PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (**http://bmjopen.bmj.com/site/about/resources/checklist.pdf**) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Effectiveness and cost-effectiveness of a web-based routine assessment with integrated recommendations for action for depression and anxiety (RehaCAT+): protocol for a cluster randomized controlled trial for patients with elevated depressive symptoms in rehabilitation facilities
AUTHORS	Knauer, Johannes; Terhorst, Yannik; Philippi, Paula; Kallinger, Selina; Eiler, Sandro; Kilian, Reinhold; Waldmann, Tamara; Moshagen, Morten; Bader, Martina; Baumeister, Harald

VERSION 1 – REVIEW

REVIEWER	Rodríguez-Nogueira, Óscar Universidad de Leon, fNursing and Physical Therapy Department
REVIEW RETURNED	09-Feb-2022

GENERAL COMMENTS	Congratulations for dealing with such an interesting and necessary topic as psychosocial aspects in rehabilitation clinics. This is a very comprehensive study that can provide a lot of data related to this field. Perhaps we need more specific data on the profile of patients (not only high scores in depression), and to know if the improvement of depressive symptomatology goes together with the improvement of somatic symptomatology. Thank you for allowing me to review this interesting study protocol.

REVIEWER	McMorrow, Rita The University of Melbourne, Department of General Practice
REVIEW RETURNED	06-Apr-2022

GENERAL COMMENTS	Well written pragmatic study protocol, some minor comments for the authors Methods Setting and participants Given this is a pragmatic study it would be helpful to understand the setting eg -can the authors describe the rehabilitation clinics, eg community or specialist based, current methods of screening for depressive symptoms in these clinics, is this cardiac rehab clinics post myocardial infarction? Types of healthcare professionals who work in these settings? How long and how frequently are patients usually seen in these clinics? Is it after hospital discharge for acute events What training will the healthcare professionals receiving in using the intervention and interpretting the PROM responses in both arms of the study? Randomisation

	-will randomisation of all participants occur at the same time? -will the research team be blinded to randomisation? Smart sensing sub-study -can the authors clarify if only participants recruited to one (or both) arms of the study are included in the sub-study? Data collection When/where is data going to be collected? (during outpatient appointments) Will all data (eg T1 T2 T3) be available to the healthcare professionals involved in care or only certain data via the RehaCAT+? Intervention Intervention (RehaCAT+) are the automated reminder etc for the healthcare professional or for the patient? what type of recommendations are made to the healthcare professionals? (eg medication prescribing/psychotherapy/further risk assessments) who is the target healthcare professional to receive the action reminders? eg GP/nurse/rehab specialists/psychologist

VERSION 1 – AUTHOR RESPONSE

Reviewer 1

Comment #9:
Congratulations for dealing with such an interesting and necessary topic as psychosocial aspects in rehabilitation clinics. This is a very comprehensive study that can provide a lot of data related to this field.

Response #9:
Thank you very much. Your positive feedback is highly appreciated.

Comment #10:
Perhaps we need more specific data on the profile of patients (not only high scores in depression), and to know if the improvement of depressive symptomatology goes together with the improvement of somatic symptomatology. Thank you for allowing me to review this interesting study protocol.

Response #10:
Thank you for your comment. We fully agree that the information on the profile of patients was too sparse before – especially considering the German rehabilitation setting of the study, which might be unfamiliar to some of the readers. We have added further information on the setting in section 2.1.1 (see changes to the manuscript below). Data on the profile of patients as well as changes in somatic symptomatology will be monitored and reported.

Changes to the manuscript #10:
The testing systems RehaCAT (control group) and RehaCAT+ (experimental group) will be implemented in the clinic routine of of 12 clinics offering cardiological or orthopedic rehabilitation treatment in Germany. Included clinics pursue medical and occupational oriented stationary rehabilitation according to German ICF diagnosis-based rehabilitation guidelines (81). With a psycho-social approach rehabilitation is focused on patients' impairments (e.g., body functions & structure), restoration of activities and removing restrictions of participation (82). Accordingly, the treatment in

clinics often contains diagnostics, pharmacotherapy, physiotherapy, and psychotherapy. Standard stationary stay usually lasts for three weeks. The treatment as well as the duration of treatment is expected to vary across patients and between clinics. Treatment will be further described post-hoc using the results from the cost-effectiveness questionnaires (see 2.5). Neither the control condition nor the experimental condition will interfere with clinical treatment (see 2.3.).

Reviewer 2

Comment #11:
Well written pragmatic study protocol, some minor comments for the authors

Response #11:
Thank you very much for your feedback.

Comment #12:
Setting and participants
Given this is a pragmatic study it would be helpful to understand the setting e.g. -can the authors describe the rehabilitation clinics, e.g. community or specialist based, current methods of screening for depressive symptoms in these clinics, is this cardiac rehab clinics post myocardial infarction? Types of healthcare professionals who work in these settings?

Response #12:
Thank you for highlighting this. We fully agree that setting description was too sparse. The German rehabilitation setting as well as the general treatment in clinics has been described in more detail and additional information has been added (see 2.1.1). We would like to refer to Comment #10 and the associated Changes to the manuscript #10 for our revision.

Changes to the manuscript #12:
The testing systems RehaCAT (control group) and RehaCAT+ (experimental group) will be implemented in the clinic routine of of 12 clinics offering cardiological or orthopedic rehabilitation treatment in Germany. Included clinics pursue medical and occupational oriented stationary rehabilitation according to German ICF diagnosis-based rehabilitation guidelines (81). With a psycho-social approach rehabilitation is focused on patients' impairments (e.g., body functions & structure), restoration of activities and removing restrictions of participation (82). Accordingly, the treatment in clinics often contains diagnostics, pharmacotherapy, physiotherapy, and psychotherapy. Standard stationary stay usually lasts for three weeks. The treatment as well as the duration of treatment is expected to vary across patients and between clinics. Treatment will be further described post-hoc using the results from the cost-effectiveness questionnaires (see 2.5). Neither the control condition nor the experimental condition will interfere with clinical treatment (see 2.3.).

Comment #13:
How long and how frequently are patients usually seen in these clinics? Is it after hospital discharge for acute events?

Response #13:
The clinics focus on medical (e.g., after hospital discharge for acute events) as well as occupational oriented stationary rehabilitation. The actual treatment within the clinics including the number of visits by doctors will vary between clinics. Treatment will be monitored and assessed by the cost-effectiveness questionnaires. A detailed description of the treatments will be provided in the results

paper.
We have specified the information on the setting (section 2.1.1), to make this transparent to the reader (see Comment #10).

Changes to the manuscript #13:
Included clinics pursue medical and occupational oriented stationary rehabilitation according to German ICF diagnosis-based rehabilitation guidelines (81). With a psycho-social approach rehabilitation is focused on patients' impairments (e.g., body functions & structure), restoration of activities and removing restrictions of participation (82). Accordingly, the treatment in clinics often contains diagnostics, pharmacotherapy, physiotherapy, and psychotherapy. Standard stationary stay usually lasts for three weeks. The treatment as well as the duration of treatment is expected to vary across patients and between clinics. Treatment will be further described post-hoc using the results from the cost-effectiveness questionnaires (see 2.5). Neither the control condition nor the experimental condition will interfere with clinical treatment (see 2.3.).

Comment #14:
What training will the healthcare professionals receiving in using the intervention and interpreting the PROM responses in both arms of the study?

Response #14:
We have revised the section on the training process to provide further details. The training will be conducted on-site and will cover technical handling of the platform, providing basic technical assistance to patients, as well as handling of recommendations and guidelines for clinical practice (e.g., interpretation of test results). This has been specified (see 2.1.1).

Changes to the manuscript #14:
For the study, one of two versions of a web-based computer-adaptive diagnostic platform will be implemented within the clinics (see 2.3). Clinic personnel will be trained in an on-site workshop during the implementation phase. The training will cover technical functions of the platform (e.g., how new patients can be registered, how patients' results can be received, etc.) as well as recommendations and guidelines for clinical practice (e.g., how results should be interpreted, information about national treatment guidelines for mental health, etc.). Lastly, clinicians will also be trained in the communication with patients and procedures for patients. After the training, written manuals providing a summary of the workshop will be available in the system for the clinic personnel. Qualification level of clinic personnel operating the system will vary across clinics (e.g., nurses, medical doctors, clinical psychologists, etc.). This will be monitored and reported (se 2.5.5). Furthermore, the technical administrator has direct contact options (e.g., e-mail) to the research team.

Comment #15:
Randomisation
Will randomisation of all participants occur at the same time?

Response #15:
Thank you for your comment. We will cluster randomize the clinics using an automatically created randomization list. Patients will not be randomized individually. We have now described this in more detail (see 2.2).

Changes to the manuscript #15:
Randomization and allocation regarding the control (RehaCAT) and experimental group (RehaCAT+) of the 12 participating rehabilitation clinics will be performed by an independent researcher to avoid

selection bias. Randomization will be done on cluster-level.
Researchers responsible for randomization will be obscured to the rehabilitation clinic names and agencies. Randomization will be done using an automatically created randomization list.
For the outcome analyses the conducting analyst will be obscured to group allocation. Patients will remain obscured to their study arm assignment. Neither the clinics (clinic personnel) nor the research team will be obscured to assigned study condition.

Comment #16:
Will the research team be blinded to randomisation?

Response #16:
Thank you for pointing this out. The information on blinding were previously incomplete and provided at different sections in the manuscript. We have reworked the section 2.2 to include all information on masking in that section: The randomization will be done by researchers obscured to the rehabilitation clinic names and agencies using an automatically created randomization section. Additionally, all analyses will be conducted by researchers without knowledge of the clinic allocation. However, neither the research team involved in the recruitment processes nor the clinic personnel itself will be obscured to study arm assignment. The patients themselves will unlikely be aware of the allocation, since they are not informed which condition has been implemented in their clinic. Please see the revised masking section below (section 2.2). Furthermore, we have added this information to the strength and limitation bullet points at the beginning of the manuscript.

Changes to the manuscript #16:
Randomization and allocation regarding the control (RehaCAT) and experimental group (RehaCAT+) of the 12 participating rehabilitation clinics will be performed by an independent researcher to avoid selection bias. Randomization will be done on cluster-level.
Researchers responsible for randomization will be obscured to the rehabilitation clinic names and agencies. Randomization will be done using an automatically created randomization list.
For the outcome analyses the conducting analyst will be obscured to group allocation. Patients will remain obscured to their study arm assignment. Neither the clinics (clinic personnel) nor the research team will be obscured to assigned study condition.

Comment #17:
Smart sensing sub-study
Can the authors clarify if only participants recruited to one (or both) arms of the study are included in the sub-study?

Response #17:
Thank you for your question. We have clarified the recruitment process of the sub-study. All patients will be informed about the optional participation in a smart-sensing study. This will occur after the assessments at T0, T1 and T2 is completed. Interested participants will receive a study invitation via e-mail. The recruitment process is independent from study participation. Both study participants and routine care patients are offered the option to participate. This has been specified in section 2.5.6.

Changes to the manuscript #17:
After completing the diagnostic measures at T0, T1 and T2, all patients will be informed in the RehaCAT(+) system about the optional mobile sensing sub-study. If interested, they can provide an e-mail address to receive further information on the study and a study invitation. This is independent from study participation in the cRCT. Therefore, both routine care patients and patients partaking in the cRCT will be able to participate.

Comment #18:
Data collection
When/where is data going to be collected? (during outpatient appointments)?

Response #18:
Thank you for highlighting this. As the platform is operating online outpatient assessment is possible. However, we expect the assessment at admission (T0) and discharge (T1) to be performed in the clinic and follow-up assessments (T2 & T3) in an outpatient setting. The actual implementation in each clinic will be monitored and reported. We have added this information to section 2.1.

Changes to the manuscript #18:
Data collection will be digital. Due to the web-based character of the platform, in- and outpatient assessments are possible. Clinics are free to implement the admission and discharge assessments as in- or outpatient assessments. Data for follow-up will be assessed solely in an outpatient setting. Assessment procedures (e.g., in- or outpatient assessment at admission) are expected to vary across clinics and will be further described post-hoc. For an explanatory illustration of the assessment procedures see Figure 2.

Comment #19:
Will all data (e.g. T1 T2 T3) be available to the healthcare professionals involved in care or only certain data via the RehaCAT+?

Response #19:
Thank you for the comment. Clinic personnel will receive all data for admission, discharge and aftercare/ follow-up 1 (T0, T1, T2) of their respective patients for depression, anxiety, satisfaction with social roles and activities, pain impairment, fatigue, sleep, health-related quality of life, self-efficacy, physical function and alcohol use. We have added this information in the manuscript (section 2.3).

Changes to the manuscript #19:
Clinicians can view the test results of their patients immediately after completion of each assessment point (T0, T1 and T2). Test results consist of a traffic light feedback (green = normal severity, yellow = elevated severity based on clinical cut-off values, red = high severity 2.5 SDs above mean (15,83)), patients' test results expressed in T-values combined with clinical cut-off values, and a line graph visualizing the results and change over assessment times. For a full overview of the assessment see 2.5.1 and 2.5.2.

Comment #20:
Intervention (RehaCAT+)
Are the automated reminder etc for the healthcare professional or for the patient?

Response #20:
Thank you for your question. Automated reminders are generated for patients only. Clinic personnel in the experimental group are able to check assessment status is a system overview. This has been specified in section 2.3. Furthermore, we have revised Figure 3 to make the distinction of RehaCAT+ more comprehensible.

Changes to the manuscript #20:
RehaCAT+ offers additional (1) system features (automated e-mail reminders for patients) (…)

See changes to Figure 3

Comment #21:
What type of recommendations are made to the healthcare professionals? (e.g. medication prescribing/psychotherapy/further risk assessments)?

Response #21:
Thank you for your comment. Clinical personnel will receive recommendations (varying in urgency) for further diagnostics depending on the screening results. Material on handling of psychological burden based on setting specific guidelines will be provided. We have added this to the intervention description (2.3).

Changes to the manuscript #21:
The urgency of the recommendation for action (i.e., need for in-depth psychodiagnostics) varies depending on screening severity. Additionally, material on handling of psychological burden can be accessed. The material is based on: a) the rehabilitation therapy standards and framework concepts (84–87), b) the practice recommendations for orthopedic and cardiological rehabilitation (54,55), c) the recommendations for psychodiagnostics in somatic rehabilitation (53), and e) the national S3 guidelines for depression (56) and anxiety (57). A summary of the two conditions is provided in Figure 3.

Comment #22:
Who is the target healthcare professional to receive the action reminders? e.g. GP/nurse/rehab specialists/psychologist

Response #22:
Thank you for this question. The target health care professionals will vary depending on the specific clinic setting, which we assess and report. This information has been added to section 2.1.1.

Changes to the manuscript #22:
Qualification level of clinic personnel operating the system will vary across clinics (e.g., nurses, medical doctors, clinical psychologists, etc.). This will be monitored and reported (se 2.5.5).

VERSION 2 – REVIEW

REVIEWER	McMorrow, Rita The University of Melbourne, Department of General Practice
REVIEW RETURNED	03-Jun-2022

GENERAL COMMENTS	Thank you for your very comprehensive responses to my comments and I wish you the best with the study.