Peer Review File

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Reviewer A

Comment 1. This is a meaningful, interesting question of study and the methods are reasonable to give us insight on adopters vs. non-adopters of telehealth. Many key concepts are not defined – concerning, as if there is not a range of definitions and variables that influence the approach and the results? Is this inpt, outpt or both adoption of telehealth?

Reply 1. Thank you for your comment. We included any adoption of telemedicine by the hospital as being an adopter. In particular, adopters had telemedicine in either setting across all years of the study.

Changes in text: Abstract page 2 line 67 and page 4 line 135.

Comment 2. Presentation.

a. Readability: good

b. Flow/logical: good, but Intro and Disc need to be better.

Response 2. We edited both the intro and discussion to improve the writing.

Changes in text: Page 3 line 102; page 4 lines 115-125; page 7 lines 241-262

Abstract.

Comment A1: General: less background, but have to define 'rural' as many definitions and define financial performance as based on _, _ and _.

Response A1: Added definitions and reduced background

Changes in text: Page 2, lines 59-65;

Comment A2: Methods: need more specifics (e.g., what done, what parameters) and what limitations were controlled for?

Response A2: We included specific information on the regression parameters.

Changes in text: Page 3 Line 70-73

Comment A3: Results: N total hosp vs. N in this study due to factors _, _ and _?

Response A3: We included a sentence on hospitals included in the study and why.

Changes in text: Page 3 lines 73-80

Comment A4: Conclusion: mention selection bias (i.e., more desperate ones have less to invest, do it more poorly due to lack of skill), more isolated communities have had to try it and 'good' leadership focuses efforts rather than diffusing efforts (though telehealth hopefully is not seen as diffusing)?

Response A4: We have included concerns with selection bias and the need for causal approaches in the conclusion.

Changes in text: Page 3 lines 81-86

Introduction.

1. The basic approach:
Comment 1a: Relevance: para 1 add sicker patients; rural not defined.
Response 1a: done.
Changes in text: Page 3 lines 94-96

Comment 1b: Current state: okay; financial parameters not defined, either.
Response 1b: changed.
Changes in text: Page 3, Line 104.

Comment 1c: The gap (that the manuscript will fill): telehealth defined as _, _ and _. Some info on where we are/aren't with rural hosp telehealth would be helpful.
Response 1c: We proposed filling the gap on rural financial performance differences using a longitudinal database and a novel case finding approach (persistently having and not having) and the factors associated with these differences. A short statement on the state of the literature was included along with a definition of telehealth.
Changes in text: Page 3, line 90; Page 3, line 109.

Comment 1d: Objectives: okay, but non-specific…list 3 as if this were a grant or we were presenting it?
Response 1d: The objectives were re-written to be more specific.
Changes in text: Page 3, line 110-112.

Methods.
1. Consider some organization, like paragraphs on…
Comment M1a: What are the basic dimensions of all the AHA rural hospitals; many readers do not know. Give a table or pie chart with basic information to give context. Compare them with urban and suburban counterparts, briefly, too?
Response M1a: Table 1 provides descriptions of the hospitals included in the database. Providing details on hospitals that were not persistent adopters or non-adopters would likely confuse the reader. Also, the analysis of persistency was complicated and not completed for urban hospitals. A separate analysis is being prepared to compare rural and urban hospitals.

Comment M1b: Design, specific objectives and data collection could use much more detail, even with what is para 4 of this section. What if I wanted to replicate this or take the next steps in improving it? What are the pros and cons of your approach – why this one? What are the limitations of it? In an idea approach, what also would be helpful to have? (This discussion is helpful for non-finance folks; it will also help those of us with an mba who are more curious.) This may also be added to limitations, if applicable, as no data set is perfect.
Response M1b: We added additional information to ensure the study could be replicated or extended. The limitations described in this comment appear best addressed in a separate section on limitations.

Changes to text: Page 4, line 128; page 4, line 133; page 7, line 243-252.

Comment M1c: Data set of participants: Is the same representative of all rural hospitals? Do you even know? If unclear = Limitation. Is 600 all of them – if not, what % of them?
Response: The reviewer raises a good point. A description of persistent versus non-persistent hospitals was included.
Changes to text: Page 4, line 145-146

Comment M1d: Methods/procedures: binary approach of adopting or not = Limitation. If don't know inpt, outpt or both = Limitation. Other measures available and pertinent?
Response: both comments addressed in the limitations section described above.
Changes to text: Page 7, line 243-252

Comment M1g:
1) Average hospital stay.
2) Bed occupancy rate.
3) Treatment costs.
4) Patient room turnover rate.
5) Growth enhanced by telehealth?
6) Patient satisfaction and quality?
7) Death rate.
8) Effects on ED visits and transitions between services.
9) Admission/discharge wait times.
10) Patient referrals.
Response: Sounds like several more studies possible with the right data (and would make a good PhD dissertation). We studied financial performance; also, the outcomes above are not available in the data used for the current study.

Comment M1e: Data analysis: good.
Response M1e: thanks.

Results.
Comment R1: Readable, good tables and figure. The heading of tables has to be on each page if it rolls over to another page.
Response: Thanks, added.

Comment R2: Others to add depending on answers to questions above?
Response R2: Sorry, no can do but we did suggest some of these outcomes as future research questions.
Changes to text: Page 7, line 243-252

Discussion.

1. Consider redoing into 4 paragraphs and make it more synthetic:
Comment D1a: Relevant findings: only 1 para;
Response: We followed the reviewer's suggestions and made the findings into one para
Changes to text: Page 6, lines 226-247

Comment D1b: Link with others' findings: largely missing.
Response: We are unaware of any studies of persistent differences in telehealth adoption. We have included a link to the larger literature on rural hospital adoption of telehealth services.
Changes to text: Page 7, para 2

Comment D1c: Implications: not very well spelled out; use some of last 2 para but list the issues and how to research them and what should be done.
Response: We have updated the implications and included recommendations for further research based on the comments above.
Changes to text: Page 7, lines 263-272

Comment D1d: Limitations: update list with ones above; this goes last in the section in almost all journals.
Response: Limitations were updated and moved to second to last paragraph prior to (modest) conclusions.
Changes to text: See page 7, lines 252+

Conclusion.
1. Modest is good.

Tables/Figures
1. Okay.

References
1. Okay.

Good, thoughtful piece. Some suggestions and limitations. Needs to be better written particularly Intro and Disc.

Reviewer B
Abstract
Comment B1: Overall the abstract is clearly written and is easy to follow. My one comment is on the conclusion. Reading the results, financial performance was significantly different between groups, so the conclusions in the abstract are appropriate, financial performance is associated with telehealth adoption. This is an important result which should be more clearly stated in the results.

Response B1: Done. We added more information from the first figure showing negative margins in all study years for non-adopters with a maximum average loss of 12 percent.
Changes to text: Page 3, line 75-76

Comment B2: Additionally, was capital investment decisions the dependent variable in the logistic regression or was it telehealth adoption? If so would recommend to revise the opening concluding statement and the following statement to better reflect the dependent variable and the effect of independent variables.
Response B2: We removed discussion of financial capital to reflect the study outcomes.
Changes to text: Page 3, lines81-82.

Introduction
Page 4 Lines 120-125

Methods
Comment B3: Page 4 Lines 140-146: how was "consistently identified as telehealth adopter" determined? Was there a minimum number of years of telehealth provision required to meet this classification? Please describe. Same w/ non-adopters.
Response B3: A previous reviewer raised the same concern. This change was made to ensure readers understand that all of the hospitals were persistent adopters or non-adopters where they always reported telehealth technology over the study period or never reported telehealth technology over the study period.
Changes to text: Page 3, lines 110-111.

Results
Comment B4: Results are clearly described and reflect the methods well.
Response B4: Many thanks!

Discussion and Conclusions
Discussion is pointed, thoughtful, articulate, and transparent. Good use of existing literature. Conclusions are appropriate.

Minor Comments:

Abstract
No comments

Introduction
Comment B5: Page 3 and 4 Lines 110-114: The objective statement here is slightly different than in the abstract and in the reverse order to how results are presented.

Would improve flow and clarity if revised.
Response B5: We made this helpful change.
Changes to text: Page 3, lines 110-111.

Methods
No comments

Results
No comments

Discussion and Conclusion
No comments

Overall a very well written and methodologically sound manuscript.

Reviewer C
The authors present a novel article that accesses telehealth technology adoption status in rural hospitals. They compare hospital and community characteristics, financial outcomes, and patient demographics in adopter and non-adopter sites using longitudinal data.

Major Concerns:
Comment C1: Telehealth technologies are not fully described in the methods – the authors state on line 140: "Telehealth adoption status was determined using the AHA IT Supplement" The authors do not define which technology categories were included in determination, Questions to consider: Did categorization require a formal telehealth program, or could one provider on campus use telehealth technology and that would qualify them as an adopter? Also, is telehealth adoption limited to video conferencing between patient and provider, provider to provider, etc. Does it also include phone calls to remote patients? Does it require remote patient monitoring?
Response C1: We have added the language from the AHA survey to clarify. It does not appear to include phone calls nor does it require remote patient monitoring.
Changes to Text: Page 3, lines 98-99.

Comment C2: The authors write: Line 191 "Telehealth adopters were physically located in counties with higher population density…" Telehealth has the potential to improve healthcare in areas of very low population density, so it is ironic it is more accessible to areas with a higher population density. Questions to consider: Do these hospitals service areas beyond their immediate location? How was hospital service area defined? The authors discussion may include that this may increase healthcare inequities if it is only available to more densely populated areas.

Response C2: This is an important observation and raised above. We have added more to the discussion around this issue and pointed out that non-adopters may be in poorer areas that causes financial hardship. The density figures are based on county where the hospital resides.
Changes to text: Page 7, line 267-268.

Comment C3: Figure 1 and 2 may be misleading based on other results. Authors write: Line 186 "Compared to Telehealth Non-adopters, Telehealth adopters were largely not-for-profit, larger facilities…" It may be that not-for-profit, larger facilities, and other sites report higher profit margins compared to alternative sites. A larger proportion of hospital types could inflate the average total margin endpoints. The author should tease apart separate hospital types and include a line for each hospital type, not-for-profit, for-profit, and government. Alternatively, they could create separate graphs for each.
Response C3: The reviewer makes an excellent point. To address this comment, we added additional graphs to show the differences in operating and total margins by hospital ownership type. We found the expected results that for-profit ownership had higher profit margins, but these differed considerably depending on whether they were persistent adopters or non-adopters. We believe the graphs add value to the manuscript.
Changes to text: lines 180+

Comment C4: The author does not touch on how large telehealth grants, such as one funded by the Federal Communications Commission, during the COVID-19 pandemic could impact telehealth technology uptake. This is especially important in governmental institutions, where a large portion did not adopt telehealth before 2019. We suggest they include this in the discussion.
Response C4: This is an important point. We did not bring up the federal investment, but have now included it. We are working on an additional manuscript that exams the change in status for non-adopters going into 2020 with new data. If this study is accepted, we will be citing our current work in building the next set of analyses. I think it will be fascinating to know what percentage of persistent non-adopters moved into adoption status for both rural and urban hospitals and the characteristics of those still not adopting. Poorest of the poor?
Changes to text: Page 7, lines 257-262;
Minor Concerns:

Comment C5: Line 121, "This study also provides…" sentence needs restructuring
Response: Done.
Changes to text: Page 4, line 120-121.

Comment C6: It may be impactful to compare hospital margins before and after telehealth adoption if that data is available.
Response C6: We are working on this analysis in another paper using a causal

approach. To date, the findings suggest no impact on margins. We added text about causal approaches.

Reviewer D

Comment D1: The topic is highly relevant, the methodology seems to be appropriate and the results promise to be of great value. In principle, this is an excellent paper calling to publication. However, I find this paper extremely short. Not only in pages, but in details and explanation. It might be appropriate if you present these findings to hospital specialists from the USA only. But the readers of IJERPH are from a broad academic background, from many countries and social systems. Many aspects which you just mention and which are - most likely – totally clear to you, are unknown to readers from other professions of public health, from other countries or social protection systems.
Consequently, I recommend re-writing this paper and giving it much more background information.
Response D1: We appreciate the comments by the reviewer and have attempted to add necessary background using appropriate definitions.
This includes:

Comment D2: The terms "rural" and "rural hospital" are used frequently without any definition. What is rural in USA? Is it the same as elsewhere on this world? And what consequences does it have in your system (e.g. financing)?
Response D1: We added definitions in the text about the definition of rural, which can include hospitals in small communities or some larger communities that serve rural areas.
Changes to text: Page 2, lines 59-65; Page 3 lines 94-96

Comment D3: The tables have some more details about te information of the dataset, but it is necessary to explain the relevant variables already in the methods.
Response D3: We added this information in the methods.
Changes to text: page 4, lines 149-154.

Comment D4: I do not think that many outside of USA will know what "AHA IT Supplement" is.
Response D4: This term was spelled out.
Changes to text: Page 4, line 130

Comment D5: The term "for-profit", "government" and "non-profit" is used, but it is not clear what it means in your country. Is it local or central government? Is it faith-based, Red Cross or local civil organisations?
Response D5: We included more details to assist readers from outside of the USA. Most faith-based hospitals are non-profit. All non-profit and for-profit hospitals are privately owned. Government hospitals can be local or federal.

Changes to text: page 4, lines 149-154.

Comment D6: The statistical methodologies (logistic regression, pooled ordinary least squares) are just mentioned. No explanation at all. We have to know what it is, how it works and why you selected this methodology here.
Response D6: Explanations have been added.
Changes to text: Page 5, lines 160-166.

Comment D7: You mention medicare several times. You should explain the system behind it and why it has such an impact on health care financing.
Response D7: We added more description of Medicare.
Changes to text: page 4, line 149-150.

Comment D8: Throughout the paper it does not become clear what is cause and what is result. Are "poor" hospitals unable to buy telemedical technology (cause: poor economic performance; result: no technology), or does lacking telemedical technology induce poor margins (cause: low wiliness to invest in technology; result: poor economic performance)? Or is it a vicious circle between the two of self-accelerating forces?
Response D8: The reviewer raises an excellent point raised by the other reviewers. We have tried to emphasize that our findings are not causal and selection bias is likely at play here. Still, as mentioned by the reviewer above, the poorest hospitals lack telehealth capabilities in the area where they may be most beneficial. This finding and the large gap in profits are the main rationale for publishing the paper.
Changes in text: Addressed above.

Minor issues:
Comment D9: I am not a native speaker. But I had to read the title several times to understand what you want to say. "Hospital persistently lacking and having telehealth technology": Shouldn't it be "Hospital persistently lacking or having telehealth technology"?
Response D9: Great catch! Change made.
Changes in text: changed title to "or"

Comment D10: In line 253-254 you write that telehealth adoption became the primary means of providing healthcare for many rural hospitals. Does that mean that more patients are seen on video than in person?
Response D10: It is hoped that this was understood as "at the beginning of the pandemic." And yes, at the beginning, hospitals probably had more telehealth visits than in-person visits.

Comment D11: They should re-write the paper. I assume it it great - but it is too short to assess fully.
Response D11: We have tried to add more details with our rewrite.

Reviewer E

Comment E1: (line128) The study area is understood to be in America, but it is not clear where the study area is located.

Response E1: All US hospitals residing in rural areas or having a rural payment code formed the sampling frame. From there, all hospitals persistently reporting telehealth over the study period or not having it persistently were the focus of the analysis.

Comment E2: in the sentence (line152) Financial performance was measured using both (1) operating margin and (2) total margin. I suggest "Financial performance was measured using both operating margin (1) and total margin(2)."

Response E2: We edited this line.

Changes to text: Page 4, line 152.

Interesting article, well written. Well explained sections. no errors or inconsistencies are observed, I recommend its publication.

Response E3: Many thanks.