PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Primary Care Workforce and Continuous Medical Education in China: Lessons to learn from a Nationwide Cross-sectional Survey
AUTHORS	Wong, William; Zhu, ShanZhu; Ong, Jason; Peng, MingHui; Lam, Cindy; Kidd, Michael; Roland, Martin; Jiang, SunFang

VERSION 1 - REVIEW

REVIEWER	Aimin Guo Capital medical University, China
REVIEW RETURNED	15-Dec-2016

GENERAL COMMENTS	1.Many studies on CME of medical staff (especially doctors and nurses) in CHCs have been implemented and some of them have been published. So this study was not the first study in mainland China. 2.In China, medical staff in CHCs are required to participate in CME organized by training institutions at variable levels. These training organizations include national, provincial, municipal, district and center level. Obviously, this study only focused on CME organized by center, and did not report comprehensively the frequencies and types of CME which medical staff in CHCs need to participate in every year.

REVIEWER	Nabil Natafgi Department of Health Management and Policy, University of Iowa, Iowa, United States of America
REVIEW RETURNED	27-Dec-2016

GENERAL COMMENTS	Overall, this paper provides a good estimate of the current primary care workforce CME reality in China. Below are some points for consideration by the authors. Abstract: 1. Follow the journal's suggested format for abstracts to include the following headings: design, setting, participants, main outcome measures 2. Spell out CME (and other) abbreviation(s) at first appearance in abstract (and main text) Introduction: comprehensive, clear, and well-written 1. Page 5 – lines 10-20: a run-on sentence, consider rewording. 2. A more detailed explanation of the expected CME program from PHC professionals in China would be helpful for the reader: content, duration, style, delivery, target audience, variation in requirements for participation across the different regions, etc… For instance, in the discussion you report that doctors and nurses must have at least

25 credits approved per year. This may be either included in the introduction section or methods section.
3. The following paper might be helpful for this study's background: Yi, Yanhua, et al. "Unmet needs in continuing medical education programs for rural Chinese township health professionals." Journal of educational evaluation for health professions 12 (2015).

Methods:
1. Are there allied health professionals (other than physicians and nurses) available in CHC?
2. Page 7 – line 4: Appendix 1 (questionnaire) is not attached in the version provided for revision
3. Page 7 – lines 13-16: "In the conditions… testing services" is an incomplete sentence. Needs to be rephrased.
4. I suggest you provide some description of the setting (CHCs in China)

Results:
1. Page 8 – line 6: Figure 1 is not shown in the version provided for revision
2. Nurse-to-doctor ratio of 1.6: I was not able to reproduce this ratio from your tables. From table 1, nurses:doctors ~ 1803:1675 ~ 1.1
3. Table 1 – 23 out of the 1700 doctors (1.4%) have 'nurse' as registered specialty. Similarly, 106 out of 1834 nurses are registered as integrative medicine, general practice or other specialty. Can you explain these results?
4. Page 8 – line 32: are the years reported in table 1 (14 and 9 years) reflective of years working in general practice (i.e. CHCs as laid in text) or in specialty (as laid in the table, which might include working in settings other than CHCs)?
5. Page 8 – line 40: check % holding CME sessions monthly or more frequently (62.9% vs. 63.55 as reported in table 2).
6. An explanation of the three different types of CME reported (Diagnosis and treatment, management and cases) might be helpful for the reader to compare to CME modules in other settings.
7. Is the CME training delivered to doctors different than (or same as) that delivered to nurses?
8. Did you consider adding other explanatory variables to your model such as clinical set-up, range of services, staff composition, community characteristics, patient demographics, etc.?
9. Page 9 – line 15: check the p –value against that reported in table 3.
10. Table 4 – report non-significant values.
11. Table 2 – consider rephrasing the following: "Who involved in learning activities organized by CHC"
12. The figures reported in Table 2 (for doctors and nurses) are inconsistent with those reported in table 3 – please check.
13. Table 4 – footnote: I believe the models adjust for age, as well. Right?

Discussion:
1. You argue that the sample is "large [and] representative" (page 9 line 37). Whilst this might be a national and potentially representative survey, it seems the sample is not necessarily 'large' since your sample is 149 CHCs out of 8,669 CHCs in China (as of 2014; i.e. less than 2%). Can you address this point by clarifying why you think your sample is nationally representative (unbiased)? What is the nature of the CHCs that were not included in this study – do you have any data on their institutional characteristics to compare

	to your included sample?
	2. How is the nurse-to-doctor ratio reported in this study compare to that reported in literature in similar settings (CHCs or primary care) in China?
	3. Your results show that a little less than half of the physicians have a less than Bachelor's degree. You attribute this to 'historical reason'. A note on physician education in China (and its history) might be helpful for the reader to understand the context of these findings. This may be added in the discussion section.
	4. What is the frequency/rate of CME activities (in primary care settings) reported in literature?
	5. Page 12 – line 32-33: Your conclusion that 'regional differentiation is unnecessary' is unclear in light of your findings that junior titles showed significant variation by region.
	6. Any recommendations for the government for improvement in primary care CME program?
	Strength and limitations:
	1. Social desirability might constitute a threat in such self-reported surveys especially if participation was encouraged by supervisors.

REVIEWER	Cathy Gong
	The Australian National University
REVIEW RETURNED	21-Jan-2017

GENERAL COMMENTS	This study conducts the first national representative survey in 2015 on participation of Continued Medical Education (CME) among primary care workforce (1734 doctors and nurses at 140 clinicians) in Community Health Centres (CHCs) in mainland China. The education and training background of Chinese community health centres' (CHC) staff, CME activities and factors affecting CME participation are examined.
	The survey found that only half of doctors have bachelor degrees or are registered as GPs as their prime registration in the primary care workforce in China. The quality of primary health care staff hence is a big concern in China.
	The vast majority of CHC staff participated in CME but the participation rats are still lower than the overall 95% standard from the "Twelfth Five Years Plan". There is still room to improve participation in terms of how CME is arranged. The survey results could be used as important evidence to support building up a strong primary care system aiming to improve the quality of staff and the quality of primary health care.
	This study has provided very good background knowledge and discussion on how to implement new policy to establish and improve primary care system in China through re-orientating specialists to General Practices, on-the-job training, job-transfer training and ongoing participation of CME activities.
	However, this study is more of a descriptive analysis from the survey, including the frequency of participation by types of CME activities among doctors and nurses by age, gender, years of working, educational and professional level. Multivariable logistic regression model was used to examine the staff characteristics as

joint factors predicting participation of CME.

The survey is valuable, the analysis is original and the paper is written fluently, however, as admitted by the authors themselves, this study is a useful baseline description on survey results while there is no evaluation on the impacts of participating CME activities on quality of primary care staff and care itself. In-depth research is required.

Minor comments:

(1) Figure 1 is mentioned on page 8 but I did not see it.
(2) Table 2 is uncompleted, needs to specify the meaning of each column, organization, doctor or nurse?
(3) Table 3 requires a note "Those with p-value less than 0.05 were considered statistically significant" and it will be better if the authors could explain why chose 0.05 instead of 0.10 as significant level (page 7).
(4) Table 4 needs a note to explain the difference between crude and adjusted OR.
(5) Discussion on lower nurse to doctor ratio (page 9) than international level needs to consider the fact that many doctors in China only had 2 or 3 years training for qualification (lower than bachelor degree) and they have conducted a lot of work which belongs to nurses according to health care professional standard in many developed countries.
(6) The discussion on page 12 is very confusing which needs to be rewritten: "However, contrary to what was believed by the policymakers (as reflected in the targets set), participation rates for doctors from the Western and peripheral region CME not only exceeded the target, but also those of junior titles participated more than their counterparts in the other regions, which suggested such regional differentiation is unnecessary".
(7) The title and conclusion section in the abstract mentioned lessons to learn and room to be improved as evidenced by the survey results, while this has not been mentioned at all in the conclusion in the main text.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: AiminGuo
Institution and Country: Capital medical University, China
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
1. Many studies on CME of medical staff (especially doctors and nurses) in CHCs have been implemented and some of them have been published. So this study was not the first study in mainland China.
Response: Thank you for the reviewer's insightful information. We searched before but could not find any study of our nature reported. Following the reviewer's comment, we conducted another search using key terms "continuous medical education", primary care" and "China" in Google Scholar and Pubmed, and examined the first 100 articles in both engines but were still unable to identify any study reported on the topic using national representative sample. We suspect that they were only reported in the Chinese literature so we changed it to the first study "reported in the international literature" under Strengths and Limitations.

2. In China, medical staff in CHCs are required to participate in CME organized by training institutions at variable levels. These training organizations include national, provincial, municipal, district and center level. Obviously, this study only focused on CME organized by center, and did not report comprehensively the frequencies and types of CME which medical staff in CHCs need to participate in every year.

Response: We fully agree with the reviewer's comment and it was specified in the Strengths and Limitations section of the previous submission. However, in the manuscript (Yi, Yanhua, et al.) recommended by Reviewer 2, it was mentioned that, "the majority of CME programs (in China) are based on the concept of institutionally oriented planning, which is dictated by the interests of the organization rather than the needs of learners." Therefore, we think examining the locally orientated CME programmes that suit the need of the end-users could be one of our strengths, which is now added in the relevant section.

Reviewer: 2
Reviewer Name: Nabil Natafgi
Institution and Country: Department of Health Management and Policy, University of Iowa, Iowa, United States of America
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
Overall, this paper provides a good estimate of the current primary care workforce CME reality in China. Below are some points for consideration by the authors.
Abstract:
1. Follow the journal's suggested format for abstracts to include the following headings: design, setting, participants, main outcome measures
Response: The abstract is re-formatted with additional headings and cross-checked with the BMJ Open requirement.

2. Spell out CME (and other) abbreviation(s) at first appearance in abstract (and main text)
Response: This is carefully checked and full spelling with abbreviation is ensured before abbreviations are used throughout the manuscript.

Introduction: comprehensive, clear, and well-written
1. Page 5 – lines 10-20: a run-on sentence, consider rewording.
Response: The first sentence is split into two and the second sentence moved to be end of the paragraph to allow explanation of "on-the-job" and "job-transfer" trainings.

2. A more detailed explanation of the expected CME program from PHC professionals in China would be helpful for the reader: content, duration, style, delivery, target audience, variation in requirements for participation across the different regions, etc… For instance, in the discussion you report that doctors and nurses must have at least 25 credits approved per year. This may be either included in the introduction section or methods section.
Response: More details about organisation of CME is added to the last paragraph of the Introduction and the sentence about minimum CME requirement is moved from the Discussion to the Introduction.

3. The following paper might be helpful for this study's background: Yi, Yanhua, et al. "Unmet needs in continuing medical education programs for rural Chinese township health professionals." Journal of educational evaluation for health professions 12 (2015).
Response: Thank you reviewer for the kind suggestion. We read the manuscript with great interest and amended the manuscript at various places with appropriate reference.

Methods:

1. Are there allied health professionals (other than physicians and nurses) available in CHC?
Response: Thank you for asking this question. In our survey, we did ask the lead physicians the make-up of the clinical staff and found there were on average 1-2 pharmacists, physiotherapists, laboratory technicians or radiographers but clinical psychologists or medical social workers were uncommon. This was reported in: Wong WCW, Jiang SF, Ong J, et al. Bridging the gaps between patients and primary care in China: A nationwide representative survey. Ann Fam Med 2017 (In press). It is now amended in the 1st paragraph of the Discussion.

2. Page 7 – line 4: Appendix 1 (questionnaire) is not attached in the version provided for revision
Response: It is now submitted with this revision.

3. Page 7 – lines 13-16: "In the conditions… testing services" is an incomplete sentence. Needs to be rephrased.
Response: It is now changed: In the second survey, we asked the frontline health professionals about their training experience, CME participation and their willingness to conduct certain testing services. (3rd paragraph in the Methods)

4. I suggest you provide some description of the setting (CHCs in China)
Response: Due to the limited scope and space, more details on CHC setting is given in our previously published paper (Ref 18). (3rd paragraph in the Methods)

Results:

1. Page 8 – line 6: Figure 1 is not shown in the version provided for revision
Response: It is now attached in the revision.

2. Nurse-to-doctor ratio of 1.6: I was not able to reproduce this ratio from your tables. From table 1, nurses:doctors ~ 1803:1675 ~ 1.1
Response: We are sorry to confuse the reviewer but staffing ratio was not the ratio of nurses to doctors recruited and surveyed in this study as shown in Table 1. Instead this staffing ratio was obtained from the lead physician survey which is now added in the first paragraph of the results.

3. Table 1 – 23 out of the 1700 doctors (1.4%) have 'nurse' as registered specialty. Similarly, 106 out of 1834 nurses are registered as integrative medicine, general practice or other specialty. Can you explain these results?
Responses: We believe a small proportion of health professionals would have other qualifications but they are required to register with a primary qualification and also what they identified themselves in CHC. This is added at the end of 1st paragraph in the Results. .

4. Page 8 – line 32: are the years reported in table 1 (14 and 9 years) reflective of years working in general practice (i.e. CHCs as laid in text) or in specialty (as laid in the table, which might include working in settings other than CHCs)?
Response: We checked the questionnaire and setting was not specified so it should mean the overall experience of the staff working as doctors or nurses rather than CHC. We have removed "in general practice" in the text.

5. Page 8 – line 40: check % holding CME sessions monthly or more frequently (62.9% vs. 63.55 as reported in table 2).
Response: Thank you for the reviewer to point it out and we have corrected it to 63.5%.

6. An explanation of the three different types of CME reported (Diagnosis and treatment, management

and cases) might be helpful for the reader to compare to CME modules in other settings.
Response: To improve clarity we have changed "diagnostic and treatment guideline discussion" into "clinical guideline discussion"; management updates (e.g. journal club) and case discussion.

7. Is the CME training delivered to doctors different than (or same as) that delivered to nurses?
Response: Although the number of credits required may be the same, the focus of CME training for doctors and nurses could be different as the doctors are responsible for diagnosis, treatment decision, and so on while the nurses conduct triage, provide patient care and health education in CHCs. (4th paragraph in the Discussion)

8. Did you consider adding other explanatory variables to your model such as clinical set-up, range of services, staff composition, community characteristics, patient demographics, etc.?
Response: Thank you for the suggestion but due to limited scope and space available, we only reported the factors that had significance.

9. Page 9 – line 15: check the p –value against that reported in table 3.
Response: Figures were doubled-checked with original data and the p-value was correct and it was adjusted in the text accordingly.

10. Table 4 – report non-significant values.
Response: We looked at many factors during the model building which were not significant and would not be appropriate to report all non-significant values in Table 4. We have added an more detail about this in the methods section and Appendix 1 which includes the factors considered for model building.

11. Table 2 – consider rephrasing the following: "Who involved in learning activities organized by CHC"
Response: It is now changed to "Staff participating in CME"

12. The figures reported in Table 2 (for doctors and nurses) are inconsistent with those reported in table 3 – please check.
Response: Sorry for the confusion. We have clarified in the Title of Table 2 that this data is from lead clinicians whilst the data in Table 3 was from CHC staff as the purpose was to show differences according to regions so there may be some minor discrepancies between the two tables.

13. Table 4 – footnote: I believe the models adjust for age, as well. Right?
Response: Yes. As shown in table 4, age was a significantly significant variable that was also included in the final adjusted model. More details of which variables were adjusted for has been added into the methods.

Discussion:
1. You argue that the sample is "large [and] representative" (page 9 line 37). Whilst this might be a national and potentially representative survey, it seems the sample is not necessarily 'large' since your sample is 149 CHCs out of 8,669 CHCs in China (as of 2014; i.e. less than 2%). Can you address this point by clarifying why you think your sample is nationally representative (unbiased)? What is the nature of the CHCs that were not included in this study – do you have any data on their institutional characteristics to compare to your included sample?
Response: Although there were 8669 CHCs in China, less than 20% were in cities which means our sample accounted for ~10% of urban practices. They were carefully selected to be geographically representative covering all regions and administrative set-up of the cities at national and regional levels when the study was designed with a biostatistician. There is no published data on the institutional characteristics of CHCs in China (2nd paragraph in the Introduction).

2. How is the nurse-to-doctor ratio reported in this study compare to that reported in literature in similar settings (CHCs or primary care) in China?
Response: We are not aware of any reported nurses-to-doctor ratio from a large-scaled study in China's primary care. However, there is international benchmark that has suggested this may be on a low side. (Ref 19)

3. Your results show that a little less than half of the physicians have a less than Bachelor's degree. You attribute this to 'historical reason'. A note on physician education in China (and its history) might be helpful for the reader to understand the context of these findings. This may be added in the discussion section.
Response: Thank you for the reviewer's suggestion. Indeed we had the very same thought in mind and hence tried to explain briefly why there were so many different medical qualifications in China. (3rd paragraph in the Introduction) We have now added a reference in the Discussion for readers who are interested to read more on this topic.

4. What is the frequency/rate of CME activities (in primary care settings) reported in literature?
Response: This varies tremendously from institution to institution and is not normally reported in the literature. As mentioned in our manuscript, health professionals have to "fulfil at least 25 credits of approved CME every year" and one credit is usually 1 hour of pre-approved CME activity. Each institution would apply to accreditation centres when they were planning for a CME programme e.g. our department would offer national CME twice a year which lasts for 1-2 days but others may do more or less often than that. (Adjustment made in the 4th paragraph in the Discussion)

5. Page 12 – line 32-33: Your conclusion that 'regional differentiation is unnecessary' is unclear in light of your findings that junior titles showed significant variation by region.
Response: We apologise for the confusion. The expectation for the western & peripheral doctors was such that they were required to do less but indeed the junior doctors in the western & peripheral region in our sample did so well that they in fact showed significantly more participation in CME compared to that of the other regions. That's why we suggested not to have differentiation in regional requirements for CME. This has spelt out more clearly in the last prargraph of the Discussion.

6. Any recommendations for the government for improvement in primary care CME program?
Response: Thank you for the reviewer's suggestion. We have now rewritten the Conclusion completely to summarise the findings in each discussion points from the Discussions as recommendations.

Strength and limitations:
1. Social desirability might constitute a threat in such self-reported surveys especially if participation was encouraged by supervisors.
Response: Thank you the reviewer for the suggestion and it is now included into our limitation.

Reviewer: 3
Reviewer Name: cathy gong
Institution and Country: The Australian National University
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
This study conducts the first national representative survey in 2015 on participation of Continued Medical Education (CME) among primary care workforce (1734 doctors and nurses at 140 clinicians) in Community Health Centres (CHCs) in mainland China. The education and training background of Chinese community health centres' (CHC) staff, CME activities and factors affecting CME participation are examined.

The survey found that only half of doctors have bachelor degrees or are
registered as GPs as their prime registration in the primary care workforce in China. The quality of
primary health care staff hence is a big concern in China.
The vast majority of CHC staff participated in CME but the participation rats are still lower than the
overall 95% standard from the "Twelfth Five Years Plan". There is still room to improve participation in
terms of how CME is arranged. The survey results could be used as important evidence to support
building up a strong primary care system aiming to improve the quality of staff and the quality of
primary health care.

This study has provided very good background knowledge and discussion on how to implement new
policy to establish and improve primary care system in China through re-orientating specialists to
General Practices, on-the-job training, job-transfer training and ongoing participation of CME
activities.

However, this study is more of a descriptive analysis from the survey, including the frequency of
participation by types of CME activities among doctors and nurses by age, gender, years of working,
educational and professional level. Multivariable logistic regression model was used to examine the
staff characteristics as joint factors predicting participation of CME.

The survey is valuable, the analysis is original and the paper is written fluently, however, as admitted
by the authors themselves, this study is a useful baseline description on survey results while there is
no evaluation on the impacts of participating CME activities on quality of primary care staff and care
itself. In-depth research is required.

Response: We thank the reviewer for the succinct summery of the study and many positive comments
on the significance of this study.

Minor comments:

(1) Figure 1 is mentioned on page 8 but I did not see it.
Response: It is now attached in this revision.

(2) Table 2 is uncompleted, needs to specify the meaning of each column, organization, doctor or
nurse?
Response: We apologize for the submitted manuscript that did not have the right formatting. This has
now been corrected.

(3) Table 3 requires a note "Those with p-value less than 0.05 were considered statistically significant"
and it will be better if the authors could explain why chose 0.05 instead of 0.10 as significant level
(page 7).
Response: We have added more detail in the methods to explain that we included variables with
$p<0.10$ in our initial model building but chose to report variables with $p<0.05$ as statistically significant
for our final model.

(4) Table 4 needs a note to explain the difference between crude and adjusted OR.
Response: We have now explained this in the last paragraph in the Methods section.

(5) Discussion on lower nurse to doctor ratio (page 9) than international level needs to consider the
fact that many doctors in China only had 2 or 3 years training for qualification (lower than bachelor
degree) and they have conducted a lot of work which belongs to nurses according to health care
professional standard in many developed countries.

Response: Thank you for the reviewer's insightful comments. However, our study did not explore and compare the range of tasks performed by the doctors and nurses and would be difficult to state that in the manuscript. To our understanding, once they pass their board exam, those with non-graduate doctors would function as any other doctors in the Chinese healthcare system.

(6) The discussion on page 12 is very confusing which needs to be rewritten: "However, contrary to what was believed by the policymakers (as reflected in the targets set), participation rates for doctors from the Western and peripheral region CME not only exceeded the target, but also those of junior titles participated more than their counterparts in the other regions, which suggested such regional differentiation is unnecessary".
Response: We have deleted 'however' to avoid double negative and clarified which junior doctors we are referring to and have changed the tense to ensure the sentences are clearer now. This has been read by two native English speakers.

(7) The title and conclusion section in the abstract mentioned lessons to learn and room to be improved as evidenced by the survey results, while this has not been mentioned at all in the conclusion in the main text.
Response: Thank you the reviewer for the reminder. We have now rewritten the Conclusion completely to highlight the lessons to be learnt and rooms for improvement.

Appendix 1

The factors considered for an association with CME participation were:
- Age (continuous variable)
- Gender (Male, Female)
- Ethnicity (Han, Minority, Other)
- Highest Qualification (Lower than associate degree, associate degree, graduate degree with postgraduate qualifications)
- Registered specialty (Integrative medicine, General practice, Other specialty, Nurse, None)
- Current field of work (Integrative Medicine, General, Other specialty, Nurse, None)
- Years of practice in current field of work (continuous variable)
- Title of technical post (Senior, Intermediate, Junior, None)
- Hours spent on patient care (continuous variable)
- Patients in CHC in the last month (Intravenous drug user, female sex worker, male sex worker, men who have sex with men, transgender people)
- Training in HIV prevention, counselling, diagnosis and care (yes/no)
- Training in common STI prevention counselling, diagnosis and care (yes/no)
- Attitudes towards HIV/STI testing in key populations (strongly disagree/disagree, neither agree or disagree/agree/strongly agree/don't know)
o I think routine STI testing is an important part of regular healthcare
o I am concerned about cost and reimbursement for STI testing
o I am concerned that patients will be offended by being offered routine STI testing
o I am comfortable discussing routine STI testing with patients
o Language barriers prevent some patients from receiving routine STI testing
o Patients often feel like they have to accept routine STI testing
o Patients receive adequate post-test information for routine STI testing
o Routine STI testing is voluntary; patients are able to decline screening
o Patients do not expect to be offered routine STI testing
o I am concerned that routine STI testing will have a negative effect on patients' opinions about our clinic
o We have the resources needed to implement STI testing
o It is difficult to provide the privacy needed for routine STI testing

o I think routine HIV testing is an important part of regular healthcare

o I am concerned about cost and reimbursement for HIV testing

o I am concerned that patients will be offended by being offered routine HIV testing

o I am comfortable discussing routine HIV testing with patients

o Language barriers prevent some patients from receiving routine HIV testing

o Patients often feel like they have to accept routine HIV testing

o Patients receive adequate pre-test information for routine HIV testing

o Patients receive adequate post-test information for routine HIV testing

o Routine HIV testing is voluntary; patients are able to decline screening

o Patients do not expect to be offered routine HIV testing

o I am concerned that routine HIV testing will have a negative effect on patients' opinions about our clinic

o We have the resources needed to implement HIV testing

o It is difficult to provide the privacy needed for routine HIV testing

o I can ask the sexual orientation of the patients

o I can obtain a sexual and reproductive health history from the patients

VERSION 2 – REVIEW

REVIEWER	Aimin Guo Capital Medical University, China
REVIEW RETURNED	27-Feb-2017

GENERAL COMMENTS	1.Although the authors think the study reported first in the international literature, it should not be reported as the first survey in mainland China. 2.The authors did not cite correctly the sentence of the reference 1. "It has been reported that the majority of CME programmes in China were based on the concept of institutionally-oriented planning, dictated by the interests of these organization rather than the needs of learners." The reference 1 is a study implemented in rural Guangxi Region. The reference 1 introduced the CME status of physicians and nurses in rural Guangxi, and described in introduction that "the majority of CME programs are based on the concept of institutionally oriented planning, which is dictated by the interests of the organization rather than the needs of learners. In 2004, the Chinese Ministry of Health issued a regulation entitled 'Training regulations for health personnel in township health centers.'". This sentence was not the conclusion of the reference 1. 3.In China, medical staff in CHCs are required to participate in CME organized by training institutions at variable levels. If the authors insisted on only introducing CME organized by centers in the result, the topic should be concreted as "Primary Care Workforce and in-house Continuous Medical Education in China: Lessons to learn from a Nationwide Representative Survey". 4.Did the authors analyze the difference of the data of GPs and community nurses in the result and that from National Health Statistics Yearbook?

REVIEWER	Nabil Natafgi Department of Health Management and Policy, University of Iowa
REVIEW RETURNED	04-Mar-2017

GENERAL COMMENTS	I thank the authors for their careful revision of the manuscript based

on the comments raised. I think, overall, they adequately addressed most of my points. I do think the findings from study survey would potentially be of interest to readership of BMJ Open. Despite the significance of the current study about the understanding of CME activities among primary care professionals (physicians and nurses) in Community Health Centers (CHCs) in China, I like to reradiate that, in my opinion, the study is limited in a number of areas. Two of my major concerns relate to: (1) representativeness of the study; and (2) comprehensiveness of the CME assessment.

(1) Representativeness of study – I raised this issue in my previous comments with respect to sample size being only 2% of the actual population of CHCs. I understand that, according to authors, less than 20% of CHCs are in cities and thus the included sample would account for ~10% of urban practices. However, your argument is that you carefully selected your sample to be geographically representative. In that case, you should have respective representation of urban, suburban and rural areas, each according to their actual national percentages (i.e. no over presentation of the urban settings). I still believe that your sample only cover 2% of CHC (and ~1% of health care professionals). Which is okay, if you can demonstrate that 1-2% is actually not biased or different from the remaining 99%.

(2) Comprehensiveness of the CME assessment – As the first reviewer noted previously, this study is limited to CMEs at the organizational level and does not factor CMEs conducted outside the organization (e.g. by training institutions or self-directed learning). Further, the factors addressed in this study were restricted to demographics (age, gender, ethnicity, education), specialty, field of work, and experience, and HIV/STI training and attitudes (which appeared in Appendix I but was not reported in the study). The survey instrument (Appendix I) seems to have focused on attitudes towards HIV/STI testing rather than attitudes towards CME (which is the focus of the study under review). A number of potential factors (e.g. costs to attend CME, management support, funding/resources, CME instructors/coaches, technical and IT skills, infrastructure, organizational characteristics, rural/urban settings, etc.) were not on the list and not addressed in the survey.

Having said that, below are some comments on the revised version:

1. Introduction comment # 2. (A more detailed explanation of the expected CME program from PHC professionals in China would be helpful for the reader…). I did not see any explanation of the CMEs (maybe I missed it) especially that it is one of the major outcomes of the study. Also you mention that this study aim to evaluate "the training (especially the content and delivery of CME) of health professionals". I did not see results on content except for Table 2 last three rows (clinical guideline discussion, management updates, and case studies).

2. Results comment # 2. (Nurse-to-doctor ratio). Thank you for the clarification. To minimize confusion to the reader, I suggest moving the phrase "with a nurse-to-doctor ratio of 1.6" (which follows "women accounted for 61% of the doctors…") to first paragraph after your discussion of the median number of full-time general practitioners and nurses.

3. Results comment # 6. I appreciate the renaming of one of the categories for clarity, but I am still not sure if all readers will have the

| | same understanding of the content of 'management updates (e.g. journal club)'. For some, management updates could mean education on recent updates and innovations in the clinical management of certain diseases (e.g. diabetes management). Whilst journal club might mean to readers a group of clinicians huddle to critically evaluate articles published in the academic literature. Still, others might understand management updates to be referring to CHC management (or leadership) on the current organizational standing of their CHC, strategic vision, mission, orientation etc. Let alone, survey participants understanding the different terms consistently. So a brief explanation/definition of each category is warranted.

4. Results comment #12 (figures reported in Table 2 vs. Table 3). I am sorry, I might be missing something here. But, my understanding is that in Table 2 the CHC column is coming from the lead clinicians survey (N=139-148) whilst the Doctors and Nurses columns are coming from the CHC staff (N=1588-1683). If that is the case, then Table 3 row 1 (health professionals) numbers (n and N) total across the three geographic region ideally should sum up to those numbers reported in Table 2.

5. Discussion comment # 5 ('regional differentiation is unnecessary'). Thanks for clarifying this in the response and in the revised version. I am sure the geographic regions and their connotations are clear to the readers who are familiar with the Chinese health care system. But in consideration of the international readership of BMJ Open, I suggest some clarification on the background behind the assumptions made by the government with respect to the regional differentiation (especially that this is one of your main results and recommendations [against regional differentiation]).

6. Page 8 of 52 (lines 26-32): you list a number of factors examined. I was not sure how some of those factors map on the items presented in Appendix 1. For instance, clinical set-up, community characteristics and patient demographics did not seem to be sufficiently mapping on representative items on the survey (Appendix 1). Further the survey seemed to be so focused on HIV or sexual and reproductive health (e.g. patient in CHC in last month were limited to sex workers, IDUs, MSM, and transgender – while I am pretty sure CHCs patient population would be larger than the listed categories).

7. Page 10 of 52 (lines 43-44): check the reference for the sentence on number of allied health professionals in CHCs as reported by lead physicians. |

VERSION 2 – AUTHOR RESPONSE

Reviewer 1, Comment 1
1.Although the authors think the study reported first in the international literature, it should not be reported as the first survey in mainland China.

Changes: We have removed the phrase that this is the first survey in mainland China.
(Page 3, line 76) This study surveyed the CME situation of a random sample of 3,580 medical staff in CHCs in mainland China.

Reviewer 1, Comment 2

2.The authors did not cite correctly the sentence of the reference 1. "It has been reported that the majority of CME programmes in China were based on the concept of institutionally-oriented planning, dictated by the interests of these organization rather than the needs of learners." The reference 1 is a study implemented in rural Guangxi Region. The reference 1 introduced the CME   status of physicians and nurses in rural Guangxi, and described in introduction that "the majority of CME programs are based on the concept of institutionally oriented planning, which is dictated by the interests of the organization rather than the needs of learners. In 2004, the Chinese Ministry of Health issued a regulation entitled 'Training regulations for health personnel in township health centers.'". This sentence was not the conclusion of the reference 1.

Changes: Thank you for noting this. We have deleted this sentence and reference from our manuscript.

Reviewer 1, Comment 3

3.In China, medical staff in CHCs are required to participate in CME organized by training institutions at variable levels. If the authors insisted on only introducing CME organized by centers in the result, the topic should be concreted as "Primary Care Workforce and in-house Continuous Medical Education in China: Lessons to learn from a Nationwide Representative Survey".

Response: Our intention was not to insist on CME being provided by centers only. Our paragraph explaining CME in China agrees with your point that CME need not be in-house.

(Page 6, line 175) Continuous medical education (CME) aimed at maintaining, developing and enhancing medical providers' professional knowledge, skills and interpersonal capacity to keep abreast of professional lives, is an essential element to maintain quality of care in this new system16,17 and CME is compulsory for ongoing registration in China. These CHC staff are required to participate in CME organised by training institutions at national, provincial, municipal, district and center level, and they have to fulfil at least 25 credits of approved CME every year which is accredited every two years.

(Page 12, line 376) Other forms of CME might include attending professional conferences, research workshops or distance learning courses so long as they have been approved by the postgraduate center in their respective city but the focus of CME undergone by doctors or nurses could be different and there is no fixed rules as how frequent they should attend these activities.

Reviewer 1, Comment 4

4.Did the authors analyze the difference of the data of GPs and community nurses in the result and that from National Health Statistics Yearbook?

Changes: Thank you for this suggestion. We have incorporated the information from the National Health Statistics Yearbook into Table 1.

(Page 8, line 235) These were compared with the National Health Statistics Yearbook12

Table 1. Basic characteristics and training of CHC health professionals, compared with the 2015 National Health Statistics Yearbook12

Variables	DOCTORS	2015 Yearbook	NURSES	2015 Yearbook
	n/N % (95%CI)		n/N % (95%CI)	
Median Age (IQR)	38 (32-46)	-	31 (26-39)	-
Gender				

Female 1,025/1675 61.2
(58.8-63.5) 53.2 1,793/1803 99.4
(99.0-99.7) 99.4
Education
Below associate degree 202/
1724 11.7
(10.2-13.3) 19.1 382/
1831 20.9
(19.0-22.8) 44.4
Associate degree* 582/
1724 33.8
(31.5-36.0) 36.9 920/
1831 50.2
(47.9-52.6) 48.3
Bachelor degree or higher 940/
1724 54.5
(52.1-56.9) 44.0 529/
1831 28.9
(26.8-31.0) 10.3
Job title
Senior 180/
1711 10.5
(9.1-12.1) 10.5 46/
1815 2.5
(1.9-3.4) 1.5
Intermediate 705/
1711 41.2
(38.9-43.6) 41.3 471/
1815 26.0
(23.9-28.0) 22.2
Junior 683/
1711 39.9
(37.6-42.3) 41.9 1,158/
1815 63.8
(61.5-66.0) 66.9
None 143/ 1711 8.4
(7.1-9.8) 6.2 140/
1815 7.7
(6.5-9.0) 9.4
Registered Speciality
Integrative Medicine 145/
1700 8.5
(7.2-10.0) - 2/ 1834 0.1
(0.0-0.4) -
General practice 799/
1700 47.0
(44.6-49.4) - 85/ 1834 4.6
(3.7-5.7) -
Other Specialty 454/
1700 26.7
(24.6-28.9) - 19/ 1834 1.0
(0.6-1.6) -

Nurse 23/
1700 1.4
(0.9-2.0) - 1712/ 1834 93.3
(92.1-94.4) -
None 75/ 1700 4.4
(3.5-5.5) - 30/ 1834 1.6
(1.1-2.3) -
Other 295/
1700 17.4
(15.6-19.2) - 18/ 1834 1.0
(0.6-1.5) -
Median Years working in above speciality (IQR) 14 (7-23) - 9 (4-18) -

(Page 9, line 274) Table 1 provides the demographics of CHC staff compared with the 2015 National Health Statistics Yearbook12.

Reviewer 2, Comment 1
I thank the authors for their careful revision of the manuscript based on the comments raised. I think, overall, they adequately addressed most of my points. I do think the findings from study survey would potentially be of interest to readership of BMJ Open. Despite the significance of the current study about the understanding of CME activities among primary care professionals (physicians and nurses) in Community Health Centers (CHCs) in China, I like to reradiate that, in my opinion, the study is limited in a number of areas. Two of my major concerns relate to: (1) representativeness of the study; and (2) comprehensiveness of the CME assessment.

(1) Representativeness of study – I raised this issue in my previous comments with respect to sample size being only 2% of the actual population of CHCs. I understand that, according to authors, less than 20% of CHCs are in cities and thus the included sample would account for ~10% of urban practices. However, your argument is that you carefully selected your sample to be geographically representative. In that case, you should have respective representation of urban, suburban and rural areas, each according to their actual national percentages (i.e. no over presentation of the urban settings). I still believe that your sample only cover 2% of CHC (and ~1% of health care professionals). Which is okay, if you can demonstrate that 1-2% is actually not biased or different from the remaining 99%.

Response: We agree that a limitation of our survey is that it may not fully represent all CHCs in China. Nevertheless, as described in the methods, bias was minimized through random selection of CHCs in mainland China.

Changes: We have de-emphasized the word "representative" from the manuscript and further discussed this limitation in our manuscript. We have also provided more information in Table 1 as a comparison of key demographic parameters with the National Yearbook 2015 (see response to Reviewer 1, Comment 4)

Deleted "representative" from the title.

(Page 3, line 76) This study surveyed the CME situation of a random sample of 3,580 medical staff in CHCs in mainland China.

(Page 3, line 88) Although we surveyed over 3,500 medial staff from a random sample of CHCs in China, they may not be representative of all CHC staff in China.

(Page 7, line 198) – deleted "representative". A nationwide survey using a stratified randomized sample was conducted amongst CHC medical professionals between September and December 2015

(Page 10, line 313) – deleted "representative". This large study of China's CHCs examines the current primary care workforce and finds it is predominantly staffed by young female health professionals, with only half of doctors holding a bachelor degree or higher, or registered as a GP

Reviewer 2, Comment 2
(2) Comprehensiveness of the CME assessment – As the first reviewer noted previously, this study is limited to CMEs at the organizational level and does not factor CMEs conducted outside the organization (e.g. by training institutions or self-directed learning). Further, the factors addressed in this study were restricted to demographics (age, gender, ethnicity, education), specialty, field of work, and experience, and HIV/STI training and attitudes (which appeared in Appendix I but was not reported in the study). The survey instrument (Appendix I) seems to have focused on attitudes towards HIV/STI testing rather than attitudes towards CME (which is the focus of the study under review). A number of potential factors (e.g. costs to attend CME, management support, funding/resources, CME instructors/coaches, technical and IT skills, infrastructure, organizational characteristics, rural/urban settings, etc.) were not on the list and not addressed in the survey.

Changes: We have added more information in our limitations to address your important points.

(Page 3, line 82) It would be valuable to also know how frequently staff participated in CMEs conducted outside of organizations (e.g. by training institutions or self-directed learning).

(Page 3, line 86). Other important parameters for CME evaluation to consider would be costs to attend CME, management support, funding/resources, quality of CME instructors/coaches.

Reviewer 2, Comment 3

1. Introduction comment # 2. (A more detailed explanation of the expected CME program from PHC professionals in China would be helpful for the reader…). I did not see any explanation of the CMEs (maybe I missed it) especially that it is one of the major outcomes of the study. Also you mention that this study aim to evaluate "the training (especially the content and delivery of CME) of health professionals". I did not see results on content except for Table 2 last three rows (clinical guideline discussion, management updates, and case studies).

Response: We had a paragraph explaining the CME program for CHC staff in China.

(Page 6, line 175) Continuous medical education (CME) aimed at maintaining, developing and enhancing medical providers' professional knowledge, skills and interpersonal capacity to keep abreast of professional lives, is an essential element to maintain quality of care in this new system16,17 and CME is compulsory for ongoing registration in China. These CHC staff are required to participate in CME organised by training institutions at national, provincial, municipal, district and center level, and they have to fulfil at least 25 credits of approved CME every year which is accredited every two years. According to the "Twelfth 5-year plan" ,18 100% of senior, 95% of mid-grade; and 80% of junior health professionals at provincial and city levels should achieve the required CME targets over two years. For staff working in western and peripheral regions of China, these targets were reduced to 95%, 80% and 70% respectively to reflect the phased development of primary care in these large and dispersed regions of the country. The hierarchy of the titles can only be achieved after passing the qualifying examination and fulfilling a number of stringent criteria including CME requirements, written examinations and publication of research manuscripts. This study aimed to

evaluate the current organization and manpower of CHCs in China, as well as the training (especially the content and delivery of CME) of health professionals within primary care in China.

(Page 8, line 238) CME content were defined as 'clinical guidelines discussion' (i.e. discussion of new clinical guidelines i.e. procedures in diagnosis or new drugs in managing a patient with a selected condition common to primary care), 'management updates' (i.e. new drugs or procedures that becomes available to the CHC or changes in workflow at the practice), and 'case discussion' (i.e. presentation of a difficult case for group input with supporting evidence form the literature).

Reviewer 2, Comment 4
2. Results comment # 2. (Nurse-to-doctor ratio). Thank you for the clarification. To minimize confusion to the reader, I suggest moving the phrase "with a nurse-to-doctor ratio of 1.6" (which follows "women accounted for 61% of the doctors…") to first paragraph after your discussion of the median number of full-time general practitioners and nurses.

Changes: (Page 9, line 277) The median age of CHC doctors and nurses were young at 38 and 31 years of age, respectively, with a nurse-to-doctor ratio of 1.6.

Reviewer 2, Comment 5
3. Results comment # 6. I appreciate the renaming of one of the categories for clarity, but I am still not sure if all readers will have the same understanding of the content of 'management updates (e.g. journal club)'. For some, management updates could mean education on recent updates and innovations in the clinical management of certain diseases (e.g. diabetes management). Whilst journal club might mean to readers a group of clinicians huddle to critically evaluate articles published in the academic literature. Still, others might understand management updates to be referring to CHC management (or leadership) on the current organizational standing of their CHC, strategic vision, mission, orientation etc. Let alone, survey participants understanding the different terms consistently. So a brief explanation/definition of each category is warranted.

Changes:
(Page 8, line 238) CME content were defined as 'clinical guidelines discussion' (i.e. discussion of new clinical guidelines i.e. procedures in diagnosis or new drugs in managing a patient with a selected condition common to primary care), 'management updates' (i.e. new drugs or procedures that becomes available to the CHC or changes in workflow at the practice), and 'case discussion' (i.e. presentation of a difficult case for group input with supporting evidence form the literature).

Reviewer 2, Comment 6
4. Results comment #12 (figures reported in Table 2 vs. Table 3). I am sorry, I might be missing something here. But, my understanding is that in Table 2 the CHC column is coming from the lead clinicians survey (N=139-148) whilst the Doctors and Nurses columns are coming from the CHC staff (N=1588-1683). If that is the case, then Table 3 row 1 (health professionals) numbers (n and N) total across the three geographic region ideally should sum up to those numbers reported in Table 2.

Response: The second column in Table 2 (labelled CHCs) has a CHC as the unit of measurement (not the number of lead clinicians' participation in CME).

Changes: For clarity, we have reformatted Table 2 so that it only presents data from CHC as the unit of measurement.

(Page 10, line 290)
Table 2 shows the range and frequency of reported on-site CME and CME participation at each CHC. CME activities were held by nearly all CHCs (97.2%), where about two-thirds (67.1%) conducted CME

sessions monthly or more frequently. The type of in-house CME activities reported were clinical guidelines discussion (100%), management updates (87.9%) and case discussions (83.6%).

(Page 20, line 589)
Table 2. Continuous medical education organised and undertaken by the CHCs.

.
n/N % (95%CI)
CHC offering Continuous Medical Education 140/144 97.2 (93.0-99.2)
Frequency of CME organised at CHCs
Yearly 16/140 11.4 (7.1-17.9)
Quarterly 25/140 17.9 (12.3-25.1)
Bimonthly 13/140 9.3 (5.4-15.4)
Monthly 77/140 55.0 (46.7-63.0)
Biweekly 15/140 10.7 (6.5-17.0)
Weekly 2/140 1.4 (0.1-5.4)
Staff participating in CME
Managers 140/140 100 (96.8-100)
Doctors 140/140 100.0 (96.8-100.0)
Nurses 140/140 100.0 (96.8-100.0)
Other medical staff 126/140 90.0 (83.8-94.1)
Types of CME activities
Clinical guideline discussion 140/140 100 (96.8-100)
Management updates 123/140 87.9 (81.3-92.4)
Case discussions 117/140 83.6 (76.5-88.9)

Reviewer 2, Comment 7
5. Discussion comment # 5 ('regional differentiation is unnecessary'). Thanks for clarifying this in the response and in the revised version. I am sure the geographic regions and their connotations are clear to the readers who are familiar with the Chinese health care system. But in consideration of the international readership of BMJ Open, I suggest some clarification on the background behind the assumptions made by the government with respect to the regional differentiation (especially that this is one of your main results and recommendations [against regional differentiation]).

Changes:
(Page 7, line 186)
These regional differentiation are based on geographic, economical and medical jurisdiction.

Reviewer 2, Comment 8
6. Page 8 of 52 (lines 26-32): you list a number of factors examined. I was not sure how some of those factors map on the items presented in Appendix 1. For instance, clinical set-up, community characteristics and patient demographics did not seem to be sufficiently mapping on representative items on the survey (Appendix 1). Further the survey seemed to be so focused on HIV or sexual and reproductive health (e.g. patient in CHC in last month were limited to sex workers, IDUs, MSM, and transgender – while I am pretty sure CHCs patient population would be larger than the listed categories).

Response: Appendix 1 provides our full survey which was to explore the experiences of HIV/sexual and reproductive health amongst CHCs in China. However, given the importance of CMEs in expanding clinical services amongst CHCs, we also collected comprehensive information alongside

this survey to understand how doctors and nurses in China were participating in CMEs.

Reviewer 2, Comment 9
7. Page 10 of 52 (lines 43-44): check the reference for the sentence on number of allied health professionals in CHCs as reported by lead physicians.

Changes: This reference has been deleted.

VERSION 3 – REVIEW

REVIEWER	Aimin Guo Capital Medical University, China
REVIEW RETURNED	22-May-2017

GENERAL COMMENTS	The reviewer completed the checklist but made no further comments.

REVIEWER	Nabil Natafgi Department of Health Management and Policy, University of Iowa, USA
REVIEW RETURNED	20-May-2017

GENERAL COMMENTS	The reviewer completed the checklist but made no further comments.