PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	How has technology been used to deliver cardiac rehabilitation during the COVID-19 pandemic? An international cross-sectional survey of healthcare professionals conducted by the BACPR.
AUTHORS	O'Doherty, Alasdair; Humphreys, Helen; Dawkes, Susan; Cowie, Aynsley; Hinton, Sally; Brubaker, Peter; Butler, Tom; Nichols, Simon

VERSION 1 – REVIEW

REVIEWER	Roland Matsouaka Duke University
REVIEW RETURNED	21-Dec-2020

GENERAL COMMENTS	Review of the paper A BACPR survey evaluating the use of technology in cardiac rehabilitation during the COVID-19 pandemic: insights for future practice Authors: O'Doherty A. F. et al. In this manuscript, O'Doherty and colleagues have sought to investigate the use of cardiac rehabilitation services before and after the onset of COVID-19 epidemic and provide some recommendations for future use. For this purpose, they collected data from healthcare professionals working in centers where such a service is offered across the UK and 12 other countries and territories. Overall, they have noted that the pandemic has ushered a rapid adoption of technology into standard practice, but also changed the dynamic in these centers and led some centers to close. This poses new challenges in terms of the ethnic composition of patients using these services as well as the downstream effects of worsen clinical symptoms and increased hospital admissions among patients who can no longer use these services. The authors have also assessed the barriers to technology use, the practitioners' experiences and challenges and what this implies for future delivery of these services. The end of the paper (page 12 and onward) is easier to read than the first portion (from page 1 to 12). I have pointed out, in the following major and minor points, what I think is missing to make the paper more complete and accessible. Major points: The lack of clear coherence in number provided in the Results section made it hard for me to read and process the information appropriately. For instance, I could not find the results reported on

	page 9 in a descriptive table. Similarly, I didn't find a table with results reported on page 12. Page 3, line 24: The sentence "Healthcare professionals working in UK, and international, exercise-based cardiac rehabilitation programmes" doesn't describe the participants appropriately. Do the authors mean that the participants are healthcare professionals working in the UK and abroad and who are participated in cardiac rehabilitation programs? Is the study restricted to healthcare professionals who are participating to home-based cardiac rehabilitation inside the UK or abroad? Do they mean something else? This is not clear to me. Reading the text, it seems like the participants are centers (or programs) that offer a cardiac rehabilitation services before the COVID-19 pandemic, whether they are located in the UK or somewhere else. Thus, the authors should keep in mind that for people living inside the UK, the other 12 countries are part of the "international", but for those like me who are outside the UK, UK is included in the "international" part of the world. Therefore, I suggest the following sentence: Participants: Healthcare professionals working in exercise-based cardiac rehabilitation programmes (in the United Kingdom and 12 other countries and territories) Minor points: Minor points: Page 8, line 46: It is "Gibraltar" not "Gibralter". Page 9, line 3: The authors wrote "… all activity (n=89, 72.4%)". Shouldn't it be "… all activities (n=89, 72.4%)"? Also, what's the denominator here? Is it the 333 centers? Another denominator? Same question for the 85.4% on line 15, since 129/187 is only equal to 77.24%. Similarly, the percentages of page 9, lines 53-60 and page 10, lines 1-11. It almost certain that the denominator is not 167. Finally, I had hard time and couldn't figure out where the numbers and percentage of the first paragraph of Page 10 came from. Are-they from Table 1, Table 2 or a different table? Page 9, line 36: Instead of "…reported used technology…" write "…reported using technology…" instead. Page 12, line 9-11: The sentence "Seventy-two (58.5%) programmes (n=71)…" is just wrong. Please, change this formulation.

REVIEWER	Xiaolin Xu Zhejiang University; University of Queensland
REVIEW RETURNED	14-Jan-2021

GENERAL COMMENTS	The authors conducted a questionnaire-based survey among BACPR members to explore how exercise-based cardiac rehabilitation services functioned during COVID-19 outbreak, and meanwhile investigated potential role and values of technology utilization. Referring to frequency calculation and qualitative text induction, the author concluded that technology, e.g. telephoned-assisted advice delivery and pre-recorded videos, was increasingly utilized when most exercise-based cardiac rehabilitation services were suspended by the pandemic.

	Here are some suggestions that may hopefully serve to improve this work. Major points 1. Motivation As we all know, multifaceted disruptions in personal and social life have been brought by Covid-19. It is a foreseeable fact that most rehabilitation services may be suspended or delivered online, just the same as the practice in other fields, such as education and commercial industry. Thus, maybe the motivation behind this study is not so strong or innovative. 2.Sample size Given that the e-survey was disseminated to international health professionals and only 330 responses were analyzed, the results are possibly not representative or reliable because of small sample size. 3.Target population While evaluating experiences of technology utilization, patients, the main service-receivers were excluded, which may lead to partial and incomplete perceptions of the actual practice in real life 4.Self-report data: As for the result part (line 173-186), the author described some basic characteristics of service provision during COVID-19, such as volume, age and other demographic information of patients. That information were self-report data, instead of first-hand investigation or fieldwork observations, relying much on recalls and generating information bias. Minor points 5. In line 177, I cannot find the number “167” in table 1. Is it possible “161” the authors were indicating?

VERSION 1 – AUTHOR RESPONSE

Reviewer 1
Comment - The lack of clear coherence in number provided in the Results section made it hard for me to read and process the information appropriately. For instance, I could not find the results reported on page 9 in a descriptive table. Similarly, I didn’t find a table with results reported on page 12.

Response – Thank you for this comment. We have amended the results section on page 10 to direct the reader, more frequently, to Table 1.

We have also changed the way we have reported the number of patients who chose to access CR. We had previously grouped a number of responses for simplicity of reporting, which is why you could not find these values in the table. We have now reported these results separately, as they are displayed in the table. We agree that this improves transparency of results reporting.

Regarding page 12 (page 10, 11, and 13) – We have reported descriptive results in the text. These are not always presented in Tables. It is not a requirement to present all data in tables or figures. We had identified data presented in Figures but we acknowledge that we didn’t signpost all sections to their Figures. All data presented in Tables/Figures are now clearly signposted.

Page 3, line 24: The sentence “Healthcare professionals working in UK, and international, exercise-based cardiac rehabilitation programmes” doesn’t describe the participants appropriately. Do the authors mean that the participants are healthcare professionals working in the UK and abroad and who are participated in cardiac rehabilitation programs? Is the study restricted to

healthcare professionals who are participating to home-based cardiac rehabilitation inside the UK or abroad? Do they mean something else? This is not clear to me.

Reading the text, it seems like the participants are centers (or programs) that offer a cardiac rehabilitation services before the COVID-19 pandemic, whether they are located in the UK or somewhere else. Thus, the authors should keep in mind that for people living inside the UK, the other 12 countries are part of the “international”, but for those like me who are outside the UK, UK is included in the “international” part of the world.

Response – Thank you for this comment. This survey was completed by healthcare professionals who worked in cardiac rehabilitation. They are not participants in the cardiac rehabilitation programme but they are participants of this study. As such, we believe it is appropriate to identify them as participants.

Regarding the international nature of respondents, we agree that this requires clarifying. We planned to obtain responses from as many countries as possible. As this section relates to our methods, we believe that saying ‘Healthcare professionals working in exercise-based cardiac rehabilitation programmes, worldwide’ accurately describe what we set out to do. We have not stated the number of countries that participants responded from because this is a result of the study, rather than a method. We have amended this according to your suggestion and hope you agree that this is now clearer to the reader (Page 2 line 39).

Page 8, line 46: It is “Gibraltar” not “Gibralter”.

Thank you for spotting this error. This has been corrected (page 9 line 213)

Page 9, line 3: The authors wrote “… all activity (n=89, 72.4%)”. Shouldn’t it be “… all activities (n=89, 72.4%)”?

Thank you for spotting this error. This has been corrected (page 10 line 220)

-Also, what’s the denominator here? Is it the 333 centers? Another denominator?
-Same question for the 85.4% on line 15, since 129/187 is only equal to 77.24%.
-Similarly, the percentages of page 9, lines 53-60 and page 10, lines 1-11. It almost certain that the denominator is not 167.

Response - Thank you for this comment. The number of responses to each question are shown in Tables 1 and 2. We agree that it is important to be transparent about the number of responses to each question, as such, we have now presented a table of responses (Appendix 4). Appendix 4 also explains where the response to each question can be found in the manuscript. We have altered our methods section to draw attention to this (page 9, line 199), and have amended page 10, line 222, to remind the reader of this. This is now clearer to the reader, thank you.

Finally, I had hard time and couldn’t figure out where the numbers and percentage of the first paragraph of Page 10 came from. Are-they from Table 1, Table 2 or a different table?

These data are reported in Figures 1 and 2. We had identified that data are presented in these figures, but we acknowledge that we didn’t signpost all results to their appropriate Figures. All data that are presented in figures are now signposted (page 11 line 243, and page 13, line 253). We also reported descriptive results that are not presented in tables/figures. It is not a requirement to present all data in tables or figures, such that repetition of results is avoided.

Page 9, line 36: Instead of "…reported used technology…" write "…reported using technology…"instead.

Thank you for spotting this error. This has been corrected. (Page 10 line 236)

Page 12, line 9-11: The sentence "Seventy-two (58.5%) programmes (n=71)…" is just wrong. Please, change this formulation.

Thank you for noticing this. The superfluous value has been removed. (Page 13, line 251)

Reviewer 2

Here are some suggestions that may hopefully serve to improve this work.

Major points
Comment - Motivation As we all know, multifaceted disruptions in personal and social life have been brought by Covid-19. It is a foreseeable fact that most rehabilitation services may be suspended or delivered online, just the same as the practice in other fields, such as education and commercial industry. Thus, maybe the motivation behind this study is not so strong or innovative.

Thank you for your comment. We respectfully disagree that the study lacks strength and innovation. We believe that this study is innovative, timely, and provides important insights and recommendations about how technology can be used to deliver cardiac rehabilitation, beyond COVID-19. Whilst we agree that the adoption of technology to deliver cardiac rehabilitation was foreseeable after COVID-19 became a pandemic, this could not have been predicted before COVID-19. The rapid adoption of of technology is highly important because uptake onto cardiac rehabilitation, before COVID-19, was low (as identified lines 124-126 of the introduction). Therefore, the increased use of technology to deliver home-based cardiac rehabilitation, reported in our manuscript, could increase participation in the longer-term. We have explained this in the introduction:

'These methods could also be adopted in to future standard practice to increase accessibility and subsequent uptake onto CR programmes.'

Furthermore, as you can see from our results, there has been no standardised approach to adopting and applying technology for home-based cardiac rehabilitation. As such, differences in implementation need to be quantified and evaluated (as we have done in this manuscript), to ensure that long-term changes to provision of cardiac rehabilitation are for the better. In the case of our results, these data identify potential health inequalities and could help to improve standardisation/prevent poor standards of care through identifying different practices with technology use.

Our study provides important preliminary data that highlights a number of considerations for future research and successful technology implementation. These include widespread use of low-tech platforms, potential exclusion of minority groups and patients at high cardiovascular risk, and patients without access to technology. These are important factors that healthcare professionals and researchers should take in to consideration when planning and developing new services.

2.Sample size Given that the e-survey was disseminated to international health professionals and only 330 responses were analyzed, the results are possibly not representative or reliable because of small sample size.

Thank you for your comment. We had stated in our conclusions that our findings may not be generalizable to countries outside the UK. However, we have expanded this limitation in the limitation section which now reads 'The high UK response rate to our survey (n=296; 89.7%) makes it likely that our findings are representative of CR in the UK. However, the response rate from CR programmes outside of the UK was low. The generalisability of our findings to the rest of the world may therefore be limited.' We agree that it is important to detail this limitation, thank you. (Page 20, line 231 to line 233)

3.Target population While evaluating experiences of technology utilization, patients, the main service-receivers were excluded, which may lead to partial and incomplete perceptions of the actual practice in real life

Thank you for this comment. The primary aim of this study was to assess the adoption of technology, by healthcare professionals, during the COVID-19 pandemic. We feel that healthcare professional's perceptions of technology adoption are important, but we agree that they do not necessarily provide a clear picture of patient perceptions. We have altered our limitations section to highlight this point:

"Additionally, we aimed to recruit healthcare professionals rather than patients. Future research should investigate patient perceptions of using technology in CR so that a more complete understanding of barriers can be reported." (Page 20, line 234 to line 236)

4.Self-report data: As for the result part (line 173-186), the author described some basic characteristics of service provision during COVID-19, such as volume, age and other demographic information of patients. That information were self-report data, instead of first-hand investigation or fieldwork observations, relying much on recalls and generating information bias.

Thank you for this comment .We agree with this limitation and have added it to our limitations section. "We also asked study participants to report on whether they perceived that certain demographics of the patients engaging with their services had changed, therefore we cannot exclude information bias." (Page 20, line 236 to line 238)

Minor points
5. In line 177, I cannot find the number "167" in table 1. Is it possible "161" the authors were indicating?

Thank you for this comment. 167 was stated because that was the maximum number of responses that were available, based on the number of centres that said their service had not been cancelled. We have now clarified this in the results section (Page 10, line 221) and have added and Appendix (Appendix 4) which lists the number of responses to each question.

VERSION 2 – REVIEW

REVIEWER	Matsouaka, Roland Duke Clinical Research Institute, Biostatistics and Bioinformatics
REVIEW RETURNED	25-Mar-2021

GENERAL COMMENTS	The authors have been through in their response to the reviewers' questions and comments. They have clarified issues that were

	raised, provided additional information, and improved the manuscript in the process. I don't have further comments or suggestions to make.