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Acceptability, safety and feasibility of in-bed cycling with critically ill patients

Supplementary Material

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Acceptability Questionnaire Development

Background:

No measure of acceptability for a similar intervention was available. Consequently, to enable assessment of the acceptability of in-bed cycling a new questionnaire needed to be developed.

Development of 'Patients Acceptability Questionnaire':

A Delphi panel that consisted of eleven members (seven clinicians (two nurses, two ICU consultants, three physiotherapists), two academics (nursing background and statistician) and two public representatives without a health background) was formed. An initial draft of the acceptability of intervention questionnaire from the patient's perspective was drafted.

Agreement defined a priori

Prior to distribution of the questionnaire consensus was defined as, 100% for the first 2 rounds, (i.e. anything that does not have universal support to include or remove requires revision or for consideration by the panel on the next round). Consensus for the final round was defined as items with more than 80% agreement will be included and items with less than 80% agreement will get removed.

Response rate

All eleven-panel members provided feedback (Round 1: 100% response rate). Based on feedback a second draft was distributed and eight members provided minor feedback. A third draft was distributed to the eleven-panel members who all responded. There was a 100% consensus on retaining all items included in the third draft. All respondents approved the third draft for distribution. The resultant questionnaire consisted of 8 questions.

Administration of 'Patients Acceptability Questionnaire':

The patients' acceptability of intervention questionnaire was administered by a study investigator at the completion of the in-bed cycling sessions. Only patients who completed and were able to recall the in-bed cycling intervention were eligible to complete the questionnaire.

Development of 'Family and Friends' and 'Clinician' Questionnaires

Following initial distribution to patients, it was determined that the acceptability of the intervention from clinicians and family and friends should also be collected. The Delphi panel members were recontacted and reviewed acceptability questionnaires that were relevant to two populations (clinicians, family and friends). Ten of the eleven members responded (one member unavailable due to maternity leave). All Delphi panel members approved the clinicians and family or friend acceptability of intervention versions of the questionnaire. The 'family and friends' questionnaire contained 7 questions and the 'clinician' questionnaire contained 9 questions.

Administration of 'Family and Friends Acceptability Questionnaire':

The friends and family members acceptability questionnaire was administered by a study investigator. If the patient was discharged from acute hospital prior to administration of the questionnaire a study investigator called a patients' family member or friend to administer the relevant questionnaire. Friends or family members were eligible to complete the questionnaire if they had observed the patient complete the intervention whilst the patient was admitted to the intensive care unit.

Administration of 'Clinicians Acceptability Questionnaire':

The clinician's questionnaire was distributed during the final 6 months of the study to enable clinician's optimal exposure to the intervention to enable informed responses. The clinician's surveys were distributed either at the bedside following an in-bed cycling session or in the staff dining area. Clinicians completed the paper-based questionnaires and then inserted their responses into a confidential sealed box that was appropriately labelled.

The completion of questionnaires by patients, family and friends and clinicians was always voluntary.

IN-BED CYCLING QUESTIONNAIRE

The following questions are related to the in-bed cycling exercise that you participated in whilst in intensive care.

Please circle only one response for each statement. Please be sure to choose a response for all 7 statements. Please add any comments or suggestions at Question 8.

1. I can <u>remember</u> in-bed cycling in the Intensive Care Unit (ICU):				
No	Yes, at least one time	Yes, 2 to 3 times	Yes, 4 to 5 times	Yes, more than 5 times
<i>If the answer to Question 1 is 'No', please skip to Question 8.</i>				

2. I feel that in-bed cycling assisted my <u>physical recovery</u>:				
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
3. In-bed cycling improved my <u>feelings of well-being</u>:				
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
4. <u>During</u> in-bed cycling my <u>pain</u> was:				
Significantly worse	Worse	No difference	Improved	Significantly improved
5. <u>After</u> in-bed cycling my <u>pain</u> was:				
Significantly worse	Worse	No difference	Improved	Significantly improved
6. If I returned to ICU I would like to take part in in-bed cycling <u>again</u>:				
Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
7. Overall, I feel that in-bed cycling for patients admitted to ICU is beneficial:				
Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree

8. Any comments / suggestions about in-bed cycling:

IN-BED CYCLING QUESTIONNAIRE (Family / Friend)

The following questions are related to the in-bed cycling exercise that your family member or friend participated in whilst in intensive care.

Please circle only one response for each statement. Please be sure to choose a response for all 6 statements. Please add any comments or suggestions at Question 7.

1. Your family member / friend completed in-bed cycling sessions in the Intensive Care Unit (ICU):				
Did you either <u>observe</u> any of these sessions or <u>discuss</u> afterwards with your family member / friend?				
No	Yes, at least one time	Yes, 2 to 3 times	Yes, 4 to 5 times	Yes, more than 5 times
<i>If the answer to Question 1 is 'No', please skip to Question 3.</i>				

2. During in-bed cycling the <u>pain or discomfort</u> of your family member / friend appeared to be: (Please only answer this question if you observed your family member / friend during one or more in-bed cycling sessions)				
Significantly worse	Worse	No difference	Improved	Significantly improved

3. Do you feel that in-bed cycling has assisted the <u>physical recovery</u> of your family member / friend:				
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

4. Do you feel that in-bed cycling improved the <u>mood</u> of your family member / friend during their ICU stay:				
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

5. If your family member / friend returned to ICU, would you like them to take part in in-bed cycling again:				
Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree

6. Overall, do you feel that in-bed cycling for patients admitted to ICU is beneficial:				
Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree

7. Any comments / suggestions about in-bed cycling (e.g. timing of initiation of first session, frequency and duration of sessions):

Clinicians' acceptability questionnaire

IN-BED CYCLING QUESTIONNAIRE (Clinician)

The following questions are related to the in-bed cycling exercise that your patient/s have participated in whilst in intensive care.

Please circle only one response for each statement. Please be sure to choose a response for all 8 statements. Please add any comments or suggestions at Question 9.

Have you completed this Questionnaire previously? Yes / No

Please only complete this questionnaire once during the study.

What is your role in intensive care

Nurse
(Role)

Medical Officer
(Role)

Physiotherapist

Other health professional
(Please specify):

1. How many times have you observed patients under your care complete in-bed cycling sessions?

At least one time

2 to 3 times

4 to 5 times

More than 5 times

2. I feel that in-bed cycling assists my patients' physical recovery:

Strongly Disagree

Disagree

Neither agree nor
disagree

Agree

Strongly agree

3. In-bed cycling appears to improve my patients' feelings of well-being:

Strongly Disagree

Disagree

Neither agree nor
disagree

Agree

Strongly agree

5. During in-bed cycling my patients' pain appeared to be:

Significantly worse

Worse

No difference

Improved

Significantly improved

6. After in-bed cycling my patients' pain appeared to be:

Significantly worse

Worse

No difference

Improved

Significantly improved

7. In-bed cycling affected my ability to access my patient for clinical assessment or interventions:

No change

Minimally affected

Unable to review/access patient

8. Overall, I feel that in-bed cycling for patients admitted to ICU is beneficial:

Strongly Disagree

Disagree

Neither Disagree nor
Agree

Agree

Strongly Agree

9. Any comments/suggestions about in-bed cycling

(e.g. timing of initiation of the first session, pain relief administration during the session, frequency, and duration of sessions):

Acceptability questionnaire response rate

Table S1: Acceptability questionnaires response rate

Respondents	Responses	Response Rate	Notes
Patient	30/36	83%	5 unable to recall, 1 passed away
Family/ friends	18/25	72%	22 responses related to 18 patients
Medical Officers	21/36	58%	Denominator from staff roster ^a
Nursing	94/221	43%	Denominator from staff roster ^a
Physiotherapy	9/14	64%	Denominator from staff roster ^a
Total	172/332	52%	

^a Due to the variable rostering pattern and variable clinician the exact number of clinicians who observed the intervention and were eligible to complete the questionnaire cannot be determined. Consequently, the estimated response rate is likely to be conservative.

Responses from patients regarding the acceptability of in-bed cycling

Table S2: Patient responses regarding the acceptability of in-bed cycling, n = 30

	n=	Median (IQR)	Median word response
Recall of in-bed cycling sessions	35*	3 (2, 4)	2 to 3 times
In-bed cycling assisted my physical recovery	30	5 (4, 5)	Strongly agree
In-bed cycling assisted my feelings of well-being	30	4 (4, 5)	Agree
My pain during in-bed cycling	30	3 (3, 4)	No difference
My pain after in-bed cycling	30	3 (3, 4)	No difference
I would participate in in-bed cycling if I was admitted to IC again	30	5 (4, 5)	Strongly agree
In-bed cycling is beneficial for ICU patients	30	5 (4, 5)	Strongly agree

* 5 participants unable to recall in-bed cycling and therefore were not asked further questions. IQR, interquartile response; ICU, intensive care unit

Table S3: Patient open responses to acceptability questionnaire regarding in-bed cycling

Any comments / suggestions about in-bed cycling?
I think it helps to maintain the muscles
I think it's good. Session too long [unable to recommend a specific duration]
Recommend padded straps. Duration: about the right time.
Good to get the muscles back to doing what they are meant to be doing. Duration: about right.
Easy to do as can do it lying down.
Anything to get you moving is good
Just found it helpful. Gave me something to concentrate on for an hour.
Less action for you to do when able to get going. Keeps your cardiovascular going as well. I wish I was able to do in-bed cycling when I had my 1 st accident.
Made the world of difference to me yesterday. Glad my son signed me up, it's been wonderful. It's made a big difference to my life. Just lie on my back and pedal away. It's great. No great feat of exercise.
Don't have pain unless coughs [post sternotomy]
Exhausted 1 st few times, better later sessions. I feel better now than before I was in hospital.
Increased chest pain post cycling [sternal ORIF]. A big benefit to people in intensive care. Whilst in ICU anything you can do to improve your day helps.
Found it difficult, in some way it helped me.
Good to get you moving
No problems, I was happy that I was able to do it
Good to set yourself goals – depends on the mindset of the person. Session length and intensity about right.
Gave me something to set for and look forward too. Stopped leg cramps after session [patient experiencing leg cramps whilst resting in bed] Helped with breathing and helped get off the mask [Hudson mask]
No additional response (n=19)

Note: Authors comments to provide a context in brackets

Responses from family / friends regarding the acceptability of in-bed cycling

Table S4: Family and friends' responses regarding the acceptability of in-bed cycling, n = 22

	n=	Median (IQR)	Median word response
Recall of in-bed cycling sessions	22*	3 (3, 4)	2 to 3 times
In-bed cycling assisted patients' physical recovery	22	5 (4, 5)	Strongly agree
In-bed cycling assisted patients' feelings of well-being	22	3.5 (3, 4.75)	Neither agree nor disagree - improved
Patients' pain during in-bed cycling	22	3 (3, 3)	No difference
I would want the patient to participate in in-bed cycling if they were admitted to ICU again	22	5 (4.25, 5)	Strongly agree
In-bed cycling is beneficial for ICU patients	22	5 (4, 5)	Strongly agree

* Responses relating to 18 patients. IQR, interquartile response; ICU, intensive care unit.

Table S5: Family / friends open responses to acceptability questionnaire regarding in-bed cycling

Any comments / suggestions about in-bed cycling?
It's got to be good, it just makes sense. Anything to keep the muscles moving must be good.
I think it's a really good idea. It's moving their muscles and helping their recovery.
Happy that I put him on the trial
I can see the benefits for everybody. I'd like to see it on a daily basis. I think it helped with clots in the legs. I like the specific data given by the machine: duration, distance.
Once they wake up they can start walking
Keeps legs moving and helps give them a better and stronger recovery. Stops the muscles from wasting away.
Depending on circumstances. Good idea if you don't use muscles you'll lose them.
No concerns
Less restless after the session
Helps the muscle recovery. I don't think they can do without it. I reckon all ICU's should do it.
I think it's a good idea. No side effects. Helped her to recover quickly.
Especially if been in [ICU] for a long time. Great idea for patients' recovery.
I think they should be on every ward where patients are bedridden. I would have liked to have used the cycle when I do chemo.
Being strong and competitive it gave [him] focus to try to beat previous days results. Exercise is an underutilised anti-depressant. Helps to flush out toxins. Has to help.
No additional response (n=6)

Note: Authors comments to provide a context in square brackets

Responses from clinicians regarding the acceptability of in-bed cycling

Table S6: Clinicians responses regarding the acceptability of in-bed cycling, n = 124

	n=	Median (IQR)	Median word response
Recall of in-bed cycling sessions	124*	3 (3, 5)	2 to 3 times
In-bed cycling assisted patients' physical recovery	124	4 (3, 4)	Strongly agree
In-bed cycling assisted patients' feelings of well-being	124	3.5 (3, 4.75)	Neither agree nor disagree
Patients' pain during in-bed cycling	124	3 (3, 3)	No difference
Patients' pain after in-bed cycling	124	3 (3, 3)	No difference
In-bed cycling affected my ability to access the patient	124	2 (1, 2)	Minimally affected
In-bed cycling is beneficial for ICU patients	124	4 (4, 5)	Strongly agree

IQR, interquartile response; ICU, intensive care unit.

Table S7: Clinicians open responses to acceptability questionnaire regarding in-bed cycling

Medical Officers

Any comments / suggestions about in-bed cycling?
If no contraindications, would advocate early commencement of cycling sessions for all patients.
I'd want it
Surprised with how well tolerated cycling sessions were in our patients
Nil issues. I believe this is crucial for ongoing patient rehabilitation.
Very supportive of this exercise. Might be some tangible benefits; be nice to find some evidence. Little downside in any case.
Appears to benefit patients. Doesn't interfere with other clinical cares.
I don't think I have had enough exposure to patients on this treatment to accurately comment of the effects it has had on my patients.
I think there is a use for bed bound patients
No additional response (n=13)

Nursing staff

Any comments / suggestions about in-bed cycling?
I feel that family's value in-bed cycling as it allows them to see the active intervention in use. This is important for family and the patient when thinking about holistic multi-dimensional care.
All patients have been heavily sedated – unable to assess recovery well-being.
My patient was sedated on large amounts of analgesia and sedatives and paralysis which doesn't allow me to assess pain levels effectively for the trial. Otherwise session is quick, easy and had no negative effects on my patient.
Duration of sessions seem appropriate. Pain did not seem to be an issue if anything more alert patients enjoyed the activity. Definitely in support of this therapy. Nil inconvenience whatsoever.
Cycling sessions have always been worked around nurses' work load and patient cares. Patients pain is constantly monitored at every stage, interventions address as necessary. Some patients appear to enjoy this study.

As long as they are continuously supported emotionally and with pain relief control, I believe it should be commenced as soon as possible as it definitely gives them a sense of achievement commencing, getting stronger each day etc.
I think physio is mindful of cares/ turns etc and times sessions appropriately. I would like to see more of it as when I have cared for someone, they seemed to enjoy the cycle/ exercise.
It's a good positive physio for patient's, a way of moving forward in their care.
Patients feel they have some ability to participate in their cares.
Patients seem to enjoy the activity, distraction and purposefulness of cycling. Patients' families / visitors usually seem to see the sessions as a positive thing, encouraging and a distraction / talking point.
Did not appear to cause any patient discomfort, my patients were sedated.
Decreased mobility has multiple side effects being able to mobilise/ exercise patients sooner should help to combat loss of muscle and decreased strength. With awake patient I think it can help their motivation, help feel making some progress. If physios arrange times with nursing staff so can time analgesia with physio be helpful to maintain patient comfort. Physio currently communicating very well with staff to co-ordinate their care.
Great idea! Keep going with it.
Your standard time management skills of touching base with the bedside nurse to arrange a mutually acceptable time makes this no harder than any other test or intervention for the bedside nurse.
Great idea to keep patients moving even if they cannot mobilise.
Can be quite bulky equipment wise!
Definitely benefits
This is awesome!!!!!!!
Liaise with nurse for timing of cycling to provide analgesia if required.
Everything that I have seen from the in-bed cycling has been positive, on both awake and unconscious patients. I don't have any suggestions.
Really good for mobility and even stretching when in passive mode. Have seen improvements in patients' mood and it's never in the way. Limited interference.
My patient was sedated and analgised therefore no change in pain observed.
Conscious patients respond well. Have seen patient try to improve their distance and this gives them a sense of improvement from the day before. No observed obs [observations] changes, appear to maintain muscle mass.
Nil suggestions, good communication with staff is in place at place.
An incredibly useful tool for critically unwell patients.
Nil issues.
In this instance the patient had minimal change from baseline pre/ during / post cycling. Although I have witness improvements in other patients prior to today.
Felt it gave patient control over situation – they had something to do.
Physiotherapist attended the patient with consult with bedside nurse. Pain relief discussed prior to commencement, monitored the entire time, session stopped if needed. Session time was dependant on the patients' medical situation, and if observations changed. I think as a bedside nurse it was good to see patients involved in this study especially if families indicated that the patients' usually active.
The patients I observed were unconscious and I did not see them when discharged from ICU so unsure if cycling helped.
Excellent incentive to get patients moving and hopefully decrease muscle wasting.
Wonderful exercise program for ICU patients. Looking forward to the results of the research.

I have only observed patients in a slow respiratory wean without pain issues cycling. I monitor their fatigue levels, and I have noticed that although they are fatigued at the end of the session, they slept much better.

No additional response (n=60)

Note: Authors comments to provide a context in square brackets

Physiotherapists

Any comments / suggestions about in-bed cycling?

Complement usual physiotherapy intervention well
--

Following patients through to the wards, patients who have cycled have seemed to be at a functional advantage. Seemed to progress faster. Patients in the ICU seem to be more alert when completing active cycling.

It may be possible to start first sessions early, depending on medical team [approval]. Is a great adjunct to normal sessions and seeing patients following cycling they appear better and stronger. Would be great to see on the ward more as well.
--

No additional response (n=5)

Note: Authors comments to provide a context in square brackets

Comparison of acceptability responses regarding the acceptability of in-bed cycling

Table S8: Comparison of acceptability responses regarding the acceptability of in-bed cycling expressed as median (IQR) and median word response, n = 176

Respondent	n=	In-bed cycling assisted patients' physical recovery	In-bed cycling assisted patients' feelings of well-being	Patients' pain during in-bed cycling	Patients' pain after in-bed cycling	If readmitted to ICU I would like to complete in-bed cycling again	In-bed cycling affected my ability to access the patient	In-bed cycling is beneficial for ICU patients
Patients	30	5 (4, 5) Strongly agree	4 (4, 5) Agree	3 (3, 4) No difference	3 (3, 4) No difference	5 (4, 5) Strongly agree	Not applicable	5 (4, 5) Strongly agree
Family	22	5 (4, 5) Strongly agree	4 (4, 5) Agree	3 (3, 4) No difference	Not enquired	5 (4, 5) Strongly agree	Not applicable	5 (4, 5) Strongly agree
Medical officers	21	4 (3, 4) Agree	3 (3, 4) Neither agree nor disagree	3 (3, 3) No difference	3 (3, 3) No difference	Not applicable	1 (1, 2) No change	4 (4, 4) Agree
Nurses	94	4 (4, 5) Agree	4 (3, 4) Agree	3 (3, 3) No difference	3(3, 3) No difference	Not applicable	2 (1, 2) Minimally affected	4 (4, 5) Agree
Physiotherapists	9	5 (4, 5) Strongly agree	4 (4, 5) Agree	3 (3, 3) No difference	3(3, 4) No difference	Not applicable	1 (1, 1) No change	5 (4, 5) Strongly agree

IQR, interquartile range, n, number; ICU, intensive care unit