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Evaluating the Effectiveness of a Digital Therapy Intervention (iCARE) to Treat Symptoms of Postpartum Depression: study protocol for a two–armed randomized controlled trial

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Study protocol

Keywords: Postpartum depression, Internet-based cognitive behavioral therapy, Randomized controlled trial, Maternal mental health, Digital health intervention, Self-guided therapy

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Titel page

Title: Evaluating the Effectiveness of a Digital Therapy Intervention (iCARE) to Treat Symptoms of Postpartum Depression: study protocol for a two—armed randomized controlled trial

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Trials structured Study Protocol template

Title (1)

Evaluating the Effectiveness of a Digital Therapy Intervention (iCARE) to Treat Symptoms of Postpartum Depression: study protocol for a two—armed randomized controlled trial

Names of protocol contributors {3a}

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Abstract

Background: Postpartum depression (PPD) is a common condition that can negatively affect maternal well-being and child development. Cognitive behavioral therapy an effective psychological treatment, but access is limited in many settings. Internet-based cognitive behavioral therapy offers a scalable alternative that can be delivered flexibly at home. This trial aims to evaluate the effectiveness and safety of a self-guided internet-based intervention, iCARE, compared to treatment as usual for mothers with symptoms of PPD.

Methods: This is a two-arm, parallel-group, randomized controlled superiority trial. Mothers within six months postpartum with an Edinburgh Postnatal Depression Scale score of 7–30 will be recruited through health nurses in 21 Danish municipalities and nationwide via self-recruitment through a project website. After baseline assessment, participants will be randomized 1:1 to iCARE plus usual care or usual care alone, stratified by symptom severity and recruitment pathway. The primary outcome is change in depressive symptoms from baseline to two months, with a secondary endpoint at six months. Key secondary outcomes include anxiety, functioning, automatic negative thoughts, and parental stress. Analyses will follow the intention-to-treat principle. Missing data will be handled with multiple imputation. Safety procedures include monitoring of symptom scores and predefined referral pathways for participants reporting self-harm thoughts or deterioration of depressive symptoms.

Discussion: This trial will provide evidence on the effectiveness and safety of a self-guided digital intervention for PPD in a real-world setting. If effective, iCARE could improve access to psychological support and reduce treatment gaps for mothers experiencing symptoms of PPD and potentially be implemented in a stepped care approach. Findings will inform future implementation strategies in public

health systems.

Trial registration: ClinicalTrials.gov ID: NCT07384273

Keywords

Postpartum depression; Internet-based cognitive behavioral therapy; Randomized controlled trial; Maternal mental health; Digital health intervention; Self-guided therapy.

Structured summary {1b}

Item	Description
Primary Registry and Trial Identifying Number {4}	ClinicalTrials.gov ID: NCT07384273
Secondary Identifying Numbers	Region of Southern Denmark: 23/15327; University of Southern Denmark: 12.250; University of Copenhagen: 514-1114/25-3000; Aarhus University: 2022-0367531. The Danish Health Research Ethics Committee: 16-0302-23.
Source(s) of Monetary or Material Support	Novo Nordisk Foundation (0077588) and Helsefonden (22-B-0255)
Primary Sponsor and contact information {3b}	Professor Trine Munk-Olsen, Department of Clinical Research, University of Southern Denmark, Research Unit of Child and Adolescent Psychiatry, Southern Denmark, Hospitalsringen 90, 5260 Odense S, Phone number +4524466297
Role of sponsor and funder {3c}	The study funder has had no role in study design, collection, management, analysis, interpretation of data, report writing, or the decision to submit the protocol for publication.
Contact for Public Queries	Tel: +45 24914740 Email: icare@rsyd.dk Web: https://icare.cedip.dk/
Contact for Scientific Queries	Trine Munk-Olsen, Department of Clinical Research, University of Southern Denmark, Research Unit of Child and Adolescent Psychiatry, Southern Denmark, Hospitalsringen 90, 5260 Odense S, Phone number +4524466297
Public Title	“iCARE: Digital selvhjælp til mødre med symptomer på fødselsdepression” [iCARE: Digital self-help for mothers with symptoms of postpartum depression]
Scientific title	Evaluating the Effectiveness of a Digital Therapy Intervention (iCARE) to Treat Symptoms of Postpartum Depression: study protocol for a two—armed randomized controlled trial
Countries of Recruitment	Denmark
Health Condition(s) or Problem(s) Studied	Symptoms of Postpartum depression
Intervention(s)	Selfguided internet based program (iCARE) including cognitive behavioural therapy (iCBT) with elements of Acceptance and

	Commitment therapy (ACT).
Key Inclusion and Exclusion Criteria	*Inclusion criteria* (1) Given birth within 6 months; (2) EPDS score of 7-30 points; (3) ≥age 18; (4) Access to the internet. *Exclusion criteria* (1) Do not understand Danish language; (2) Substance abuse or dependence; (3) Alcohol abuse, defined by a weekly consumption of alcohol exceeding 10 units; (4) A diagnosis of schizophrenia, other psychotic disorders or in immediate need of psychiatric treatment.
Study Type	Two-arm, parallel-group, single-blinded, randomized controlled superiority trial with 1:1 allocation
Date of First Enrollment (planned)	February 2nd 2026
Sample Size	356 participants, 178 in each arm.
Primary outcome(s)	Changes in Edinburgh Postnatal Depression Scale score from baseline to 2 months follow-up
Key Secondary outcome(s)	Generalized Anxiety Disorder assessment (GAD7) World Health Organization Disability Assessment Schedule (WHODAS 2.0) Automatic Thoughts Questionnaire 8 item version (ATQ-8) Danish Parental Stress Scale (DPSS)
Ethics Review	Medical Research Ethics Committees under the Danish National Center for Ethics (Journal No 16-0302-23)
Individual Trial Participant Data sharing statement	The individual de-identified participant data will be stored in (Open Patient data Explorative Network) and access will be available for affiliated researchers working with the existing permissions under relevant data governance and approvals. Data management and analysis code will be available from the corresponding author on reasonable request.

Protocol version {2}

Version 1 (16.02.2026)

Introduction

Background and rationale {9a}

Postpartum depression (PPD) is a depressive episode occurring after childbirth, characterized by symptoms such as low mood, loss of interest, fatigue, and impaired functioning (2, 3). The prevalence of PPD is estimated at 9.5% in high-income countries (4). If untreated, PPD can persist for months and negatively affect maternal well-being, child development, and family dynamics (5, 6). Early identification and timely intervention are therefore essential. In Denmark, health nurses systematically screen mothers using the

Edinburgh Postnatal Depression Scale (EPDS) during routine postpartum visits (1). Although EPDS is not diagnostic, a score of 11 or higher indicates risk of PPD (7).

Despite screening efforts, access to psychological treatment for PPD varies across municipalities, leading to unequal care (1). Cognitive behavioral therapy (CBT) is an effective psychological intervention for perinatal depression (8, 9), but limited availability and long waitlists create barriers. Internet-based CBT (iCBT) offers a scalable, cost-effective alternative that can be delivered flexibly at home (10, 11). Self-guided iCBT has demonstrated efficacy in reducing depressive symptoms compared to waitlist controls (12, 13). However, challenges remain, including high dropout rates (24–67%) and the need to monitor potential adverse effects (14, 15).

International studies support the effectiveness of self-guided iCBT for perinatal populations. Trials in Norway, Portugal, Iran, Australia, South Korea, and the United States have shown reductions in depressive symptoms and improvements in maternal well-being (16-24). Some recent iCBT based interventions have also incorporated elements of Acceptance and Commitment Therapy (ACT) — which emphasizes psychological flexibility via mindfulness-based acceptance and value-driven action—and have demonstrated efficacy in reducing postpartum depression symptoms (25). These kinds of interventions (either iCBT or iCBT + ACT) have not yet been tested and evaluated in Denmark.

Explanation for the choice of comparator {9b}

In Denmark, there is considerable variation in the availability and quality of prevention and treatment options for mothers experiencing symptoms of PPD, leading to inconsistent and sometimes unequal care across municipalities (1). Some regions offer specialized psychological support, while others provide only basic follow-up visits by health nurses. Even where services exist, barriers such as stigma, transportation challenges, and lack of childcare often prevent mothers from accessing treatment.
Given these disparities, the trial evaluates iCARE as an add-on to treatment as usual (TAU) rather than as a replacement. This approach reflects real-world conditions and ensures that participants retain access to existing care pathways. From an ethical perspective, withholding usual care or assigning mothers to a waitlist-only control would be inappropriate, as untreated depression can worsen and negatively impact maternal and child health (5, 6). By offering iCARE alongside standard care, the study aims to improve accessibility while safeguarding participants' right to receive available support.

Objectives {10}

The primary aim of this trial is to investigate whether a self-guided iCBT + ACT intervention, iCARE, in addition to TAU, is more effective than TAU alone in reducing symptoms of PPD. We hypothesise that mothers receiving iCARE will show a greater improvement in depressive symptoms, measured by the EPDS, at 2 months (primary endpoint) and 6 months (secondary endpoint) compared to those receiving TAU. Secondary aims are to evaluate whether iCARE improves anxiety and impairment at 2 and 6 months, and whether the intervention leads to better outcomes in maternal cognitive and emotional functioning at 2 months, including fewer automatic negative thoughts, and reduced parental stress.

Methods: Patient and public involvement, and trial design

Patient and public involvement {11}

Patient and public involvement has been integrated throughout the development of the intervention. During the design phase, we conducted interviews with mothers who had experienced PPD to ensure that the intervention content, format, and usability reflected the needs and preferences of the target population. Feedback from these interviews informed the intervention structure, language, and inclusion of practical exercises. Additionally, a usability test was carried out with mothers prior to trial initiation to evaluate acceptability and user-friendliness, leading to further refinements.

An advisory board was established at the start of the project, including representatives from patient organizations (e.g., “Sind og Fødsel”), clinical researchers, and health professionals. This board provided input on recruitment strategies, safety procedures, and participant information materials. Health nurses from participating municipalities were also consulted to align trial procedures with routine care and ensure feasibility in real-world settings.

Public involvement will continue during the conduct of the trial through regular communication with health nurses and patient representatives to address emerging issues and maintain transparency. For dissemination, results will be shared not only through scientific publications but also in lay summaries tailored for mothers and families, which will be published on the project website. These summaries will explain the findings in accessible language and highlight implications for practice.

Trial design {12}

This trial is a randomized (allocation 1:1), controlled, parallel-group superiority trial. Eligible participants will be randomised to iCARE in addition to TAU or TAU alone. The primary outcome will be change in depressive symptoms, measured using the EPDS, from baseline to 2 months after initiating iCARE. Secondary outcome assessment will be from baseline to 6 months follow-up. The trial protocol is reported in accordance with the existing Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) statement (26), and the trial report will follow the Consolidated Standards of Reporting Trials (CONSORT) guidelines (27). The analysis plan and description of the intervention are reported in accordance with respective guidelines (28, 29).

Process Evaluation

A qualitative process evaluation of the iCARE intervention will be conducted alongside the randomized trial to explore implementation, acceptability, and mechanisms of impact. Its primary aim is to understand how participants experience iCARE, with particular focus on implementation fidelity, acceptability, and contextual influences. The secondary aim is to explore perceived mechanisms of change (e.g., cognitive, emotional, behavioral) and identify barriers and facilitators to participant engagement (Detailed description in Supplementary 1).

Methods: Participants, interventions and outcomes

Trial setting {13}

The 21 participating municipalities include Brønderslev, Egedal, Greve, Haderslev, Hedensted, Herning, Ishøj, Kalundborg, Kerteminde, Lolland, Nyborg, Odsherred, Rønne, Slagelse, Svendborg, Stevns, Tårnby, Vejen, Viborg, Vordingborg, and Aabenraa. Self-recruitment through the iCARE webpage is nationwide.

Characteristics of the people who are needed for the trial

Table 1: Characteristics of participants needed for the trial

Characteristic	**The participants we would expect to see included**
Age	Mean: 31.7 years
Sex	Female
Gender	Female
Race, ethnicity and ancestry	All
Socioeconomic status	High, middle, low
Geographic location	Recruitment through health nurses in 21 municipalities: Brønderslev, Egedal, Greve, Haderslev, Hedensted, Herning, Ishøj, Kalundborg, Kerteminde, Lolland, Nyborg, Odsherred, Rønne, Slagelse, Svendborg, Stevns, Tårnby, Vejen, Viborg, Vordingborg, and Aabenraa Online recruitment: nationwide in Denmark
Other characteristics relevant to the trial	(1) Given birth within 6 months; (2) EPDS score of 7-30 points; (3) ≥age 18; (4) Access to the internet; (5) Understand Danish language

Eligibility criteria for participants {14a}

Inclusion criteria

(1) Given birth within 6 months; (2) EPDS score of 7-30 points; (3) ≥age 18; (4) Access to the internet.

Exclusion criteria

(1) Do not understand Danish language; (2) Substance abuse or dependence; (3) Alcohol abuse, defined by a weekly consumption of alcohol exceeding 10 units; (4) A diagnosis of schizophrenia, other psychotic disorders or in immediate need of psychiatric treatment.

Eligibility criteria for sites and those delivering interventions {14b}

Participating municipalities function solely as recruitment sites. Municipalities were chosen as eligible if they

were willing and able to support recruitment through health nurses conducting routine home visits as part of standard perinatal care, without introducing substantial additional administrative or organisational burden. Very large municipalities were not included, as implementation of iCARE within these settings was considered infeasible. In large municipalities, maternal and child health services are typically organised across multiple administrative units with several lead health nurses and contact persons. This organisational structure limits the possibility for direct and consistent communication at the municipal level and increases the risk of heterogeneity in recruitment procedures and care practices within a single municipality. Municipalities offering highly specialised postpartum mental health services were also excluded, as the added value of an internet-based self-help intervention was expected to be limited in settings where structured specialist services are already routinely available.
Municipalities were recruited in two phases using an existing list of lead health nurses. Only one municipality declined participation.

Who will take informed consent? {32a}

Written informed consent from all participating mothers will be obtained electronically via secure digital mail (Digital post) sent from REDCap (Research Electronic Data Capture) prior to randomization. Participants will receive detailed oral information from health nurses or a person from the research team, as well as written information via secure digital mail about the study purpose, procedures, potential risks, and their right to withdraw at any time without consequences for usual care. A copy of the signed consent form will be provided to each participant.

Additional consent provisions for collection and use of participant data and biological specimens {32b}

Intervention and comparator

Intervention and comparator description {15a}

Participants randomized to the intervention group will receive iCARE, a self-guided digital therapy intervention designed for mothers with symptoms of PPD. The iCARE program is a self-guided iCBT intervention that also incorporates exercises and approaches from ACT. The iCARE program consists of four core modules and four optional modules. The core modules focus on self-care (Module 1), identifying and reframing unrealistic expectations with self-compassion (Module 2), increasing positive experiences and countering self-critical thoughts (Module 3), and recognizing and challenging thinking traps (Module 4). Together, the intervention aim to enhance psychological flexibility, reduce negative thinking, and promote well-being in daily life. The additional optional modules provide strategies for practicing being present, communicating needs and asking for support, bonding with the baby, and coping with anxious and intrusive thoughts (Detailed description of the intervention in Supplementary 2).
The comparator group will receive TAU, which consists of standard care provided by municipal health services and general practitioners. In Denmark, there is large variation in the available prevention and treatment municipalities offers for mothers experiencing symptoms of PPD. Some municipalities offer

specialized psychological support and support groups, while others provide only basic follow-up visits by health nurses. Mothers can also be referred to their general practitioner, who can provide free ongoing follow-up and prescribe antidepressant medication if needed. Alternatively, it is possible to be referred to a privately practicing psychologist, usually with some out-of-pocket cost or covered by private insurance.

Criteria for discontinuing or modifying allocated intervention/comparator {15b}

Participants may discontinue the intervention at any time without consequences for their usual care. Discontinuation will occur if a participant withdraws consent or if safety monitoring indicates acute psychiatric needs requiring referral to specialized care. No modifications to the intervention content are planned during the trial.

Strategies to improve adherence to intervention/comparator {15c}

To support adherence, participants will receive clear instructions during enrolment emphasizing that the intervention is flexible and can be completed at their own pace.
Automated weekly reminders will be sent from the iCARE platform to encourage participants to continue engaging with the iCARE intervention. Also, automated reminders will be sent through secure digital mail to encourage completion of follow-up assessments. In addition, a technical support call will be offered approximately two weeks after the intervention begins to address any platform-related issues and provide guidance if needed. Throughout the trial, participants will have access to assistance from the research team for technical or procedural questions. Adherence will be monitored using platform log data, including the number of logins, modules completed, and time spent on the intervention, allowing the team to identify and address potential barriers promptly and provide relevant technical support to the mothers if necessary.
To further promote completion of study assessments, all surveys have been designed to be as brief as possible to reduce participant burden. In line with this, two secondary outcomes (ATQ-8 and DPSS) are measured only at the 2-month follow-up rather than at baseline, to keep the baseline assessment concise and minimize risk of dropout or survey fatigue.

Concomitant care permitted or prohibited during the trial {15d}

All participants may continue or initiate any usual care offered by their municipality or general practitioner during the trial, including medical treatment. The intervention is provided as an add-on and does not replace existing treatment options. No treatments are prohibited. Participants will be encouraged to seek additional support if needed, and any concomitant care will be documented at baseline and follow-up.

Ancillary and post-trial care {34}

Participants will have continued access to the iCARE intervention until trial completion. Information about relevant support services will be provided at the end of the study. In case of harm related to participation, participants are covered under the Danish patient compensation scheme, and guidance on how to apply will be provided to the participants.

Outcomes {16}

Baseline Characteristics

Participants will be described using baseline variables: age, educational level, marital status, social isolation (Berkman-Syme Social Network index), region, number of children, complications during pregnancy/delivery, breastfeeding status, age of baby, antidepressant use, nonpharmacological depression treatment, Six-Item Adult ADHD Self-Report (ASRS-6), other mental disorders than depression, previous depression, previous treatment for depression past 5 years, previous treatment for anxiety, and partner's mental health (30, 31).

Primary outcome

Edinburg Postnatal Depression Scale (EPDS)

The EPDS is a validated screening questionnaire that measures symptoms of postnatal depression, such as low mood, anxiety, and loss of enjoyment, over the past week. It helps identify mothers who may need further assessment or support but does not provide a diagnosis. The primary outcome is the between-group difference in change from baseline to 2-months follow-up in EPDS score (range 0–30; higher scores indicate more severe symptoms) (32). The secondary endpoint from baseline to 6 months follow-up will also be assessed. A clinically meaningful response is defined as a ≥3-point reduction from baseline (7), from which participants will be categorized as responders/non-responders, and proportions will be reported for each group.

Key secondary outcome

Generalized Anxiety Disorder assessment (GAD7)

The GAD-7 is a validated self-report questionnaire designed to assess symptoms of generalized anxiety disorder and overall anxiety severity. It consists of seven items scored from 0 (not at all) to 3 (nearly every day), producing a total score ranging from 0 to 21 (33, 34). Higher scores indicate greater anxiety symptoms. While the GAD-7 was originally developed to measure Generalized Anxiety Disorder, it has also been validated as a general measure of symptom severity of anxiety across different anxiety disorders in heterogeneous samples (33). In this trial, changes in GAD-7 scores from baseline to 2 and 6 months will indicate whether the intervention reduces anxiety symptoms.

World Health Organization Disability Assessment Schedule (WHODAS 2.0)

WHODAS 2.0 is a generic, internationally validated tool for assessing health-related disability and functioning. The 12-item version used here provides a total score from 0 (no disability) to 48 (severe disability) (35). It captures the broader impact of mental health symptoms on daily functioning and quality of life. Changes from baseline to 2 and 6 months will help determine whether iCARE improves overall functioning beyond symptom reduction.

Automatic Thoughts Questionnaire 8 item version (ATQ-8)

The ATQ-8 measures the frequency of automatic negative thoughts (negative self-statements). The shortened version includes 8 items rated on a 5-point Likert scale, assessing thoughts such as self-criticism, hopelessness, and personal failure. Scores range from 0 (few negative thoughts) to 32 (frequent negative

thoughts) (36). Evaluating between-group differences in ATQ-8 at 2 months follow-up will indicate whether the intervention effectively targets maladaptive thinking patterns.

Danish Parental Stress Scale (DPSS)

The DPSS measures stress related to parenting responsibilities. It consists of 18 items rated on a 5-point scale, with total scores ranging from 18 (low stress) to 90 (high stress) (37). Assessing between group differences in DPSS at 2 months will help determine whether the intervention reduces stress associated with caring for an infant.

Exploratory outcomes

Exploratory outcomes regarding the potential effect on the children of the participating mothers will be investigated in another publication. These outcomes include withdrawal symptoms (measured with the health nurse reported Alarm Distress Baby Scale), social and emotional challenges (measured with Ages and Stages Questionnaire, ASQ-SE), general wellbeing (including crying and feeding patterns), and medical care (including emergency room visits and all hospitalizations including infections, respiratory and digestive system disorders from population registers) (38, 39).

Harms {17}

Harms are defined as worsening in depression score (EPDS score>18), thoughts of self-harm, and negative effects (NEQ). NEQ measures experienced negative effects during treatment (40). To adapt it to the self-guided delivery format, we will remove the three questions pertaining to the therapist interaction, since no therapist interaction is available (items 21, 23, and 25), resulting in 29 items each score from 0-4 (total score 0-116). The NEQ is measured at two-months follow-up. Participants in the study will be asked to complete the EPDS after completing each of the main modules in the intervention and before enrolling, before randomization, at 2 months follow-up and 6 months follow-up. If deterioration occur, the author group will contact the participant and assess the suicide risk. The intervention has a function that calculates the mother's EPDS score. If the score is >18, the mother is advised to seek guidance from a health nurse or general practitioner, recognizing that she may need support beyond what the intervention can offer.

Participant timeline {18}

Tabel 2: Schedule of enrolment, interventions, and assessments.

	TRIAL PERIOD				
	Enrollment		Post-randomization		
TIMEPOINT	***-t_1*** ***(Screening)***	**0 (Baseline)**	***t_1*** ***(0-2 months)***	***t_2*** ***(2 months)***	***t_3*** ***(6 months)***
ENROLLMENT:					
Eligibility screen	X				
Informed consent	X				
Randomization		X			
INTERVENTION/ COMPARATOR:					
iCARE		X[1]	X[1]	X[1]	
TAU	X	X	X	X	X
ASSESSMENTS:					
Baseline Age, age of baby, educational level, marital status, social isolation, region, number of children, complications during pregnancy/delivery, breastfeeding, age of baby, ASRS-6, other mental disorders, previous depression, previous treatment, partner's mental disorder		X			
Primary outcome EPDS	X	X	X[1] X[1] X[1] X[1]	X	X
Secondary outcomes ATQ-8, DPSS				X	
Secondary outcomes GAD-7, WHODAS 2.0		X		X	X
Harms NEQ				X[1]	
Other Information about other treatment		X		X	

iCARE: internet-based cognitive behavioral therapy intervention, TAU: treatment as usual, ASRS-6: Six-Item Adult ADHD Self-Report, Social isolation: Berkman-Syme social network index, EPDS: Edinburg Postnatal Depressions scale, ATQ-8: Automatic Thoughts Questionnaire 8 item version, DPSS: Danish Parental Stress Scale, GAD7: Generalized Anxiety Disorder assessment, WHODAS 2.0: World Health Organization disability assessment schedule 2.0., NEQ: Negative Effects Questionnaire.

[1]Only in the intervention group (iCARE)

Sample size {19}

The power calculation is based on two randomization arms with an equal number in each. The outcome is measured on the EPDS scale, where a change of 3 is considered clinically relevant (25). The EPDS scale is not normally distributed, hence, we cannot use the standard deviation (which is 5) alone to take the variation into account. Instead, we applied sqrt (2) * SD. We set a significance level of 5% and a power of 80%. This

results in a calculation indicating a need for 89 participants in each arm (178 in total). Because the intervention is self-guided, we expect a (worst case) dropout rate of 50% at two months follow-up (21). This results in doubling the number of participants needed in each arm, resulting in 356 participants in total.

Recruitment {20}

Participants will be recruited through two pathways: health nurses in 21 collaborating municipalities and self-recruitment via a national project website. Recruitment through health nurses follows existing municipal screening procedures, where all mothers are routinely offered screening with the EPDS approximately two months after childbirth. Health nurses will provide verbal and written information about the study to eligible mothers during home visits and encourage participation if inclusion criteria are met. Recruitment progress will be monitored continuously, and periodic updates will be communicated to municipal health nurses to address any questions or challenges.

To facilitate self-recruitment via the project website, awareness will be raised through targeted campaigns on social media platforms (e.g., Facebook, Instagram) and news outlets, as well as advertisements on relevant websites. Mothers who have given birth within the past six months can visit the project website, where they will find detailed information about the trial and complete an online screening questionnaire. If eligibility criteria are met, they will receive a phone call from a member of the research team and be given both written and oral information about the study. Afterwards, participants will proceed to electronic consent and baseline assessment before randomization.

To ensure that no individual participates more than once, the participant's civil registration number (CPR number) will be checked for duplicates each time the screening form is submitted. Participants cannot proceed to randomisation until this check has been successfully completed.

Assignment of interventions: randomisation

Sequence generation: who will generate the sequence {21a}

Randomization will be performed using a computer-generated randomization schedule created in REDCap by an independent data manager.

Sequence generation: type of randomisation {21b}

After completion of the baseline assessment, participants will be randomized in a 1:1 ratio to either iCARE + TAU or TAU alone. Stratified randomization will be applied based on baseline EPDS score (<11, 11–18, >18) to ensure balance in depression severity across groups, as well as stratification on recruitment type (self-recruitment online or through health nurses). Randomization is fully automated within REDCap and occurs immediately after baseline data entry.

Allocation concealment mechanism {22}

The allocation sequence is concealed within REDCap and cannot be accessed by investigators or health nurses. The randomization sequence is securely stored in the REDCap system and managed exclusively by the independent data manager. This ensures that group assignment remains unknown until the point of allocation.

Implementation {23}

The randomization procedure is implemented automatically in REDCap after baseline survey completion. Health nurses and research staff involved in recruitment have no influence on the allocation process. Participants are informed of their group assignment via secure digital mail (Digital post) after randomization.

Assignment of interventions: blinding

Who will be blinded {24a}

Investigators and statisticians will be blinded to group assignment. Due to the nature of the intervention, participants and health nurses cannot be blinded. Health nurses maintain ongoing contact with participants but are not involved in outcome assessment or data analysis, minimizing risk of bias.

How will be blinding be achieved {24b}

Investigators and statisticians will remain blinded to group allocation during data cleaning and preliminary interpretation.

Procedure for unblinding if needed {24c}

The randomization sequence will only be unsealed after consensus interpretation of blinded results has been documented.

Data collection and management

Plans for assessment and collection of outcomes {25a}

All outcome data will be collected electronically via REDCap at baseline, 2-month, and 6-month follow-up. Participants will receive automated reminders and notifications prior to each scheduled assessment through secure digital mail (Digital post).

Plans to promote participant retention and complete follow-up {25b}

If questionnaires are not completed within 7 days, a follow-up reminder will be sent, and participants who have consented to telephone contact will receive a call from the research team supporting completion and providing technical assistance if needed. If the participant is not reached by phone, the research team will send an email.

Data management {26}

Participants will complete all trial questionnaires electronically via REDCap. Built-in validation rules and mandatory fields will be applied to minimize missing data and ensure completeness of responses. Data entry will occur in real time, and automated range checks will be implemented for selected variables. Each participant will be assigned a unique study identification number to ensure pseudo-anonymisation. No directly identifiable information will be stored in the analytical dataset. All electronic data will be encrypted and stored on a password-protected server within the Region of Southern Denmark, in compliance with institutional policies and the General Data Protection Regulation (GDPR).

Access to raw data will be restricted to authorized study personnel only. Data handling procedures, including storage and transfer, will follow institutional security protocols. The raw dataset will be retained for ten years after trial completion, after which it will be archived under secure conditions with indefinite restricted access due to the sensitive nature of the data. Audit trails within REDCap will document all data entry, modifications, and user activity. Data quality will be monitored regularly by the data manager, and any discrepancies will be resolved according to predefined procedures.

Following publication of the primary results, the statistical code will be made available upon reasonable request to the corresponding author, subject to approval by the data controller and compliance with ethical and legal requirements.

Confidentiality {33}

All participant data will be pseudo-anonymised by assigning unique study IDs. Identifiable information will be stored separately from research data on encrypted, password-protected servers in compliance with GDPR. Access is restricted to authorized study personnel only. Publications will present aggregated data to ensure participant confidentiality.

Statistical methods

Statistical methods for primary and secondary outcomes {27a}

All analyses will follow the principles outlined by the updated SPIRIT and CONSORT guidelines for randomized controlled trials (26, 27). Descriptive statistics will summarize baseline characteristics by group using counts and percentages for categorical variables and as mean and standard deviation (SD) or median and interquartile range (IQR) for continuous variables, depending on distribution. No statistical tests will be performed, but clinically relevant imbalances will be noted.

The primary outcome is the change in EPDS score from baseline to 2 months (primary endpoint) and 6 months (secondary endpoint). Between-group differences over time will be estimated using linear mixed-effects models with fixed effects for group, time (baseline, 2 months, 6 months), and group × time interaction, and a random intercept for participant ID to account for repeated measures. Recruitment pathway (health nurse vs. self-recruitment) will be included as a covariate. Baseline values will be included as dependent

observations. Model assumptions will be assessed via residual diagnostics (Q-Q plots, residual plots). If violations occur, transformations or heteroskedasticity-robust standard errors will be considered.

Key secondary outcomes (GAD-7, WHODAS 2.0) will be analyzed using mixed-effects models for repeated measures. Outcomes assessed only at 2 months (ATQ-8, DPSS) will be analyzed using linear regression adjusted for recruitment pathway. All estimates will be reported as mean differences with 95% confidence intervals (CIs) and two-sided p-values (<0.05 considered statistically significant).
Harms will be summarized descriptively by group and include worsening of depressive symptoms (EPDS >18), self-harm thoughts, and negative effects measured by the Negative Effects Questionnaire (NEQ). Frequencies and percentages will be presented at 2 and 6 months.

All analyses will be performed using Stata (StataCorp, College Station, TX, USA). Results will be presented with 95% CIs and p-values.

Who will be included in each analysis {27b}

The primary analysis will be conducted according to the intention-to-treat (ITT) principle, including all randomized participants in the groups to which they were allocated, regardless of adherence or protocol deviations. Sensitivity analyses will include Per-protocol (PP) (excluding participants who did not complete the intervention (fewer than four modules)) and As-treated (AT) (reclassifying non-adherent participants to the control group).

How missing data will be handled in the analysis {27c}

Efforts will be made to follow up all randomized participants regardless of adherence. If missing data remain, multiple imputation using chained equations will be applied under the assumption of missing at random. The primary analysis will use imputed datasets; sensitivity analyses will include complete-case analysis.

Methods for additional analyses (e.g. subgroup analyses) {27d}

Sensitivity analyses will assess robustness of ITT results using PP and AT populations. Prespecified analyses will explore whether treatment effects differ by baseline depression severity (EPDS strata), recruitment pathway, and presence of other treatments, using interaction terms in mixed models. Additional subgroup analyses may be conducted if sample size permits.
No formal adjustment for multiple testing will be applied; interpretation of secondary outcomes will consider potential multiplicity.

Interim analyses {28b}

No statistical interim analyses or stopping guidelines are planned for this trial because the intervention is considered low risk and safety monitoring is integrated into the study procedures. The principal investigator and research team will oversee participant safety and trial conduct, including monitoring harms and protocol

compliance.

Protocol and statistical analysis plan {5}

A detailed statistical analyses plan can be found in Supplementary 3.

Oversight and monitoring

Composition of the coordinating centre and trial steering committee {3d}

Administrative tasks, data collection, verification, storage, and analysis of data will take place at Southern University of Denmark (SDU). Recruitment will take place through health nurses in the 21 participating municipalities and online nationwide. Key personnel involved in decision making in the study include PI (Trine Munk-Olsen), Co-PI's (Kathrine Bang Madsen and Maria Marti Castaner), post.doc (Christine Leonhard Birk Sørensen) PhD student (Anja Friis Elliott), and research assistants (Charlotte Thomsen and Stine Sinning). Research assistants and post.doc will be responsible for implementing study procedures under supervision of the PI.

Composition of the data monitoring committee, its role and reporting structure {28a}

A formal Data Monitoring Committee has not been established for this trial because the intervention is considered low risk and safety monitoring is integrated into the study procedures.

Frequency and plans for auditing trial conduct {29}

Trial monitoring will follow a risk-based approach led by the principal investigator. The research team will review compliance with key procedures every six months, including timely questionnaire distribution, consent documentation, and secure data storage in REDCap. Weekly checks of incoming data will be performed by the project coordinator, with monthly updates to the principal investigator. In addition, quarterly communication with head health nurses in participating municipalities will address recruitment progress and any operational issues. All monitoring activities will be documented and archived.

Protocol amendments {31}

Any substantial amendments to the protocol will be submitted for approval to the ethics committee and updated in the trial registry before implementation. All changes will be documented in the version history of the protocol.

Dissemination policy {8}

Results (positive, negative, or inconclusive) will be submitted to peer-reviewed journals (open access where feasible), presented at conferences, disseminated to health nurses in participating municipalities, reported on the project homepage with lay summaries, and posted in the registry.

Discussion

This trial addresses a critical gap in the treatment of PPD by evaluating the effectiveness and safety of a self-guided iCBT + ACT intervention, iCARE, as an adjunct to TAU. PPD is a prevalent condition with significant consequences for maternal and child health (4-6), yet access to psychological interventions remains limited in Denmark due to resource constraints and regional differences in service provision (1). Digital interventions such as iCARE offer a scalable, cost-effective solution that can be delivered flexibly, potentially reducing barriers related to stigma, transportation, and childcare (10, 11).

The study design reflects real-world conditions by allowing participants to continue usual care while receiving the intervention. This pragmatic approach enhances external validity and ensures ethical conduct by not withholding standard treatment. Stratified randomization and prespecified sensitivity analyses will help account for variability in usual care across municipalities. The inclusion of mothers with a broad range of symptom severity, including those with high EPDS scores but without acute psychiatric needs, increases generalizability and aligns with recommendations to avoid unnecessary exclusion of vulnerable groups (41). Enhanced safety procedures, including monitoring of symptom scores and predefined referral pathways, mitigate potential risks associated with self-guided interventions.

The trial's strengths include its randomized controlled design, integration of patient and public involvement in intervention development, and comprehensive outcome assessment covering depressive symptoms, anxiety, functioning, cognitive and emotional processes, and parental stress. A key limitation is the reliance on self-reported measures, which may introduce reporting bias because no clinician-rated outcomes are collected. Another limitation is potential attrition, which will be addressed through adherence monitoring and the use of multiple imputation to handle missing data. As an effectiveness study, the trial does not standardize usual care, which may introduce heterogeneity; however, this reflects real-world practice and will be explored through subgroup analyses.

If iCARE proves effective, the findings could inform implementation strategies for digital mental health interventions in routine perinatal care potentially as part of a stepped care approach, contributing to improved accessibility and equity in maternal mental health services.

Trial status

Participant enrolment started February 1st, 2026, and is expected to be completed at the latest on February 1st, 2028, or before, if sample size is reached. This protocol is version 1 (16.02.2026).

Abbreviations

ACT: Acceptance and Commitment therapy

ASRS-6: Six-Item Adult ADHD Self-Report

AT: As Treated

ATQ-8: Automatic Thoughts Questionnaire 8 item version

CBT: cognitive behavioral therapy

CONSORT: Consolidated Standards of Reporting Trials guidelines

CPR number: Civil Registration number

DPSS: Danish Parental Stress Scale

EPDS: Edinburg Postnatal Depressions scale

GAD7: Generalized Anxiety Disorder assessment

GDPR: General Data Protection Regulation

iCARE: internet-based cognitive behavioral therapy intervention with elements of Acceptance and Commitment Therapy

iCBT: internet-based cognitive behavioral therapy

IQR: interquartile range

ITT: Intention to Treat

NEQ: Negative Effects Questionnaire

PP: Per Protocol

PPD: Postpartum depression

REDCap: Research Electronic Data Capture

SD: Standard deviation

SPIRIT: Standard Protocol Items: Recommendations for Interventional Trials

TAU: treatment as usual

WHODAS 2.0: World Health Organization disability assessment schedule 2.0

Declarations

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We are grateful to the members of our advisory board for their valuable input throughout the project. In particular, we thank Kim Mathiasen for his expert feedback during the development phase, drawing on his extensive experience with digital mental-health interventions, and Johanne Smith-Nielsen for her

contributions through the advisory board, informed by her significant expertise in maternal mental-health research, stakeholder engagement, and collaboration with municipal health services.

Authors' contributions {3a}

AFE, KBM, MMC, CT, FHM, and TMO were part of the trial design. CLBS, SS and CNP contributed to discussion of the design and CLBS described the statistical analysis plan. AFE and CLBS wrote the first draft of the protocol, while KBM, MMC, SS, CNP, FHM, CT and TMO revised the protocol, and all authors approved the final version. Both AFE and CLBS contributed equally to this work and share first authorship.

Sources of funding and other support {7a}

The Novo Nordisk Foundation (0077588) and Helsefonden (22-B-0255) have supported the trial. The authors declare no conflicts of interest for principal investigators and steering committee members.

Availability of data and materials {6}

The individual de-identified participant data will be stored in Open Patient data Explorative Network, University of Southern Denmark, and access will be available for only affiliated researchers working with the study permission and under the relevant data governance and approvals. The data management and analysis code will be available from the corresponding author on reasonable request.

Ethics approval and consent to participate {30}

The trial has been approved by the Medical Research Ethics Committees under the Danish National Center for Ethics (Journal No 16-0302-23). Data management and processing are registered in institutional GDPR directories for all participating institutions: Region of Southern Denmark (Journal No. 23/15327), University of Southern Denmark (Notification No. 12.250), University of Copenhagen (Case No. 514-1114/25-3000), and Aarhus University (Journal No. 2022-0367531).

Consent for publication

Consent forms are available upon request.

Competing interests {7b}

The authors declare that they have no competing interests.

Authors' information (optional)

References

1. Sundhedsstyrelsen. Kortlægning af eksisterende indsatser vedr. tidlig opsporing og behandling af fødselsdepressioner: Sundhedsstyrelsen; 2021. Available from: https://www.sst.dk/-/media/Viden/Boernesundhed/Rapport_foedselsdepressioner_Version-1_1-_002_.ashx?la=da&hash=6BA7191A7A2D71C717B1DB796C949136F5B9DBDE.
2. Wisner KL, Moses-Kolko EL, Sit DK. Postpartum depression: a disorder in search of a definition. Arch Womens Ment Health. 2010;13(1):37–40.
3. World Health Organization. The ICD-10 classification of mental and behavioural disorders : clinical descriptions and diagnostic guidelines. Geneva: World Health Organization; 1992. 362 s. p.
4. Woody CA, Ferrari AJ, Siskind DJ, Whiteford HA, Harris MG. A systematic review and meta-regression of the prevalence and incidence of perinatal depression. J Affect Disord. 2017;219:86–92.
5. Howard LM, Molyneaux E, Dennis CL, Rochat T, Stein A, Milgrom J. Non-psychotic mental disorders in the perinatal period. Lancet. 2014;384(9956):1775–88.
6. Meltzer-Brody S, Howard LM, Bergink V, Vigod S, Jones I, Munk-Olsen T, et al. Postpartum psychiatric disorders. Nat Rev Dis Primers. 2018;4:18022.
7. Smith-Nielsen J, Matthey S, Lange T, Væver MS. Validation of the Edinburgh Postnatal Depression Scale against both DSM-5 and ICD-10 diagnostic criteria for depression. BMC Psychiatry. 2018;18(1):393.
8. Vigod SN, Frey BN, Clark CT, Grigoriadis S, Barker LC, Brown HK, et al. Canadian Network for Mood and Anxiety Treatments 2024 Clinical Practice Guideline for the Management of Perinatal Mood, Anxiety, and Related Disorders: Guide de pratique 2024 du Canadian Network for Mood and Anxiety Treatments pour le traitement des troubles de l'humeur, des troubles anxieux et des troubles connexes périnatals. Can J Psychiatry. 2025;70(6):429–89.
9. Branquinho M, Rodriguez-Muñoz MF, Maia BR, Marques M, Matos M, Osma J, et al. Effectiveness of psychological interventions in the treatment of perinatal depression: A systematic review of systematic reviews and meta-analyses. J Affect Disord. 2021;291:294–306.
10. Andrews G, Basu A, Cuijpers P, Craske MG, McEvoy P, English CL, et al. Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: An updated meta-analysis. J Anxiety Disord. 2018;55:70–8.
11. Hedman E, Ljótsson B, Kaldo V, Hesser H, El Alaoui S, Kraepelien M, et al. Effectiveness of Internet-based cognitive behaviour therapy for depression in routine psychiatric care. J Affect Disord. 2014;155:49–58.
12. Andersson G, Cuijpers P. Internet-based and other computerized psychological treatments for adult depression: a meta-analysis. Cogn Behav Ther. 2009;38(4):196–205.
13. Karyotaki E, Riper H, Twisk J, Hoogendoorn A, Kleiboer A, Mira A, et al. Efficacy of Self-guided Internet-Based Cognitive Behavioral Therapy in the Treatment of Depressive Symptoms: A Meta-analysis of Individual Participant Data. JAMA Psychiatry. 2017;74(4):351–9.
14. Gilbody S, Littlewood E, Hewitt C, Brierley G, Tharmanathan P, Araya R, et al. Computerised cognitive behaviour therapy (cCBT) as treatment for depression in primary care (REEACT trial): large scale pragmatic randomised controlled trial. Bmj. 2015;351:h5627.

15. Etzelmueller A, Vis C, Karyotaki E, Baumeister H, Titov N, Berking M, et al. Effects of Internet-Based Cognitive Behavioral Therapy in Routine Care for Adults in Treatment for Depression and Anxiety: Systematic Review and Meta-Analysis. J Med Internet Res. 2020;22(8):e18100.
16. Haga SM, Drozd F, Lisøy C, Wentzel-Larsen T, Slinning K. Mamma Mia - A randomized controlled trial of an internet-based intervention for perinatal depression. Psychol Med. 2019;49(11):1850–8.
17. Carona C, Pereira M, Araújo-Pedrosa A, Canavarro MC, Fonseca A. The Efficacy of Be a Mom, a Web-Based Intervention to Prevent Postpartum Depression: Examining Mechanisms of Change in a Randomized Controlled Trial. JMIR Ment Health. 2023;10:e39253.
18. Danaher BG, Seeley JR, Silver RK, Tyler MS, Kim JJ, La Porte LM, et al. Trial of a patient-directed eHealth program to ameliorate perinatal depression: the MomMoodBooster2 practical effectiveness study. Am J Obstet Gynecol. 2023;228(4):453.e1–.e10.
19. Jannati N, Mazhari S, Ahmadian L, Mirzaee M. Effectiveness of an app-based cognitive behavioral therapy program for postpartum depression in primary care: A randomized controlled trial. International Journal of Medical Informatics. 2020;141:104145.
20. Loughnan SA, Butler C, Sie AA, Grierson AB, Chen AZ, Hobbs MJ, et al. A randomised controlled trial of 'MUMentum postnatal': Internet-delivered cognitive behavioural therapy for anxiety and depression in postpartum women. Behaviour Research and Therapy. 2019;116:94–103.
21. Loughnan SA, Sie A, Hobbs MJ, Joubert AE, Smith J, Haskelberg H, et al. A randomized controlled trial of 'MUMentum Pregnancy': Internet-delivered cognitive behavioral therapy program for antenatal anxiety and depression. J Affect Disord. 2019;243:381–90.
22. Milgrom J, Danaher BG, Gemmill AW, Holt C, Holt CJ, Seeley JR, et al. Internet Cognitive Behavioral Therapy for Women With Postnatal Depression: A Randomized Controlled Trial of MumMoodBooster. J Med Internet Res. 2016;18(3):e54.
23. Milgrom J, Danaher BG, Seeley JR, Holt CJ, Holt C, Ericksen J, et al. Internet and Face-to-face Cognitive Behavioral Therapy for Postnatal Depression Compared With Treatment as Usual: Randomized Controlled Trial of MumMoodBooster. J Med Internet Res. 2021;23(12):e17185.
24. Seo J-M, Kim S-J, Na H, Kim J-H, Lee H. Effectiveness of a Mobile Application for Postpartum Depression Self-Management: Evidence from a Randomised Controlled Trial in South Korea. Healthcare. 2022;10(11):2185.
25. Fonseca A, Monteiro F, Alves S, Gorayeb R, Canavarro MC. Be a Mom, a Web-Based Intervention to Prevent Postpartum Depression: The Enhancement of Self-Regulatory Skills and Its Association With Postpartum Depressive Symptoms. Front Psychol. 2019;10:265.
26. Chan AW, Tetzlaff JM, Gøtzsche PC, Altman DG, Mann H, Berlin JA, et al. SPIRIT 2013 explanation and elaboration: guidance for protocols of clinical trials. Bmj. 2013;346:e7586.
27. Hopewell S, Chan AW, Collins GS, Hróbjartsson A, Moher D, Schulz KF, et al. CONSORT 2025 explanation and elaboration: updated guideline for reporting randomised trials. Bmj. 2025;389:e081124.
28. Gamble C, Krishan A, Stocken D, Lewis S, Juszczak E, Doré C, et al. Guidelines for the Content of Statistical Analysis Plans in Clinical Trials. Jama. 2017;318(23):2337–43.

29. Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. Bmj. 2014;348:g1687.
30. Kessler RC, Adler L, Ames M, Demler O, Faraone S, Hiripi EVA, et al. The World Health Organization adult ADHD self-report scale (ASRS): a short screening scale for use in the general population. Psychological Medicine. 2005;35(2):245–56.
31. Berkman LF, Syme SL. SOCIAL NETWORKS, HOST RESISTANCE, AND MORTALITY: A NINE-YEAR FOLLOW-UP STUDY OF ALAMEDA COUNTY RESIDENTS. American Journal of Epidemiology. 1979;109(2):186–204.
32. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry. 1987;150:782–6.
33. Beard C, Björgvinsson T. Beyond generalized anxiety disorder: psychometric properties of the GAD-7 in a heterogeneous psychiatric sample. J Anxiety Disord. 2014;28(6):547–52.
34. Löwe B, Decker O, Müller S, Brähler E, Schellberg D, Herzog W, et al. Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. Med Care. 2008;46(3):266–74.
35. Saltychev M, Katajapuu N, Bärlund E, Laimi K. Psychometric properties of 12-item self-administered World Health Organization disability assessment schedule 2.0 (WHODAS 2.0) among general population and people with non-acute physical causes of disability - systematic review. Disabil Rehabil. 2021;43(6):789–94.
36. Beck Lichtenstein M, Dervisevic A, Eg J, Wilson R, Wesselhoeft R. A psychometric evaluation of the automatic thoughts questionnaire in Danish adolescents and emerging adults. Nordic Psychology. 2019;71(4):262–75.
37. Pontoppidan M, Nielsen T, Kristensen IH. Psychometric properties of the Danish Parental Stress Scale: Rasch analysis in a sample of mothers with infants. PLoS One. 2018;13(11):e0205662.
38. Guedeney A, Matthey S, Puura K. SOCIAL WITHDRAWAL BEHAVIOR IN INFANCY: A HISTORY OF THE CONCEPT AND A REVIEW OF PUBLISHED STUDIES USING THE ALARM DISTRESS BABY SCALE. Infant Mental Health Journal: Infancy and Early Childhood. 2013;34(6):516–31.
39. Krijnen LJG, Verhoeven M, van Baar AL. Assessing social-emotional development in infants and toddlers using parent-reports: Comparing the ASQ-SE-NL to the Social-Emotional Scale of the Bayley-III-NL. Early Hum Dev. 2021;161:105439.
40. Rozental A, Kottorp A, Forsström D, Månsson K, Boettcher J, Andersson G, et al. The Negative Effects Questionnaire: psychometric properties of an instrument for assessing negative effects in psychological treatments. Behav Cogn Psychother. 2019;47(5):559–72.
41. National Institutes of Health. NIH Policy and Guidelines on the Inclusion of Women and Members of Racial and/or Ethnic Minority Groups in Clinical Research. Bethesda, MD, USA: National Institutes of Health; 2025.

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- Supplementary3StatisticalAnalysisPlan.docx