Figure 3. Risk of bias summary in the included non-randomized studies.The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage II): Guo et al. 2022 Effects of a WeChat-based individualized post-discharge rehabilitation program on patients with lumbar fusion surgery.

Specify a target randomized trial specific to the study

Design	Quasi-experimental design
Participants	2 x 36
Experimental intervention	WeChat-based individualized post-discharge rehabilitation program
Comparator	Routine hospitalized patient exercise rehabilitation program

Is your aim for this study…?

X to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Numeric Rating Scale, ODI, exercise self-efficiency

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Continuous variables were presented as mean (standard deviation) or inter-quartile range, and categorical variables and ranked data as frequencies (p. 6).

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	1.1 PY Quote: "Strict randomization was not achieved in selecting the patients, which resulted in inconsistent baselines. Although the variables (age and education level) which caused baseline imbalances were included in the GEE analysis as covariants, the possibility of results being affected by unmeasured baseline imbalance variables cannot be ruled out" p. 11. Comment: The authors do not account for possible confounders: e.g. pain level, technological skills, exercise compliance before intervention	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	1.2 N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	NI No information on whether confounding might be present.	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	NI No information on whether confounding might be present.	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	NI No information on whether confounding might be present.	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?		Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	2.1 N Quote: "All patients included in the study met the following criteria: (1) underwent LFS with no prior history of spinal surgery; (2) received routine nursing care in the spinal surgery department of the hospital as per surgeon's discharge instructions; (3) were able to use smart phones and the WeChat app; and (4) were over 18 years of age and willing to cooperate in the data collection. The exclusion criteria were: (1) pregnancy; (2) serious organ diseases such as that of liver, lung, and brain; (3) inability to exercise due to musculoskeletal disorders or limb and joint deformities; and (4) readmission or reoperation due to disease progression or improper treatment" p. 2.	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	2.4 Y Quote: "The disease-related information of the patients was obtained by referring to the case files. The data was collected on the day before discharge, and in third first, second and third months after the surgery. The time of outcome measurements in the control group was the same, but the method of outcome measurements was by telephone" p. 6.	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?		Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	3.1 Y Quote: "Thirty-six eligible patients from the Spinal Surgery Department of the First People Hospital of Nantong were enrolled in the control group from October 2018 to November 2018, and thirty-six eligible patients were enrolled in the experimental group from December 2018 to February 2019. One participant from the experimental group dropped out during the study due to readmission. Five participants from the control group dropped out due to readmission (2 cases) and other reasons (3 cases)" p. 6. Comment: Fig. 1.	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	3.2 Y	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	3.3 PN	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?		Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	4.1 PN	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?		Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?		Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?		Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?		Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	5.1 PY Comment: Nearly all (92 %). Fig. 1.	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	5.2 PN Comment: Fig. 1	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	5.2 PN Comment: Fig. 1	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?	5.4 PY Comment: 1 lost to follow-up in the intervention group; 5 lost to follow-up in the control group. The reasons were readmission and drop-out. Fig. 1.	NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	5.5 NI	NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?		Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	6.1 PY Comment: Knowledge of the assignment could influence participant-reported outcomes.	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	6.2 Y Comment: The outcome assessor is the study participant.	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	6.3 Y Comment: Comparable methods of outcome measurement and time points.	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	6.4 PN	Y / PY / PN / N / NI
Risk of bias judgement	Moderate The methods of outcome assessment were comparable between the groups, and any error in measuring the outcome is only minimally related to intervention status.	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?		Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	7.1 PN Comment: The researchers' pre-specified intentions are not available in sufficient details.	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	7.2 PN Comment: Analysis intentions are not available.	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	7.3 PN Comment: Analysis intentions are not available.	Y / PY / PN / N / NI
Risk of bias judgement	Moderate Comment: There is no indication of selection of the reported analysis from among multiple analyses and there is no indication of selection of the cohort or subgroups for analysis and reporting on the basis of the results.	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?		Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Moderate risk of bias.	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?		Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable