Author's response to reviews

Title: Early telemedicine training and counselling after hospitalization in patients with severe chronic obstructive pulmonary disease: A feasibility study.

Authors:

Lisbeth K Rosenbek Minet (lisbeth.minet@rsyd.dk)
Line W Hansen (line.willads.hansen2@rsyd.dk)
Claus D Pedersen (Claus.Duedal.Pedersen@rsyd.dk)
Ingrid Titlestad (ingrid.titlestad@rsyd.dk)
Jette K Christensen (Jette.Kroejgaard@rsyd.dk)
Kristian Kidholm (Kristian.Kidholm@rsyd.dk)
Kathrine Rayce (Kathrine.Rayce@rsyd.dk)
Lilian Møllegård (Lilian.Moellegaard@rsyd.dk)

Version: 4 Date: 27 August 2014

Author's response to reviews: see over
Dear Editor,

Thank you for being willing to consider a revised version of our article “Early telemedicine training and counselling after hospitalization in patients with severe chronic obstructive pulmonary disease: A feasibility study” for acceptance to your journal.

We have attempted to address all of the conflict comments. We are hopeful that we have made corrections and clarifications to the extent that the manuscript can be accepted. Because of the suggestions made, we believe that our manuscript has been strengthened.

You will find answers to the referees’ comments below. The answers are typed in bold font. The revised manuscript, table and title page has been resubmitted. All changes are highlighted in red in the revised version. If you have any question please do not hesitate to contact the corresponding author.

Sincerely,

Lisbeth Minet

Corresponding author
A Summary of Changes to the Manuscript

Reviewer’s report (Reviewer no 1)

Title: Early telemedicine training and counselling after hospitalization in patients with severe chronic obstructive pulmonary disease: A feasibility study.

Version: 3 Date: 16 June 2014

Reviewer: Tanja Effing

Reviewer’s report:
This paper described a feasibility study of an early telemedicine training and counselling intervention in patients with severe COPD who have been hospitalised. The authors conclude that the study showed that home-based supervised training and counselling via video conference is feasible and that telemedicine can help to ensure more equitable access to rehabilitation in patients with severe COPD after hospitalisation with an exacerbation of COPD. Whereas the authors report some interesting findings with regard to patient and health care provider perspectives, safety and costs, I feel that the information regarding the patient assessment is given far too much value throughout the paper. As this study is clearly not designed to evaluate the effects of the intervention (no control group included) far less attention should be given to effects on patient outcomes (HRQoL etc) otherwise results could be easily misinterpreted by readers.

The program has a duration of only three weeks, this is extremely short for a PR program. The authors don’t discuss this at all. It is not clear whether they are planning to extend the program to 8 weeks (as their usual PR program) in future studies. If this is the case, it will seriously influence the costs of the program and will probably change the conclusion with regard to the economic analysis. If they are not planning to extend it, it is seriously questionable what effects on clinical outcomes they can expect from such a short PR program.

Other major comments:
It should be made clearer that this study was not designed to evaluate the effects of the intervention itself (and that this was just a secondary analysis). Having no
control group and including patients in which you could expect positive changes (because they are recovering from an exacerbation), results in clinical outcomes (HRQoL etc) are impossible to interpret (and this should therefore be avoided as much as possible). The text needs to be changed (and re-ordered) throughout the whole manuscript to make clearer that this study was not designed to evaluate effects of the intervention itself. The discussion needs to be rewritten.

ANSWER: The manuscript has been rewritten.

Page 6, second paragraph (Introduction): I found it a bit confusing that this paragraph is mainly directed towards the need to evaluate effects of programs given the fact that the current study is not aimed to evaluate effects. I would prefer to see more information about what is already known (and not known) regarding the feasibility to add telemedicine to interventions that have been proven effective previously.

ANSWER: Thank you for the comment. We agree and have changed this paragraph to be more directed towards the feasibility to add telemedicine to rehabilitation: Previous research has demonstrated that various forms of telemedicine are feasible, but there is a lack of information about what effects they have on health outcomes and costs (7), and the knowledge about the use of telemedicine strategies in pulmonary rehabilitation is limited (8). Nevertheless, there is a growing interest in using health technologies to provide safe and effective telemedicine solutions involving supervised training for people with COPD. A center-based telemedicine rehabilitation programme involving supervised training was found to be an effective tool for increasing COPD pulmonary rehabilitation (9). However, this telemedicine strategy did not overcome transportation difficulties. Another study examining the feasibility of a long-term telerehabilitation service involving training at home for COPD patients suggests that it may reduce healthcare utilization (10). A recently study found that home-based supervised training using existing widely available technology is safe and feasible for people with COPD (11). This study found that effective delivery of telerehabilitation requires an adequate data network. Further research is needed to show whether supervised training via tele-medicine is feasible and effective in patients with severe COPD after hospitalization with exacerbation.

Page 7, first paragraph, last line: ‘Thus, this....MAST (13)’. This sentence needs more explanation. What exactly is the MAST model? What are the domains. And what domains are included in this study.

ANSWER: We have now added the following: MAST is a model or framework for assessment of telemedicine applications that is based on a service provider’s need for information for decision making on whether to implement telemedicine. MAST includes 7 assessment domains (health problem and characteristics of the application, safety, clinical effectiveness, patient perspectives, economic aspects, organisational aspects, and socio-cultural, ethical and legal aspects).
Page 8, first paragraph. This paragraph is confusing. If you read this paragraph it seems that an 8-week PR program + the telemedicine sessions (one week?) is offered to all patients that have been hospitalised with an exacerbation. I don’t believe this information is correct, do the authors mean that this is their ‘usual care’ approach?

**ANSWER:** Yes. It is our usual care approach. This is corrected:

Usual care for patients with severe COPD is twice weekly participation for 8 weeks in an out-patient hospital based rehabilitation programmes that include supervised exercise training and patient education. For patients hospitalized with acute exacerbation of COPD the usual care approach also includes telemedicine education sessions with a nurse daily in the first week after discharge focusing on lung health, drugs, nutrition, coping and stress management (13).

Please clarify.

‘the intervention’ (page 9-10): I think it would be more logical to explain first more about the whole intervention and then insert the information regarding the specific telemedicine equipment (so insert the first paragraph later in the ‘intervention part’).

**ANSWER:** We agree. We have made a separate paragraph to describe the equipment used in the intervention:

**The equipment**

The telemedicine videoconferencing equipment was designed to look like a briefcase and was known as the "Patient Briefcase". The briefcase contained a screen, micro-phone, an on/off switch and a volume control (Figure 1). A camera was installed in the patient’s home together with the briefcase. The camera made it possible to follow the patients’ movements around the room during the training session. A pulse oximeter was used to monitor saturation and heart rate. The therapist’s equipment consisted of a computer with an in-built webcam and microphone, a second display for reading patient measurements and a computer for the electronic patient record. Communication took place via the internet (ADSL), wireless or satellite communication, and measurements were transferred from the patient’s home to the hospital in a closed secure system. Thus only invited users could participate in, view or hear the videoconferences. The patient’s equipment was installed by a technician who also provided instruction in how to switch the system on and off and how to position the fingerclip pulse oximeter. Figure 2 shows the supervised training via the Patient Briefcase.

• Page 9: ‘there was a camera installed’: I think it would be good to explain the purpose of this.

**ANSWER:** Ok. This is added in the paragraph:

The camera made it possible to follow the patients’ movements around the room during the training session.

• Page 10, second paragraph, last line: ‘communication through internet’ instead
of ‘internet connection’

ANSWER: OK. This is changed:
In addition, patients were asked to train on their own on days when there was no telemedicine session with a physiotherapist.

• Page 10, third paragraph: ‘The intervention concluded(?).....as required’. Not exactly clear what authors mean, please rephrase

ANSWER: Is rephrased:
If required, a second session of 30 minutes was given in the third week.

Page 11-13: Measurements:

• Please replace information regarding clinical outcomes to the end of measurements

ANSWER: As we now describe in the background section this study follow the MAST framework, in which safety and clinical outcomes are the first domains. Therefore safety and clinical outcomes are presented in the beginning of the section on measurement in the same way as the safety and clinical results are presented in the beginning of in the result section.

• Where were the different measurements performed?

ANSWER: All measurements were performed in the patient’s own home. This is now added:
The functional tests were carried out by specially trained therapists and were performed in the patient’s home just before and just after the telemedicine training and counselling.

• No inclusion of walking test?

ANSWER: We did not include the 6-minute walk distance or the shuttle walk test as these tests could not be applied in patients’ home because of lack of space. A discussion about functional measurements is added in the discussion section: The functional test assessing physical performance was performed in patients’ own homes. It was not possible to perform the shuttle walk test or the 6 minute walk test in the patients’ homes because of lack of space. These two tests are commonly used to measure physical performance in the evaluation of physical training in patients with COPD (3). A sit-to-stand test (FTSST) was used to measure functional lower limb muscle strength in this study. The FTSST has previously been found to be reliable, valid and responsive in patients with COPD and suitable for use in most healthcare settings (33). The sit-to-stand test is associated with mortality (34) and strength of the quadriceps muscle (35) in patients with COPD. Physical performance tests are important for characterizing COPD patients and predicting their prognosis (34), in our study we found FTSST easy to administer, feasible and easy to apply in the patients’ homes. The timed Up & Go test (TUG) was found to be feasible and
easy to apply in the patients’ homes in this study. This test has been found useful to explore functional balance impairment among older adults with COPD (36), and our study suggest that TUG could be used to complement other physical performance tests when evaluating physical training of people with severe COPD.

Page 15-18, Results:

* Please replace the information regarding the clinical outcomes to the end

**ANSWER:** As we now describe in the background section this study follow the MAST framework, in which safety and clinical outcomes are the first domains. Therefore safety and clinical outcomes are presented in the beginning of the results section in the same way as the safety and clinical outcome measures are presented in the beginning of in the measurement section.

* Page 15, first paragraph: Please report whether the patients who did withdraw had different (baseline) characteristics than the remaining patients

**ANSWER:** We have added a report on the differences between dropouts and the remaining patients:
The group that dropped out during the intervention differed from the group that completed it. A larger proportion in the dropout group was men, a higher proportion received home help and they had poorer Borg scores at rest (4.5 vs. 2.6), FTSST (21.19 vs. 18.96 sec.) and poorer CCQ scores (4.09 vs. 3.58). There were no significant differences in the other clinical parameters.

* Table 4: would prefer to see the average minuted (+SD) or when not normally distributed the median and IQR.

**ANSWER:** The data in Table 4 is based on an assessment made by the project manager after the pilot study. Thus, we do not have information on SD etc. We have tried to make this more clear by describing in the method section that: “The use of staff was assessed during an interview with the project manager, who carried out the telemedicine project.”

Similar in the discussion we now underline the uncertainty in the estimated costs by adding: “It should be noticed, that data on use of staff is uncertain because it was based on an assessment made by the project manager after the pilot study and that the results need to be confirmed on a larger prospective study. “

* On page 13 it is stated that a focus group interview was done with the occupational and physiotherapists that were involved in carrying out the intervention. However on page 18 it is said that interviews were carried out with one physio, one occupational therapist, and one representative from the Rehab department. This information is not consistent.... Why weren’t all therapists involved in the focus group? In addition, I would prefer to see some baseline characteristics of all health care providers involved in the intervention and the ones participating in the focus groups (e.g. age, number of years of experience in
PR) and some more in-depth information of the interviews (in a Table?).

ANSWER: Agree. The descriptions of the respondents are now similar in the two sections. In addition it is described in the discussion that the total number of involved therapists in the project was four, but one of the therapists was not working any longer at the hospital at the time of the interview.

Page 19, discussion:
• In the first paragraph the authors state that the intervention is likely to have an impact on clinical outcomes. I don’t think that they conclude that from there data and I strongly recommend to delete the text related to this from the discussion. I think the last part of the first paragraph, in which they reason that they are not able to draw conclusions from this study with regard to clinical outcomes, should be included in the end of the discussion. The major part of the discussion should be focused on the discussion of feasibility data instead.

ANSWER: The discussion has been rewritten:
This study has shown how telemedicine can support rehabilitation of patients with severe COPD, who are not able (or willing) to participate in established rehabilitation programmes provided by hospitals and municipal training centres. Results from the study show that telemedicine training and counselling aimed at improving functioning can be carried out under safe conditions and are likely to have an impact on clinical outcomes in patients with severe COPD just after hospitalization with an exacerbation of COPD.

The experiences from this study suggests that the Patients Briefcase, monitoring provided using pulse oximetry and a physiotherapist, were sufficient to allow safe and effective supervised exercise training for patients with severe COPD at home. In this study the programme completion rate was higher than in the Holland et al study (11), but in the Holland et al study the programme lasted for 8 weeks compared to our 3 week pro-grame. For the participants who completed the programme, we found substantial improvements in FTSST. We know from other studies that resistance training can improve muscle strength in patients with exacerbation of COPD (26, 27, 28) even after short training sessions over 7 days, with a load of 70% of 1RM (28).

This study was not conducted with a randomized controlled design; we therefore cannot say whether the achieved post intervention effect can be attributed to the intervention or whether other factors have played a role, such as improvement in the inflammatory condition. With a dropout rate of 25% and no intention to treat, analysis bias associated with the results cannot be ruled out. In the rehabilitation of patients with COPD, the supervised exercise training is recommended to last at least six to eight weeks with twice-weekly sessions (2). Therefore, this individual 3-week supervised exercise program for patients with severe COPD will in most cases not be sufficient. Currently, patients are referred to individualized rehabilitation in the municipality after the telemedicine training. Our study suggests that telemedicine can be a useful element in the rehabilitation of patients with COPD.
who declines out-patient rehabilitation. There is a need for further investigation into how a supervised home-based training program for patients with severe COPD should be planned and for exploration of how telemedicine rehabilitation may be effective for health improvements in patients with severe COPD with an exacerbation of their condition. A previous study that tested the effect of telecounselling by a nurse using the patient briefcase found the equipment easy to use, technically stable with high up-time, high confidence in the equipment from nursing staff and high patient satisfaction (29). Using satellite involved a delay, which was slightly disturbing, but could be dealt with through training (29).

In this study, health status was assessed by the CCQ. The CCQ has shown good reliability, validity, and responsiveness at the group and individual levels in patients with COPD (30). CCQ was also found to be a predictor of mortality in patients with COPD, and as mortality and health status are important clinical endpoints, it has been suggested that CCQ could be used to target interventions (31). CCQ was found to correlate with St. George’s Respiratory Questionnaire (SGRQ) and The COPD Assessment Test (CAT) in patients with severe COPD undergoing pulmonary rehabilitation (32). SGRQ, that includes 50 questions, is commonly used in the assessment of health status in pulmonary rehabilitation trials (2, 30), but we did not find SGRQ feasible for use in our study because the participants had to complete the questionnaire at home without assistance. Ringbaek et al found that the need for assistance while answering the questionnaire was 86.5% for SGRQ, 53.9% for CAT, and 36.0% for CCQ (32). All the CCQ questionnaires received from the participants in our study were completed. The functional test assessing physical performance was performed in patients’ own homes. It was not possible to perform the shuttle walk test or the 6 minute walk test in the patients’ homes because of lack of space. These two tests are commonly used to measure physical performance in the evaluation of physical training in patients with COPD (3). A sit-to-stand test (FTSST) was used to measure functional lower limb muscle strength in this study. The FTSST has previously been found to be reliable, valid and responsive in patients with COPD and suitable for use in most healthcare settings (33). The sit-to-stand test is associated with mortality (34) and strength of the quadriceps muscle (35) in patients with COPD. Physical performance tests are important for characterizing COPD patients and predicting their prognosis (34), in our study we found FTSST easy to administer, feasible and easy to apply in the patients’ homes. The timed Up & Go test (TUG) was found to be feasible and easy to apply in the patients’ homes in this study. This test has been found useful to explore functional balance impairment among older adults with COPD (36), and our study suggest that TUG could be used to complement other physical performance tests when evaluating physical training of people with severe COPD.

This study showed that it is important for patients with severe COPD to have access to supervised training and counselling. The study participants believed this to be essential for getting started with being physically active as well as for improving their physical and mental wellbeing. The participants’ connection via the Patient Briefcase provided them with a feeling of proximity and security when in contact with their therapists. A smaller study, which tested an internet-based rehabilitation programme including super-vised training for COPD patients, showed that the
intervention was well received by the participants (37). Another study of home-based exercise rehabilitation with telemedicine following cardiac surgery scored very highly for health professional support, yield/effect, and ease of use (38). These findings are supported by a systematic review, which shows that patients with severe COPD experience trust and peace of mind when receiving healthcare via telemedicine solutions (39). The review does not specifically focus on telemedicine training but includes all types of telemedicine treatment.

The economic analysis indicated that under the current contract financing system and DRG-rates, the reimbursement to the hospital is slightly higher than the hospital costs. Thus the business case for the hospital was positive, also compared to usual care because these patients have declined rehabilitation at the hospital. Two main factors may influence this result. Firstly, the registration of the treatments in the administrative system must be correct. Secondly, the compliance of the patients and their participation for the whole three weeks are important. If the patients only have five consultations, the costs remain about the same, but the reimbursement will be only half as much. It should be noted, that data on use of staff is uncertain because it was based on an assessment made by the project manager after the pilot study and that the results need to be confirmed in a larger prospective study. In addition the economic analysis performed has a very narrow perspective on the costs and reimbursement for the hospital and did not include the wider societal costs or the cost-effectiveness of the intervention.

The focus group interviews showed that the clinicians found the safety of the service acceptable, that the service improved the continuity of the rehabilitation programme for the patients and that the service improved the possibility of including the patient’s everyday life by giving the staff the opportunity to see the patient in his or her own home. The total number of therapists involved in the project was four, but only three participated in the focus group interview because one therapist was no longer working at the hospital at the time. In addition the interview was done six months after the study period and this may have affected the answers from the clinicians.

• Authors should discuss the 3-week versus 8-week program.

**ANSWER:** We agree and have added a discussion of this in the discussion section: In the rehabilitation of patients with COPD, the supervised exercise training is recommended to last at least six to eight weeks with twice-weekly sessions (2). Therefore, this individual 3-week supervised exercise program for patients with severe COPD will in most cases not be sufficient. Currently, patients are referred to individualized rehabilitation in the municipality after the telemedicine training. Our study suggests that telemedicine can be a useful element in the rehabilitation of patients with COPD who declines out-patient rehabilitation. There is a need for further investigation into how a supervised home-based training program for patients with severe COPD should be planned and for exploration of how telemedicine rehabilitation may be effective for health improvements in patients with severe COPD with an exacerbation of their condition.
• Recommendations regarding future studies should be included.

ANSWER: With all due respect we have already stated “We would recommend a study with a randomized design that examines the effects of telemedicine rehabilitation including supervised training of patients with severe COPD. When researching the development of telemedicine solutions, it is important to consider the technical solution and the service simultaneously, what contribution telemedicine makes and to explore how each service is used by the relevant users and how it fits into the individual's daily practice. Therefore, it is essential that future research includes clinical, patient-centred, economic and organizational perspectives (40, 41).”.

Minor comments:

• Page 6, second paragraph, line 12: could you please give some examples of monitor devices

ANSWER: The sentence containing the words "monitor devices" are removed from the manuscript.

• Page 7, first paragraph, ‘hospital after being discharged’ instead of ‘hospital after discharged

ANSWER: Ok. The change is made.

• Page 14, ‘Research ethics: informed consent patients?

ANSWER: Yes. The change is made.

• Page 15, first paragraph: ‘and 2 did not show up’: this is a bit strange with a home-based program, did they refuse to participate?

ANSWER: Yes. The change is made.

• Page 15: ‘All patients had a first....50 minutes’: suggestion to change this to: All patients had at least one telehealth session with the occupational therapist (average duration 50 minutes), XX patients (=20%) needed an additional second session with the occupation therapist.

ANSWER: OK, the change is made.

• Table 1: In prednisolone treatment: current prednisolone treatment?

ANSWER: Yes. The change is made.

• Explanations of abbreviations should be included in footnotes of Tables
ANSWER: Ok. This is done.

• Please be consistent in wording: telehealth devices, telemonitoring devices, telehealth etc.

ANSWER: Ok. This is done.
Reviewer's report (Reviewer no 2)

Title: Early telemedicine training and counselling after hospitalization in patients with severe chronic obstructive pulmonary disease: A feasibility study.

Version: 3 Date: 19 June 2014

Reviewer: Didier Saey

Reviewer's report:
The aims of the study was to evaluate a home based training and counselling programme via video conference to patients with severe COPD early after hospitalization with regard to safety, clinical outcomes, patients’ perception, organisational aspects and economic aspects.

The main results are
• a statistically but not clinically improvement in the Health status, assessed by the Clinical COPD Questionnaire
• a slight improvement in physical performance assessed by TUG and a significant but not clinical improvement when assessed by FTSST
• Comparison of the costs and the reimbursement show the reimbursement was slightly higher than the costs of intervention
• Patient and staff perceptions are favorable and not fall or emergency contact with a general practitioner during the study was occurred during the study
• Clinicians find the safety of the service acceptable, that the service has improved the continuity of the rehabilitation programme and the possibility of including the patient’s everyday life

The authors conclude that telemedicine training and counselling aimed to improve functioning can be carried out under safe conditions and is likely to have an impact on clinical outcomes in patients with severe COPD early after hospitalization with an exacerbation of COPD.

The authors have conducted a relevant study in a clinical setting and provided encouraging data. However, I have some major concerns with the paper in the current form and particularly with the setting and the outcome measures that need to be better defined and justified. Thus, data analysis and interpretation need to be improved.

ANSWER: We agree and have addressed all the concerns below.

Major Compulsory Revisions:

A major comment concerns the choice and justification of the outcome measures and context of the study.
ANSWER: As described below more information on the choice of outcome measures have been added. The section on the setting and the context of the study is also expanded with more information about the usual care of the patients.

- I understand the study was proposed to patients early after exacerbation but it is unclear for me if only patients who declined participation in the hospital-based rehabilitation and participation in videoconference with a nurse have been invited to participate to the study. When were exactly included the patients? It is not clear if patients had the choice between the standard care and protocol. If only patients who not accepted usual care were recruited in the study, this could considerably affect the results.

ANSWER: We have stated in the inclusion criteria that patients were included if they have “declined participation in the hospital-based rehabilitation and participation in videoconference sessions with a nurse for one week immediately after discharge” as we are only interested find out if these patients can participate in another relevant training. Patient hospitalized with exacerbation are offered videoconferencing with a nurse after discharge. We have added: Patients were included in the study right after the videoconference with the nurse the first week after discharge from hospital.

- Some of the outcome measures chosen are non-usual in pulmonary rehabilitation and need to be justified (and described).

ANSWER: A discussion about outcome measures is added in the discussion section:
In this study, health status was assessed by the CCQ. The CCQ has shown good reliability, validity, and responsiveness at the group and individual levels in patients with COPD (30). CCQ was also found to be a predictor of mortality in patients with COPD, and as mortality and health status are important clinical endpoints, it has been suggested that CCQ could be used to target interventions (31). CCQ was found to correlate with St. George’s Respiratory Questionnaire (SGRQ) and The COPD Assessment Test (CAT) in patients with severe COPD undergoing pulmonary rehabilitation (32). SGRQ, that includes 50 questions, is commonly used in the assessment of health status in pulmonary rehabilitation trials (2, 30), but we did not find SGRQ feasible for use in our study because the participants had to complete the questionnaire at home without assistance. Ringbaek et al found that the need for assistance while answering the questionnaire was 86.5% for SGRQ, 53.9% for CAT, and 36.0% for CCQ (32). All the CCQ questionnaires received from the participants in our study were completed. The functional test assessing physical performance was performed in patients’ own homes. It was not possible to perform the shuttle walk test or the 6 minute walk test in the patients’ homes because of lack of space. These two tests are commonly used to measure physical performance in the evaluation of physical training in patients with COPD (3). A sit-to-stand test (FTSST) was used to measure functional lower limb muscle strength in this study. The FTSST has previously been found to be reliable, valid and responsive in patients with COPD and suitable for use in most healthcare settings (33). The sit-to-stand test is associated with mortality (34) and strength of the quadriceps muscle.
(35) in patients with COPD. Physical performance tests are important for characterizing COPD patients and predicting their prognosis (34), in our study we found FTSST easy to administer, feasible and easy to apply in the patients’ homes. The timed Up & Go test (TUG) was found to be feasible and easy to apply in the patients’ homes in this study. This test has been found useful to explore functional balance impairment among older adults with COPD (36), and our study suggest that TUG could be used to complement other physical performance tests when evaluating physical training of people with severe COPD.

# By example: Physical performance was quantified by TUG and FTSST. The authors need to explain why they are not used some of the recognized tests in PR such as the Incremental cycling test, endurance test, 6- Minute walking test or Shuttle test. These tests are very usual in pulmonary rehabilitation and are recommended by the international Guideline (ATS/ERS statements). Moreover, they have been shown sensitive to rehabilitation in patients with COPD.

ANSWER: A discussion about outcome measures are added in the discussion section (see above).

# Same comment for the CCQ

ANSWER: A discussion about outcome measures is added in the discussion section (see above).

o Safety and technical was not really reported, excepted for fall or emergency contact with a general practitioner during the study. What about others events such pain, cough, dyspnea, desaturation... From an others point of view, what were the quality and safety of the transmission

ANSWER: We agree that this could be useful, but we do not have systematic reports on these data. As stated the saturation was closely monitored during the physical training as standard procedure.

o Circumstances surrounding the initial and final assessments are not clear for me and need to be detailed. By ex: Are these outcomes performed in a clinical or research context? When are they performed? During hospitalisation or during the first week before intervention. Are the patients stable at the time of assessment? .... Who conducted the assessment (usual care providers or blinded researchers)?, etc ...

ANSWER: As we did not have a control group blinding was difficult to accomplish. We have added:
The functional tests were carried out by specially trained therapists and were performed in the patient’s home just before and just after the telemedicine training and counselling. At the time of the assessment the patients were in the sub-acute phase.
In the same line, please provide more information about modalities and intensity of exercise performed during training. In addition it is surprising that the only counselling intervention was concerning energy conservation provided by the occupational therapy. It is not exactly was it is expected in pulmonary rehabilitation. Please, clarify and justify this point.

**ANSWER:** In the manuscript we have stated “cardio training with an intended intensity of 60%-90% of max capacity, strength training with an intended intensity of 60% of 1 Repetitions Maximum (RM)”. We have added: The training involved: 5-10 minutes warming up, consisting of thoracic mobilization exercises, exercises for upper extremities, lower extremities and neck/shoulder; 10-15 minutes cardio training, consisting of swing exercises, walking on the spot, seated exercises and, if possible, a stair workout; 10-15 minutes strength training, consisting of elastic exercises for upper and lower extremities, standing squats and stand and sit chair exercises. Breathing exercises such as pursed lip breathing and diaphragmatic breathing were used between the exercises to alleviate intercostal breathing.

Patient education was part of the telecounselling delivered by the nurses. We have added:

… also includes telemedicine education sessions with a nurse daily in the first week after discharge focusing on lung health, drugs, nutrition, coping and stress management (13).

**Others Revisions**

• Reference need to be updated.

• Some of relevant original papers or reviews are missing and need to be considered to improve introduction and discussion. By example:
  # Holland AE, J Telemed Telecare. 2013
  # Stickland M, Can Respir J. 2011 :216-20
  # Cruz J., Int J Med Inform, 2014
  # …

**ANSWER:** We agree and have rewritten the introduction and discussion.

• Some affirmations need to be supported by reference
  # P 7: Some of these patients decline participation in the COPD rehabilitation due to transportation difficulties (a reference is missing)
  # P8. severe and very severe COPD, i.e. with an FEV1 value under 50% of the predicted value, an FEV1/FVC ratio < 70% (a reference is missing)
  # …

**ANSWER:** Thank you for bringing our attention to this. We have added references.

• Also some reference seems not appropriate (ie P 6 reference 6 does not address COPD population) please review carefully through the entire document
ANSWER: We agree. The reference is removed.

• Introduction, I suggest the authors focus deeply on importance to implement an early and adapted intervention post exacerbation in COPD patients

ANSWER: We agree and have added:
It is recommended that patients with a Medical Research Council (MRC) Dyspnoea score of 3–5 who are functionally limited by breathlessness are offered pulmonary rehabilitation (4) and that pulmonary rehabilitation is commenced within 4 weeks after exacerbation of COPD (5).

• Data analysis:
o I’m not convinced that the cost analysis is conducted in the right way.

ANSWER:
This is correct. The economic analysis estimates the business case for the hospital and not the societal costs. This is now underlines in the method section by the following:
“Thus, the perspective was only on economic impact and financing for the hospital and not a societal cost-effectiveness analysis.”
Similar in the discussion it is now described that:
“In addition the economic analysis performed has a very narrow perspective on the costs and reimbursement for the hospital and do not included the wider societal costs or the costs-effectiveness of the intervention. “

o Please provide information how were analysed the missing data and drop-out patients

ANSWER: We have added:
A per-protocol analysis was performed and restricted to the participants who fulfil the protocol in the terms of the eligibility, interventions, and outcome assessments.

• Results:
Please consider to avoid duplication of result provided in the text and in the table

ANSWER: Ok. The text about results is removed.

o Organisational aspects is a little bit soft and need to be documented by more robust and quantitative data such as time spend by the professional for technical,....

ANSWER:
We agree that it seems “a little bit soft”, but all results from the interview study of organizational aspects are included in the description. Information of use of time by the staff is included in the economic section.

o Also, It is a little bit surprizing for me that the interview was performed 6 months after the end of the study and only with 2 health care providers. This could affect data and conclusion.
ANSWER:
Agree. It is now described that the total number of respondents was three therapists and that the total number of therapists participating in the project was four.
In the discussion it is now also added that:
“In addition the interview was done six months after the study period and this may have affected the answers from the clinicians”.

• Discussion
Of course, the methodology choices have greatly influenced the discussion and analysis of results.
Discussion seems a little bit speculative (by example the part on muscle strength and daily activity level, P19 and 20) and suffers from a lack of robust data.

ANSWER: We agree and have rewritten the discussion and it no longer includes discussion concerning speculation about muscle strength and daily activity level.

• Conclusion is fair

Level of interest: An article whose findings are important to those with closely related research interests.

Quality of written English: Needs some language corrections before being Published.

Answer: The manuscript has been rewritten for language corrections.

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interests
Reviewer's report (Reviewer no. 3)

Title: Early telemedicine training and counselling after hospitalization in patients with severe chronic obstructive pulmonary disease: A feasibility study.

Version: 3 Date: 22 June 2014

Reviewer: Anne Holland

Reviewer's report:

This manuscript details the use of telerehabilitation and counselling immediately after an admission for an acute exacerbation of COPD.

The use of telerehabilitation at this time point is novel and arguably represents the time where it is most likely to have an important impact, given the impact of traditional rehabilitation on hospitalisation and survival when delivered after an exacerbation.

The study recruited individuals with severe COPD who declined traditional rehabilitation, which is also a novel approach. The study includes relatively large numbers of subjects (n=37 completed) compared to other pilot studies in this area.

However, the application of telerehabilitation at this time point also presents some significant challenges for interpretation of results. All patients would still be undergoing natural recovery following the exacerbation, and thus in an uncontrolled trial it is impossible to tell whether the changes in clinical outcomes have anything to do with the intervention. The economic argument is difficult to support, given that we cannot exclude the possibility that the patients may have improved similarly without any intervention. This problem is exacerbated by the application of nurse-led counselling via teleconferencing, which was clearly an existing intervention in this setting.

**ANSWER:**

The economic analysis of the costs of the hospital and the reimbursement of the telemedicine session will not be affected by whether the patients would have improved without the telemedicine service or not. The reason is that the economic analysis performed is not a cost-effectiveness analysis, but a business case analysis focusing on expenditures and reimbursement of the hospital of the specific telemedicine service. This is now underlined in the method section and the discussion.

Major compulsory revisions

1. Given the uncontrolled nature of this trial, and the likelihood that spontaneous recovery contributed substantially to the observed improvements, the authors should consider being much more conservative in their interpretation of clinical and economic outcomes. The manuscript would be stronger if it were to focus first and most strongly on the feasibility and acceptability of the intervention.
ANSWER: Thank you for the comment. We have rewritten the manuscript to focus on feasibility and acceptability of the intervention.

There should be a much lesser focus on the clinical and economic outcomes, both in the results and the discussion, in keeping with the difficulty in interpreting these data.

ANSWER: We agree. The manuscript has been rewritten so the focus is in feasibility of the intervention.

2. The abstract contains no data and thus does not reflect the content of the manuscript. The authors could consider revising this, taking into consideration the uncontrolled nature of the trial.

ANSWER: We agree and the abstract has been rewritten:

Background: An essential element in the treatment of patients with chronic obstructive pulmonary disease (COPD) is rehabilitation, of which supervised training is an important part. However, not all individuals with severe COPD can participate in the rehabilitation provided by hospitals and municipal training centres due to distance to the training venues and transportation difficulties. The aim of the study was to assess the feasibility of an individualized home-based training and counselling programme via video conference to patients with severe COPD after hospitalization including assessment of safety, clinical outcomes, patients’ perceptions, organisational aspects and economic aspects.

Methods: The design was a pre- and post-test intervention study. Fifty patients with severe COPD were included. The telemedicine training and counselling included three weekly supervised exercise sessions by a physiotherapist and up to two supervised counselling and training sessions in energy conservation techniques by an occupational therapist. The telemedicine videoconferencing equipment was a computer containing a screen, a microphone, an on/off switch and a volume control. A camera was also in stalled in the patients’ home.

Results: Thirty seven (74%) participants completed the programme, with improvements in health status assessed by the Clinical COPD Questionnaire and physical performance assessed by a sit-to-stand test and a timed-up-and-go test. There were no cases of patient fall or emergency contact with a general practitioner during the telemedicine training sessions. The study participants believed the telemedicine training and counselling was essential for getting started with being physically active in a secure manner. The economic analysis showed that under the current financing system, the reimbursement to the hospital was slightly higher than the hospital costs. Thus, the business case for the hospital was positive. The organizational analysis indicated that the perceptions of the staff were that the telemedicine service had improved the continuity of the rehabilitation programme for the patients and enabled the patients’ everyday lives to be included in the treatment.

Conclusion: This study showed that home-based supervised training and counselling via video conference is safe and feasible and that telemedicine can help to ensure more equitable access to supervised training in patients with severe COPD after hospitalization with exacerbation of COPD.
3. The lack of an intention to treat analysis is a weakness, given that 25% of participants dropped out and we do not know anything about their outcomes. This should be acknowledged.

**ANSWER:** Ok. In the discussion section we have added:
With a dropout rate of 25% and no intention to treat, analysis bias associated with the results cannot be ruled out.

4. It appears that the trial was registered retrospectively, after data collection was complete. Please clarify.

**ANSWER:** The trial had been registered as requested from the journal.

Minor Essential Revisions

5. Introduction - there are now a number of other pilot studies of telerehabilitation for COPD. This should be reflected in the literature review.

**ANSWER:** Thank you for this comment. We have added:
Previous research has demonstrated that various forms of telemedicine are feasible, but there is a lack of information about what effects they have on health outcomes and costs (7), and the knowledge about the use of telemedicine strategies in pulmonary rehabilitation is limited (8). Nevertheless there is a growing interest in using health technologies to provide safe and effective telemedicine solutions involving supervised training for people with COPD. A center-based telemedicine rehabilitation programme involving supervised training was found to be an effective tool for increasing COPD pulmonary rehabilitation (9). However this telemedicine strategy did not overcome transportation difficulties. Another study examining the feasibility of a long-term telerehabilitation service involving training at home for COPD patients suggests that it may reduce healthcare utilization (10). A recently study found that home-based supervised training using existing widely available technology is safe and feasible for people with COPD (11). This study found that effective delivery of telerehabilitation requires an adequate data network. Further research is needed to show whether supervised training via telemedicine is feasible and effective in patients with severe COPD after hospitalization with exacerbation.

6. Reference 11 is an editorial. The authors should reference the original research by Stickland et al, to which this editorial refers.

**ANSWER:** Ok. This is done.

7. Methods - please clarify whether the usual pulmonary rehabilitation program is offered in an inpatient or outpatient setting.

**ANSWER:** Ok. This is done.

8. Please clarify why an intervention period of 3 weeks was chosen when current
pulmonary rehabilitation standards recommend a duration of 8 weeks (Spruit et al 2013) and your usual program is also of this length?

**ANSWER:** We have added in the discussion: In the rehabilitation of patients with COPD, the supervised exercise training is recommended to last at least six to eight weeks with twice-weekly sessions (2). Therefore, this individual 3-week supervised exercise program for patients with severe COPD will in most cases not be sufficient. Currently, patients are referred to individualized rehabilitation in the municipality after the telemedicine training. Our study suggests that telemedicine can be a useful element in the rehabilitation of patients with COPD who declines out-patient rehabilitation. There is a need for further investigation into how a supervised home-based training program for patients with severe COPD should be planned and for exploration of how telemedicine rehabilitation may be effective for health improvements in patients with severe COPD with an exacerbation of their condition.

9. Were the functional tests carried out at home or in the hospital?

**ANSWER:** In the manuscript we have added that the functional tests was carried out at home.

10. Discussion - Reference 27 refers to a very different study where exercise intensity was controlled using external cues. In this study the authors do not provide any evidence that the desired exercise intensity was achieved. Consider revising this section to be consistent with the data available.

**ANSWER:** Ok. This is done.

11. Abbreviations - please define RM in English

**ANSWER:** Ok. This is done.

12. Table 2 - the number of subjects in this table is not consistent with the text. Here we have subject numbers ranging 40 - 46, where the text indicates this table refers to subjects who completed (n=37).

**ANSWER:** Thank you for drawing our attention to this mistake. The number has now been corrected.

Discretionary revisions:

13. Were the characteristics of non-completers different to completers?

**ANSWER:** We have added:
The group that dropped out during the intervention differed from the group that com-pleted it. A larger proportion in the dropout group was men, a higher proportion re-ceived home help and they had poorer Borg scores at rest (4.5 vs.
2.6), FTSST (21.19 vs. 18.96 sec.) and poorer CCQ scores (4.09 vs. 3.58). There were no significant differences in the other clinical parameters.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being published

**Answer:** The manuscript has been rewritten for language corrections.

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**
I declare that I have no competing interests.