

iDecide: the Advance Directive app to facilitate engagement in Advance Care Planning

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Summary

STUDY AIMS: Advance Directives (AD) are central to Advance Care Planning (ACP), allowing patients to document medical preferences in legally binding documents. Despite broad public awareness and support, only one-fifth of the Swiss population has completed an AD. Consequently, the roadmap for ACP implementation by the ACP National Task Force calls for the development of digital applications to promote ACP in Switzerland. This study details the development process for the mobile application “iDecide” for AD creation based on the Swiss Medical Association (FMH) AD template. The primary aim is to ensure optimal usability and user satisfaction with the app.

METHODS: Using a Participatory Action Research (PAR) approach, four research cycles were conducted to create an evidence-based AD creation tool. The iDecide app, published in October 2024 (www.idecide.ch), was reviewed by users through an online survey. The survey evaluated the app’s user-friendliness, educational information quality and concordance with ACP goals, measuring 14 items on a 5-point Likert scale.

RESULTS: The PAR approach led to the successful development of the iDecide app for AD creation. The app guides users through the process of drafting their personalised AD. It provides multimedia patient information on the content and value of AD, encourages reflection on personal preferences and promotes communication with surrogate decision-makers and healthcare professionals. The drafted AD is available in both print and in a digital format via an offline QR code. This QR code allows AD information to be stored, shared and accessed when needed. Survey responses from 94 app users indicated high usability, information quality and user satisfaction. On a 5-star rating system, the mean overall rating was 4.69 (SD: 0.57, 95% CI: 4.56–4.81), consistent across age groups. Users rated the app as easy to use and making AD creation more attractive.

DISCUSSION: While various online forms for AD creation exist in Switzerland, no mobile app has previously enabled the public to complete an AD. iDecide is a ready-to-use AD application, operating without the need for additional infrastructure and freely available to the general public. The tool aligns with the national roadmap for ACP implementation and adheres to key recommendations for digital ACP tool design. It effectively tackles barriers to widespread AD implementation in Switzerland, addressing engagement and accessibility issues. iDecide thus has the potential to empower people to actively engage in their ACP.

Introduction

Healthcare providers are increasingly adopting patient-centred care models that prioritise patients’ decisional autonomy. Advance Care Planning (ACP) helps preserve patient autonomy when patients can no longer make decisions [1]. ACP is defined as “the ability to enable individuals to define goals and preferences for future medical treatment and care, to discuss these goals and preferences with family and healthcare providers, and to record and review these preferences if appropriate” [2]. The Swiss government has implemented a National Task Force to strengthen ACP in Switzerland [3]. The Task Force published a national roadmap including recommendations to improve accessibility, equity and quality standards for Advance Directives (AD) [4]. Advance Directives are a optional but central component of ACP. They define a patient’s medical preferences in formal documentation [5]. In Switzerland, Advance Directives are anchored in the Civil Code and are binding for healthcare professionals (HCP). In other countries, the legal status of Advance Di-

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rectives may differ. Advance Directives help HCPs deliver care aligned with the wishes of incapacitated patients [6] and reduce stress for surrogate decision-makers acting on the patient's behalf [7]. For Advance Directives to be effective, they must be accompanied by qualitative communication between patients, HCPs and surrogate decision-makers within an ongoing, participatory ACP process – ideally supported and guided by professionally trained ACP facilitators [2, 7]. A deep understanding of patients' preferences – beyond what is documented – increases the likelihood that their wishes will be honoured, even in unforeseen situations [8].

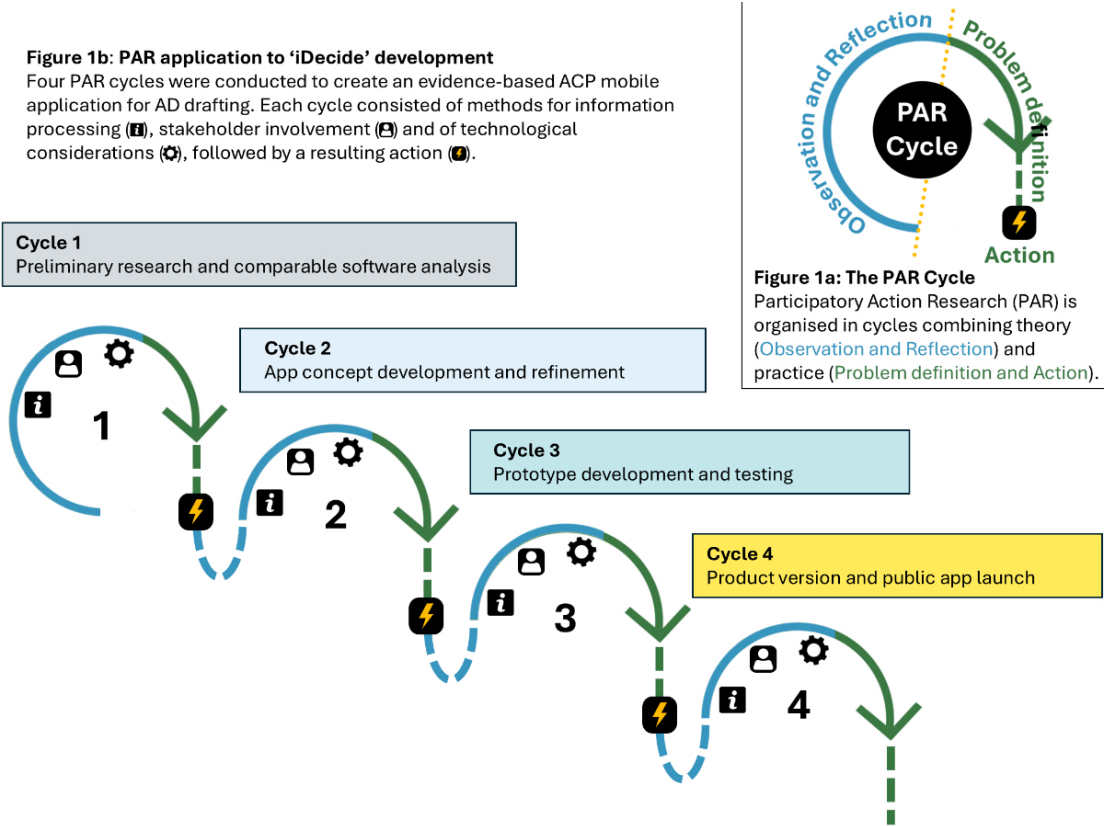
Drafting an AD is recommended for all citizens with decision-making capacity, regardless of age or health status [9–11]. Nevertheless, despite widespread awareness and approval of Advance Directives [12], only one-fifth of the Swiss population has completed this important document [13, 14]. Addressing this shortfall, the Swiss national ACP roadmap underscores the need for innovative solutions, explicitly calling for the development of digital applications [4]. While various online forms for AD creation exist in Switzerland [15], to the best of our knowledge there are no mobile applications available for the public to complete an AD. Mobile health applications (mHealth apps) are a promising technology for improving AD completion rates [16]. They offer scalable solutions that personalise the AD drafting process and can help with periodic document revision. However, an international review of existing ACP apps identified shortcomings in both content quality and user-friendliness [16].

The goal of this study was to develop a user-friendly mobile application for AD creation. Effective AD app development must be grounded in strong ACP evidence and prioritise usability [16], which is dependent on user satisfaction [17]. We therefore used a scientifically established method that promotes collaboration between researchers and stakeholders: Participatory Action Research (PAR) [18]. This paper provides in-depth knowledge of the development and testing process of the free mobile application "iDecide". The primary aim was to ensure optimal usability and end-user satisfaction with the app.

Methods

The PAR methodology used in this study is a community-based, action-driven research approach pursuing practical solutions for issues of pressing concern [18, 19]. By involving participants in research, PAR can increase the social validity of findings [20]. It further allows for the continuous iteration and optimisation needed for software development [21, 22]. PAR operates in consecutive research cycles, bridging theory and practice. Each cycle begins with an "observation and reflection" step, followed by the "problem definition" and a resulting "action", which is then researched in the next cycle (figure 1a).

Figure 1: a: The PAR Cycle: Participatory Action Research (PAR) is organised in cycles combining theory (Observation and Reflection) and practice (Problem definition and Action). b: Application of PAR to iDecide development. Four PAR cycles were conducted to create an evidence-based ACP mobile application for AD drafting. Each cycle consisted of methods for information processing, stakeholder involvement and of technological considerations, followed by a resulting action.



The “observation and reflection” step was divided into three categories relevant to digital technology development: a) *Information processing* gathered evidence from literature and findings from previous cycles, b) *Stakeholder involvement* identified how to engage target groups throughout the development process and c) *Technological considerations* evaluated tech-related challenges and constraints for the next development steps. Four PAR cycles were conducted to transform the iDecide app from an early-stage idea into an evidence-based final product (figure 1b): 1) Literature research and comparable software analysis, 2) App concept development and refinement, 3) Prototype development and testing, and 4) Product version and public app launch. The methods of each PAR cycle are detailed below (figure 2). The in-depth methodology and analysis of the survey studies conducted in cycles 3 and 4 are available in the appendix.

Figure 2: Overview table of observation and reflection methods across PAR cycles. Summary of methods for information processing, stakeholder involvement and technological considerations used in each PAR cycle.

Cycle	Observation and Reflection			Action
	 Information processing	 Stakeholder involvement	 Technological considerations	
1	▪ Literature research: ACP / AD / digital health / mHealth / Switzerland ▪ FMH-AD comprehensibility study	▪ Stakeholder identification: users, healthcare professionals, legal experts	▪ Overview of global ACP/AD tools and apps available in Switzerland	Results
2	▪ App concept evaluation: alignment with ACP goals and effectiveness in overcoming AD implementation barriers	▪ App concept evaluation by stakeholder feedback group ▪ Legal validation by expert ▪ Consultation with FMH representatives	▪ Options for secure storage and sharing: investigation of QR-Codes as offline data transfer solution	
3	▪ Extensive prototype test by Action Group members ensuring functionality and fixing software bugs	▪ Prototype test with users to assess usability (feedback button and prototype survey)	▪ Restriction to iOS software: switching to crossplatform environment (iOS+Android)	
4	▪ Preparation of product version for public user test	▪ Product version survey to assess usability, user satisfaction and improvement potential	▪ Review by Google and Apple for public distribution ▪ Public app launch	

The study was conducted and supervised by an Action Group consisting of a palliative medicine expert (SE), a communication expert (SJF), a medical doctor (AvS) and a medical graduate (RR). The group collaborated with patient representatives, nursing experts, intensive care unit doctors and legal experts throughout the study.

The ethics commission of Bern canton reviewed the project and determined that it does not fall within the scope of the Swiss Human Research Act (HFG). Therefore, ethical approval was not required for its conduct. Reference: ID Req-2025-00035.

Cycle 1 – Preliminary research and comparable software analysis

Information processing

A scoping literature search was conducted on ACP and Advance Directives, their implementation in Switzerland and the use of eHealth and mHealth solutions to support them, using various combinations of search terms on PubMed and Google Scholar. The detailed search strategy is provided in the appendix. *FMH-AD comprehensibility study.* A study by our institute [23] evaluated the comprehensibility of the AD of the Swiss Medical Association (FMH-AD short version) revised in 2022 [24]. While highlighting areas for improvement, the AD showed good overall comprehensibility. It therefore served as a foundation for this project.

Stakeholder involvement

Stakeholder identification. Three main stakeholder groups were identified. The app's primary addressees are its target users, comprising all individuals with decision-making capacity in Switzerland, as drafting an AD is recommended for every person [9–11]. The second target group includes healthcare professionals who advise patients on Advance Directives and are responsible for their implementation. The third group, legal experts, reviews the digital AD's compliance with legal requirements.

Technological considerations

A literature and online search was conducted to identify international ACP and AD creation software. Google and Apple app stores were searched for mobile apps offering ACP or AD services in Switzerland.

Cycle 2 – App concept development and refinement

Information processing

The findings from cycle 1 guided the development of the iDecide app concept. The Action Group evaluated the concept for compatibility with key ACP requirements and its effectiveness in addressing identified barriers to AD implementation.

Stakeholder involvement

Stakeholder feedback group. In March 2024, the app concept was presented to a feedback group with relevant stakeholders (patient representative; physician; experts in palliative care, nursing and communication). Members provided feedback on the app concept in a meeting and an online survey, focusing on usability, navigation and data safety. *Legal validation.* To ensure the legal validity of the planned digital AD format, a summary of the app concept focusing on legal aspects was reviewed by a private law professor specialised in Swiss family and medical law (Prof. Regina E. Aebi-Müller). *Consultation with FMH representatives.* As Switzerland's main physicians' association, efforts were undertaken to streamline the app with FMH objectives. In a meeting, FMH AD experts provided insights on legal challenges, technical difficulties and lessons learned from the 2022 FMH-AD form revision [25].

Technological considerations

The Action Group evaluated options for secure storage and sharing of Advance Directives within the app. Because of data safety concerns with online data storage, an offline solution using a QR code was further investigated.

Cycle 3 – Prototype development and testing

Information processing

Based on the refined app concept, a prototype app was developed. The prototype underwent rigorous testing by the Action Group to ensure all intended functions were properly working and to detect software bugs.

Stakeholder involvement

Prototype version survey. An online survey was conducted to assess the prototype. Participants were recruited via a flyer explaining the iDecide app and providing access through Apple's TestFlight beta-testing environment. The survey was informed by the validated Mobile App Rating Scale (MARS) [26]. The survey evaluated the prototype's user-friendliness, the quality of educational information and its alignment with ACP goals, such as facilitating the AD drafting process and raising awareness about ACP. Detailed survey methodology and results are available in the "Prototype Survey Report" in the appendix.

Feedback button. Test users could directly report app issues and suggestions via a feedback button accessible on all main module pages.

Technological considerations

The prototype was limited to iOS devices due to resource constraints. A cross-platform framework (iOS and Android) was chosen for the product version to ensure wider accessibility.

Cycle 4 – Product version and public app launch

Information processing

User feedback informed the development of the product version. The Action Group tested and finalised the product version for a public user test, which began in October 2024.

Stakeholder involvement

Product version survey. To address low participation rates in the prototype survey of cycle 3, a slightly shortened survey was drafted to evaluate the product version. The survey, conducted in German, consisted of 14 statements in the 5-point Likert scale format and 5 free-text questions. It was divided into the following sections: User-friendliness, educational information quality, concordance with ACP goals and user demographics (age category, sex, highest educational level attained and current occupation). Participants for the product version survey were primarily approached in person during the Bernese City Festival on End-of-Life Communication (October

2024) through flyer distribution and additional participants recruited within the author’s personal network. Detailed survey methodology and results are available in the “Product Version Survey Report” in the appendix.

Technological considerations

The product version had to undergo review by Apple and Google to be accepted for public distribution.

Use of artificial intelligence

Large language models were used for language and grammar editing within the article (ChatGPT 4o) and to assist with R code scripting for graph generation (Claude-Sonnet 3.5). All AI-assisted contributions were carefully reviewed by the authors, who assume full responsibility for the publication’s content.

Results

The following section summarises key findings from each PAR cycle and the actions taken as a result (figure 3).

Figure 3: Overview table of key findings and resulting actions across PAR cycles.

Cycle	 Key findings	 Resulting action
1	- Identifying barriers to AD implementation: ACP engagement difficulty, AD template variety, accessibility issues, avoidance of ACP discussions Comparable software analysis: No widely available AD app for Switzerland and shortcomings of most digital ACP tools	- Developing the app concept: - FMH AD as a foundation (adaptions according to comprehensibility study) - Fulfillment of app functionality and key ACP elements lists - ACP modules as building blocks - Incorporation of newly developed patient information materials
2	- Stakeholder feedback group involvement: Data safety concerns and recommendations for improving engagement in ACP - Legal validation: No legal concerns with paper-based AD; reluctance to purely digital AD	Data safety concept: Offline solution for full user control over data - Express Version of the AD: AD in 15 minutes to lower engagement hurdles - Legal concept adaptation: Paper-based AD with QR-code digital component Prototype development for iOS
3	Prototype survey (n=8): 4.5/5★ overall app rating - Improvement potential in navigation and entertainment (incorporation of videos)	- Development of whiteboard animation educational videos for all modules - Integration of communication guide as module Product version development for iOS / Android
4	Product version survey (n=94, ongoing): 4.69/5★ overall app rating - High ratings for user friendliness, information quality and concordance with ACP goals (see Table 3)	To be defined: See in discussion

Cycle 1 – Preliminary research and comparable software analysis

Key findings

Barriers to AD implementation in Switzerland. The literature search identified barriers to comprehensive AD implementation in Switzerland including patient engagement difficulties, AD template variety, document accessibility issues and avoidance of ACP discussions by patients and HCPs.

Engagement. Reluctance to create an AD might stem from heavily text-based processes underlying most AD tools [27] and limited consideration of AD benefits in young and healthy individuals. Technology and gamification are suggested solutions to make ACP processes more interactive and engaging [28].

AD template variety. In Switzerland, numerous AD templates exist [15], offering patients many options but complicating standardisation and making AD adherence challenging for HCPs [7].

Accessibility. A major obstacle to AD implementation is limited document accessibility in critical situations [7]. Providing solutions to access AD information is therefore an organisational quality indicator of AD tools [9, 11]. Advance Directives should be accessible across institutions and easily shared with surrogate decision-makers and HCPs.

Starting ACP discussions. Drafting an AD should involve discussions with surrogate decision-makers, loved ones and HCPs [4, 29]. Such discussions help surrogates represent patient wishes better [30] and provide valuable guidance for HCPs [7]. Including communication elements in ACP interventions increases AD completion rates, and improves concordance between care preferences and delivered care [29]. Resources to initiate discussions and facilitate communication are therefore crucial [7].

FMH-AD comprehensibility study. The study on the revised FMH-AD with patients and physicians [23] delineated three areas for improvement of the current AD template: 1) Patients struggled to differentiate between short-, medium- and long-term incapacitation. 2) Both groups found the organ donation section challenging due to limited explanations of basic concepts, organ preparation measures and eligible organs, relying instead on a link to the website of the Swiss organ transplantation organisation (Swisstransplant) for further details. 3) The “Attitudes to life” section was generally well understood, but patients found the free-text questions challenging to answer and sometimes struggled to see their practical relevance.

Comparable software analysis. The search for similar apps in Switzerland found one app, “Accordons-nous” (“Let’s Agree”), a submodule of the University Hospital of Geneva (HUG) app “Concerto”, which informs users about ACP but limits AD drafting to HUG patients [31]. Various international ACP programs (web- and app-based) were reviewed and relevant findings from their evaluations integrated into the concept. Dupont et al. found that most internationally existing web-based ACP tools had significant shortcomings [32]. Most tools did not fulfil the functions and ACP key elements lists outlined by the authors and only 10% involved end-users in their development.

Resulting action

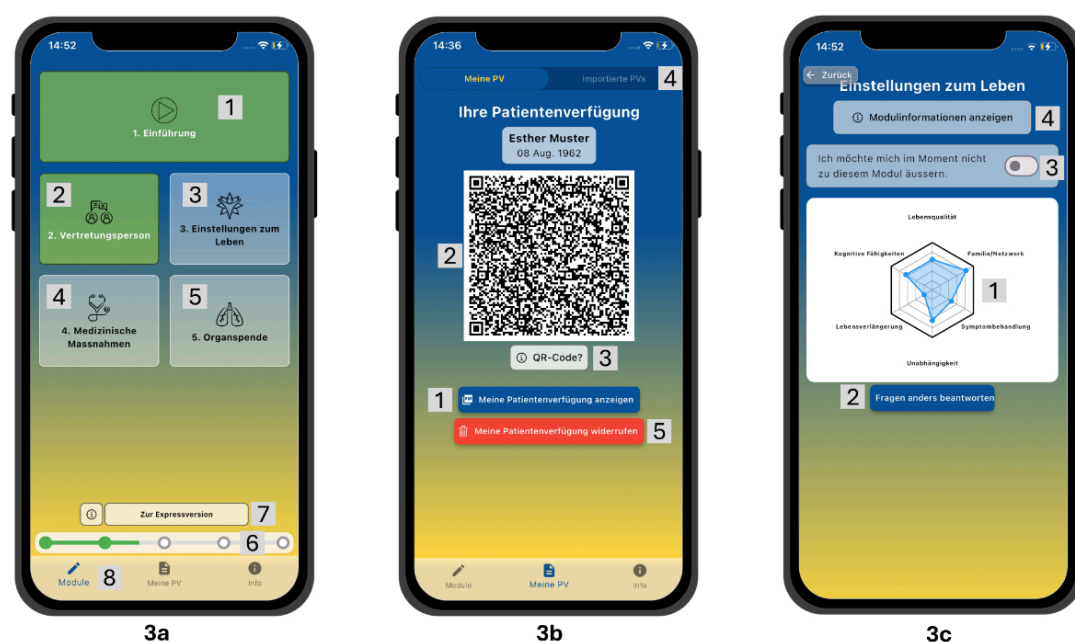
App concept. An initial app concept was drafted to address AD barriers and meet with the functions and ACP key elements lists described by Dupont et al. [32]. The appendix contains detailed information about iDecide’s compliance with both lists. The app uses a modular design for quick access to the four main AD topics: surrogate decision-maker, attitudes to life, medical treatments and organ donation (figure 4a). Each module includes informational texts and links to external websites. Interactive elements keep users engaged, allow customisation, track progress and enable progress saving. Each module includes a questionnaire for users to state their personal preferences. User input is compiled into a PDF that can be downloaded, shared or printed directly within the app (figure 4b). By signing and dating the physical document, the AD becomes legally binding.

Patient information materials. Educational information texts were developed by RR based on the transtheoretical model of health behaviour change [33] and organised in drop-down menus, portioning content for reading ease. Additionally, a communication guide was integrated to help users discuss their wishes with surrogate decision-makers.

FMH-AD content validity study: Adaptations. The following changes to the FMH-AD template were made based on the study recommendations [23]:

1. The scenarios of incapacitation were simplified from three to two (short-term and long-term) to reduce confusion about terminology.
2. The organ donation module was rewritten entirely, based on publicly available information by Swisstransplant [34] and in cooperation with the local Swisstransplant officer. It addresses changes in Swiss organ donation law, recently transitioning from an opt-in to an opt-out model [35].
3. To simplify answering the questions in the “Attitudes to Life” section, they were converted into statements users can agree or disagree on by swiping a lever. The calculated “attitudes” are then visually represented in a personalised spider web diagram (radar chart) (figure 4c).

Figure 4: a: Screen of the editing menu of the iDecide app, showing the five modules for drafting an AD: (1) Introduction, (2) Surrogate decision maker, (3) Attitudes to life, (4) Medical treatments and (5) Organ donation. Progress is visualised by a progress bar (6) and by completed modules turning green (1, 2). A button (7) allows switching to the Express Version or Standard Version of AD. The navigation bar (8) at the bottom allows users to switch from the editing menu to either the “My AD” section or to the info section providing additional information about the app. b: Screen showing the “My AD” section of the iDecide app. The AD can be viewed as a PDF (1) or as a personalised QR code (2) containing all the information of the AD. Button (3) provides additional information on how to use the QR code. Button (4) allows users to view an imported AD or to import an AD by scanning a QR code. Button (5) allows users to recall an AD. c: Screen of the results of the “Attitudes to life” questionnaire module graphically representing patient values in a spider web (1), based on user valuation of ACP statements. Categories from the graph commencing at the top in a clockwise direction are: quality of life, family/network, treatment of symptoms, independence, life prolongation and cognitive abilities. Button (2) to change answers to ACP statements. Button (3) to omit an answer to each module. Button (4) to show the module’s information again.



Cycle 2 – App concept development and refinement

Key findings

Stakeholder feedback group. The feedback group survey indicated strong approval for the app concept; however, it highlighted the critical importance of a robust and transparent data safety concept due to widespread mistrust of digital solutions managing healthcare data.

Legal validation. The consulted law professor confirmed that there were no legal concerns with the app generating a PDF for physical printing and signing. She advised against using a solely digital AD format, as validated digital signatures are not yet widely adopted. Representing the AD as a signed and dated QR code card was also considered not fully compliant with current legal standards. However, such a QR code card can serve as a strong indicator of the person’s presumed wishes, which could prove valuable in time-sensitive clinical decisions.

Resulting action

Data safety concept. The Action Group developed a data safety concept, choosing an offline solution that does not require user registration. Personal data is only saved on users’ phones to give them full control of data handling.

Quick Start with Express Version AD. The Express Version AD offers a 15-minute starting point for hesitant users to engage in ACP. It focuses on appointing a surrogate decision-maker and specifying organ donation preferences. Users are encouraged to later transition to the Standard Version to expand their ACP.

Adaptation of the legal concept. In response to the raised legal concerns about a purely digital AD, the Action Group adopted a hybrid approach. An electronically generated paper-based AD, manually signed by the user, is complemented by a personalised QR code containing the identical

information for easy sharing and visualisation. QR codes can store data offline by representing it in a binary matrix. They can be read by most devices without requiring additional software. The QR code serves as a strong indicator of presumed wishes, with its legal value bound to the signed paper-based AD. The app clarifies this to users by repeatedly reminding them that only the hand signed AD is legally binding.

Prototype development. Based on the refined app concept, the development of a prototype began in January 2024. Initially, the software was created for iOS by the volunteer PS.

Cycle 3 – Prototype development and testing

Key findings

Feedback button. Users reported functional errors (e.g. questionnaire flaws, QR code scanning issues), suggestions for improved user experience (e.g. font size) and content issues (e.g. text repetitions, information overload).

Prototype survey. Eight users ($n = 8$) completed the survey, rating the prototype app an average of 4.5 (SD: 0.54, 95% CI: 4.05–4.95) on a 5-star rating system for overall satisfaction. Users indicated a high likelihood of recommending the app. The prototype was rated very user-friendly in terms of ease of use and structure, though navigation and attractiveness could be improved.

Educational content was considered highly understandable, helpful and convincing, though an excess of information content was noted. Users felt the app made AD drafting easier and more appealing while raising awareness of ACP, but less effective for facilitating discussions with loved ones or HCPs. One key suggestion from users was to add educational videos.

Resulting action

Product version development. A professional programmer and physician (RS) was tasked with programming the product version of the app starting in August 2024. The product version incorporated findings from the prototype test, adding whiteboard animation educational videos to all app modules and shortening informational texts.

Cycle 4 – Product version and public app launch

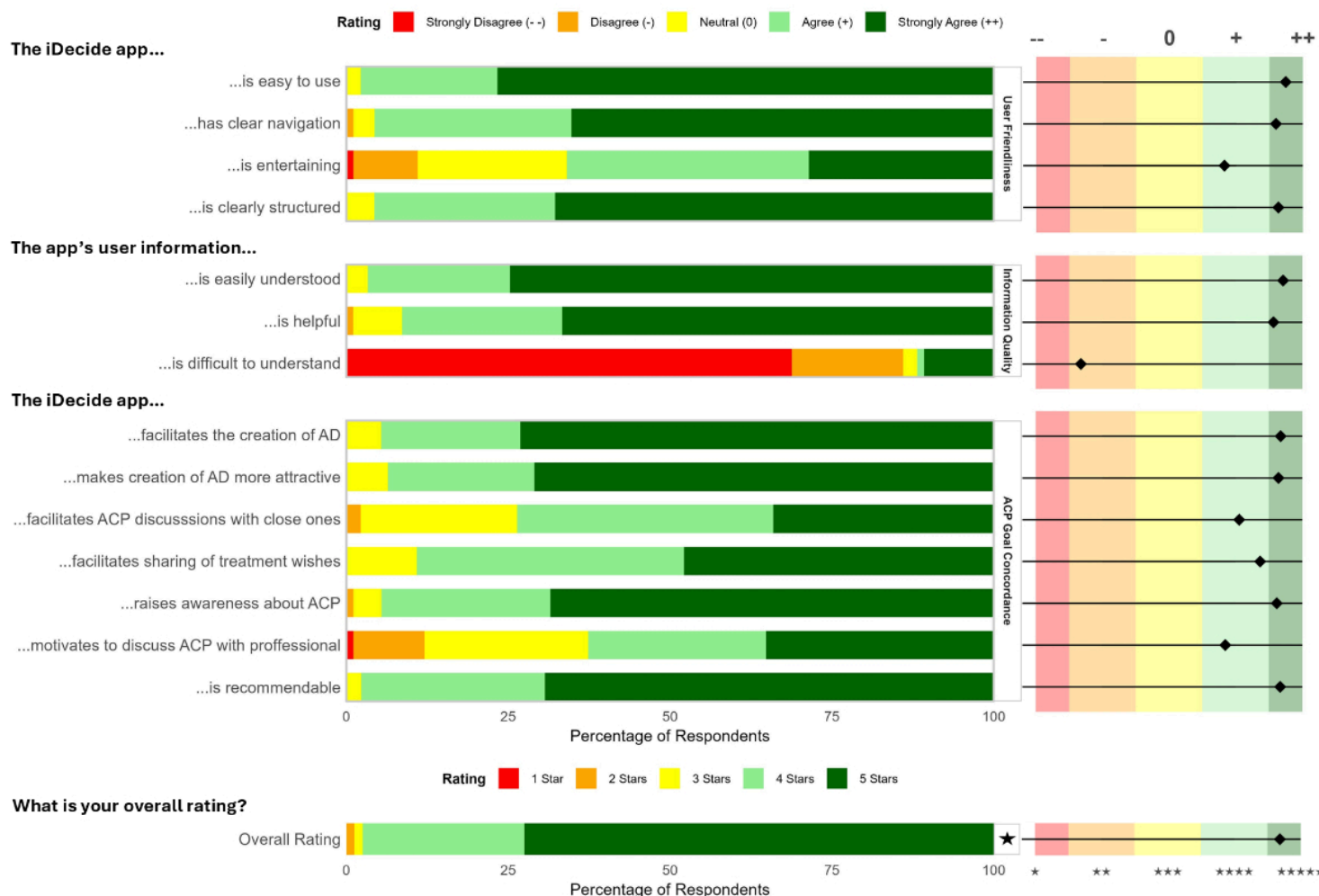
Key findings

iDecide was approved for public distribution in October 2024 by Apple and in December 2024 by Google. The product version is freely available for download in the Swiss Play Store and App Store (www.iDecide.ch/download).

Product version survey: Survey results collected between 22 October 2024 and 31 January 2025 are graphically represented in figure 5. Ninety-four ($n = 94$) users (59.6% female; 59.6% <30 years; 86.2% with a university degree) completed the survey, rating the app an average of 4.69 (SD: 0.57, 95% CI: 4.56–4.81) on a 5-star rating system for overall satisfaction. Users indicated a high likelihood of recommending the app to others. Users rated the app as very user-friendly (ease of use, navigation clarity, entertainment and structure). Educational content was considered highly understandable and helpful. The app was rated as making the AD drafting process easier and more appealing while raising awareness of ACP. Compared to the prototype, users rated the product version as more effective for facilitating ACP discussions with loved ones or HCPs. An analysis of variance (ANOVA) showed no significant age-related differences in ratings for user-friendliness and overall satisfaction. Key suggestions by users included enabling uploads of signed Advance Directives and allowing the selection of multiple substitute decision-makers.

As of January 2025, the 4th PAR development cycle remains ongoing. The ongoing user feedback collected will be used for the future optimisation of iDecide.

Figure 5: Distribution and mean responses for the iDecide product version survey (n = 94). The left panel shows the percentage distribution of responses for each survey item on a Likert scale (Strongly Disagree, 1 star, to Strongly Agree, 5 stars). The right panel displays the mean responses for each item, plotted on a spectrum ranging from "--" (Strongly Disagree) to "++" (Strongly Agree) or from 1 star to 5 stars for overall rating.



Discussion

As a result of the four conducted PAR cycles, we successfully developed iDecide, Switzerland's first mobile application for the general public to create an AD. User evaluations demonstrated high overall satisfaction and confirmed the app's user-friendliness, as well as its potential to make AD creation more attractive. The Swiss national ACP roadmap states the need for new ideas and practical solutions to promote ACP [4]. iDecide represents such a solution, being a ready-to-use application freely available to everyone. Co-created with users, the app was designed to be engaging, to promote health literacy around AD creation and to support the articulation and communication of care preferences. Ultimately, the app intends to offer the time-saving possibility to create a personalised AD on mobile phones that is easily accessible for patients, surrogates and HCPs.

The PAR approach enabled the systematic identification and improvement of barriers to AD implementation in Switzerland, such as engagement difficulties, AD template variety, document accessibility issues and avoidance of ACP discussions.

Engagement

iDecide facilitates engagement in the ACP process by leveraging the advantages of mobile applications. Estimates assume that over 95% of the Swiss population possess a smartphone [36], granting them access to download iDecide, consult its contents and draft an AD at no cost. Further,

iDecide's animation videos may make it easier to take the first ACP steps, as interventions using educational videos have been shown to increase ACP knowledge, behavioural intention and AD completion rates [37, 38]. Gamification has been proposed to boost ACP engagement [28]. iDecide's spider web graphic of users' "Attitudes to life" aims to apply this concept to value clarification. Survey results support these theoretical considerations, as users reported that the app made it easier and more attractive to engage in AD creation. They were likely to recommend the app, which might propagate engagement through mouth-to-mouth transmission. Results were consistent throughout age groups, indicating user-friendliness spanning all generations.

AD template variety

Variation of AD versions contributes to confusion and difficulty for HCPs to follow a standard procedure [7]. The iDecide AD was therefore based on the FMH-AD, which is used nationwide [24]. Based on recommendations from an FMH-AD comprehensibility study [23], minor adaptations were made to the official format, which appear to be well-received by users. Further discussions with the FMH and HCPs, particularly from emergency and intensive care departments, are needed to promote standardisation.

Accessibility

A main focus of the national roadmap is ensuring document accessibility across institutions, ideally integrating AD into electronic health records [4]. Due to data safety concerns, iDecide was created as an offline solution. That said, iDecide enables easy sharing and access to AD content through a personalised QR code, which can also integrate with healthcare information systems or electronic health records. This makes it a viable solution for both the present and the future, as the electronic health record is not yet widely used. The QR code card allows healthcare providers to quickly access detailed AD information and substitute decision-maker contact details. As with other reference cards, the QR code card must be interpreted with caution, as it alone does not fulfil the legal requirements of an AD. Nonetheless, having AD information readily available on patients' and relatives' phones might in itself be a substantial contribution to accessibility, as phones are personalised items, often constantly carried around. At this stage, we cannot yet report on experiences in daily clinical practice.

Starting ACP discussions

Survey results indicate that iDecide encourages users to discuss personal preferences with surrogates and HCPs. It provides a communication guide to help users initiate meaningful ACP discussions, improving concordance between care preferences and delivered care [29].

Strengths and limitations

This study's main strength is the application of PAR methodology, which directly involved users in the research – a fundamental premise in ACP software development [32]. Additionally, the iDecide app operates independently of existing infrastructure and implements a robust data safety concept without online data storage. However, recruiting survey participants through convenience sampling within the app carries a considerable risk of selection bias. Users more engaged with ACP are more likely to participate than those not engaging with the app at all. Additionally, highly educated young individuals were overrepresented in the sample. Furthermore, the perspectives of surrogate decision-makers were not included and the ACP expertise of users was not assessed. iDecide supports users in updating their AD by providing clear instructions on how to replace old versions. Still, the circulation of multiple versions remains a potential limitation of AD. While the app was demonstrated to be user-friendly, user-friendliness alone does not ensure the quality or clinical applicability of an AD; therefore, future studies should examine the qualitative content and real-world implementation of Advance Directives created with iDecide.

Further development and future potential

To ensure nationwide accessibility, translation from German into the other national languages should soon follow. Additionally, a linking possibility to integrate AD information into healthcare information systems is needed. A joint study with general practitioners (GP) could assess the app's effectiveness in clinical practice. GPs have limited time to support patients in drafting their AD. iDecide could support them by assisting with informational tasks, allowing GPs to focus on revising the drafted documents for medical clarity and conciseness. Future development should address

the overrepresentation of highly educated young users and improve accessibility, particularly for older adults and individuals from diverse educational backgrounds. While apps can support engagement and informational tasks, a complete ACP process still requires discussions with HCPs. Given the importance of such facilitated discussions for effective ACP, it is important to further strengthen the app's capacity to encourage and support such exchanges. Although tailored to Switzerland's healthcare and legal context, the app's decentralised documentation method works on an international scale. App contents can be adapted to other regional, cultural and legal contexts.

Conclusion

The iDecide mobile application for AD complies with the national roadmap for ACP implementation and checklists for ACP digital tool development. It effectively addresses barriers to widespread AD implementation in Switzerland. By encoding the AD as a QR code, it strengthens AD accessibility for surrogate decision-makers and HCPs. Survey results confirm high usability and user satisfaction with the app throughout age groups, consistent with the research aim. iDecide could therefore transform how individuals engage with ACP. In the future, research collaboration and funding will be essential to realise the app's full potential as a tool empowering people to make their medical wishes known and accessible when needed.

Data availability statement

Deidentified raw survey data and app-related usability data supporting the findings of this study was made publicly available on 6 January 2026 via the Zenodo repository (<https://doi.org/10.5281/zenodo.18147732>). The shared dataset consists of fully anonymised CSV files derived from survey-based usability studies conducted among users of the iDecide advance directive app and includes all data elements necessary to reproduce the analyses reported in the manuscript. No names, contact details or other personally identifiable information are included. The data is available without restriction to all users for purposes such as reanalysis, replication and secondary research and will remain accessible indefinitely, subject to continued hosting by the repository.

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Potential competing interests

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflict of interest related to the content of this manuscript was disclosed.

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iDecide Advance Directive App - Appendix

Contents

- 1. iDecide-App Compliance with ACP Key Elements and ACP-Tool Functionalities 2**
 - 1.1 Compliance with ACP Key Elements List2
 - 1.2 Compliance with ACP-Tools Functionalities List3
- 2. Scoping Literature Search Strategy 5**
- 3. iDecide Prototype Survey Report..... 6**
 - 3.1 Executive Summary.....6
 - 3.2 Methods6
 - 3.3 Results10
 - 3.4 Interpretation.....14
- 4. iDecide Product Version Survey Report..... 16**
 - 4.1 Executive Summary.....16
 - 4.2 Methods16
 - 4.3 Results19
 - 4.4 Interpretation.....25
- 5. References 27**

> 1. iDecide-App Compliance with ACP Key Elements and ACP-Tool Functionalities

In their systematic review of web-based Advance Care Planning (ACP) tools[1], Dupont et al. conducted a comprehensive assessment of existing digital platforms for ACP. Their evaluation focused on two aspects: the integration of key ACP elements and the functionalities provided by the tools. The key ACP elements are derived from the European consensus definition of ACP by Rietjens et al.[2]. The functionalities list provides practical elements for developing effective digital ACP solutions. The app functionalities list offers guidance for developers, representing adaptable features tailored to the app's context and user needs rather than mandatory requirements.

The following sections detail the compliance of the iDecide app with the ACP key elements list and app functionalities list.

1.1 Compliance with ACP Key Elements List

1. **Providing information on ACP**

iDecide offers detailed educational resources on ACP, focusing on Advance Directives (AD), including educational texts, animation videos, and interactive learning modules.

2. **Providing information on legal frameworks**

The app integrates current legal guidelines for creating AD (adapted to the Swiss legal context) and explains them to users.

3. **Address readiness and timing for ACP**

iDecide informs users that creating AD is recommended for everyone and prompts them to take their time to reflect on answers. This approach aligns with ACP as a continuous process rather than a one-time event.

4. **Stimulates to explore personal values and goals**

The entire app is designed to facilitate the exploration of users' values and goals, using a variety of resources (e.g., texts, videos, interactive questionnaires such as a spider web chart representation of personal values).

5. **Stimulates to explore preferences regarding future care**

iDecide guides users in articulating preferences for medical treatments, substitute decision-maker and organ donation.

6. **Stimulates to explore uncertainties and consequences**

The app informs users about potential scenarios and their implications for care decisions.

7. **Stimulates to explore preferences regarding the last days of life**

iDecide helps users reflect on their preferences for medical interventions in severe illness scenarios or states of incapacity, guiding them to make thoughtful choices aligned with their values.

8. **Stimulates to explore preferences for a possible proxy decision-maker**

The app guides users in identifying and selecting proxies. The app explains the role of medical proxies, outlining their responsibilities to communicate with healthcare teams and make decisions in line with the user's wishes during incapacitation.

9. **Encourages to appoint a proxy decision-maker**

The app includes a dedicated module for formally designating a healthcare proxy.

10. Encourages to discuss ACP with family

iDecide repeatedly emphasises the importance of discussing preferences with proxies and loved ones. A specific module for communication is included, aiming to facilitate ACP conversations.

11. Encourages to discuss ACP with healthcare professionals

The app actively prompts users to consult healthcare professionals, particularly to address questions about medical treatments.

12. Encourages to document ACP

iDecide is designed to encourage users to document their wishes in an AD, repeatedly emphasising the importance of recording these preferences while providing step-by-step guidance to achieve this goal.

13. Encourages to generate that document (in the tool)

The goal of generating a document (AD) is set right at the beginning of interaction with the app, which is specifically designed to make this process straightforward and user-friendly.

14. Encourages to share that document

iDecide supports users in sharing their AD with relatives and healthcare professionals. Leveraging smartphone technology's sharing capabilities, the app offers a variety of options (e.g., email, text message, integrated QR code feature) to share documents easily.

1.2 Compliance with ACP-Tools Functionalities List

1. The tool is free of charge

iDecide can be downloaded in the Swiss App Stores of Google and Apple free of charge, providing all users access to the app's full functionalities without restrictions.

2. Registration is needed

iDecide avoids mandatory registration, ensuring full access to its informational and educational content before users enter any personal data. This approach protects user privacy while enabling individuals to use the app as a learning tool leading to the drafting of a valid AD. All personal data is stored exclusively offline on user phones.

3. There is a save and return option

User progress is automatically saved, allowing users to resume the drafting process at any time. Users are invited to take their time to reflect on their answers before inserting them into the app.

4. It is possible for the user to give input

The app allows users to input their personal choices and preferences.

5. The tool is tailored to the user

The content is adaptable to individual user needs. Providing information in various forms (e.g., text, video) allows users to interact with the material at a depth tailored to them, with web links leading to further information if required. The personal AD can always be viewed in the "My AD" Section, once an AD has been drafted.

6. The tool provides feedback based on the input of the user

The app is designed to provide real-time feedback based on user input, ensuring that actions like saving changes or completing steps are clearly flagged. This feedback helps to guide users effectively through the AD drafting process.

7. The input from the user can be printed

Users can generate and print a legally binding AD directly from the app.

8. The tool suggests a predetermined ACP path

The app guides users through a structured, step-by-step pathway tailored to drafting an AD.

9. The tool gives an indication of the progress of the user

Visual progress trackers (e.g. progress bar, modules turning to green when completed) keep users informed about their completion status.

10. Videos are used, as well as hyperlinks to other web pages

iDecide includes videos, hyperlinks and other interactive elements to ease engagement and understanding.

11. There is a text-to-speech option

iDecide does not yet incorporate a Text-to-Speech option.

12. A privacy policy is mentioned

iDecide operates entirely offline, storing all data exclusively on user devices without any cloud or online storage. The app includes a privacy policy (PDF document) to inform users about how their data is managed and how to ensure full user control over personal information.

13. Data log analysis is mentioned

All data entered into the app is stored exclusively on user devices. Users also have a prominent option to completely delete all their data if wanted, restoring the app to its original state.

2. Scoping Literature Search Strategy

A scoping literature search was conducted to identify relevant literature on ACP and ADs, their implementation in Switzerland and the role of e- and mHealth solutions in their dissemination and optimisation. The goal was to gain an overview of relevant concepts, existing software solutions and approaches, the level of digitalisation in the field, and to find effective implementation strategies. The search was conducted in September 2023.

Databases Used

PubMed, Google Scholar

Search algorithms were set to "best match" in both databases.

Search Terms:

The following keywords were used in the search:

- "Advance Care Planning" OR "ACP"
- "Advance Directives" OR "AD"
- "e-Health"
- "m-Health"
- "Advance Care Planning" AND "Advance Directives"
- ("Advance Care Planning") AND ("e-Health" OR "m-Health")
- "Advance Care Planning" AND "Switzerland"
- ("Advance Care Planning") AND ("e-Health" OR "m-Health") AND ("Switzerland")
- ("Advance Directives") AND ("e-Health" OR "m-Health")
- "Advance Directives" AND "Switzerland"
- ("Advance Directives") AND ("e-Health" OR "m-Health") AND ("Switzerland")

Screening Strategy:

The first 300 search results for each query were initially screened by title. Studies that appeared potentially relevant were then assessed through an abstract review. In total, 196 abstracts were evaluated and rated on a scale from 1 (low relevance) to 3 (high relevance). Based on these scores, 64 texts with high relevance were selected for full-text analysis. These full texts were subsequently rated on a scale from 1 to 5, with a score of 5 indicating a high level of relevance to the research objective.

Inclusion and Exclusion Criteria:

Age Criteria: Only studies conducted on adults were included.

Language criteria: Articles in English, German and French were considered.

Publication year: Preference was given to studies published from 2010 onwards, especially when more recent research was available. Papers from 1991 to 2023 were included.

> 3. iDecide Prototype Survey Report

3.1 Executive Summary

The iDecide prototype survey measured user satisfaction with the iDecide-App for the creation of Advance Directives (AD) and identified improvement potential for the product version of the app. Eight participants (n=8) evaluated usability, educational content, alignment with Advance Care Planning (ACP) Goals and overall user satisfaction. Overall satisfaction was high, with an average rating of 4.5 on a five-star system and a strong likelihood of recommendation. Users attested the app good ease of use and structure but suggested improvements in navigation and entertainment. Educational content was rated highly understandable, helpful and convincing, though an excess of information content was noted. The app was rated as making the AD drafting process easier and more attractive as well as raising awareness on ACP, though less effective for facilitating ACP discussions with close-ones and healthcare professionals. Key suggestions by users were the incorporation of educational videos and improvement in user interface design for easier navigation. Limitations include the small sample size, overrepresentation of highly educated young adults and potential response bias, affecting generalisability. Survey findings informed the app product version design and refined approaches to feedback collection.

3.2 Methods

Survey Design

The cross-sectional survey consisted of six sections: Advance Directive Version and Time Spent (Question 1), User Friendliness (Questions 2-7), Educational Information Quality (Questions 8-13), Concordance with Advance Care Planning Goals (Questions 14-22), Overall Satisfaction and Recommendations (Questions 23-26) and User Demographics (Questions 27-31). The free online survey instrument “Tally” was used to draft the questionnaire and collect responses.

The survey consisted mostly of 5-point Likert scale questions (ranging from 1=strongly disagree to 5=strongly agree) and free-text options allowing to comment on each section of the questionnaire. No question was mandatory to fill out the questionnaire.

The survey was conducted in German. The questions of the survey were translated into English for this survey report.

Survey Questions

Section 1: Advance Directive Version and Time Spent

1. Which versions of the advance directive did you complete using iDecide?
 - Response Possibilities: Express Version / Standard Version / Both Versions
- 1.1. How long did it take you to complete the express version of the advance directive?
(only if 1= Express Version or Both Versions)

- Response: Free numerical input (in minutes).

1.2. How long did it take you to complete the standard version of the advance directive?
(only if 1= Standard Version or Both Versions)

- Response: Free numerical input (in minutes).

Section 2: User Friendliness

2. The iDecide app was easy for me to use.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
3. The navigation within the app was clear to me.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
4. The app is entertaining.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
5. The app is clearly structured.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
6. The goal of the app is clear to me.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
7. Space for personal suggestions, comments, criticism, or praise (1)
 - Response: Free-text input

Section 3: Educational Information Quality

8. The patient information materials in the app are easy to understand.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
9. The information in the app was helpful to me.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
10. The information is convincing.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
11. The information was difficult for me to understand.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
12. The app provided me with too much information.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
13. Space for personal suggestions, comments, criticism, or praise (2)
 - Response: Free-text input

Section 4: Concordance with Advance Care Planning Goals

14. The iDecide app makes it easier to create an advance directive.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
15. The app makes it more attractive to create an advance directive.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
16. The app makes it easier to discuss personal treatment wishes with family members / close ones.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
17. The app facilitates the documentation of treatment wishes.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
18. The app facilitates sharing treatment wishes.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
19. The app raises awareness about Advance Care Planning.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
20. The app motivates to discuss personal Advance Care Planning with a healthcare professional.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
21. The app respects data protection and privacy.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
22. Space for personal suggestions, comments, criticism, or praise (3)
 - Response: Free-text input

Section 5: Overall Satisfaction and Recommendations

23. What is your conclusion about iDecide?
 - Response: Free-text input
24. What are your suggestions for improving iDecide?
 - Response: Free-text input
25. How likely are you to recommend iDecide to others?
 - Response Scale: 1(Not at all likely) to 5 (Extremely likely)
26. What is your overall assessment of iDecide?
 - Response Scale: Star rating from 1 (Very bad) to 5 (Excellent)

Section 6: User Demographics

27. Which age category do you belong to?
 - Response Possibilities: Under 30 / 30-45 / 45-60 / 60-75 / Over 75
28. What is your gender?
 - Response Possibilities: Male / Female / Other

29. What is your highest level of education?

- Response Possibilities: Compulsory Education (9 years) / Apprenticeship / High School Diploma (Matura) / University or University of Applied Sciences or Advanced Technical College / No School Degree / Other

30. What is your current occupation?

- Response: Free-text input.

31. Did you already have an advance directive before using iDecide?

- Response Possibilities: Yes / No

31.1. I discussed my advance directive with my representative (if I have designated one). *(only if 31=Yes)*

- Response Possibilities: True / False

31.2. I have deposited my advance directive with my general practitioner.
(only if 31=Yes)

- Response Possibilities: True / False

31.3. I have deposited my advance directive in a Hospital Information System.
(only if 31=Yes)

- Response Possibilities: True / False

31.4. I have reviewed/updated my advance directive within the last two years.
(only if 31=Yes)

- Response Possibilities: True / False

Participants

Following a convenience sampling technique, participants were invited to take part in the survey through a digital flyer that provided a brief overview of the iDecide project, along with instructions on downloading the prototype app. The flyer was distributed to patient representative groups, doctors, legal experts and other individuals within the network of the main author. Participants needed an iOS device (version 17 or higher) to download the app and complete the survey. Individuals without a device could request a device on loan from the survey organisers. Participants accessed the survey through a button in the iDecide prototype app, which linked to the questionnaire. An onboarding screen in the app explained how to access the survey. There were no exclusion criteria. The recruitment period ran from August 10, 2024, to October 1, 2024. Participants could optionally provide contact information for follow-up questions by the Action Group to resolve unclear answers. This measure also helped prevent multiple participation.

Sample Size

The sample size is unknown, as it is not clear how many persons received the flyer and consecutively downloaded the app. No formal sample size calculation was conducted due to the exploratory nature of this survey and the constraints of early-stage testing. The aim was to gather initial user feedback rather than achieve statistical significance. As a result, the findings may not fully generalise to all potential app users.

Pretesting

The questionnaire was pretested various times by members of the Action Group and revised by an external post-doctoral research fellow.

Statistical Analysis

Survey data was analysed using descriptive statistics, including mode, mean, median, standard deviation for Likert scale items and frequency counts for categorical data. Analyses were conducted using R version 4.4.2 (R Core Team, 2024) and JASP version 0.19.1. In R, the following packages were used: tidyverse (v2.0.0; including dplyr v1.1.4, tidyr v1.3.1, readr v2.1.5, and ggplot2 v3.5.1) and patchwork (v1.3.0). Graphs were generated with ggplot2 using custom Likert-scale visualisations. Large language models (Claude-Sonnet 3.5) were used to optimise R-code for graph generation. No modifications were made to the variables during the analysis. Missing data was marked in data tables and excluded from descriptive statistics. The convenience sampling method and lack of information on total recipients prevented the measurement of response rate and non-response error. No weighting or propensity scores were applied due to the study's exploratory nature and small sample size. Similarly, no multivariable or sensitivity analysis was conducted.

3.3 Results

Characteristics of study participants

The prototype survey was filled out by eight participants. The age range of participants ranged from under 30 to 75. All participants had higher education (University, University of Applied Sciences or Technical Advanced College). 75% of respondents were female. 25% had already completed an AD before using iDecide.

Confounders

Potential confounders of the survey results include an overrepresentation of young adult groups (62.5 % of respondents were in the <30 age group) and the use of convenience sampling, also including individuals from the personal network of the main author, that may have influenced the nature of the feedback received. No formal confounder-adjusted estimates were conducted.

Descriptive Statistics

AD Version and Time Spent

Descriptive Statistics

	Valid	Missing	Median	Mean	Std. Deviation	Minimum	Maximum
Completed AD Version	8	0					
Completion Duration Express Version (min)	4	4	7.500	8.750	4.787	5.000	15.000
Completion Duration Standard Version (min)	5	3	30.000	28.000	4.472	20.000	30.000

User friendliness

Descriptive Statistics

	Valid	Missing	Mode	Median	Mean	Std. Deviation	Minimum	Maximum
The iDecide app was easy for me to use.	8	0	5.000 ^a	5.000	4.500	0.756	3.000	5.000
The navigation within the app was clear to me.	8	0	3.000 ^a	3.000	3.500	0.756	3.000	5.000
The app is entertaining.	8	0	3.000 ^a	3.500	3.500	0.926	2.000	5.000
The app is clearly structured.	8	0	5.000 ^a	4.500	4.375	0.744	3.000	5.000
The goal of the app is clear to me.	8	0	5.000 ^a	5.000	5.000	0.000	5.000	5.000

^a The mode is computed assuming that variables are discreet.

Educational Information Quality

Descriptive Statistics

	Valid	Missing	Mode	Median	Mean	Std. Deviation	Minimum	Maximum
The patient information materials in the app are easy to understand.	8	0	5.000 ^a	5.000	4.625	0.518	4.000	5.000
The information in the app was helpful to me.	8	0	5.000 ^a	5.000	4.750	0.463	4.000	5.000
The information is convincing.	8	0	5.000 ^a	5.000	4.625	0.744	3.000	5.000
The information was difficult for me to understand.	8	0	1.000 ^a	1.500	1.750	1.035	1.000	4.000
The app provided me with too much information.	8	0	1.000 ^a	2.500	2.500	1.512	1.000	5.000

^a The mode is computed assuming that variables are discreet.

Concordance with ACP Goals

Descriptive Statistics

	Valid	Missing	Mode	Median	Mean	Std. Deviation	Minimum	Maximum
The iDecide app makes it easier to create an advance directive.	8	0	5.000 ^a	5.000	5.000	0.000	5.000	5.000
The app makes it more attractive to create an advance directive.	8	0	5.000 ^a	5.000	4.625	0.518	4.000	5.000
The app makes it easier to discuss personal treatment wishes with family members / close ones.	8	0	3.000 ^a	3.000	3.625	0.916	3.000	5.000
The app facilitates the documentation of treatment wishes.	8	0	5.000 ^a	5.000	5.000	0.000	5.000	5.000
The app facilitates sharing of treatment wishes.	8	0	5.000 ^a	5.000	4.625	0.518	4.000	5.000
The app raises awareness about Advance Care Planning.	8	0	5.000 ^a	5.000	4.625	0.744	3.000	5.000
The app motivates to discuss personal Advance Care Planning with a healthcare professional.	7	1	3.000 ^a	3.000	3.429	1.397	1.000	5.000
The app respects data protection and privacy.	8	0	5.000 ^a	4.500	4.125	0.991	3.000	5.000

^a The mode is computed assuming that variables are discreet.

Overall Satisfaction and Recommendations

Descriptive Statistics

	Valid	Missing	Mode	Median	Mean	Std. Deviation	Minimum	Maximum
How likely are you to recommend iDecide to others?	8	0	5.000 ^a	5.000	4.750	0.463	4.000	5.000
What is your overall assessment of iDecide?	8	0	4.000 ^a	4.500	4.500	0.535	4.000	5.000

^a The mode is computed assuming that variables are discreet.

User Demographics

Frequency Tables

Frequencies for Age category

Age category	Frequency	Percent	Valid Percent	Cumulative Percent
60-75	2	25.000	25.000	25.000
<30	5	62.500	62.500	87.500
30-45	1	12.500	12.500	100.000
Missing	0	0.000		
Total	8	100.000		

iDecide Advance Directive App - Appendix

Frequencies for Gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	6	75.000	75.000	75.000
Male	2	25.000	25.000	100.000
Missing	0	0.000		
Total	8	100.000		

Frequencies for Highest level of education

Highest level of education	Frequency	Percent	Valid Percent	Cumulative Percent
Universität / Hochschule / höhere Fachschule	8	100.000	100.000	100.000
Missing	0	0.000		
Total	8	100.000		

Frequencies for Did you already have an advance directive before using iDecide?

Did you already have an advance directive before using iDecide?	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	2	25.000	25.000	25.000
No	6	75.000	75.000	100.000
Missing	0	0.000		
Total	8	100.000		

iDecide Advance Directive App - Appendix



Table 1.
Distribution and Mean Responses for the iDecide Prototype Survey
The left panel shows the percentage distribution of responses for each survey item on a Likert scale (Strongly Disagree to Strongly Agree or 1 Star to 5 Stars). The right panel displays the mean responses for each item, plotted on a spectrum ranging from "--" (Strongly Disagree) to "++" (Strongly Agree) or from 1 Star to 5 Stars for overall rating.

Summary of Free-text Questions and Comments

Section 2 (User Friendliness):

Users appreciated the user interface and the "spiderweb" value depiction. Suggested improvements include clearer buttons, better initial guidance, and a more minimalistic design.

Section 3 (Educational Information Quality):

One participant found the information clear, while another had difficulty combining medical information with life choices.

Section 4 (Concordance with Advance Care Planning (ACP) Goals):

One participant expressed the intention to recommend the app to the entire family after the prototype phase.

Section 5 (Overall Satisfaction and Recommendations):

Users thought the app was well thought-through and effective in simplifying engagement with ACP. One user suggested that the app should remain fully digital, without requiring any analogue (paper-based) transition.

Suggestions included adding explanatory videos for the modules, better QR-code card labels, adding a personality quiz, a method to add family members' ADs to the app, an invitation button for family members via standard messages, push notifications after 2 years for review, clearer data input section buttons, an overview of user data input before creating the AD-PDF, a free-text field for personal notes about life quality, and font size adjustments.

Section 6 (User Demographics (Job Responses)):

Occupations included homoeopath, medical intern, student, doctoral candidate, business development specialist, communication specialist, and physician.

3.4 Interpretation

Eight users completed the survey consisting of the Likert-scale statements and free-text questions. The survey item means ($\bar{x}$) are interpreted as follows:

$\bar{x}1$ = strongly disagree with statement, $\bar{x}2$ =disagree, $\bar{x}3$ = neutral, $\bar{x}4$ agree, $\bar{x}5$ strongly agree with statement.

Users showed very high overall satisfaction with the iDecide app, giving it an average rating of 4.5/5 stars and being very likely to recommend it to others ($\bar{x}$ 4.75).

Users rated the app highly for user-friendliness (ease of use ($\bar{x}$ 4.5), clear app structure ($\bar{x}$ 4.375), clear app goal ($\bar{x}$ 5)). Clearness of navigation ($\bar{x}$ 3.5) and the app's entertainment value ($\bar{x}$ 3.5) had lower scores, indicating improvement potential in navigation design and entertainment value.

The quality of educational information was rated highly. Information materials were considered easy to understand ($\bar{x}$ 4.63), helpful ($\bar{x}$ 4.75), convincing ($\bar{x}$ 4.63) and posed low difficulty to users ($\bar{x}$ 1.75). However, users were rather neutral about whether the app provided too much information ($\bar{x}$ 2.5).

Users found that the app had a high concordance with ACP goals. Users reported using the app made drafting an AD easier (Ø 5) and more attractive (Ø 4.63) as well as raising awareness about ACP (Ø 4.63). Users were less certain about the app making it easier to discuss personal treatment wishes with family members and close ones (Ø 3.63) or with healthcare professionals (Ø 3.43). Users agreed that the app respects data protection and privacy (Ø 4.13), indicating users felt safe using the app.

Users provided free-text recommendations for improving the app, highlighting the length of educational texts and suggesting the addition of educational videos as a priority to enhance entertainment value.

Limitations

Limitations of the survey include a small sample size, an overrepresentation of young adults and highly educated participants, and potential response bias due to the use of convenience sampling. The small sample size reduces the generalisability of the survey results. The overrepresentation of young adults limits the assessment of usability and satisfaction among older age groups. This is particularly relevant as older adults tend to have more difficulty using digital technologies. All participants had a high education level, limiting the ability to make assumptions on usability among users with lower education levels. Further, the convenience sampling method might have influenced answers and therefore contributed to response bias. Additionally, participation was limited to iOS 17 users, which could have excluded Android users or those with older iOS versions.

Recommendations for future research

Evaluation of the next app version should target a larger sample size, include more opinions from older age groups and reduce potential for response bias through modifications in the convenience sampling method. The next app version should not be restricted to iOS 17 users.

> 4. iDecide Product Version Survey Report

4.1 Executive Summary

The iDecide product version survey is an ongoing feedback tool integrated into the iDecide app for the creation of Advance Directives (AD). It aims to measure user satisfaction and identify areas for app improvement. This survey report analyses the responses collected between October 22, 2024 and January 31, 2025. Ninety-four (n=94) participants evaluated usability, educational content, alignment with Advance Care Planning (ACP) Goals and overall user satisfaction. Overall satisfaction was high, with an average rating of 4.69/5 on a five-stars rating system and a strong likelihood of recommendation. Users highlighted the app's ease of use and clear structure. Navigation design and entertainment were rated higher than in the Prototype Survey. Educational content was rated as highly understandable, helpful and convincing. Users thought the app made drafting AD easier and more appealing while also raising awareness about ACP. In comparison with the Prototype Survey, the app was rated more effective for facilitating ACP discussions with close-ones and healthcare professionals. Key suggestions by users were enabling uploads of signed advance directives directly into the app and allowing the selection of multiple substitute decision-makers. Limitations included overrepresentation of highly educated young respondents and potential response and courtesy bias, affecting generalisability. Survey findings will be used to continuously improve the app.

4.2 Methods

Survey Design

The product version survey is a condensed version of the prototype survey. It consists of six sections: Advance Directive Version and Time Spent (Question 1), User Friendliness (Questions 2-6), Educational Information Quality (Questions 7-10), Concordance with Advance Care Planning Goals (Questions 11-17), Overall Satisfaction and Recommendations (Questions 18-20) and User Demographics (Questions 21-25). The free online survey instrument "Tally" was used to draft the questionnaire and collect responses. The survey primarily used 5-point Likert scale questions (1 = strongly disagree to 5 = strongly agree) and included free-text fields for commenting on each section. The survey was conducted in German. The questions of the survey were translated into English for this survey report.

Survey Questions

Section 1: Advance Directive Version and Time Spent

1. Which versions of the advance directive did you complete using iDecide?
 - Response Possibilities: Express Version / Standard Version / Both Versions
- 1.1. How long did it take you to complete the express version of the advance directive?
(only if 1= Express Version or Both Versions)
 - Response: Free numerical input (in minutes).

1.2. How long did it take you to complete the standard version of the advance directive?
(only if 1= Standard Version or Both Versions)

- Response: Free numerical input (in minutes).

Section 2: User Friendliness

2. The iDecide app was easy for me to use.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
3. The navigation within the app was clear to me.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
4. The app is entertaining.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
5. The app is clearly structured.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
6. Space for personal suggestions, comments, criticism, or praise (1)
 - Response: Free-text input

Section 3: Educational Information Quality

7. The patient information materials in the app are easy to understand.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
8. The information in the app was helpful to me.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
9. The information was difficult for me to understand.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
10. Space for personal suggestions, comments, criticism, or praise (2)
 - Response: Free-text input

Section 4: Concordance with Advance Care Planning Goals

11. The iDecide app makes it easier to create an advance directive.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
12. The app makes it more attractive to create an advance directive.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
13. The app makes it easier to discuss personal treatment wishes with family members / close ones.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
14. The app facilitates sharing treatment wishes.

- Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
- 15. The app raises awareness about Advance Care Planning.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
- 16. The app motivates to discuss personal Advance Care Planning with a healthcare professional.
 - Response Scale: 1 (Strongly Disagree) to 5 (Strongly Agree)
- 17. Space for personal suggestions, comments, criticism, or praise (3)
 - Response: Free-text input

Section 5: Overall Satisfaction and Recommendations

- 18. What are your suggestions for improving iDecide?
 - Response: Free-text input
- 19. How likely are you to recommend iDecide to others?
 - Response Scale: 1(Not at all likely) to 5 (Extremely likely)
- 20. What is your overall assessment of iDecide?
 - Response Scale: Star rating from 1 (Very bad) to 5 (Excellent)

Section 6: User Demographics

- 21. Which age category do you belong to?
 - Response Possibilities: Under 30 / 30-45 / 45-60 / 60-75 / Over 75
- 22. What is your gender?
 - Response Possibilities: Male / Female / Diverse
- 23. What is your highest level of education?
 - Response Possibilities: Compulsory Education (9 years) / Apprenticeship / High School Diploma (Matura) / University or University of Applied Sciences or Advanced Technical College / No School Degree / Other
- 24. What is your current occupation?
 - Response: Free-text input.
- 25. Did you already have an advance directive before using iDecide?
 - Response Possibilities: Yes / No
- 25.1. I discussed my advance directive with my representative (if I have designated one). *(only if 31=Yes)*
 - Response Possibilities: True / False
- 25.2. I have deposited my advance directive with my general practitioner. *(only if 31=Yes)*
 - Response Possibilities: True / False

25.3. I have deposited my advance directive in a Hospital Information System.
(only if 31=Yes)

- Response Possibilities: True / False

25.4. I have reviewed/updated my advance directive within the last two years.
(only if 31=Yes)

- Response Possibilities: True / False

Participants

Participants were recruited using a convenience sampling method. Flyers describing the iDecide project were distributed at a city festival in Berne focused on end-of-life communication, held alongside the International Public Health and Palliative Care Congress. Participants who downloaded the app could access the survey via a button in the app's information section that linked to the questionnaire. There were no exclusion criteria. The recruitment period began on October 22, 2024, and is ongoing (this report analyses responses collected before January 31, 2025). Participants could optionally provide contact information for follow-up questions by the Action Group to clarify unclear answers. This measure also helped prevent multiple participation.

Sample Size

The exact sample size is unknown. Approximately 500 flyers were distributed and until January 31, 2025, around 400 people downloaded the app. No formal sample size calculation was conducted due to the exploratory nature of the survey.

Statistical Analysis

Survey data was analysed using descriptive statistics, including mode, mean, median, standard deviation for Likert scale items and frequency counts for categorical data. Analyses were conducted using R version 4.4.2 (R Core Team, 2024) and JASP version 0.19.1. In R, the following packages were used: tidyverse (v2.0.0; including dplyr v1.1.4, tidyr v1.3.1, readr v2.1.5, and ggplot2 v3.5.1) and patchwork (v1.3.0). Graphs were generated with ggplot2 using custom Likert-scale visualisations. Large language models (Claude-Sonnet 3.5) were used to optimise R-code for graph generation. No modifications were made to the variables during the analysis. Missing data was marked in data tables and excluded from descriptive statistics. An analysis of variance (ANOVA) was performed in JASP to examine potential differences between age groups for user-friendliness items and overall assessment scores, based on the expectation that older adults might experience greater challenges with technology. For elements that approached significance, post hoc tests were conducted to identify potential pairwise differences between age groups. The use of convenience sampling and the absence of data on total recipients prevented the measurement of response rate and non-response error. No weighting or propensity scores were applied due to the study's exploratory nature and small sample size. Likewise, no multivariable or sensitivity analysis was performed.

4.3 Results

Characteristics of study participants

The product version survey was completed by ninety-four participants (n=94). Participant's ages ranged from under 30 to over 75. 86% of participants had higher education (University, University of Applied Sciences or Technical Advanced College). 60% of respondents were female. 27% had already completed

an AD before using iDecide. Results from ANOVA of the user-friendliness category and overall rating by age groups showed no significant differences in answers between age groups.

Confounders

Potential confounders include an overrepresentation of highly educated individuals (87 % of respondents) and the use of convenience sampling, also targeting individuals from the personal network of the main author, that may have influenced the nature of the feedback received. No formal confounder-adjusted estimates were conducted.

Descriptive Statistics

AD Version and Time Spent

Descriptive Statistics

	Valid	Missing	Median	Mean	Std. Deviation
Completed AD Version	94	0			
Completion Duration Standard Version (min)	59	35	20.000	23.203	19.663
Completion Duration Express Version (min)	44	50	10.000	12.182	8.932

User Friendliness

Descriptive Statistics

	Valid	Missing	Mode	Median	Mean	Std. Deviation
The iDecide app was easy for me to use.	90	4	5.000 ^a	5.000	4.744	0.487
The navigation within the app was clear to me.	92	2	5.000 ^a	5.000	4.598	0.612
The app is entertaining.	91	3	4.000 ^a	4.000	3.824	0.995
The app is clearly structured.	93	1	5.000 ^a	5.000	4.634	0.567

^a The mode is computed assuming that variables are discreet.

Educational Information Quality

Descriptive Statistics

	Valid	Missing	Mode	Median	Mean	Std. Deviation
The patient information materials in the app are easy to understand.	91	3	5.000 ^a	5.000	4.714	0.523
The information in the app was helpful to me.	93	1	5.000 ^a	5.000	4.570	0.682
The information was difficult for me to understand.	93	1	1.000 ^a	1.000	1.677	1.278

^a The mode is computed assuming that variables are discreet.

Concordance with ACP Goals

Descriptive Statistics

	Valid	Missing	Mode	Median	Mean	Std. Deviation
The iDecide app makes it easier to create an advance directive.	93	1	5.000 ^a	5.000	4.677	0.574
The app makes it more attractive to create an advance directive.	93	1	5.000 ^a	5.000	4.645	0.602
The app makes it easier to discuss personal treatment wishes with family members / close ones.	91	3	4.000 ^a	4.000	4.055	0.821
The app facilitates sharing of treatment wishes.	92	2	5.000 ^a	4.000	4.370	0.675
The app raises awareness about Advance Care Planning.	92	2	5.000 ^a	5.000	4.620	0.626
The app motivates to discuss personal Advance Care Planning with a healthcare professional.	91	3	5.000 ^a	4.000	3.846	1.064

^a The mode is computed assuming that variables are discreet.

Overall Satisfaction and Recommendations

Descriptive Statistics

	Valid	Missing	Mode	Median	Mean	95% Confidence Interval Mean		Std. Deviation
						Upper	Lower	
How likely are you to recommend iDecide to others?	88	6	5.000 ^a	5.000	4.670	4.780	4.560	0.519
What is your overall assessment of iDecide?	80	14	5.000 ^a	5.000	4.688	4.813	4.562	0.565

^a The mode is computed assuming that variables are discreet.

User Demographics

Frequency Tables

Frequencies for Age category

Age category	Frequency	Percent	Valid Percent	Cumulative Percent
<30	56	59.574	59.574	59.574
30-45	15	15.957	15.957	75.532
>75	4	4.255	4.255	79.787
60-75	13	13.830	13.830	93.617
45-60	6	6.383	6.383	100.000
Missing	0	0.000		
Total	94	100.000		

Frequencies for Gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	56	59.574	59.574	59.574
Male	37	39.362	39.362	98.936
Divers	1	1.064	1.064	100.000
Missing	0	0.000		
Total	94	100.000		

iDecide Advance Directive App - Appendix

Frequencies for Highest level of education

Highest level of education	Frequency	Percent	Valid Percent	Cumulative Percent
University, University of Applied Sciences or Technical Advanced College	81	86.170	86.170	86.170
Apprenticeship	6	6.383	6.383	92.553
High School Diploma	6	6.383	6.383	98.936
Obligatorische Schulausbildung (9 Jahre)	1	1.064	1.064	100.000
Missing	0	0.000		
Total	94	100.000		

Frequencies for Did you already have an advance directive before using iDecide?

Did you already have an advance directive before using iDecide?	Frequency	Percent	Valid Percent	Cumulative Percent
No	68	72.340	72.340	72.340
Yes	26	27.660	27.660	100.000
Missing	0	0.000		
Total	94	100.000		

ANOVA of User-friendliness by Age category

ANOVA - The iDecide app was easy for me to use.

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Age category	2.199	4	0.550	2.469	0.051	0.104
Residuals	18.923	85	0.223			

Note. Type III Sum of Squares

Descriptives - The iDecide app was easy for me to use. ▼

Age category	N	Mean	SD	SE	Coefficient of variation
<30	53	4.811	0.395	0.054	0.082
30-45	15	4.867	0.352	0.091	0.072
>75	3	4.333	1.155	0.667	0.266
60-75	13	4.615	0.506	0.140	0.110
45-60	6	4.333	0.816	0.333	0.188

ANOVA - The navigation within the app was clear to me. ▼

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Age category	1.474	4	0.368	0.982	0.422	0.043
Residuals	32.646	87	0.375			

Note. Type III Sum of Squares

Descriptives - The navigation within the app was clear to me.

Age category	N	Mean	SD	SE	Coefficient of variation
<30	55	4.618	0.561	0.076	0.121
30-45	15	4.733	0.458	0.118	0.097
>75	3	4.000	1.732	1.000	0.433
60-75	13	4.538	0.519	0.144	0.114
45-60	6	4.500	0.837	0.342	0.186

ANOVA - The app is entertaining.

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Age category	3.571	4	0.893	0.897	0.470	0.040
Residuals	85.616	86	0.996			

Note. Type III Sum of Squares

Descriptives - The app is entertaining. ▼

Age category	N	Mean	SD	SE	Coefficient of variation
<30	55	3.818	1.056	0.142	0.276
30-45	14	4.214	0.699	0.187	0.166
>75	3	3.333	1.528	0.882	0.458
60-75	13	3.615	0.961	0.266	0.266
45-60	6	3.667	0.816	0.333	0.223

ANOVA - The app is clearly structured.

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Age category	1.379	4	0.345	1.076	0.373	0.047
Residuals	28.191	88	0.320			

Note. Type III Sum of Squares

iDecide Advance Directive App - Appendix

Descriptives - The app is clearly structured.

Age category	N	Mean	SD	SE	Coefficient of variation
<30	55	4.636	0.522	0.070	0.113
30-45	15	4.867	0.352	0.091	0.072
>75	4	4.500	1.000	0.500	0.222
60-75	13	4.462	0.660	0.183	0.148
45-60	6	4.500	0.837	0.342	0.186

ANOVA Overall Rating by Age Category

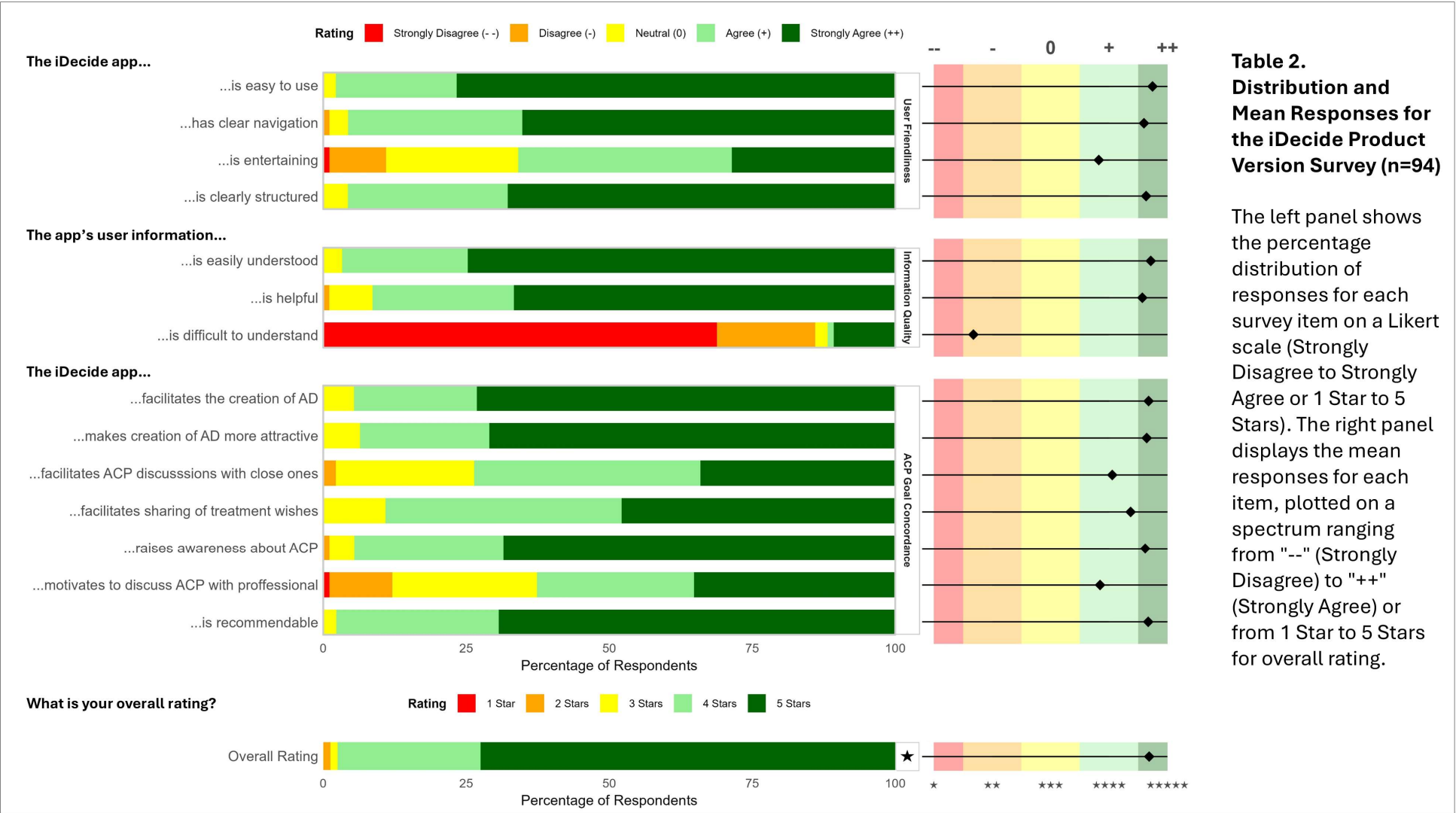
ANOVA - What is your overall assessment of iDecide?

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Age category	1.579	4	0.395	1.254	0.296	0.063
Residuals	23.609	75	0.315			

Note. Type III Sum of Squares

Descriptives - What is your overall assessment of iDecide? ▼

Age category	N	Mean	SD	SE	Coefficient of variation
<30	48	4.729	0.449	0.065	0.095
30-45	14	4.786	0.426	0.114	0.089
>75	4	4.250	1.500	0.750	0.353
60-75	9	4.444	0.726	0.242	0.163
45-60	5	4.800	0.447	0.200	0.093



Summary of Free-text Questions and Comments (evaluated until 31.12.2024)

Section 2 (User Friendliness):

Users generally found the app user-friendly, with straightforward guidance and easy navigation, even for those less experienced with apps. Some users were confused by the back button and the navigation of subchapters in the communication module, prompting a suggestion to display all subchapter titles upfront. Other feedback included requests for less text with larger font sizes, the ability to add more than one substitute decision maker, clearer options for editing completed advance directives and making the advance directive more detailed, covering topics like artificial nutrition and limited intubation.

Section 3 (Educational Information Quality):

Participants found the app's educational content helpful in understanding complex topics, with one noting it enabled them to finally decide on organ donation. While the app was considered a strong starting point for AD, one user emphasised the importance of consulting a general practitioner for specific questions. It was suggested to add examples for challenging concepts, such as permanent incapacitation, to make the information more relatable.

Section 4 (Concordance with Advance Care Planning (ACP) Goals):

Users appreciated the app for offering an accessible way to address the challenging topic of advance care planning. Users highlighted its motivational impact, stating that it encouraged them to engage with the subject and create a personalised AD in a relatively short time. Users praised the inclusion of videos for simplifying complex information. Participants expressed optimism about the app's potential to elevate the standard of advance directives in Switzerland.

Section 5 (Improvement suggestions):

The app was described as clear, helpful, and impactful in addressing personal healthcare questions. Suggestions for improvement included adding explanatory videos to specific questions, enabling uploads of signed advance directives directly into the app and aligning background colours with the app's logo. A recurring suggestion was to allow users to choose more than one substitute decision maker. A few users reported issues with the app, such as difficulties editing the AD. One user suggested moving the "Attitudes to life" module to the end of the process for better flow.

Section 6 (User Demographics (Job Responses) until 31.1.2025):

The responses represented a variety of professions, including students (15), healthcare professionals such as physicians (15), nurses (7), midwives (2), physiotherapists (1), shiatsu therapists (3), psychosocial counsellors (2), medical practice assistants (3), and a nutritionist. Other professions included lawyers (4), consultants (5), project manager (1), engineer (1), marketing specialist (1), housewives (2), retirees (8), teachers (3), and various academic roles such as doctoral candidates (2), researcher (1), and university lecturer (1).

4.4 Interpretation

Ninety-four users (n=94) completed the survey consisting of Likert-scale statements and free-text questions. The survey item means (Ø) are interpreted as follows:

Ø1= strongly disagree with statement, Ø2=disagree, Ø3= neutral, Ø4 agree, Ø5 strongly agree with statement.

Users reported high overall satisfaction with the iDecide app, giving it an average rating of 4.69/5★ stars and being very likely to recommend it to others (Ø 4.67). This reflects higher user satisfaction compared to the Prototype Survey (4.5/5★).

User-friendliness received high ratings: ease of use (Ø 4.74), clear app structure (Ø 4.63), navigation clarity (Ø 4.6), and entertainment value (Ø 3.82). All categories were therefore rated higher than in the Prototype Survey.

The quality of educational information was rated highly. Information materials were considered easy to understand (Ø 4.71), helpful (Ø 4.57), and posed low difficulty to users (Ø 1.68). These ratings are comparable to the ones from the Prototype Survey.

Users found the app to have high concordance with ACP goals. Users reported that the app made drafting an AD easier (Ø 4.67), more attractive (Ø 4.65) and helped raise awareness about ACP (Ø 4.62) as well as facilitating sharing of treatment wishes (Ø 4.37). Facilitating ACP discussions with family members / close ones (Ø 4.06) and healthcare professionals (Ø 3.85) showed improvement compared to the Prototype Survey.

An Analysis of Variance (ANOVA) was conducted to examine differences across age groups for the overall assessment and the user-friendliness category, which included ease of use, navigation clarity, entertainment, and clear structure. The results for overall assessment showed no statistically significant differences between age groups ($F(4, 75) = 1.254, p = 0.296, \eta^2 = 0.063$). Within the user-friendliness category, ease of use approached significance ($F(4, 85) = 2.469, p = 0.051, \eta^2 = 0.104$), while navigation clarity, entertainment, and clear structure showed no significant differences. Post hoc tests conducted for ease of use revealed no significant pairwise differences between age groups. Results suggest that user-friendliness and overall assessment were relatively consistent across age groups, though findings should be interpreted cautiously due to small sample sizes in some groups, particularly >75 and 45-60.

Notable free-text recommendations for app improvement included enabling uploads of signed advance directives directly into the app and allowing the selection of more than one substitute decision maker.

Limitations

Limitations of the survey include overrepresentation of highly educated young participants and the convenience sampling technique. While the educational status was more diverse than in the Prototype Survey, 86% of respondents still had higher education. Results might therefore not be representative for lower education level groups. The convenience sampling technique, which recruited participants directly within the app and also included individuals from the main author's network, carries a significant risk of response and courtesy bias.

Recommendations for future research

Future studies aiming for more generalisable findings should target a larger sample size with representative groups and use a different sampling method than convenience sampling. They should further measure the response and no-response rate of interventions, as these are very important indicators of how well the AD intervention via app is received by a large audience.

> 5. References

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