PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Can Unsuccessful Treatment in Primary Medical Institutions Influence Patients' Choice? A Retrospective Cluster Sample Study from China
AUTHORS	Yadong, Niu; ZHANG, LIANG; Ye, Ting; Yan, Yan; Zhang, Yan

VERSION 1 – REVIEW

REVIEWER	Mohammad Afzal Mahmood University of Adelaide, South Australia, Australia
REVIEW RETURNED	26-Mar-2018

GENERAL COMMENTS	This is an important work, and the authors have attempted a deeper look into the issue of pyramidal referral system, patient choice, quality of care and financial and health system implication. The objectives are important and design of the investigation relevant to an extent. However, in its current form there are many places where the narrative, methods and results description lacks clarity and needs to be redrafted. I hope that the authors find the following specific comments useful to redraft the article. Line 31: It is not clear what is meant by "the choice of patients between township hospitals (primary medical institutions) and county hospitals was determined". Does it mean that 'it was noted whether patient chose township hospital or country hospital to receive health care'? In any case this statement does not belong the heading 'settings'. 39: It is not clear what is meant by 'nonTC patients'. Does it mean that the study included patients who did not attend any township or country hospitals? It becomes clear to some extent in the body of the article but needs to be clarified in the abstract as well. 49: It is mentioned that "….unsuccessful treatment in primary institutions is inevitable..". Need to clarify that it means 'unsuccessful for some'. 61. It is not clear what is meant by 'precise programming' in the sentence "Patients' choice of medical institutions before and after unsuccessful treatment experience was selected out based on precise programming". There is a need for English editing. For example not clear what is meant by "(line 65) Whether the influence of unsuccessful treatment experience could sustain is unstudied" and (line 68) "A good thing is that different people need different level of health resource, and the level is higher, the need is less". Probably it meant to say patients' healthcare needs differ and a majority could be successfully treated

	in good quality primary care with only a few needing care at secondary and tertiary levels. 76. "…. …emergency apartment for mild …" Emergency Department? 77. It is problematic to claim that people's behaviour is 'inappropriate'. Often community's bypassing practices are borne out of fact that primary care services provide less than optimal quality care and people tend to know that and try by-passing. Hence; from community members' perspective this practice could be justifiable on the account of poor health care in primary institutions. 81 Not clear "… gatekeepers of the health system gradually disappeared.." 83: It is mentioned that "Health resources (i.e. health workforce, medical equipment) have been increasingly consolidated in large hospitals and people have progressively preferred high level medical institutions which caused great waste and inefficacy". If the resources are 'consolidated' in larger hospitals with fewer resources in primary care, then the claim [that bypassing primary care] causes great waste could not be justified. 86. The statements such as "….. free choice gradually turned into inappropriate choice" tend to lay the onus with the patients and communities, discounting the fact that when primary care is not resourced and supported well and that the resources drain towards high-end care in tertiary hospitals, then primary care tend to suffer from poor quality in turn leading to a lack of trust by the community. 98: With regard to the information about decrease in the number of patients attending the primary care institutions prior to visiting the higher level facilities, what was the target i.e. what % of patients were anticipated to go to the primary care institutions before accessing care at the higher levels. Were there any criteria set which allows the patients to go directly to the higher levels? 111. It is mentioned that "to date, no study has paid attention to the influnece of ….". There is much research conducted on various aspects including quality that influence the use of primary and secondary care services. For example, see a review paper Huntley A, Lasserson D, Wye L, et al. Which features of primary care affect unscheduled secondary care use? A systematic review. BMJ Open 2014;4:e004746.doi:10.1136/bmjopen-2013-004746) 118. It is mentioned that "Patients who experienced unsuccessful treatment in primary medical institutions are identifiable because they will transfer thereafter to another medical institution". Were there any patients who on discharge from township hospital needed further treatment but chose not to go to another hospital (due to financial or other reasons) and used no or traditional healthcare? How this was made sure that there were no such patient? 140. "All the rural residents are employed in New Rural Cooperative Medical System". 'employed' or enrolled? 152. The statement "Nevertheless, if patients were not suggested admission by doctor of county hospitals right after the discharge ……." is based on an assumption that the country hospital doctors'

	decisions were correct all the time or that the decision was not made due to country hospital being overcrowded etc. need to expand and clarify. 181. The objective is to identify if the effective care at primary care institutions influenced the use at higher levels. Therefore, if the primary care was effective and patient illnesses were cured then there was no need to go to the secondary level. Hence, it is difficult to consider that as a 'choice behaviour'. There are patients who access care at the county hospitals without first visiting the township hospital. This is explained later in the paper. However, the method does not describe with clarity who were enrolled in the study. Results Section RoCC .. There is a need to clearly define whether once a patient experience using township hospital, then they bypassed the township hospitals in future and went directly to the county hospital. The way results are at present, it is difficult to interpret. For the readers it would be useful to present the results with simple analysis first; for example informing about simple frequencies such as what % of the 2090 patients who attended the township hospitals, attended the county hospitals within the next 30 days and what % of patients who attended township hospitals then attended the country hospital for another disease without first going to the township hospital. These results are available but are not presented with clarity. One issue that reduces the readability is the use of many non-conventional acronyms such as TC, TH, THa, RoCC etc. It is difficult for the reader to remember and then follow the narrative and comprehend the situation. 261. The statement "……. indicates that only a few patients would have unsuccessful treatment experience ….." is a challenging assumption; many patients might not have received effective treatment but probably did not attend the county hospital just to avoid direct and indirect costs associated with such visits. 285. It is not clear what is meant by "Secondly, insufficient cooperation owing to interest conflict between county hospitals and township hospitals drives inappropriate choice for medical institutions". Does this mean that the township and county hospitals compete for the patients for financial or other reasons, and for that reason may not facilitate referrals even when required? 293. It's a valid argument that ITIC patients RoCC decreased probably because they were heavily financially burdened due to two admissions. This means that the NCMS did not cover the cost fully. That information about NCMS needs to be included in the paper. 315 Not clear what is meant by "those social changes promoted the influence of unsuccessful treatment experience". Does social change means 'freedom of choice'. Freedom of choice is one of the facets of 'responsiveness of health care systems, and is necessary. It is logical to consider that patient will probably avoid going to higher level hospitals because of the higher cost (indirect and direct) associated with that. The fact that the patients still bypass despite

	the higher indirect and direct cost informs about the potential dissatisfaction and perceived and actual sub-optimal standard of care in primary care institutions. Discussion about such factors needs to be included. 316. It might be that the proportion is small in the study. However, at some stage during the recent past the local community members might have used the township hospitals and might have felt dissatisfied with the timeliness or quality. That might have led to them bypassing the township. This concept is touched on briefly in the conclusion section (line 350) where it is mentioned that the influence on choice may be an accumulated process. This concept needs to be elaborated to discuss the results further. Figures 1 and 2 do not add much to the argument or clarity, and could be taken out.

REVIEWER	Pooja Balchandra Scunthorpe General Hospital UK
REVIEW RETURNED	03-Apr-2018

GENERAL COMMENTS	Objective needs to be rewritten..it is unclear whether the study is to determine patient choice for a particular institution or whether institutions are choosing their patients. There seems to be an assumption made that patient choice of a county hospital instead of a township hospital indicates treatment failure at the township hospital. Line 118/119- Is there any proof that the treatment at the township hosp or primary medical institution was unsuccessful? Why is the study using the 30 day criteria? Why are patients getting compensated for choosing a township or "lower level" institution? Is health care free at the point of contact? If the general belief is that the county hospital is a more tertiary service or provides better care, it would automatically lead to patients choosing that kind of service rather than go to the "lower level" of health care provision. Has this study taken this concept into consideration?

REVIEWER	Fang Qiu University of Nebraska Medical Center, US
REVIEW RETURNED	16-May-2018

GENERAL COMMENTS	Review Checklist #4: It is not clear how cluster sampling was done in the study. How were the clusters defined and what methods was used for sampling? The capacity of township hospitals was classified as low, medium, and high levels in Table 1. It would be helpful if authors give more description about such classification. Review Checklist #5: No research ethics statement was found in the paper. Review Checklist #6: It is confusing if the outcome of RoCC was defined at the patient level and calculated for each patient. Please provide more information to clarify this.

	Review Checklist #7: Assuming the outcome of RoCC is defined at the patient level. The outcome of RoCC is rate data not dichotomous data. It is not appropriate to use Chi-square test to compare RoCC of before TC and after TC, and to compare RoCC of TC patients and matched non-TC patients. Instead, Wilcoxon signed-rank test should be used to compare RoCC of before TC and after TC to account for the correlation from the same patient. Generalized Linear Models should be used to control for other confounding factors. Assuming imbalance between TC and matched non-TC is greatly reduced or can be ignored after coarsened exact matching, Wilcoxon rank-sum tests should be used to compare RoCC of TC patients and matched non-TC patients. Review Checklist #10: On page 13 line 249, 563 OTOC patients were used in OTOC and non-TOC matching. However, in Table 1, the sample size of OTOC is 546. Please explain the difference. Were variable age3 and distance2 on page 14 Table 2 same as age and driving time to center county hospital on page 11 Table 1 respectively? Please comment on sample size N used before and after CEM in Table 2; Would and how this affect the generalizability of conclusion? Fig. 3 and Fig. 4 need add sample size either in the graph or the legend. Review Checklist #11: The authors conclude, “experience of unsuccessful treatment in primary medical institutions can influence patients’ choice thereafter and patients likely choose high-level medical institutions regardless of the disease”. But it is questionable that authors could draw causal inference from a retrospective study after coarsened exact matching considering there are many other factors influencing the choice of medical institutions such as income.

VERSION 1 – AUTHOR RESPONSE

Dear professor Mohammad Afzal Mahmood
Our responses to your comments are below:
1. It is not clear what is meant by “the choice of patients between township hospitals (primary medical institutions) and county hospitals was determined”. Does it mean that ‘it was noted whether patient chose township hospital or country hospital to receive health care’? In any case this statement does not belong the heading ‘settings’.
Response: The health system in rural area of China is a tertiary structure, in which village clinics, township hospitals and county hospitals play major roles in health delivery (page 6, line 121-125). By “the choice of patients between township hospitals (primary medical institutions) and county hospitals was determined”, we meant that this study only observed patients’ choices between township hospitals and county hospitals. We agree with your opinion that this statement does not belong “setting”, and we have moved this statement into “Main outcome measures” (page 2, line 36-37).

2. It is not clear what is meant by 'nonTC patients'. Does it mean that the study included patients who did not attend any township or country hospitals? It becomes clear to some extent in the body of the article but needs to be clarified in the abstract as well.
Response: It is a question. TC means the experience of firstly went to township hospitals and then county hospitals within 30 days for the same disease. TC patients are those who had this experience and non-TC patients are those who did not. We have added more explanation (page 2, line 40; page 7, line 146-147).

3. It is mentioned that "….unsuccessful treatment in primary institutions is inevitable..". Need to clarify that it means 'unsuccessful for some'.
Response: It is a good suggestion. We have modified this (page 3, line 48).
Line 48:
Unsuccessful treatment in primary medical institutions is inevitable for patients.

4. It is not clear what is meant by 'precise programming' in the sentence "Patients' choice of medical institutions before and after unsuccessful treatment experience was selected out based on precise programming".
Response: We realized that The statement of "Patients' choice of medical institutions before and after unsuccessful treatment experience was selected out based on precise programming" was improper. What we wanted to express was that "Patients' choice of medical institutions before and after unsuccessful treatment experience were selected out". It's been modified (page 3, line 60-61).

5. There is a need for English editing. For example not clear what is meant by "(line 65) Whether the influence of unsuccessful treatment experience could sustain is unstudied" and (line 68) "A good thing is that different people need different level of health resource, and the level is higher, the need is less". Probably it meant to say patients' healthcare needs differ and a majority could be successfully treated in good quality primary care with only a few needing care at secondary and tertiary levels.
Response: We edited the manuscript with the help of an experienced English teacher before submission and did not realize the mistakes you mentioned. We have reedited the manuscript with the help of an editing company named KGsupport. "Whether the influence of unsuccessful treatment experience could sustain is unstudied" was replaced by "Whether the influence of unsuccessful treatment experience can last over time is unclear." (page 3, line 64-65) "A good thing is that different people need different level of health resource, and the level is higher, the need is less" was replaced by "An advantage is that different people need diverse levels of health resources and high level indicates limited needs." (page 4, line 67-69)

6. "…. …emergency apartment for mild …" Emergency Department?
Response: It was our mistake. We have replaced "apartment" by "department" (page 4, line 75).

7. It is problematic to claim that people's behaviour is 'inappropriate'. Often community's bypassing practices are borne out of fact that primary care services provide less than optimal quality care and people tend to know that and try by-passing. Hence; from community members' perspective this practice could be justifiable on the account of poor health care in primary institutions.
Response: It is a good point. It might be inappropriate if patients go to high level medical institutions regardless their health condition. Our statement was too absolute. We have removed "inappropriate" (page 4, line 75-76), and modified other "inappropriate" in the article ("inappropriate choice" was replaced with "choice of high-level medical institutions".

8. Not clear "… gatekeepers of the health system gradually disappeared.."
Response: By "gatekeepers of the health system gradually disappeared", we meant that people could go to any level of medical institutions on their own will and the primary medical institutions no longer

played the role of health gatekeeper. We have modified the statement (page 4, line79-81).
Line79-81:
People could go to any level of medical institutions on their own will and the primary medical institutions no longer played the role of health gatekeeper
9. It is mentioned that “Health resources (i.e. health workforce, medical equipment) have been increasingly consolidated in large hospitals and people have progressively preferred high level medical institutions which caused great waste and inefficacy”. If the resources are ‘consolidated’ in larger hospitals with fewer resources in primary care, then the claim [that bypassing primary care] causes great waste could not be justified.
Response: We agree with your point. If primary medical institutions do not have enough resource to provide qualified and safety health care, bypassing behavior will not cause waste. However, the primary medical institutions are capable to provide qualified and safety health care for common disease. Bypassing behavior caused waste because the price of the same service in high-level medical institutions is much higher than that in primary medical institutions. Bypassing behavior also caused resource consolidation in high-level medical institutions, which promoted more bypassing behavior and more waste. We have modified the statement (line page 4-5, 84-88).

10. The statements such as “….. free choice gradually turned into inappropriate choice” tend to lay the onus with the patients and communities, discounting the fact that when primary care is not resourced and supported well and that the resources drain towards high-end care in tertiary hospitals, then primary care tend to suffer from poor quality in turn leading to a lack of trust by the community.
Response: It is a question. Not all the choices of high-level medical institutions are inappropriate. We have modified this statement (page 4, line 83-84).
Line 83-84:
Inappropriate choice gradually emerged out of free choice.
11. With regard to the information about decrease in the number of patients attending the primary care institutions prior to visiting the higher level facilities, what was the target i.e. what % of patients were anticipated to go to the primary care institutions before accessing care at the higher levels. Were there any criteria set which allows the patients to go directly to the higher levels?
Response: There was no criteria set which allows the patients to go directly to the higher levels. However, the decrease in the number of patients attending the primary care institutions prior to visiting the higher level facilities reflects that people have progressively preferred high-level medical institutions.

12. It is mentioned that “to date, no study has paid attention to the influnece of ….”. There is much research conducted on various aspects including quality that influence the use of primary and secondary care services. For example, see a review paper Huntley A, Lasserson D, Wye L, et al. Which features of primary care affect unscheduled secondary care use? A systematic review. BMJ Open 2014;4:e004746.doi:10.1136/bmjopen-2013-004746)
Response: It is a good question and thanks for the recommendation. We have read the review and noticed that “Evidence relating to quality of care was limited and mixed” was showed in the result. Besides, the service quality of institution can be reflected both by objective indicators and subjective experience or perceived quality. Our study focused on the later one (experience of unsuccessful treatment). The statement of “no study” was too absolute and we have replaced “no study” with “few study” (page 6, line 112).

13. It is mentioned that “Patients who experienced unsuccessful treatment in primary medical institutions are identifiable because they will transfer thereafter to another medical institution”. Were there any patients who on discharge from township hospital needed further treatment but chose not to go to another hospital (due to financial or other reasons) and used no or traditional healthcare? How this was made sure that there were no such patient?
Response: It is a good question. There may be patients who on discharge from township hospital

needed further treatment but chose not to go to another hospital and they can also be our study sample. Both patients who on discharge from township hospital chose not to go to another hospital and those who chose to go to another hospitals needed further treatment and experienced unsuccessful treatment in township hospitals. Our study was based on the inpatient/outpatient database. We can easily selected out patients who went to another hospital after discharging from township hospital from the database. However, we can hardly selected out patients who chose not to seek for further treatment after discharging from township hospital. That is why they were not included in our study.

14. “All the rural residents are employed in New Rural Cooperative Medical System”. ‘employed’ or enrolled?
Response: The New Rural Cooperative Medical System is an insurance for rural patients. Therefore, “employed” was appropriate. Besides, we have added more explanation for New Rural Cooperative Medical System. (page 7, line 141).
Line 141:
NRCMS, an insurance for rural residents in China

15. The statement “Nevertheless, if patients were not suggested admission by doctor of county hospitals right after the discharge …….” is based on an assumption that the country hospital doctors’ decisions were correct all the time or that the decision was not made due to country hospital being overcrowded etc. need to expand and clarify.
Response: We agree with your opinion. Incorrect decision of doctors in county hospitals or overcrowding in county hospitals may also be the reasons that patients were not suggested admission by doctor of county hospitals right after the discharge from a township hospital. However, the possibility of incorrect decision by county doctors is small and county hospitals usually do not reject more patients even they are crowded in China. We have modified the statement with “highly possible”(page 7-8, line 155-158).
Line 155-158:
If patients were not suggested admission by doctor of county hospitals right after the discharge from township hospitals, it was highly possible that service provided by township hospitals worked well. Besides, this rarely happens in actual situations.

16. The objective is to identify if the effective care at primary care institutions influenced the use at higher levels. Therefore, if the primary care was effective and patient illnesses were cured then there was no need to go to the secondary level. Hence, it is difficult to consider that as a ‘choice behaviour’.
Response: We agree with the opinion that if the primary care was effective and patient illnesses were cured then there is no need to go to the secondary level. What we want to answer is that if patients experienced unsuccessful treatment in primary medical institutions, whether would they prefer secondary-level hospitals later. We retrospectively observed their choices through the NRCMS database (Information of health service utilization is recorded in the NRCMS database because of reimbursement). We consider this as a “choice behavior” because it is a choice made after unsuccessful treatment.

17.There are patients who access care at the county hospitals without first visiting the township hospital. This is explained later in the paper. However, the method does not describe with clarity who were enrolled in the study.
Response: It is a question. All the TC patients (patients who firstly went to township hospitals and then county hospitals within 30 days for the same disease) were enrolled in our study. We have modified this (page 7, line 145-147).

18. RoCC .. There is a need to clearly define whether once a patient experience using township

hospital, then they bypassed the township hospitals in future and went directly to the county hospital. The way results are at present, it is difficult to interpret.
Response: We realize that RoCC was unclear. The definition and calculation method of Ratio of choosing county hospitals (RoCC) was explained in the statistical method part. We have added further explanation (page 9, line 191-192). RoCC means the percentage county hospital takes up among all the choices of health seeking for a period of time. It reflects patients' tendency of choosing medical institutions.

19. For the readers it would be useful to present the results with simple analysis first; for example informing about simple frequencies such as what % of the 2090 patients who attended the township hospitals, attended the county hospitals within the next 30 days and what % of patients who attended township hospitals then attended the country hospital for another disease without first going to the township hospital. These results are available but are not presented with clarity.
Response: We have present some simple analysis at the beginning of the results." In 2013, a total of 185,790 patients used outpatient service and 23,763 patients used inpatient service in township hospitals. We selected out 2,090 TC patients (including 546 OTOC patients, 725 OTIC patients and 801 ITIC patients). The ratio of TC for outpatient in township hospitals is 0.68% (1,271/185,790) and that for inpatient in township hospitals is 3.37% (801/23,763)." In this statement, all the 2090 patients are TC patients (patients who firstly went to township hospitals and then county hospitals within 30 days for the same disease). OTOC, OTIC and ITIC were explained in line (page 7-8, 149-154).

20.One issue that reduces the readability is the use of many non-conventional acronyms such as TC, TH, THa, RoCC etc. It is difficult for the reader to remember and then follow the narrative and comprehend the situation.
Response: We do have tried to reduce non-conventional acronyms. TH, THa, THb, CH, CHa, and CHb were merely showed in line 196-202, and they are supposed to simplify the formula of RoCC. The full names of OTOC, OTIC and ITIC are similar, readers may be easily to misread (for example, OTOC may be misread as OTIC). The abbreviations are supposed to make them distinguishable. The full name of RoCC (ratio of choosing county hospitals) is a bit long, and may also lower the readability. After all the consideration, we did not reduce the abbreviations.

21. The statement "……. indicates that only a few patients would have unsuccessful treatment experience ….." is a challenging assumption; many patients might not have received effective treatment but probably did not attend the county hospital just to avoid direct and indirect costs associated with such visits.
Response: It is a good question. Our statement was too absolute. We have added more discussion (page 15, line 277-282).
Line 277-282:
There are two possible reasons to explain this. One is that only a few patients would have unsuccessful treatment experience for outpatient service in primary medical institutions. The other is that patients chose not to attend the county hospital to avoid more cost, even the treatment in township hospital did not work. We prefer the first one as health demand of residents has been largely increased with the development of economy and universal coverage.

22. It is not clear what is meant by "Secondly, insufficient cooperation owing to interest conflict between county hospitals and township hospitals drives inappropriate choice for medical institutions". Does this mean that the township and county hospitals compete for the patients for financial or other reasons, and for that reason may not facilitate referrals even when required?
Response: Not exactly. The township hospitals have to refer patients to county hospitals when required. However, the county hospitals usually choose not to refer patients to township hospitals even the condition is mild (township hospitals are capable to handle). We have added more discussion and explanation on this (page 16-17, line 307-3011).

Line 307-311:
County hospitals have been competing with township hospitals for patients and have no motive to refer patients of mild condition (township hospitals are capable to handle) to township hospitals. If patients of mild condition can be referred to township hospitals, they may hold more trust on township hospitals.

23. It's a valid argument that ITIC patients RoCC decreased probably because they were heavily financially burdened due to two admissions. This means that the NCMS did not cover the cost fully. That information about NCMS needs to be included in the paper.
Response: It is a good suggestion. We have added this information into the paper (page 7, line 143-144).
Line 143-144:
People would get compensated when any cost was incurred in medical institutions and the reimbursement covers only part of the cost.

24. Not clear what is meant by "those social changes promoted the influence of unsuccessful treatment experience". Does social change means 'freedom of choice'. Freedom of choice is one of the facets of 'responsiveness of health care systems, and is necessary. It is logical to consider that patient will probably avoid going to higher level hospitals because of the higher cost (indirect and direct) associated with that. The fact that the patients still bypass despite the higher indirect and direct cost informs about the potential dissatisfaction and perceived and actual sub-optimal standard of care in primary care institutions. Discussion about such factors needs to be included.
Response: By social change, we mean the increasing economic capacity of the Chinese residents, universal healthcare coverage and free choice. We have added more discussion on this (page 18, line 336-340). The reason why patient prefer higher-level hospitals despite of higher cost is mainly that their economic capacity has increased and they can get high ratio of compensation from the insurance. This would cause crowdedness in high-level medical institutions (which can lower the service quality and patients' satisfaction) and burden for the NRCMS. The capacity of primary medical institutions is lower than high-level hospitals, which may cause dissatisfaction in primary medical institutions. Even so, the primary medical institutions are capable to handle common disease and they are still the optimal choice for first point of contact.
Line 336-340:
The social changes above promoted the influence of unsuccessful treatment experience. Besides, increasing economic capacity also allows people to consume better non-technical medical service in higher-level medical institution, which may also increase the tendency of bypassing.

25. It might be that the proportion is small in the study. However, at some stage during the recent past the local community members might have used the township hospitals and might have felt dissatisfied with the timeliness or quality. That might have led to them bypassing the township. This concept is touched on briefly in the conclusion section (line 350) where it is mentioned that the influence on choice may be an accumulated process. This concept needs to be elaborated to discuss the results further.
Response: It is a good suggestion. The opinion "at some stage during the recent past the local community members might have used the township hospitals and might have felt dissatisfied with the timeliness or quality" is similar to another of our assumption that the influence of unsuccessful treatment may last over time. We have not testified this assumption yet. We have added more discussion on this (page 19, line 368-370).
Line 368-370:
Besides, whether the influence of TC can last over time remains to be further explored, and the TC influence found in 2013 may has been enhanced by TC before 2013.

26. Figures 1 and 2 do not add much to the argument or clarity, and could be taken out.

Response: We have reconsidered the figures and removed figure 1 and 2.

Dear professor Pooja Balchandra
Our responses to your comments are below:
1. Objective needs to be rewritten..it is unclear whether the study is to determine patient choice for a particular institution or whether institutions are choosing their patients.
Response: It is a question. We have rewritten the objective (page 2, line 26-28).
Line 26-28:
We aim to analyze whether unsuccessful treatment in primary medical institutions can lead to patients' choice of high-level medical institutions.

2. There seems to be an assumption made that patient choice of a county hospital instead of a township hospital indicates treatment failure at the township hospital. Line 118/119- Is there any proof that the treatment at the township hosp or primary medical institution was unsuccessful?
Response: It is a good question. We have no direct evidence to prove that the treatment at the township hospital was unsuccessful. We infer that it was unsuccessful based on the fact that patients went to higher-level medical institutions (county hospitals) for the same disease after discharge from township hospitals. We use the word "unsuccessful" instead of "failure" because it is also possible that the treatment was not effective enough to reach patients' expectations.

3. Why is the study using the 30 day criteria?
Response: We adopted the criteria from the definition of readmission, which usually means readmission within 30 days (most commonly used). Referred from [Stevens S. Preventing 30-day readmissions[J]. Nurs Clin North Am, 2015,50(1):123-137. DOI: 10.1016/j.cnur.2014.10.010]. We have added more explanation (page 8, line 173-174).

4. Why are patients getting compensated for choosing a township or "lower level" institution?
Response: The insurance policy in China allows people to get compensated when cost was incurred in medical institutions. We have added more explanation (page 7, line 143-144).

5. Is health care free at the point of contact?
Response: Health care is not free at the point of contact. However, people would higher rate of reimbursement if they go to lower-level medical institutions (page 5, line 92-93).

6. If the general belief is that the county hospital is a more tertiary service or provides better care, it would automatically lead to patients choosing that kind of service rather than go to the "lower level" of health care provision. Has this study taken this concept into consideration?
Response: We have taken this concept into consideration. County hospitals have more and better resources than township hospitals. Even so, the township hospitals are capable to handle common disease, which occurs the most. Besides, county hospitals cost more (direct or indirect) compared with township hospitals. If all the patients go to county hospitals, a series of problems would follow, for example, crowdedness in county hospital, heavy burden for patients and the NRCMS, et.al. Therefore, the Chines government tries to avoid unnecessary health care in county hospitals for patients.

Dear professor Fang Qiu
Our responses to your comments are below:
1. It is not clear how cluster sampling was done in the study. How were the clusters defined and what methods was used for sampling?
Response: By cluster sampling, we meant that all the TC patients in the sample county were our study objects. Besides, we also included all the patients who did not experience TC (non-TC patients) into our study as controls (page 7, line 145-148).

2. The capacity of township hospitals was classified as low, medium, and high levels in Table 1. It would be helpful if authors give more description about such classification.
Response: The classification was another of our study and was performed based on weighted rank-sum ratio method (indicators included were human resource, financial resource, equipment, medical service, public health service and other service). We have published the results. Details of the classification research can be found in [Jing J, Yan Z, Wenjun L, et al. Comprehensively evaluating the capacity of health service in township health centers of Macheng City based on weighted rank-sum ratio method. Chinese Health Service Management 2016(4):264-66,95.] (page 10, line 216-219).

3. No research ethics statement was found in the paper.
Response: The research ethics statement has been provided.

4. It is confusing if the outcome of RoCC was defined at the patient level and calculated for each patient. Please provide more information to clarify this.
Response: The calculation of RoCC was at population level. We did not calculate RoCC for each patient. We have clarified this (page 9, line 193-195).
Line 193-195:
This ratio was calculated at population level and was used to analyze the choice change of TC patients and comparison of choice between TC patients and non-TC patients.

5. Assuming the outcome of RoCC is defined at the patient level. The outcome of RoCC is rate data not dichotomous data. It is not appropriate to use Chi-square test to compare RoCC of before TC and after TC, and to compare RoCC of TC patients and matched non-TC patients. Instead, Wilcoxon signed-rank test should be used to compare RoCC of before TC and after TC to account for the correlation from the same patient. Generalized Linear Models should be used to control for other confounding factors. Assuming imbalance between TC and matched non-TC is greatly reduced or can be ignored after coarsened exact matching, Wilcoxon rank-sum tests should be used to compare RoCC of TC patients and matched non-TC patients.
Response: We realize that our explanation for RoCC is confusing and has caused your misunderstanding. The calculation of RoCC was at population level actually. Chi-square test was used to test the choice change of medical institution. The Choice of medical institution was dichotomous data (township hospital or county hospital), therefore Chi-square test was appropriate. We have modified this statement in the statistical method part (page 11, line 220-221).
Line 220-221:
Chi-square test was used to compare the choice of medical institution before TC and after TC, the choice of medical institution for TC patients and non-TC patients.

6. On page 13 line 249, 563 OTOC patients were used in OTOC and non-TOC matching. However, in Table 1, the sample size of OTOC is 546. Please explain the difference.
Response: It is our mistake. “546” in Table 1 should be “564” (2090-801-725=564). We have correct it (page 12, line 243).

7. Were variable age3 and distance2 on page 14 Table 2 same as age and driving time to center county hospital on page 11 Table 1 respectively?
Response: Yes, variables in Table 2 are the same as that in Table 1.

8. Please comment on sample size N used before and after CEM in Table 2; Would and how this affect the generalizability of conclusion?
Response: It is a good suggestion. We have added more comment on it (page 16, line 292-293).
Line 292-293:
Besides, the sample size change of TC patients was little after CEM, therefore brought limited

influence on the generalizability of conclusion.

9. Fig. 3 and Fig. 4 need add sample size either in the graph or the legend.
Response: It is a good suggestion. We have added information of sample size on the legend (line 500-503).

10. The authors conclude, “experience of unsuccessful treatment in primary medical institutions can influence patients’ choice thereafter and patients likely choose high-level medical institutions regardless of the disease”. But it is questionable that authors could draw causal inference from a retrospective study after coarsened exact matching considering there are many other factors influencing the choice of medical institutions such as income.
Response: We agree that the matching did not include all the interfering factors, because of the limitation of database. We believe that is the reason why patients did not merely go to high-level medical institution thereafter. We used the word “likely” to avoid an absolute conclusion. Besides, we have put some statement in the limitation part.

VERSION 2 – REVIEW

REVIEWER	Mohammad Afzal Mahmood University of Adelaide
REVIEW RETURNED	19-Jul-2018

GENERAL COMMENTS	The authors have addressed the issues and concerns highlighted at the previous review. The one area that still needs improvement is the required clarity in presenting methods and results. For example, it is still not clearly stated whether it was noted that once the patients had a TC (township-county) experience, for their health care needs for the next episode of an illness they bypassed the township hospital and visited the county hospitals directly. While the English has improved somewhat it still needs to be improved further as the narrative clarity is still compromised. For example, it is not clear what is meant by "Health resources are known to be finite, and the better, the less" And "An advantage is that different people need diverse levels of health resources and high level indicates limited needs (line 67-69) AND Bypassing behavior also caused resource consolidation in high-level medical institutions....(Line 86) The statements at line 64/65 contradicts what is stated at line 45/46 The line 282 "We prefer the first one as health demand of residents has been largely increased with the development of economy and universal coverage". is not necessary.

REVIEWER	Fang Qiu University of Nebraska Medical Center, US
REVIEW RETURNED	07-Sep-2018

GENERAL COMMENTS	Review Checklist #4: It is not clear how the city Macheng was sampled. Review Checklist #11: Authors agree that the matching did not include all the interfering factors due to the limitation of database. Therefore, please consider emphasizing the definitive association instead of causal inference.

	The word “influence” in your conclusion seems to mislead the readers to a causal inference.

VERSION 2 – AUTHOR RESPONSE

Dear professors Mohammad Afzal Mahmood,
Our responses to your comments are below:
1. The authors have addressed the issues and concerns highlighted at the previous review. The one area that still needs improvement is the required clarity in presenting methods and results. For example, it is still not clearly stated whether it was noted that once the patients had a TC (township-county) experience, for their health care needs for the next episode of an illness they bypassed the township hospital and visited the county hospitals directly.
Response: Thanks for your advice. The assumption we want to verify is that whether patients will prefer high-level health facilities after TC. Therefore, we did not pay attention to bypass behavior. We analyzed the change of RoCC (ratio of choosing county hospitals) to test the assumption. We realized that some of our presentation in the methods and results may cause misunderstanding for reviews and other readers, and had added more explanation (Line 189-191).
Line 189-191: It is hard to track the choice of medical institutions for each of the patients. Therefore, we used ratio of choosing county hospitals (RoCC) to analyze the choice change of TC patients and comparison of choice between TC patients and non-TC patients.
2. While the English has improved somewhat it still needs to be improved further as the narrative clarity is still compromised. For example, it is not clear what is meant by "Health resources are known to be finite, and the better, the less" And "An advantage is that different people need diverse levels of health resources and high level indicates limited needs (line 67-69) AND Bypassing behavior also caused resource consolidation in high-level medical institutions....(Line 86)
Response: we paid high attention to the question above and have required the editing company (KGsupport, http://www.kgsupport.com/index.htm) to check the English again. We have modified line 67-89 and line 86.
Line 67-69 was replaced with “Health resources are known to be limited”, which conveys the main idea of former expression. Besides, it is concise and brings little confusing.
“Resource consolidation” in Line 86 was replaced with “resource concentration”, which means that most health resource is distributed in high-level health facilities.
3. The statements at line 64/65 contradicts what is stated at line 45/46
Response: We realized that confusing presentation was used at line 64/65. What we want to express is that our study was based on one year data, and the result may turn over when we enlarge the time range of database. We have modified our presentation (Line 64-65).
Line 64-65: □ Only one year data was included, and further track is needed to strengthen the conclusion.
4. The line 282 "We prefer the first one as health demand of residents has been largely increased with the development of economy and universal coverage". is not necessary.
Response: It is a good suggestion, and we have removed the line.

Dear professors Fang Qiu,
Our responses to your comments are below:
1.It is not clear how the city Macheng was sampled.
Response: It is a good question. We added some explanation why Macheng was sampled (Line135-143).
Line135-143: This retrospective cluster sample study was carried out in Macheng city, which is a typical county in Hubei province, central China. The city has a large population (approximately 880, 000) and medium GDP per capital (22,758¥ or 3,705$). There are 4 public county hospitals and 20 township hospitals in Macheng (2013), and all the rural residents are employed in New Rural

Cooperative Medical System(NRCMS, an insurance for rural residents in China). Information related to health service utilization (including outpatient service and inpatient service) is recorded in the NRCMS database because of reimbursement (People would get compensated when any cost was incurred in medical institutions and the reimbursement covers only part of the cost).

2. Authors agree that the matching did not include all the interfering factors due to the limitation of database. Therefore, please consider emphasizing the definitive association instead of causal inference. The word “influence” in your conclusion seems to mislead the readers to a causal inference.

Response: we agree with your opinion and replaced “influence” with “association” in discussion and conclusion part. “Influence” was our main assumption, so we did not change it in title or background.