Protocol for a cluster randomised trial of a goal-oriented care approach for multimorbidity patients supported by a digital platform

Margarida Gil Conde,1,2 Mariana Peyroteo,3,4 Ana Maria,5 Mélanie Raimundo Maia,3,4,5 João Gregório,6 Marilia Silva Paulo,5,7 Marta Alves,8 Ana Luísa Papoila,8 Luís Velez Lapão,3,4,9 Bruno Heleno6

ABSTRACT

Introduction Health information systems represent an opportunity to improve the care provided to people with multimorbidity. There is a pressing need to assess their impact on clinical outcomes to validate this intervention. Our study will determine whether using a digital platform (Multimorbidity Management Health Information System, METHIS) to manage multimorbidity improves health-related quality of life (HR-QoL).

Methods and analysis A superiority, cluster randomised trial will be conducted at primary healthcare practices (1:1 allocation ratio). All public practices in the Lisbon and Tagus Valley (LVT) Region, Portugal, not involved in a previous pilot trial, will be eligible. At the participant level, eligible patients will be people with complex multimorbidity, aged 50 years or older, with access to an internet connection and a communication technology device. Participants who cannot sign/read/write and who do not have access to an email account will not be included in the study. The intervention combines a training programme and a customised information system (METHIS). Both are designed to help clinicians adopt a goal-oriented care model approach and to encourage patients and carers to play a more active role in autonomous healthcare. The primary outcome is HR-QoL, measured at 12 months with the physical component scale of the 12-item Short Form questionnaire (SF-12). Secondary outcomes will also be measured at 12 months and include mental health (mental component Scale SF-12, Hospital Anxiety and Depression Scale). We will also assess serious adverse events during the trial, including hospitalisation and emergency services. Finally, at 18 months, we will ask the general practitioners for any potentially missed diagnoses.

Ethics and dissemination The Research and Ethics Committee (LVT Region) approved the trial protocol. Clinicians and patients will sign an informed consent. A data management officer will handle all data, and the publication of several scientific papers and presentations at relevant conferences/workshops is envisaged.

Trial registration number NCT05593835.

INTRODUCTION

Background and rationale

Health services are challenged by the increasing prevalence of multimorbidity and polypharmacy in an ageing population.1 People with multimorbidity use healthcare services 3.5 times more often than those without chronic conditions, even after adjustment for socioeconomic variables.2 These patients have poorer clinical outcomes (increased mortality, poorer health-related quality of life (HR-QoL), more disability), disruption to their personal and social lives, and a more significant financial burden.3–6 Moreover, patients with multimorbidity report several barriers to accessing healthcare services, including inadequate communication from healthcare professionals and non-consideration of their circumstances in managing their care plans.7

One of the most often-used definitions of multimorbidity is the coexistence of two or more chronic conditions.2 This means that people with multimorbidity are a very heterogeneous group, making it very challenging to identify what matters most to patients. One important contribution is the core outcome set for multimorbidity, which identified 17 outcomes that should be assessed in clinical
trials involving people with multimorbidity. The authors recommend that all studies assess HRQoL, mental health outcomes and mortality; and that researchers also consider 14 other outcomes, related to patient activities, physical activity, function and health system outcomes. This core outcome set was developed to improve clinical trials, which assess the average effects of interventions in groups of patients. The relative importance of these outcomes may not be directly transferable to clinical practice.

Clinical guidelines help to translate the evidence of clinical trials and other forms of research into clinical practice, policy and healthcare organisation. However, the traditional care approach for people with multimorbidity has been supported by multiple single-organ management guidelines, which is burdensome and potentially harmful. New, patient-centred approaches have been proposed, emphasising the need to prioritise patient preferences and agreed shared treatment goals. A patient-centred focus of multimorbidity management potentially allows patients to express their concerns and expectations (leading to greater involvement and adherence) while shifting the health management plan from a vertical disease-oriented model to a person-centred model.

The goal-oriented care (GOC) approach is an example of a person-centred model, where healthcare professionals help patients to identify their desired goals. These goals (ie, health concerns and expectations) can be related to preventing premature mortality or disability, improving ‘good death’, optimising HRQoL, and fostering personal growth and development during the remaining lifespan. Goals help to prioritise healthcare discussions and simplify decision-making when patients have multiple conditions. Important mechanisms for GOC implementation are functional integration, whereby care is adapted to lead providers to adopt a GOC approach (eg, IT systems designed for GOC) and normative integration, where clinical guidelines compel providers to use the GOC approach (eg, providing training to health professionals on GOC). Many of these can be achieved through information systems. Mobile technologies have been used to support the functional integration of different levels of care, reducing inappropriate referrals and improving access to specialised care. Point-of-care computer reminders often lead to modest improvements in health professionals’ behaviour. Even the redesign of digital charts has led to substantial improvements in adherence to evidence-based practice.

**Intervention objectives**

Evidence on the impact of digital health in the disease management of patients with multimorbidity appears to lead to moderate improvements. However, most studies have used only short follow-ups (≤6 months) and rarely assessed patient-oriented outcomes (HR-QoL or mortality) or the complex needs of people living with multimorbidity. Therefore, this study aims to evaluate the improvement in the QoL in patients using a primary healthcare digital platform (METHIS: Multimorbidity Management Health Information System) which assists patients and primary healthcare clinicians in managing multimorbidity within a GOC framework. In addition, it will also assess whether the digital platform impacts anxiety, depression, physical activity and serious adverse events.

**Trial design**

The ‘METHIS’ intervention is a decentralised trial that combines the implementation of a training programme and the use of a customised digital platform, which is designed to prompt clinicians to adopt a GOC approach. A 12-month cluster randomised trial (CRT) (planned for 1 June 2025) with an assignment ratio of 1:1 in a superiority framework will be conducted. The CRT design will avoid the possible selection bias of individual randomisation conducted by clinicians. In addition, cluster randomisation will facilitate trial implementation since the practices share an identical electronic health records (EHRs) server. The trial is registered on ClinicalTrials.gov under the identifier NCT05593835, and the patient timeline can be seen in figure 1.

**METHODS AND ANALYSIS**

**Study setting**

The trial will be conducted in primary care practices (henceforward, practices) in the Lisbon and Tagus Valley Region (ARSLVT) within the Portuguese National Health Service. These practices have 4–12 family physicians, 4–12 nurses and 2–6 clinical secretaries.

**Eligibility criteria**

All practices in ARSLVT that did not pilot the METHIS digital platform will be eligible at the cluster level. The staff at participating units will constitute the local research team. Eligible patients will be community-dwelling people aged 50 or older with complex multimorbidity (co-occurrence of three or more chronic conditions affecting three or more different body systems) and access to an internet connection and a communication technology device. Exclusion criteria will be the inability to: provide informed consent, to read or write, inability to access an email or electronic device, even when helped by an informal caregiver.

**Intervention**

The METHIS intervention will consist of two components (figure 2).

The first component is a GOC Training Programme for health professionals. The training programme will include the concept of personalised care, methods of goal elicitation and goal-setting, implications of GOC in healthcare practice and how the METHIS platform can be used to support the application of GOC. The training will be implemented through a blended-learning, continuous education programme that NOVA University of
Lisbon will credit. It will have three stages: initial face-to-face training, which will happen before the data collection, followed by remote, asynchronous training over 12 months, and a final seminar to discuss the results and inquire about the usability of the GOC model and the METHIS platform. The course will be offered to the intervention group 1 month before the start of patient recruitment and the control group at least 1 month after the end of data collection.

The second component is a GOC information system. We will adapt the platform developed from a pilot study during the COVID-19 pandemic (METHIS). The prototype was developed with the input of clinicians, but patients were not involved. Briefly, the platform was designed to nudge clinicians to adopt a GOC approach and encourage patients and caregivers to take an active role in healthcare. It is a web-based platform with several modules. To ensure each user only has access to the features and information relevant to them, patients can access patient-specific features, while clinicians are given access to a different set of capabilities tailored to their needs. A goal-setting module will help the process of goal elicitation. Patients will have information on the relevance of this process, while clinicians will have prompts to guide them during the process. A health literacy module will give patients access to education materials and to the outputs of decision aids that were used during clinical appointments. Clinicians can add new education materials or decision aids to a preset library available in the information system. Patients can contribute with self-monitoring data, which will allow them to track their monitoring data. Clinicians will have access to a summary

---

**Figure 1** Participant timeline. HADS, Hospital Anxiety and Depression Scale; SF-12, 12-item Short Form questionnaire.
of this self-monitoring data in the patient record. There will be a dashboard with patient goals and a timeline with self-monitoring data relevant to their goals to help patients and clinicians monitor the achievement of goals. Patient goals will be highlighted on every screen, to nudge patients and clinicians in every interaction with the system. Service and features of the information system may be changed during pilot implementation, according to feedback from patients and clinicians. Online supplemental appendix 1 provides more information about the platform.

Control
The control group in this trial will be the best usual care, using the standard EHR available to primary care practices. Our understanding of what ‘best usual care’ is for people with multimorbidity is informed by qualitative research in an earlier stage of this project. Our results suggest that healthcare professionals often provide disease-driven care. When faced with multiple healthcare problems, they prioritise based on (1) patient complaints, (2) which condition is less well controlled or (3) which condition is more likely to impact patient HR-QoL adversely. General practitioners and primary care nurses are often unfamiliar with the GOC model. However, they already tried to implement some of its principles, such as identifying patient goals and supporting shared decision-making.

Cluster adherence and cointerventions
We will use a mix of strategies to help promote cluster adherence. We will provide an easy-access support line to assist participants with technical difficulties. We will use physical items (eg, mouse pads, pens and notepads) to remind them of the study. We will simplify trial-related processes using an aggregate profile of patients in the study. We will provide clinicians with regular updates about the progress of the trial, including the number of participants recruited and any preliminary results used letters before final collection. These letters will be sent after the end of participant recruitment and another month before data collection.

All participating practices can implement other interventions to better support managing patients with multimorbidity. The types of health system interventions according to the Taxonomy of Effective Practice and Care Organisation and their permissions during the trial can be consulted (online supplemental appendix 2). Financial and governance arrangements are probably not relevant at the primary care practice level since all will be recruited from the same regional health authority, and any changes to the financial or governance arrangements will be simultaneously applied to all.

Outcomes
Primary outcome
HRQoL is a core outcome in multimorbidity studies. Participants will be asked to fill in the 12-item Short Form questionnaire (SF-12) at baseline, 6 months and 12 months. This questionnaire generates a Physical Component Score (PCS) and a Mental Component Score (MCS). The primary outcome will be the mean difference in the

Figure 2  METHIS intervention framework: impact on health-related quality. GOC, goal-oriented Care; METHIS, Multimorbidity Management Health Information System.
variation (delta) of the PCS of SF-12 between baseline and 12 months. The SF-12 can be filled in 2–4 min, and it is validated for the Portuguese population. Minimum significant differences validated across large populations and multiple disease categories are a change between 2 and 3 points from the population mean of 50.35 36

Secondary outcomes
Mental health status is another core outcome in multimorbidity studies. We will ask participants to complete the Hospital Anxiety and Depression Scale questionnaire (HADS-A and HADS-D, respectively) at baseline, 6 months and 12 months. We will calculate the mean difference in the variation (delta) in HADS-A and HADS-D between baseline and 12 months. Although HADS was designed for inpatients, it was posteriorly validated in the primary care outpatient setting.37 A minimum significant difference of 1.5 has been reported in other chronic disorders.38

Physical activity will be monitored through the number of steps walked daily. To assess the number of steps per day, a smart band with a triaxial accelerometer will be used in both arms of the trial. Although traditional step counters use pedometers to detect daily step counts, accelerometers are more accurate and sensitive to lower force accelerations (eg, slow walking), considered the current standard for collecting physical activity data.39–41 Most accelerometer-based fitness wearables measure acceleration in three directions.42 They can be used to estimate the type of movement, count steps, calculate energy expenditure and intensity, and estimate sleep patterns. Although the validity and reliability of these metrics vary, they found high reliability for steps and distance.43 Sedentary older adults and individuals with a disability and chronic illness benefit from a physically active lifestyle, with approximately 4600–5500 daily steps. The lowest median values for steps/day found are in disabled older adults (1214 steps/day) and people living with Chronic obstructive pulmonary disease (2237 steps/day).40

Serious adverse events (clinician reported) are the safety outcomes chosen for this trial. In both trial arms, data about patient mortality will be collected and combined with data on emergency department visits and hospital admissions as a proxy for serious adverse events. Family physicians will be asked, at 6 and 12 months after randomisation, to check the life status of enrolled patients and whether patients in the trial were admitted to a hospital or had visited an emergency service since the randomisation date. This information is available through the common Portuguese EHR. Due to legal requirements, the information about hospital admissions and other contacts with healthcare organisations ceases to be open to the attending physician after death.

Potentially missed diagnoses (clinician reported) will be a second safety outcome. At 18 months, we will ask clinicians in the intervention arm if they know of any severe diagnosis that might have been missed due to the intervention. This report, 6 months after the intervention phase, is a compromise between avoiding recall bias and allowing enough time for a missed diagnosis to become clinically apparent.

Sample size
To address our primary outcome, it was assumed that for the PCS of the SF-12 scale, a mean of 38.3 for the control group, a mean of 41.3 for the intervention group and a typical SD of 11.3. The mean difference of 3 points used in the sample size calculation is informed by earlier research suggesting that the minimum significant difference for SF-12 in different populations’ diseases ranges between 2 and 3 points.35 36 A conservative intraclass correlation coefficient of 0.08, an alpha of 0.05, and a power of 80% were still considered. To achieve the desired strength, approximately 600 patients will need to be enrolled in each arm, implying about 20 patients per practice, with a minimum of 50 practices in the intervention arm and 30 in the control arm. The sample size will be corrected considering the 10% lost to follow-up. This means that 1380 participants will have to be enrolled (ie, 23 participants per cluster).

Recruitment
All potentially eligible practices will be randomly ordered and contacted by a member of the leading research team until the number of clusters obtained in the sample size calculations is reached. These units will be invited to engage in the CRT as members of a local research team. A short questionnaire will be sent to identify primary care teams (family physician plus family nurse) willing to participate and collect the required practice characteristics for minimisation.

Eligible participants will be determined by the members of the local research team through a review of records and confirmed by a leading research team member. Participant screening will continue until the target population is achieved. A random sample of 32 participants will be drawn from each practice. Participants will have no financial or non-financial incentives other than using a smart band for 2 months. The recruitment phase will extend over 6 months.

Once contacted, patients will be provided with an informed consent form and any queries they may have will be addressed. Most contacts will be made through their healthcare professionals to maintain trust and anonymity.

Allocation
Clusters will be allocated to the intervention or control groups (1:1) using minimisation with a random element, a method to achieve a good balance regarding baseline characteristics that could influence the outcomes when the number of clusters is small. Cluster variables used in the minimisation will be the type of setting (urban, rural, mixed), patient age distribution (50–75 years/>75 years), patient level of education (lower/higher), baseline HR-QoL (below median SF-12/above median SF-12), and baseline mental health status (HADS-A and HADS-D).
After patient recruitment and baseline data collection, the trial manager (ie, the data protection officer, DPO) will assign a pseudonymised code to each participant and send the practice code and minimisation variables to the statistician, who will then allocate practices into two groups. Members of the local research team will then assess for patient eligibility, and recruitment will be performed by one of the trial researchers. The trial statistician will generate the allocation sequence.

Blinding
Given the nature of the intervention, none of the people involved in the trial (participants, care providers and outcome assessors) will be blinded to the intervention.

Data collection
Data on HR-QoL, mental health and physical activity will be collected at baseline, 6 months and 12 months. For baseline assessment, after signing the informed consent, patients will be invited to fill in the electronic forms with the questionnaires, either using a personal computer or using a tablet. At the 6-month and 12-month assessments, participants will be contacted by research team members and asked to fill in the electronic forms at home, using a personal computer or a tablet.

Data on physical activity will be stored locally and uploaded to a cloud-based health repository. For patients on the intervention arm, data will be available for consultation by health professionals and patients on the web platform, either using a personal computer or a tablet. As for patients in the control arm, data will be collected similarly but will not be available for consultation (only by researchers at baseline, at 6 months and at 12 months).

Mortality
Members of the local research team will be asked to fill in a small survey at 6 and 12 months after randomisation. They will be asked to check the life status of their enrolled patients in the Portuguese common EHR. Data recorded will be life status (alive, dead) and, if relevant, date of death.

Hospital admissions (clinically reported)
At 6 and 12 months after randomisation, members of the local research team will be invited to check the number of hospital admissions in the previous 6–12 months in the Portuguese common EHR. Data recorded will be the number of admissions (count) and, if relevant, dates of admissions. Due to legal requirements, data will only be available for patients alive at the end of the intervention phase.

Composite outcome
The composite outcome will be defined as the date until death, hospital admission or visit to the emergency department, whichever comes first.

Baseline characterisation of individual participants
Patient month and year of birth (self-reported), gender (self-reported), number of years of education (self-reported), profession, number of hospital admissions in the previous 12 months, active chronic medications, and active chronic health problems (information and International Classification of Primary Care-2, ICPC-2, codes in the patient’s EHR extracted by the family physician) will be collected.

Baseline characteristics of clusters
After practice (cluster) recruitment, data about the type of setting (urban, rural, mixed) and the number of clinicians (nurses, family physicians, residents) will be collected.

Interactions with the platform (intervention group only)
METHIS platform will register the following intervention data: the basic information about the patient’s condition (eg, chronic diseases, medications, care goals), any tele-consultations done with members of the local research team, any communication exchange between health workers and data registered by both patient (physiological and biochemical data, SF-12, mental health and mobility data) and health workers, members of the local research team (relevant notes over consultations considering patient’s therapeutics).

Potentially missed diagnoses (intervention group only)
At 18 months, physicians and members of the research team, following the intervention group will be invited to report any severe diagnosis that might have been missed due to the use of METHIS. If relevant, missed serious diagnoses and the date of diagnosis will be collected.

Data management
The data collected in this study will come from healthcare professionals and patients at different stages. Given its diverse nature and sources, data will be collected, treated, and analysed in specific datasets. Each dataset will be set up to answer the respective research questions.

A data management plan (DMP) will be formulated and overseen by the DPO. DMP follows General Data Protection Regulation, within FAIR principles, to ensure transparency of results dissemination, notwithstanding data security and privacy. International Standards Organization/International Electrotechnical Commission 27001 will be used as a standard.

Regarding the datasets focused on the digital platform activities, it generates anonymised databases to be worked on by the researchers. Its functionalities enable planning and organising data entry, proper participants’ coding, security and storage, including range checks for data values (eg, patients will receive an alert whenever the data entry is invalid or out of typical values).

Data analysis
Individual participants will be analysed according to their randomly allocated group regardless of adherence to the
intervention (intention-to-treat analysis). If participants transfer to another unit within the health region, they will be considered lost to follow-up, even if they move to a practice conducting the trial. All the collected variables will be summarised using descriptive statistics. Quantitative variables will be summarised by mean, SD, median and range (minimum and maximum values), and qualitative variables will be summarised by absolute (n) and relative frequencies (%).

Both groups will be compared on primary and secondary outcomes using generalised mixed-effects models, accounting for variables used in the minimisation (cluster level). We will report the mean difference between the two groups of the change of HR-QoL (PCS and MCS subscales) from baseline to end of follow-up, the mean difference of the evolution of the HADS scale from baseline to end of follow-up, the mean difference of the change of step count, the HR for the composite outcome of mortality, hospital admission or visits to accidents and emergencies.

Statistical significance will be assumed for a p<0.05. The latest version of R software will be used to conduct the analysis.

Data monitoring
There will be no data monitoring committee assigned in this trial. The trial does not assess a life-threatening situation; the trial is not aimed at an especially vulnerable population, and there is no suspicion that the intervention may harm participants. There will not be any preplanned interim analyses, nor are we planning on an adaptive trial design.

Although no direct physical or mental harm is expected from using the METHIS platform, patients and members of the local research team in the intervention arm may substitute/postpone face-to-face consultations with remote consultations in which physical examination is not possible. There is a theoretical risk of missing a serious diagnosis, and a safety follow-up phase is planned, where we will receive reports from members of the local research team 18 months after randomisation (6 months after the intervention phase). We will assess whether any patients enrolled in the intervention arm had a missed diagnosis. All the events related to adverse events notified by healthcare professionals, members of the local research team and patient participants will be registered in the data reporting books and will be available for auditing purposes.

Patient and public involvement
The METHIS project is based on Design Science Research. In this approach, the methods used always have a participatory research perspective that allows the users of the artefact to be involved at all stages of its development.\textsuperscript{44} Needs assessment (before the intervention) and evaluation (after the intervention) are done with qualitative methods. The intervention builds on a qualitative study with primary care clinicians during the development of the METHIS information system prototype. In this project, health professionals identified facilitating factors and barriers to changing from the current HIS to METHIS.\textsuperscript{33} Clinicians also identified the required features of the information system. We will seek patients’ insights on the best design for the intervention, through a series of interviews and focus groups with patients. Qualitative data will be collected during a pilot implementation of the intervention in two primary care practices. This will be used to refine the patient interface for the information system.\textsuperscript{33} To assess the intervention, we will also gather a group of participants and conduct a focus group in the intervention arm.

ETHICS AND DISSEMINATION
Research ethics approval
The trial protocol was approved by the Research and Ethics Committee of ARSLVT (March 2022, 094/CES/INV/2021). Protocol amendments, such as changes to eligibility criteria, outcomes and analysis, will be submitted for review and reapproval to the Research and Ethics Committees. If the protocol amendment involves changes related to patient data or significant changes that deem the previous consent invalid, patient participants will be invited to fill in a new informed consent that explains the changes made to the protocol.

Informed consent
Members of the local research team will sign an informed consent for conducting the trial (online supplemental appendix 3). Patients will sign an informed consent as participants in the trial.

Confidentiality
Only healthcare professional members of the local research team will have access to each patient’s demographic and clinical data. The DPO will be responsible for automatically generating an alphanumeric code that will provide an anonymised table with the previously mentioned variables for researchers and statistical analysis purposes. Data will be stored in a secure server which the DPO can only access.

Access to data
The complete research dataset will be stored in an encrypted and secure location to be accessed for secondary analyses or comparative studies or per request of the patients involved or the research and ethics committee.

Ancillary and post-trial care
If we verify an improvement in HR-QoL and mental health related to care given through the METHIS platform, we will provide access to this platform for practices and patients in the control groups.

Dissemination
The trial protocol, the main paper with the trial results and a short report with the results of the final physician
survey will be published in peer-reviewed journals. All team members who fulfill the International Committee of Medical Journal Editors criteria for authorship will be coauthors of these publications.

We will not disclose the database or grant access to data reproduction for legal reasons. However, the research team may make processed data available on request, with appropriate justification.

Author affiliations
1 USF Jardins da Encarnação, AcS Lisboa Central Research and Ethics Committee, ARSLV, Lisboa, Portugal
2 University Clinic of Family Medicine, Faculty of Medicine of the University of Lisbon, Lisbon, Portugal
3 UNIDEMI, Department of Mechanical and Industrial Engineering, NOVA School of Science and Technology, Universidade NOVA de Lisboa, Caparica, Portugal
4 Laboratório Associado de Sistemas Inteligentes, LASEI, 4800-059 Guimarães, Portugal
5 CHRC, NOVA Medical School, Faculdade de Ciências Médicas, NMS, FCM, Universidade NOVA de Lisboa, Lisboa, Portugal
6 CBSIS, Universidade Lusófona de Humanidades e Tecnologias Escola de Ciências e Tecnologias da Saúde, Lisboa, Portugal
7 Institute of Public Health, College of Medicine and Health Sciences, United Arab Emirates University, Al Ain, UAE
8 CEUL, NOVA Medical School, Faculdade de Ciências Médicas, NMS, FCM, Universidade NOVA de Lisboa, Lisboa, Portugal
9 WHO Collaborating Center on Health Workforce Policy and Planning, Instituto de Ciência e Tecnologia, Universidade NOVA de Lisboa, Lisboa, Portugal
10 CHRC, NOVA Medical School, Faculdade de Ciências Médicas, NMS, FCM, Universidade NOVA de Lisboa, Lisboa, Portugal
11 CHRC, NOVA Medical School, Faculdade de Ciências Médicas, NMS, FCM, Universidade NOVA de Lisboa, Lisboa, Portugal
12 CHRC, NOVA Medical School, Faculdade de Ciências Médicas, NMS, FCM, Universidade NOVA de Lisboa, Lisboa, Portugal

Acknowledgements
The team acknowledges the health professionals and patients involved in the development and participation of this study.

Contributors
VL and BH conceived the study. The following authors contributed to the study design: MGC, AM and BH provided specific methodological expertise in the clinical strand, MP, MM and JS in the technological strand, and MSP, BH and LVL in the pedagogical strand. ALP and MA provided specific methodological expertise in statistics in cluster randomised clinical trials. MM and MP provided specific methodological expertise in research data management, protection and confidentiality. MGC, MP, AM, MM, MJ, MSP, MA, ALP, BH and VL prepared the initial proposal for funding application. MGC and MP prepared the first draft of this study protocol. MGC, MP, AM, MM, MJ, MSP, MA, ALP, BH and VL contributed to rewrites and refinements with important intellectual content; all the authors approved the final manuscript and agreed to be accountable for all aspects of the work.

Funding
The present publication was funded by Fundação Ciência e Tecnologia, IP national support through CHRC (UIDP/04923/2020).

Competing interests
None declared.

Patient and public involvement
Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication
Not applicable.

Provenance and peer review
Not commissioned; externally peer reviewed.

Supplemental material
This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access
This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs
Margarida Gil Conde http://orcid.org/0000-0001-9367-5899
Marianna Peyroteo http://orcid.org/0000-0003-4976-2862

REFERENCES