# Implementation of the WHO integrated care for older people (ICOPE) programme in clinical practice: a prospective study

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## Summary

**Background** The INSPIRE integrated care for older people (ICOPE)-CARE programme is a public health programme implementing the ICOPE health-care pathway in clinical practice. The primary objective of this study was to describe the large-scale implementation and feasibility of the INSPIRE ICOPE-CARE guidelines in clinical practice. The secondary aims were to describe the characteristics of patients who were identified as positive for abnormalities in intrinsic capacity (ie, locomotion, cognition, psychology, vitality, hearing, and vision) during step 1, and to describe the prevalence of these positive screenings.

**Methods** In this prospective study, we evaluated a real-life population of users of primary care services in the Occitania region (France). Participants who were aged 60 years and older and lived in a community were eligible for inclusion in our study. Individuals aged ≥60 years were screened (step 1) by health-care providers or through self-assessments using digital tools (the ICOPE MONITOR app and the ICOPEBOT conversational robot). Our implementation strategy involved raising awareness among health-care professionals about the WHO ICOPE programme, training professionals in the ICOPE-CARE guidelines, and developing a digital infrastructure (ie, digital tools, a database, and a remote ICOPE monitoring platform). The feasibility of implementing the INSPIRE ICOPE-CARE guidelines was determined by the anticipated inclusion of ≥10000 participants, and having a follow-up rate of over 50%.

**Findings** Between Jan 1, 2020, and November 18, 2021, 10903 older people (mean age 76·0, SD 10·5 years; 6627 [60·8%] of whom were women) had a baseline step 1 screening done, and 5185 (70·4%) of 7367 eligible participants had a 6-month follow-up of step 1 screening. 10285 (94·3%) participants had a positive intrinsic capacity result during screening at baseline. 958 (9·3%) participants were evaluated with step 2 (in-depth assessments). Positive intrinsic capacity was confirmed in 865 (90·3%) participants. Most recommendations in step 3 (care plan) were related to locomotion, vitality, and cognition.

**Interpretation** The high number of participants included in our study, as well as the high rates of follow-up, provides evidence to suggest that the large-scale implementation of ICOPE in clinical practice is feasible. The very high prevalence of positive screening for impaired intrinsic capacity during step 1, as well as the high rates of confirmed deficits in intrinsic capacity during step 2, suggest that the INSPIRE ICOPE-CARE programme is able to target individuals who are at increased risk for functional loss and disability.

**Funding** Occitania Regional Health Agency, Region Occitanie and Pyrénées-Méditerranée, European Regional Development Fund, and The Interreg Program V-A Spain-France-Andorra

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*Lancet Healthy Longev* 2022; 3: e394–404

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## Introduction

In 2017, WHO published the integrated care for older people (ICOPE) guidelines.[1] These guidelines represent an innovative function-centred and person-centred (instead of disease-centred) approach to caring for older people. The ICOPE guidelines emphasise the optimisation of intrinsic capacity (the composite of all the physical and mental capacities of an individual) as the most important focus to promote healthy ageing and reduce care dependency.[1–4]

The ICOPE care pathway aims to improve, maintain, or slow declines in intrinsic capacity[2,5] by assessing and longitudinally monitoring six core domains of intrinsic capacity: locomotion; vitality; vision; hearing; cognition; and psychology. The intrinsic capacity construct differs from other approaches by being framed as a dynamic continuum and its trajectory can be monitored across the second half of a person's life course to provide insight into the effectiveness of clinical actions, as well as its effectiveness in public health, and on the needs of older populations.[6]

The ICOPE approach is designed to be implemented in clinical practice in the primary care of older people. It is composed of five steps. Step 1 is screening participants for potential declines in one or more of the six domains of intrinsic capacity. Step 2 is an in-depth assessment of

## Research in context

### Evidence before this study

In 2020, 20·6% of people living in the EU were aged 65 years and over. Public long-term care spending among EU countries is estimated to increase from 1·6% to 2·2% of gross domestic product between 2016 and 2040, which is mainly linked to an increase in the number of people who will be dependent. In 1984, comprehensive geriatric assessments made it possible to identify the major geriatric syndromes and to propose medico–psycho–social care. The effect of this approach has been shown to reduce functional decline in older people. Subsequently, the concept of frailty made it possible to identify the stages that led to the loss of autonomy. The care management of frail older people, including doing in-depth assessments and creating personalised care plans, has proven to be effective in delaying dependence. In continuation of this work, WHO created the integrated care for older people (ICOPE) guidelines in 2019, which is a prevention programme that is aimed to be implemented before frailty occurs. This programme was based on the monitoring of intrinsic capacity from the second half of life. In these guidelines, intrinsic capacity was defined by six functions (locomotion, cognition, vitality, psychology, vision, and hearing) which, taken together, constitute a predictive marker of the future level of dependence validated in a longitudinal study in the general population. In the ICOPE programme, the methods of assessment and care management have been defined through a process of consultation with leading experts in the WHO Clinical Consortium on Healthy Ageing drawn upon evidence-based medicine. However, the implementation of this programme in clinical practice is challenging.

### Added value of this study

In our study, we present results for the real-world implementation of the INSPIRE ICOPE-CARE programme in a large population in the Occitania region (France). The strengths of this programme are the capacity building for care workers and the creation of digital tools to facilitate assessment and monitoring for health-care professionals and participants as proactive participants. This programme opens up multiple avenues for improvement in the areas of prevention, care, innovation, and clinical research, and presents a new strategy to improve the service provided to older people by placing them at the centre of the prevention approach. The capacity building for health-care professionals and the use of digital technology are key components required for the implementation of the ICOPE programme.

### Implications of all the available evidence

It is essential to make the concept of healthy ageing a political priority by scaling up the ICOPE approach and providing ICOPE interventions within the framework of universal health coverage so that every older person can have access to ICOPE screening, assessment, and intervention without financial burden. This study shows good adherence of the participants and health-care professionals to the programme, under the conditions of current clinical practice, which is a particularly interesting result. Our results support the feasibility of this model to reduce the loss of autonomy among older people. Our programme is relevant to private and public health-care workers and social workers, policy makers, researchers, and older people and their families, and could build collaborations to address challenges in generating the evidence to achieve healthy ageing for all. Our study could also create an innovative mechanism to judge the effectiveness of interventions and services on the preservation of autonomy in older people.

participants who were identified during screening as having deficits in intrinsic capacity in domains of interest, as well as their underlying conditions, physical environment, and social environment. Step 3 is development of a personalised care plan that takes into account declines in intrinsic capacity, associated diseases, socioenvironmental needs and, most importantly, the goals and preferences of the older person. ICOPE recommends the monitoring of intrinsic capacity every 6 months, including for participants who show no declines during the screening. The same is true for monitoring the implementation of the personalised care plan proposed at the end of the in-depth assessment (step 4). Step 5, which is a transversal step, concerns the involvement of communities and support for caregivers to facilitate the implementation of the previous four steps.[2]

Since January, 2020, the Gerontopole of the Toulouse University Hospital (France), which is a WHO Collaborating Center for Frailty, Clinical and Geroscience Research, and Geriatric Training, has been implementing ICOPE guidelines in routine clinical practice. This deployment, called the INSPIRE ICOPE-CARE programme, uses digital tools for screening, allowing the routine collection and monitoring of data concerning intrinsic capacity.[7] The primary aim of our study was to describe the large-scale implementation and feasibility of the INSPIRE ICOPE-CARE guidelines (including the number of participants joining the programme and their adherence to follow-up evaluations) during the first 2 years of implementation in clinical practice. Our secondary aims were to describe the characteristics of patients who were identified as positive for abnormalities in intrinsic capacity (ie, locomotion, cognition, psychology, vitality, hearing, and vision) during step 1, and to describe the prevalence of these positive screenings.

## Methods

### Study design and participants

The INSPIRE ICOPE-CARE programme[7] is part of the INSPIRE project,[8] which has the clinical objective of implementing the WHO ICOPE programme in real-life

clinical practice. This study describes the implementation of ICOPE in the real-life setting of a health-care system. INSPIRE ICOPE-CARE[7] is a public health programme developed in the Occitania region (southwest France), where it is currently standard of care. The Occitania region comprises more than 6 million people, 30% of whom are aged 60 years or older.[9] The implementation strongly relies on primary care providers, in particular physicians and nurses.

The INSPIRE ICOPE-CARE guidelines are intended to provide information on the change in intrinsic capacity of people who use primary care services in France, mainly in the Occitania region. Participants who were aged 60 years and older and lived in a community were eligible for inclusion in our study. Individuals who met the eligibility criteria and who were looking for primary care services from providers trained in the ICOPE programme (who worked in the Occitania region) were invited by primary care service providers to participate in the study. Participants who were undertaking ICOPE step 1 by self-assessment were also included in our study. These participants were made aware of the study via various communication campaigns launched by the Gerontopole (eg, by mail, communications in the press, conferences for the general public, flyers, posters, and videos). All patients gave either oral consent or consented via the ICOPE MONITOR app or ICOPEBOT.

### Procedures

The strategy of the INSPIRE ICOPE-CARE programme contains three fundamental actions: (1) to provide information and training on the WHO ICOPE programme; (2) to facilitate screening via the development of digital tools (the ICOPE MONITOR app and the ICOPEBOT conversational robot); and (3) use of a remote ICOPE monitoring platform. The implementation of the INSPIRE ICOPE-CARE programme began with raising awareness among health-care professionals, and training these professionals with the ICOPE guidelines.

Two types of training were developed: first, professionals were trained on ICOPE concept guidelines and step 1 training in a 40 min virtual (webinar) mode (with replay link available); second, training on step 2 (in-depth assessment; panel), step 3 (development of personalised preventive and care plan) and step 4 (implementation and monitoring of personalised plan). This more extensive training targeted all health-care professionals, in particular nurses, who have a large involvement in the care of older people. Health-care professionals were recruited via email. In total, 31 sessions of step 1 training were conducted and 1711 professionals were trained in Occitania, including 1053 nurses, 104 physicians, and 245 pharmacists (other professionals included 21 psychologists, 67 physiotherapists, psychomotor therapists, occupational therapists, and adapted physical activity teachers; 19 social assistants; seven clinical research assistants; three dietitians; and 192 people whose profession was unknown). Training on steps 2 through to step 4 was provided for 410 nurses and 12 physicians. Trained health-care professionals were responsible for assessing older adults' intrinsic capacity by using the INSPIRE ICOPE-CARE digital tools or by using paper and pencil and then entering the information directly into the INSPIRE ICOPE-CARE database.

Different types of materials intended for the general public (to encourage people to enrol and to provide information about the programme for those who had already enrolled) were developed, including communication materials (eg, flyers, posters, press releases, interviews, and a film promoting the ICOPE MONITOR application) and training materials (eg, webinars and conferences).

The 2019 ICOPE WHO guidelines step 1 involves screening in six domains of intrinsic capacity through simple tests and questions, which takes approximately 10–15 mins to be completed. The INSPIRE ICOPE-CARE guidelines recommend using the step 1 assessment every 6 months for early detection of deterioration in one or more domains of intrinsic capacity, which can be done by health-care professionals, the older adults themselves (via self-assessment), or with the help of older adults' relatives. Therefore, the INSPIRE ICOPE-CARE programme offers older people the opportunity to be involved in managing their own health and encourages them to self-screen through the use of digital tools.

Two digital tools for step 1 assessment have been developed: the ICOPE MONITOR app, which can be downloaded free of charge from the Apple Store or Google Play, and the ICOPEBOT conversational robot, which is accessible on the internet. These digital tools have two modes of use that we consider equivalent: a professional mode for professionals, and a self-assessment mode for older people and their relatives; step 1 intrinsic capacity positive screening and monitoring, as defined by WHO,[2] is applied equally to both modes. The collection of the participants' personal data requires their consent for data storage and monitoring. The information notice and the consent form are integrated into the tools. The entry of participants' data were conditional on their agreement; the person conducting the step 1 screening (ie, health-care professionals, the older adult's relatives, or the older person themselves in the case of self-assessment) must provide consent by checking the appropriate box in the digital tool. The Gerontopole (Toulouse University Hospital, Toulouse, France) ensures the deployment and updating of these digital tools.

For more on **ICOPEBOT** see https://icopebot.botdesign.net

The data from two digital tools (the ICOPE MONITOR app and ICOPEBOT) are transmitted automatically and recorded in the ICOPE database in compliance with security and confidentiality rules according to general data protection regulation.[10] The database is hosted on a physical server in France with an approved high quality secure hosting supplier. The database containing health

data was approved by the French National Commission for Computing and Liberties in 2017 (registration number 247169284s; reference MMS/OSS/NDT171027). Health-care professionals can follow and monitor whether a participant has abnormalities in intrinsic capacity identified at the point of screening.

The ICOPE database is equipped with several features that facilitate remote monitoring of participants' health, such as generating alerts in the event of a patient showing evidence of having an abnormality during step 1 screening, the display of alerts and their trend on a dashboard, and the automatic scheduling of re-assessments (follow-up step 1 assessments; figure 1). Health-care professionals who are involved in the programme have access to their own patients' data for follow-up.

Health-care professionals can process alerts for their own patients. To support health-care professionals in this task, a remote ICOPE monitoring platform was created within the Gerontopole of Toulouse, which was composed of experienced nurses who are trained in geriatrics, and geriatricians. The nurses of the remote ICOPE monitoring platform manage participants' alerts for health-care professionals who request this support, as well as for older people doing their own assessment (self-assessment) in step 1. At the nurses' request, the intervention of geriatricians was provided in complex situations. Following an established protocol, each step 1 alert was examined and its clinical relevance was validated to ensure that the alert was real. If there was any abnormality identified by step 1 assessment, the nurse of the remote ICOPE monitoring platform contacted the individual's general practitioner. Then, a step 2 assessment (in-depth assessment), and eventually subsequent steps (steps 3 and 4), as appropriate, could be done by a physician in conjunction with other health-care professionals. To develop step 3 (personalised preventive and care plan), it is recommended by the ICOPE guidelines to rely on local systems and actors.

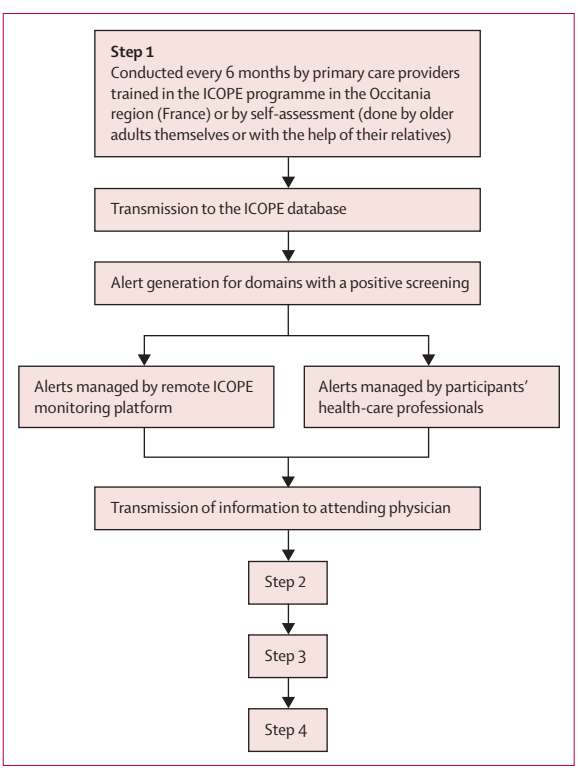


***Figure 1:*** **Organisation model of step 1 and the remote ICOPE monitoring platform in the INSPIRE ICOPE-CARE programme**
ICOPE=integrated care for older people.

## Outcomes

To assess the feasibility of implementing the INSPIRE ICOPE CARE programme, two process indicators were selected as primary outcome measures: number of participants, and percentage of step 1 assessments that were followed up.

The first of these indicators related to the number of individuals aged 60 years and older who had their intrinsic capacity assessed during ICOPE step 1. Because of our clinical experience and network of primary care providers in the Occitania region, we expected to have data for intrinsic capacity using ICOPE step 1 for at least 10000 older people during the first 2 years of our study (from January, 2020, to December, 2021).

Regarding the second indicator, percentage of follow-up step 1 assessments, the INSPIRE ICOPE-CARE programme was designed to follow up people longitudinally during older adulthood. Based on a WHO report[11] from 2003 that showed that about 50% of patients adhere to long-term therapy in middle-income and high-income countries, we defined that, in participants who were evaluated with an initial ICOPE step 1 assessment, a rate higher than 50% of participants who had a second step 1 assessment over a 1-year follow-up would constitute an acceptable adherence rate.

Secondary outcomes involved the following information: the prevalence of positive screening (step 1) by intrinsic capacity domain; the number of participants with a positive screening across intrinsic capacity domains; and demographic characteristics (ie, age and sex) of the older adults participating in the INSPIRE ICOPE-CARE programme. A positive screening in intrinsic capacity at step 1 was defined according to the WHO guidance.[2] A positive result during screening was noted by any of the following criteria: inability to complete the five chair stand test in ≤14 s (intrinsic capacity domain: locomotion); a mistake in any of the three-word recall, orientation in time, or memory complaint (cognition); responding yes to the questions "feeling down, depressed or hopeless?" and "little interest or pleasure in doing things?" (psychology); an excess in weight loss (defined as ≥3 kg in the past 3 months) or appetite loss (vitality); responding yes to "difficulties in seeing far, reading, eye diseases or currently under medical treatment (eg, diabetes, high blood pressure)?" (vision); hearing difficulties according to the Whisper test (hearing; evaluated by a health professional);

and self-reported hearing loss in the past 4 months (hearing; evaluated by self-assessment).

Other measurements were undertaken in the subpopulation of participants who received ICOPE step 2 evaluations, including a description of the following assessment: step 2 assessments (panel); Fried frailty phenotype,[12] Activities of Daily Living score,[13] Instrumental Activities of Daily Living score,[14] and demographics (ie, age, sex, and whether the participant lived alone); and a description of the health professional's recommendations from step 3. Among participants included in the satisfaction survey, a description of the following assessments was included: the percentage of older adults who were able to use the INSPIRE ICOPE-CARE digital tools (categories: without help, with the help of a third person, or evaluated by a health-care professional) and their overall level of satisfaction with such tools (ie, satisfied *vs* unsatisfied).

### Statistical analysis

Our results were extracted from the ICOPE database during the period from Jan 1, 2020, to Nov 18, 2021 (ie, the deployment phase of the INSPIRE ICOPE-CARE programme). We obtained data for the characteristics of the participants included in the programme, the results of the assessments done in step 1 and step 2, and the analysis done in step 3.

The distributions of the numerical variables were represented by the mean and the SD for normally distributed variables (normality was checked by kernel density estimation). For non-normally distributed variables, we used the median and IQR. Analyses were done using the Stata software package (StataCorp LP, College station, TX, USA), version 14.2.

### Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

## Results

A total of 10903 older people (mean age 76·0, SD 10·5 years; 6627 [60·8%] of whom were women) joined the INSPIRE ICOPE-CARE programme by having their intrinsic capacity screened between Jan 1, 2020, and Nov 18, 2021. This study population overcame the initial expected number of 10000 people. Furthermore, among the 7367 participants who should have had a follow-up step 1 assessment at 6 months (ie, participants who joined the programme before May 19, 2021, and who therefore had a follow-up time length ≥6 months), 5185 did a follow-up step 1 assessment (ie, 70·4% of the eligible population). This number also exceeded the pre-planned follow-up rate of 50%.

Between Jan 1, 2020, and Nov 18, 2021, 2714 professionals, most of whom were nurses (n=980 [36·1%]) and physicians (n=646 [23·8%]), joined the INSPIRE ICOPE-CARE programme via the digital tools (ie, the ICOPE MONITOR app or the ICOPEBOT conversational robot). Among the 10903 participants, the first step 1 screening was done through self-assessment for 1540 (14·1%) participants, whereas 9363 (85·9%) participants were assessed by a professional. The ICOPE MONITOR app was used in 5623 (51·6%) participants, ICOPEBOT in 666 (6·1%) participants, and direct ICOPE database entry in 4614 (42·3%) participants (table 1). Most (9334 [85·6%] of 10903) step 1 assessments were done in the Occitania region.

***Panel:*** **Step 2 assessments conducted in the INSPIRE ICOPE-CARE programme**

**Intrinsic capacity domain**

**Vision**
- WHO simple eye chart for near and far vision (deficit: yes or no)
- Amsler Grid test for detection of age-related macular degeneration (macular degeneration: yes or no)

**Cognition**
- Mini Mental State Examination or Montreal Cognitive Assessment (scores: 0–30, with lower scores indicative of worse cognitive impairment)

**Hearing**
- Audiometry
- Hearing Handicap Inventory for the Elderly–Screening (score: 0–40, with higher scores indicative of worse hearing ability)

**Locomotion**
- Short Physical Performance Battery (score: 0–12, with lower scores indicative of worse locomotion)
- One leg standing test (abnormal or normal)

**Psychology**
- Patient Health Questionnaire-9 (score: 0–27, with higher scores indicative of a higher risk of depression)
- Mini Geriatric Depression Scale (with a score ≥1 indicative of a high probability of depression)

**Vitality**
- Body-mass index (kg/m$^2$)
- Mini Nutritional Assessment (score: 0–30, with higher scores indicative of better nutrition)

**Other assessments**
- Activities of Daily Living (score: 0–6, with lower scores indicative of more dependence)
- Instrumental Activities of Daily Living (score: 0–8, with lower scores indicative of less independence for the instrumental activities of daily living)
- Fried's frailty criteria (score: 0–5, with higher scores indicative of increased frailty; 0=not frail; 1–2=pre-frail; ≥3=frail)
- Fall history in last 3 months (yes or no)

| | ICOPE step 1 cohort, n=10903 |
|---|---|
| Age (years) | 76·0 (10·5) |
| Sex | |
| Women | 6627 (60·8%) |
| Men | 4276 (39·2%) |
| Mode of screening | |
| Self-assessment | 1540 (14·1%) |
| Screening by a professional | 9363 (85·9%) |
| Tool used for screening | |
| ICOPE MONITOR app | 5623 (51·6%) |
| ICOPEBOT conversational robot | 666 (6·1%) |
| ICOPE database entry | 4614 (42·3%) |
| Intrinsic capacity domains with potential abnormality | |
| Vision | 7423 (68·1%) |
| Cognition | 6488 (59·5%) |
| Hearing | 5521 (50·6%) |
| Psychology | 4145 (38·0%) |
| Locomotion | 3767 (34·6%) |
| Vitality | 2043 (18·7%) |

Data are presented as mean (SD) or n (%). ICOPE=Integrated Care for Older People.

***Table 1:*** **Characteristics of participants during the first step 1 ICOPE screening**

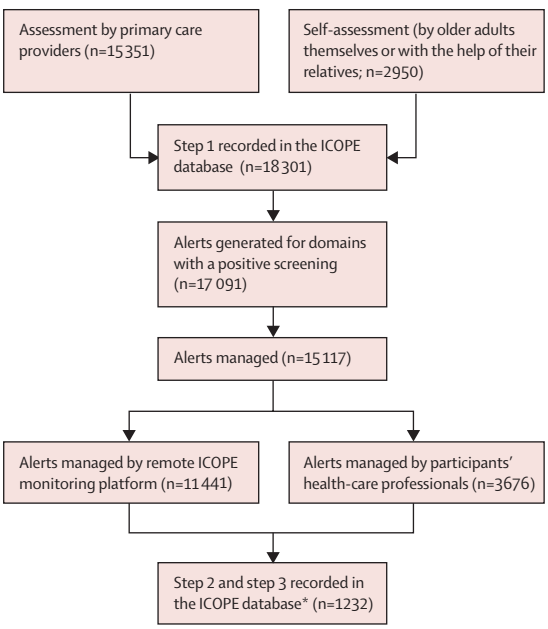


***Figure 2:*** **Flowchart of the INSPIRE ICOPE-CARE programme**
ICOPE=integrated care for older people. *The number of participants in the step 2 and step 3 stage corresponds only to those recorded in the ICOPE database.

In total, 18301 step 1 assessments were done, including 10903 initial step 1 assessments and 7398 follow-up step 1 assessments. As of Nov 18, 2021, among people with at least one follow-up step 1 assessment, 653 (12·6%) participants had been followed up for more than 1 year. The median time between the first step 1 assessment and the first follow-up step 1 assessment was 167 days (IQR 140–205). Among the 7398 follow-up step 1 measurements done, 5988 (80·9%) were done by professionals and 1410 (19·0%) were done by self-assessment. Of the 5988 follow-up step 1 assessments done by professionals, 4538 (61·3%) were done by the Gerontopole remote ICOPE monitoring platform. Among the whole population (n=10 903), 1495 (13·7%) participants dropped out. The main reasons for dropping out among these participants (n=1495) were refusal (529 [35·4%] participants), the deterioration of the state of health, in particular due to care dependence (341 [22·8%] participants), and loss to follow-up (308 [20·6%] participants).

In total, positive screenings for intrinsic capacity in 10801 participants generated 17091 alerts in the ICOPE database. Health-care professionals processed 15117 alerts; 11441 (75·7%) of these alerts were processed by the Gerontopole remote ICOPE monitoring platform (figure 2). Regarding the prevalence of intrinsic capacity positive screenings, 10285 (94·3%) of 10903 participants had potential declines in at least one domain of intrinsic capacity during the first step 1 assessment. This screening concerned potential declines in vision (7423 [68·1%] participants), cognition (6488 [59·5%] participants), hearing (5521 [50·6%] participants), psychology (4145 [38·0%] participants), locomotion (3767 [34·6%] participants), and vitality (2043 [18·7%] participants; table 1). The median (IQR) number of potential impaired capacities was 3 (2–4): 618 (5·7%) participants had no positive screening across the six intrinsic capacity domains; 1837 (16·8%) participants had one; 2640 (24·2%) participants had two; 2591 (23·8%) participants had three; 1895 (17·4%) participants had four; 1015 (9·3%) participants had five; and 307 (2·8%) participants had positive screenings for all the six intrinsic capacity domains.

With regard to step 2 assessments (in-depth assessment), a total of 1232 step 2 assessments were recorded in the database for all the positive step 1 assessments: 958 initial step 2 (10285 [9·3%] of the participants with positive screening) and 274 follow-up step 2 assessments (figure 2). Most of the step 2 assessments (95·0%) were done within 2 days of a positive step 1 assessment. Of 958 participants who received an initial step 2 assessment, 865 (90·3%) had at least one impaired capacity confirmed by the in-depth assessment. Table 2 shows the results of the 958 initial step 2 assessments and table 3 shows the recommendations proposed (during step 3) to participants following these assessments. The mean age of this subpopulation of 958 participants was 80·4 (SD 7·6) years, 657 (68·6%) of whom were women, and 444 (46·3%) of whom lived alone at home. The mean Activities of Daily Living score was 5·4 (SD 1·02). According to Fried's criteria,[13] 151 (15·8%) participants were deemed not

| | ICOPE step 2 cohort, n=958 |
|---|---|
| Age (years) | 80·4 (7·6) |
| Sex | |
| Women | 657 (68·6%) |
| Men | 301 (31·4%) |
| Living home alone | 444 (46·3%) |
| Activities of Daily Living score (scored out of 6) | 5·4 (1·02) |
| Dependent individuals (Activities of Daily Living score scored out of 6) | 133 (13·9%) |
| Instrumental Activities of Daily Living score (scored out of 8) | 6·1 (2·4) |
| Number of Fried's criteria | 2 (1–3) |
| Frailty status (Fried criteria) | |
| Not frail (0 criterion) | 151 (15·8%) |
| Pre-frail (1–2 criteria) | 411 (42·9%) |
| Frail (≥3 criteria) | 263 (27·4%) |
| Vision | |
| Far vision (abnormal) | 106 (11·1%) |
| Near vision (abnormal) | 140 (14·6%) |
| Amsler grid (abnormal) | 117 (12·2%) |
| Hearing Handicap Inventory for the Elderly–Screening score (scored out of 40) | 4 (0–12) |
| Cognition | |
| Memory complaint expressed by the participant | 491 (51·3%) |
| Memory complaint expressed by the family | 268 (28·0%) |
| Mini Mental State Examination score (scored out of 30) | 24·8 (4·6) |
| Psychology | |
| Patient Health Questionnaire-9 score (scored out of 27) | 4 (1–8) |
| Mini Geriatric Depression Scale ≥1 | 233 (24·3%) |
| Locomotion | |
| Fall history in the past 3 months | 338 (35·3%) |
| Short Physical Performance Battery score (scored out of 12) | 8·1 (3·4) |
| One leg standing test (abnormal) | 507 (52·9%) |
| Vitality | |
| Body-mass index (kg/m²) | 25·9 (4·9) |
| Short Mini Nutritional Assessment score (scored out of 14) | 11·2 (2·4) |
| Long Mini Nutritional Assessment score (scored out of 30) | 24·1 (4·1) |
| Risk of malnutrition (Mini Nutritional Assessment score of 17·0–23·5) | 275 (28·7%) |
| Malnourished (Mini Nutritional Assessment score of <17) | 65 (6·8%) |

Data are presented as mean (SD), n (%), or median (IQR). Median values are reported for description of variables with skewed distribution. ICOPE=integrated care for older people.

***Table 2:*** **Characteristics of participants during the first ICOPE step 2 assessment**

| | ICOPE step 2 cohort, n=958 |
|---|---|
| Vision | 374 (39·0%) |
| Referral to an ophthalmologic consultation | 285 (29·7%) |
| General advice on eye care and hygiene | 96 (10·0%) |
| Tips for everyday living with poor vision | 24 (2·5%) |
| Cognition | 623 (65·0%) |
| Lifestyle advice | 262 (27·3%) |
| Referral to a memory consultation | 165 (17·2%) |
| Cognitive stimulation exercises | 159 (16·6%) |
| Orientation towards multi-domain workshops* | 80 (8·4%) |
| Hearing | 396 (41·3%) |
| Referral to an ear, nose, and throat consultation | 211 (22·0%) |
| General tips for ear care and hygiene | 147 (15·3%) |
| Referral to a hearing aid centre | 111 (11·6%) |
| Locomotion | 828 (86·4%) |
| Referral to a physiotherapist | 430 (44·9%) |
| Tips, recommendations, education | 382 (39·9%) |
| Nutritional advice or protein intake | 290 (30·3%) |
| Proposal for multimodal exercises (alone or supervised) | 184 (19·2%) |
| Psychology | 429 (44·8%) |
| Advice and suggestions to strengthen social ties | 152 (15·9%) |
| Referral to a specialist consultation (if organic cause: anaemia, undernutrition, hypothyroidism, etc) | 54 (5·6%) |
| Referral to a psychologist consultation | 81 (8·5%) |
| Referral to a psychiatrist consultation | 22 (2·3%) |
| Vitality | 740 (77·2%) |
| Nutritional advice | 642 (67·0%) |
| Weight monitoring | 300 (31·3%) |
| Fortified diet or oral nutritional supplements | 196 (20·5%) |
| Referral to a dentist | 81 (8·5%) |

ICOPE=integrated care for older people. *Workshops containing exercises in three domains: cognition, nutrition, and locomotion.

***Table 3:*** **Step 3 health-care professional recommendations following the first step 2 assessment**

frail, 411 (42·9%) participants were pre-frail, and 263 (27·4%) participants frail. 117 (12·2%) participants had an abnormal Amsler grid. The mean Mini Mental State Examination score[15] was 24·8 (SD 4·6) and 268 (28·0%) participants had memory complaints expressed by their family. 507 (52·9%) participants had an abnormal one-leg standing test.[16] According to the Mini Nutritional Assessment scale,[17] 275 (28·7%) participants were at risk of malnutrition and 65 (6·8%) participants had probable malnutrition.

At the end of the step 2 assessments (n=958), most of the recommendations proposed within the framework of the step 3 assessments concerned the domain of locomotion for 828 (86·4%) participants in the step 2

assessments, followed by vitality (740 [77·2%] participants), and cognition (623 [65·0%] participants). Most of the referrals were for physiotherapy (430 [44·9%] of 958 participants), followed by ophthalmology (285 [29·7% participants), an ear, nose, and throat specialist (211 [22·0%] participants), and memory consultation (165 [17·2%] participants). Of the 274 participants in the step 2 follow-up, 39 (14·2%) did not apply the recommendations of the previous step 3 assessment, 26 (9·5%) fully implemented the recommendations, and 176 (64·3%) partially applied the recommendations. These data were missing for 33 (12·0%) participants.

Among 10903 participants, those for whom an email address was available in the INSPIRE ICOPE-CARE database (n=3000) received an email survey regarding their level of satisfaction with several aspects of the INSPIRE ICOPE-CARE programme. 1215 (40·5%) participants responded to the survey. The mean age was 72·5 years, 676 (55·6%) of whom were women. Among the 1215 responders, 638 (52·5%) used digital tools without assistance, 82 (6·7%) used digital tools with the help of a caregiver or a family member, and 495 (40·7%) were assessed by a professional. Among those using digital tools without assistance or with the help of a caregiver or a family member (n=720): 353 (49·0%) used the ICOPE MONITOR app, and 367 (51·0%) used the ICOPEBOT. 563 (78·2%) participants were satisfied overall with the digital tool they used.

## Discussion

Our study is, to the best of our knowledge, the first large-scale pragmatic implementation of the ICOPE guidelines in clinical practice with a monitoring platform. Our findings support the feasibility of ICOPE implementation in health-care systems in the real world, with more than 10000 individuals having their intrinsic capacity screened in the ICOPE step 1 assessment in the first 2 years of the INSPIRE ICOPE-CARE programme. Furthermore, about 70% of participants did a follow-up step 1 evaluation at approximately 6 months after the initial step 1 evaluation. This result represented a high adherence level under conditions of current clinical practice. According to a WHO report,[11] adherence to long-term therapy (including both adherence to medication and patients' adherence to health-care providers' recommendations) is about 50% in middle-income and high-income countries. This rate is lower still in low-income countries. Given that ICOPE is expected to be applied on a long-term basis, the rate of adherence to ICOPE step 1 in this study is encouraging for future ICOPE implementation.

Even though the prevalence of positive screening in intrinsic capacity domains during ICOPE step 1 in this study was very high (about 94% of patients had ≥1 alert), this result can be explained at least partly by the following reasons: firstly, ICOPE step 1 was a screening tool (not a diagnostic tool); as with any condition, high prevalence of alerts is expected at the screening stage. Secondly, most participants who were entered into the INSPIRE ICOPE-CARE programme were evaluated when receiving care (especially in ambulatory services) in the hospital geriatric department. These individuals constitute a vulnerable, often frail population. Thirdly, changing the habits of health-care professionals takes time and it is possible that the participating primary care providers did not perceive the importance of applying the ICOPE step 1 screening assessment for older adults who are not frail. These primary care providers might have used this evaluation preferentially among individuals with signs of functional loss or frailty. Finally, because most previous studies that operationalised screening steps have been conducted before WHO recommendations for ICOPE implementation, they have used adapted tools[18,19] that vary from the WHO ICOPE screening instrument. In 2020, Ma and colleagues,[20] who used the WHO ICOPE step 1 tool, found a prevalence of 69·1% positive screening for intrinsic capacity. However, this study was small (n=376) and was done in younger individuals (mean age 68·6 years) than those included in our study.

Beyond the large implementation experience from France described in our study, several other countries have started pilots of the WHO ICOPE programme, including Andorra, China, India, Mexico, South Korea, Spain, Taiwan, and Vietnam.[20–24] However, most of these studies are pilot studies aimed at assessing the relevance of ICOPE tools and there has been little research into the implementation or impact of these instruments. All of these reported pilot studies have been far smaller in scale than the INSPIRE ICOPE-CARE programme. Won and colleagues[22] are implementing the ICOPE guidelines in primary care centres (the ICOOP Frail randomised controlled trial of the National Evidence-based Healthcare Collaborating Agency in South Korea). No results have yet been presented. In China, Ma and colleagues[20] published results from the implementation of the ICOPE programme: the study showed that the ICOPE screening tool was useful at identifying participants with poor physical and mental capacities, can help to identify declines in intrinsic capacity, and can slow the process of care dependence. China also launched the ICOPE-CHINA programme to provide integrated and diverse services to meet the clinical, rehabilitative, and psychological person-centred needs of older patients.[23] Cheng and colleagues[24] also used the ICOPE screening tool in a study of 457 participants aged 65 years and older in Taiwan. However, none of these initiatives to implement the WHO ICOPE programme used a procedure that was adapted to the longitudinal monitoring of older people like the INSPIRE ICOPE-CARE programme.

In France, a large programme for the prevention of loss of autonomy in older adults has been underway since 2014. The first results from this trial[25] did not show a significant effect on the outcome indicators used (eg, cumulative length of hospital stays, rate of

rehospitalisation at 30 days, and polypharmacy). Or and colleagues[25] suggested that these negative results would be linked to the heterogeneity of territories and systems, delays in scaling up tools, and operationalisation of systems, lack of mobilisation of primary care actors, lack of city-hospital coordination, and difficulties in changing professional habits. This programme has enabled us to better understand the modalities of implementing interventions in the real-life setting of the French health-care system, informing the implementation of INSPIRE ICOPE-CARE. The creation of both digital tools for data collection and a database that automatically receives these data and produces alerts when positive screenings for intrinsic capacity are detected facilitate a timely follow-up of patients and are essential to increase the involvement of stakeholders.[26] To shorten the time required for the implementation of organisational changes, and the time for these changes to produce results, several communication, information, and training campaigns have been launched with professionals and older people. Finally, the creation of the INSPIRE ICOPE-CARE monitoring platform, made up of experienced nurses who support health-care professionals to monitor their patients, is a crucial step in the deployment of this programme.

The continuity of the INSPIRE ICOPE-CARE programme faces three main challenges. First, to propose an innovative approach to the care of older people that goes beyond the usual practice currently undertaken by health-care professionals. Second, to achieve this ambitious goal in a personalised care prevention setting. Last, to achieve this goal with the use of digital tools. The first obstacle, linked to the integration of an innovative practice into routine care, has been partly overcome because in less than 2 years, about 11000 older people are being monitored using digital tools (ICOPE MONITOR and ICOPEBOT) and the ICOPE database. However, difficulties remain to be resolved. In particular, difficulties regarding the remuneration of health-care professionals by the French national health insurance fund. Currently, only nurses who are not employees of an establishment are paid by the Occitania Regional Health Agency funds for conducting the step 1 screening in the framework of a pilot project. Involvement in step 2, step 3, and step 4, as well as involvement in recording these data in the ICOPE database, are not funded. A shortage of funding is the main reason why only 9·3% of participants with potentially positive intrinsic capacity at screening (step 1) had their step 2 and step 3 assessments done and recorded in the ICOPE database. The Occitania Regional Health Agency funds are not permanent. Work at the national level is underway to pay all health professionals for all the steps of the WHO ICOPE programme by the French national health insurance fund in routine practice. This change could hugely increase the involvement of health-care professionals in the INSPIRE ICOPE-CARE programme.

Developing a personalised care plan (step 3 in our study) is decisive for a successful ICOPE pathway. The Taiwan Integrated Geriatric Care randomised controlled study[27] showed the positive impact of a multi-domain primary care intervention, which is recommended in the ICOPE guidelines, on patients' quality of life and the physical and cognitive functions of older people.[27] However, we had many difficulties implementing step 3, including having only low amounts of support to help older people. Only 9·5% of the personalised care plans that were proposed to participants in the INSPIRE ICOPE-CARE programme were fully applied because of lack of coordination between stakeholders and communication with the participants. Improving communication between older people and health-care professionals is needed, including through the use of technologies (eg, a secure web platform containing functionalities for chat and video conferences with professionals, training and information documents, and links to multi-domain online workshops). Further studies are needed to show whether full implementation of step 3 can prevent dependence.

The use of digital tools in INSPIRE ICOPE-CARE is an important asset to facilitate and generalise the large-scale implementation of step 1. Step 1 has shown to be associated with the probability of frailty,[28] disability,[28] and increasing health-care costs[29] in older people. We are developing an additional digital tool including step 2 and step 3, which will be connected to the ICOPE database in July, 2022. This tool allows professionals to no longer use paper and pencil and to make all assessments and data entry into the ICOPE database with digital tools. The support of the French national health insurance fund for paying health professionals for the entire ICOPE pathway (from step 1 through to step 4) should encourage them to get involved in the INSPIRE ICOPE-CARE programme.

The main strength of this study is its large-scale implementation in a real-life population of older people. This study, however, has several limitations. We could not test the effectiveness of the ICOPE care pathway in improving clinical outcomes, as well as its cost-effectiveness as this study was not a randomised controlled trial; only ICOPE step 1 has been implemented on a large scale. Therefore, it is not possible to know how the whole care pathway (from step 1 to step 5) will work in a real-life health-care system.

The INSPIRE ICOPE-CARE programme opens up multiple avenues for improvement in the areas of prevention, care, innovation, and clinical research by placing older people at the centre of the prevention approach. Future investigations on this topic should examine the potential reversibility of intrinsic capacity deficits over time, in particular using step 2 in-depth assessments. Furthermore, the interactions of intrinsic capacity deficits and the management of underlying medical conditions are crucial for older adults' health and should be further explored using a longitudinal

approach. Investigating the whole ICOPE care pathway might bring valuable information on care planning (ICOPE step 3) and its monitoring (ICOPE step 4); INSPIRE ICOPE-CARE will contribute to these benefits as further development of step 3 and step 4 are the next elements that will be integrated in this implementation programme. Finally, now that we have provided evidence to support the feasibility of implementing the ICOPE guidelines on a large scale in clinical practice, pragmatic randomised controlled trials can be developed to test the effectiveness of ICOPE implementation in the real world of health-care systems on clinical outcomes, in particular disability and care dependence.

#### Contributors

NT, CB, SA, FN, MESM, and BV contributed to the study design. NT, FN, MESM, and BV supervised the study. NT, CB, CM, JdK, CL, CT, FN, MESM, and BV coordinated the study. NT, CB, CM, JdK, CL, CT, IC, TJ, and AP contributed to data collection and verification. NT and CB analysed the data. NT, PdSB, CB, CM, JdK, CL, CT, SA, FN, JRB, MESM, and BV contributed to data interpretation. NT wrote the first draft of the manuscript. NT and PdSB wrote the revised drafts of the manuscript. All authors contributed to drafting and revision of the manuscript. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

#### Declaration of interests

PdSB reports consulting fees from Pfizer. CB received payment for teaching at nursing institutes of the Red Cross, Toulouse Hospital, and Castres Hospital, outside of the submitted work. SA reports a grant and consulting fees from Nestec and payment for lectures or presentations from Roche. JRB reports consulting fees from the United Nations Population Fund and WHO; payment from UBS; and participated at Global Coalition on Ageing, Home Instead, and Amgen and had a leadership or fiduciary role in Global Centre on Modern Ageing. BV is a member of the International Conference on Frailty and Sarcopenia Research scientific board, the head of the Gerontopole at WHO collaborative centres, and principal investigator of INSPIRE project. All other authors declare no competing interests.

#### Data sharing

De-identified data related to the results reported in this Article (ie, text, tables, figures, and the appendix) and a data dictionary will be made available for other researchers, subject to the approval of an independent review committee and after signing a data access and a data use agreement. The dataset will be made available under reasonable request to the corresponding author, starting 6 months and ending 5 years following article publication.

#### Acknowledgments

We thank Yuka Sumi from the Department of Maternal, Newborn, Child, Adolescent Health and Ageing at WHO in Geneva, Switzerland, as well as all the health-care professionals who participated in the INSPIRE ICOPE-CARE programme, especially the members of the Gerontopole Hospital out of the walls care unit (Sandrine Augusto, Véronique Bezombes, Pascale Baby, Laure Bouchon, Marie Christine Cazes, Florence Da Costa, Caroline Oliveira-Soares, Magali Poly, Charlene Seguela, and Sandrine Vaysset) and all the members of the Occitania Territorial Teams of Aging and Prevention of Dependence. The INSPIRE ICOPE-CARE programme was supported by grants from the Occitania Regional Health Agency (Region Occitanie and Pyrénées-Méditerranée; reference number 1901175), the European Regional Development Fund; project number MP0022856) and The Interreg Program V-A Spain-France-Andorra (European Union) in the context of the APTITUDE project (reference EFA232/16).

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