligned to current needs of healthcare workers at the frontlines. Following the six-step approach proposed by Kern et al., the next step would be to develop training programs on these identified procedures depending on the local context i.e. targeted learners (targeted needs assessment). Goals and objectives should be well-defined and clearly stated, including assessment of learning with set criteria for passing to ensure that the set competences are achieved. Deliberate selection of educational strategies is also vital prior to efficient implementation and lastly evaluation of training delivery.[6]

Pg 11, line 16, “Perform airway suction”, this is an example of an item on both lists. Having so clearly divided this process by professional role (inadvisable in my opinion), you need to clarify whether this item is identical for the two groups.

Thank you. please see our response above, R3.4.

VERSION 2 – REVIEW

REVIEWER	Traci Wolbrink Boston Children's Hospital, USA
REVIEW RETURNED	22-Feb-2021

GENERAL COMMENTS	The authors have adequately addressed the concerns by this reviewer, and the manuscript has been improved. There are a few typos in Tables 2/3 that should be addressed on the proof stage, i.e. ECMO spelled wrong.

REVIEWER	Prof Colin Macdougall Warwick Medical School, University of Warwick, UK.
REVIEW RETURNED	12-Feb-2021

GENERAL COMMENTS	Thanks for re-submitting this paper. At resubmission, the paper is clearer. There remains a challange with applicability - as there remain outcomes that are open ended, such as "Understanding and using mechanical ventilation" - a potentially very broad topic which could really do with some parameters. Also, the professional siloing (whilst contextual) will limit international applicability. However, overall, it will be a reasonable addition to the literature as a baseline checklist for those developing training