Original Paper

CareCheck, a Digital Risk Screening Tool for Family Caregivers in Gynecologic Oncology Care Settings: Usability Study

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Abstract

Background: Providing care to a family member or friend with a serious illness like cancer increases the risk for poor physical, psychological, and functional health outcomes. Despite their critical role, family caregivers (FCGs) are rarely screened in clinical settings for the wide range of factors that may put them and the person they care for at risk for poor outcomes. Mobile health (mHealth) apps can efficiently facilitate access to high-quality health information for FCGs; however, few are clinically integrated.

Objective: This study aimed to evaluate the usability of CareCheck, an mHealth-based digital risk screening tool designed to enable FCGs' self-awareness of potential caregiving-related risks for adverse health and psychosocial outcomes and to support health care professionals in personalizing interventions that address FCGs' specific risk factors.

Methods: This usability study of CareCheck was conducted between June and August 2023 at a large academic medical center, using two evaluation methods: (1) quantitative measurement with a modified 5-item Mobile Health App Usability Questionnaire (MAUQ) and (2) exploratory qualitative content analysis based on feedback from FCGs and trained staff. FCGs of patients seen in gynecologic oncology care settings were recruited through two pathways: (1) a convenience sample of caregivers approached in the outpatient clinic waiting area and (2) caregivers receiving support through the institution's Family Caregiver Advocacy, Research, and Education (CARE) Center. Participants completed CareCheck and the usability questionnaire via a tablet-based mHealth app, with an interview-administered option available for those who were assessed via telephone. Trained staff from the CARE Center held a dual role in the study: they helped administer CareCheck to FCGs, and they also participated as respondents themselves, offering their own perspectives on CareCheck's clinical usability and workflow fit, which were analyzed alongside FCG data.

Results: A convenience sample of 56 FCGs and 2 trained staff participated in the usability study. Of the 56 FCGs, 54 completed the usability questionnaire; the mean MAUQ score was 6.49 (SD 1.06) out of 7, indicating high usability. Qualitative analysis identified recommendations in 2 areas: (1) perceptions of CareCheck's usability and functionality and (2) clinical implementation considerations for CareCheck.

Conclusions: FCGs and staff found CareCheck to be user-friendly and easy to navigate. While further iterations are needed to refine content and optimize integration with clinical workflows, CareCheck demonstrated potential as a clinically integrated tool for identifying and addressing FCG risk for poor social, psychological, or health outcomes in gynecologic oncology care settings.

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(J Particip Med 2026;18:e99381) doi: 10.2196/99381

KEYWORDS

caregiver risk assessment; caregiving risk factors; gynecologic cancer; digital screening tools; mHealth; usability evaluation; clinical implementation

Introduction

Family caregivers (FCGs) provide the majority of long-term, unpaid support for individuals living with serious illnesses, including gynecologic cancers—a contribution valued at over US $600 billion annually in the United States, yet largely unrecognized and undersupported by health systems [1,2]. Family caregiving is nonetheless associated with significant physical, psychological, and financial burden: FCGs of individuals with cancer frequently report elevated distress, anxiety, depressive symptoms, sleep disruption, and role strain [3,4], which can accumulate into social isolation, reduced workforce participation, and adverse health outcomes [5]. FCG well-being is closely linked to patient outcomes, as FCG distress is associated with reduced caregiving capacity, compromised care coordination, and increased health care utilization [6-8]. Addressing FCG risk is therefore not only a matter of caregiver health, but a critical component of patient-centered oncology care.

Despite this, routine FCG screening remains uncommon in clinical practice [9,10]; FCG needs are often identified informally, if at all, resulting in missed opportunities for early intervention. A key barrier is the lack of brief, validated screening tools that are feasible to integrate into routine clinical workflows and can inform targeted support [11,12]. Developing standardized, adaptive FCG screening tools that balance scientific rigor with clinical practicality therefore represents a critical gap in supportive oncology care.

Digital health screening tools offer a promising strategy to systematically identify and address FCG needs within clinical settings, integrating efficiently into existing workflows and delivering automated, tailored feedback to patients, FCGs, and clinical staff based on individual risk profiles [13]. This enables timely identification of psychosocial risks and unmet needs and facilitates recommendations to enhance coping, self-efficacy, and well-being [13]. Although several FCG risk screening tools exist to identify burden, depression risk, and related concerns [14-17], these have primarily functioned as assessment instruments rather than tools designed for routine clinical integration and domain-specific, actionable feedback for both FCGs and staff; few, to our knowledge, have been developed to support both functions simultaneously. There is therefore an ongoing need to evaluate the usability, acceptability, feasibility, and real-world implementation of such tools across diverse clinical settings [18].

To address this gap and align with national priorities such as the 2022 National Strategy to Support Family Caregivers [19], our team developed CareCheck, an evidence-based mobile health (mHealth) risk screening tool designed to identify FCGs at risk for adverse functional and psychosocial outcomes and generate tailored feedback to guide clinical interventions (G Campbell, PhD, unpublished data, October 2026). CareCheck's item development and preliminary psychometric evaluation have been described in detail elsewhere (G Campbell, PhD, unpublished data, October 2026) and are summarized briefly in the Methods. This study focuses on the usability testing of its mHealth implementation, which enables real-time assessment and delivery of personalized feedback within clinical settings.

To enhance flexibility, accessibility, and integration into routine care, CareCheck was subsequently adapted into an mHealth app, enabling real-time assessment and delivery of personalized feedback within clinical settings.

Initial usability testing of the digital CareCheck was performed within a gynecologic oncology care setting, among FCGs of patients seen in that setting—a population that often encounters complex caregiving demands due to prolonged, uncertain disease trajectories involving cycles of intensive treatment, remission, recurrence, and survivorship [20,21]. This setting therefore represents a clinically relevant context in which structured FCG risk screening may help identify unmet needs and facilitate timely supportive interventions.

Given that usability and implementation feasibility are critical determinants of clinical adoption, this study had two objectives to be assessed among FCGs and trained staff within an inpatient and outpatient gynecologic oncology setting: (1) to evaluate the usability of the CareCheck mHealth screening tool, using both quantitative usability metrics and qualitative feedback, among FCGs and trained staff within inpatient and outpatient gynecologic oncology settings; and (2) to examine staff and FCG perspectives on the feasibility of integrating CareCheck into routine clinical workflows to facilitate structured supportive interventions.

Methods

Study Design

This usability testing study employed parallel quantitative usability metrics and an exploratory qualitative content analysis of semistructured stakeholder interviews. Because this study was embedded within an ongoing quality improvement initiative, CareCheck was iteratively refined throughout the study period based on emerging FCG and staff feedback, as described in the Results.

Participants and Setting

This study was conducted at a large academic medical center in the northeastern United States between June and August 2023. Participants were recruited across outpatient and inpatient gynecologic oncology settings to ensure representation of FCGs engaged at different points along the cancer care continuum.

FCGs were eligible to participate if they were 18 years of age or older and were identified by the patient as their primary

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source of support. Because CareCheck was developed as a disease-agnostic FCG risk screening tool, FCGs recruited through the outpatient clinic waiting area were not required to be caring for a patient with a confirmed gynecologic cancer diagnosis; this pathway represented a convenience sample of FCGs present at the gynecologic oncology outpatient clinic, regardless of the diagnosis of the patient they were accompanying. FCGs recruited through the Caregiver Advocacy, Research, and Education (CARE) Center, by contrast, were caring for a patient diagnosed with gynecologic cancer, consistent with that center's caseload [22].

In addition to FCG participants, trained staff from the Family CARE Center at the institution, who provide direct supportive services to FCGs, participated in the study. These trained staff were not primary oncology medical providers but specialized in delivering caregiver-centered support within the CARE Center. Their involvement was essential, given their expertise in caregiver-focused care and their ability to provide insight into CareCheck's clinical usability, workflow alignment, and integration within supportive oncology services.

Ethical Considerations

This project underwent review and was granted ethical approval as a quality improvement study (#4425) by the University of Pittsburgh Medical Center (UPMC) Quality Improvement Review Committee, which is the ethics, regulatory, and legal oversight body for protecting patient/participant rights, confidentiality, consent (including waiver of consent), and the analysis and dissemination of deidentified data within the UPMC system. Verbal consent was obtained from all FCG participants prior to completion of the CareCheck assessment. Participation was anonymous; no identifying demographic information was collected from FCGs. All screening and usability data were transmitted via encrypted connection and stored on a secure, Health Insurance Portability and Accountability Act (HIPAA)-compliant, institutionally managed cloud server hosted by the University of Pittsburgh. No compensation was provided to FCGs or trained staff for participation.

Procedures

We recruited FCGs through two convenience sampling approaches. First, trained study personnel approached all FCGs present in the waiting area of a gynecologic oncology outpatient clinic during routine visits. After explaining the study purpose and procedures, those who agreed to participate were given a tablet device to complete the CareCheck digital risk screening tool and usability questionnaire during the visit. Second, trained CARE Center staff approached all eligible FCGs due for services/support through the Center, introduced the project, and following verbal consent, provided a tablet device for completion of the CareCheck assessment in the clinical setting.

To ensure accessibility and inclusivity, FCGs engaged by the CARE Center staff member working remotely completed CareCheck via a telephone-based interview, in which the assessment and usability questions were administered verbally and entered directly into the tablet by that staff member. FCGs engaged in person by CARE Center staff or study personnel completed CareCheck directly via the tablet.

CareCheck: The Digital Caregiver Risk Screening Tool

CareCheck was operationalized within an mHealth app—a standalone tablet-based application, separate from the electronic medical record—designed to support FCGs of individuals with serious illnesses (G Campbell, PhD, unpublished data, October 2026), deployed on mobile or tablet devices to facilitate point-of-care administration in clinical settings (Figure 1). The screening tool consists of 20 items spanning four risk domains: (1) Caregiving Setting and Intensity, (2) Caregiver Physical and Functional Health, (3) Caregiver Social Support, and (4) Caregiver Emotional Health (G Campbell, PhD, unpublished data, October 2026) (Table 1).

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Figure 1. CareCheck assessment interface: (A) introductory screen orienting FCGs to the assessment; (B) example assessment item, illustrating the format in which FCGs respond to individual risk-screening questions; (C) review screen allowing FCGs to check responses before submission. FCG: family caregiver.

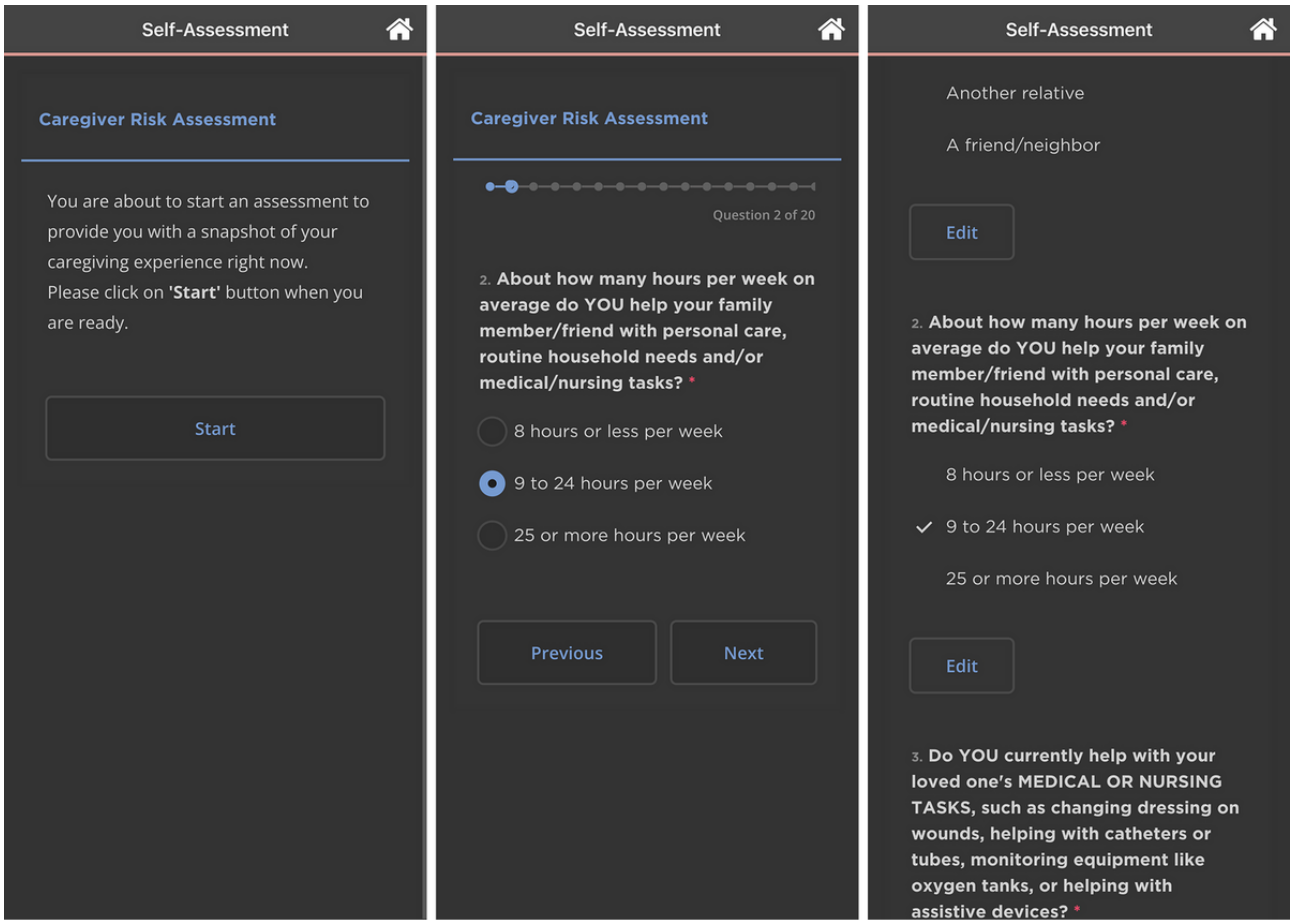


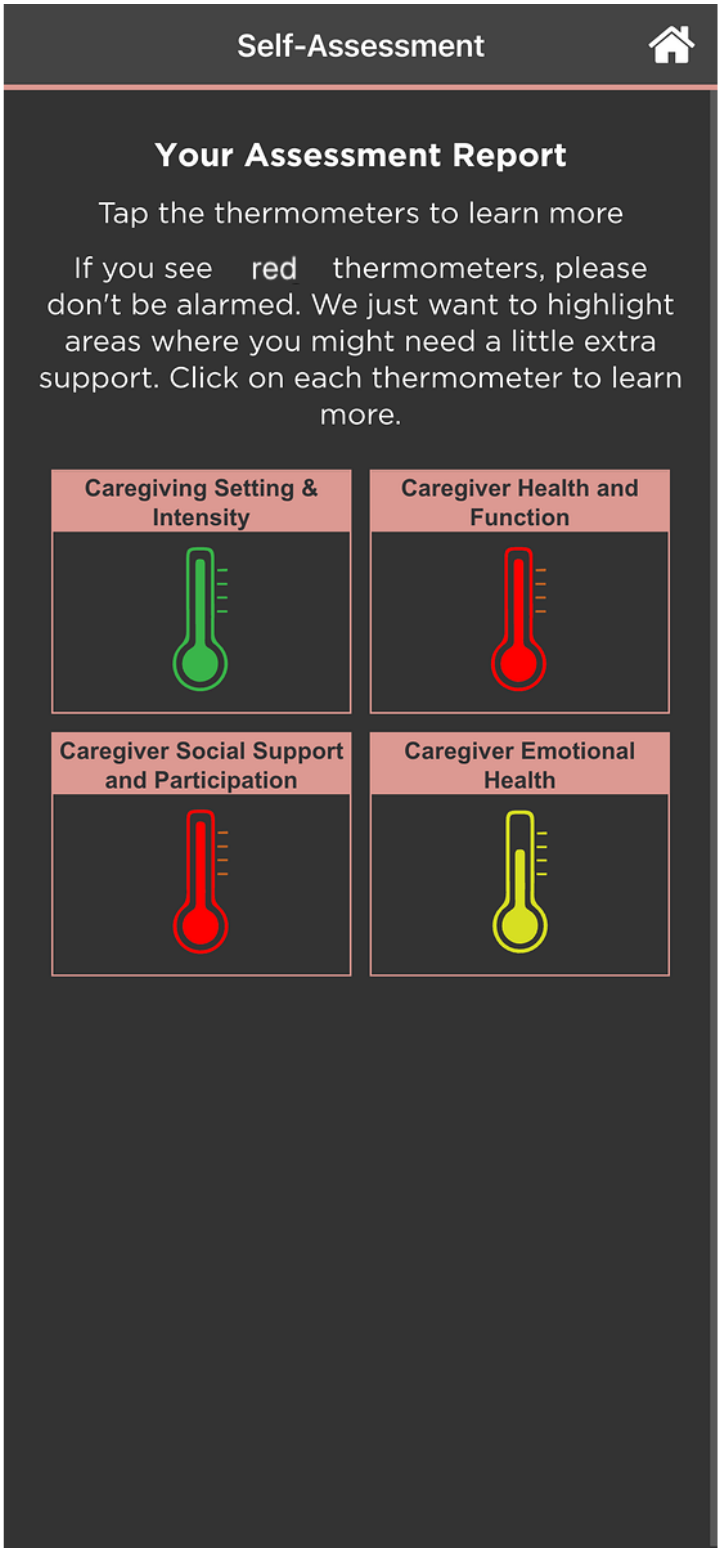
Table 1. CareCheck risk domains.

Domain	What it assesses
Caregiving Setting and Intensity	Relationship to care recipient (CR), intensity of care (hours/week, type of care, CR distressing symptoms), challenging home set up, financial hardship
Caregiver Physical and Functional Health	Caregiver's physical function, sleep, skipping own health appointments, work changes, and social role limitations
Social Support	Availability of a backup caregiver and satisfaction with social support
Caregiver Emotional Health	Anxiety and depressive symptoms, worry about own health, role strain, anger/frustration with caregiving

Upon completion, FCGs received an automated summary dashboard displaying domain-specific risk levels through a color-coded thermometer interface (green = low risk, yellow = elevated risk, red = high risk) (Figure 2).

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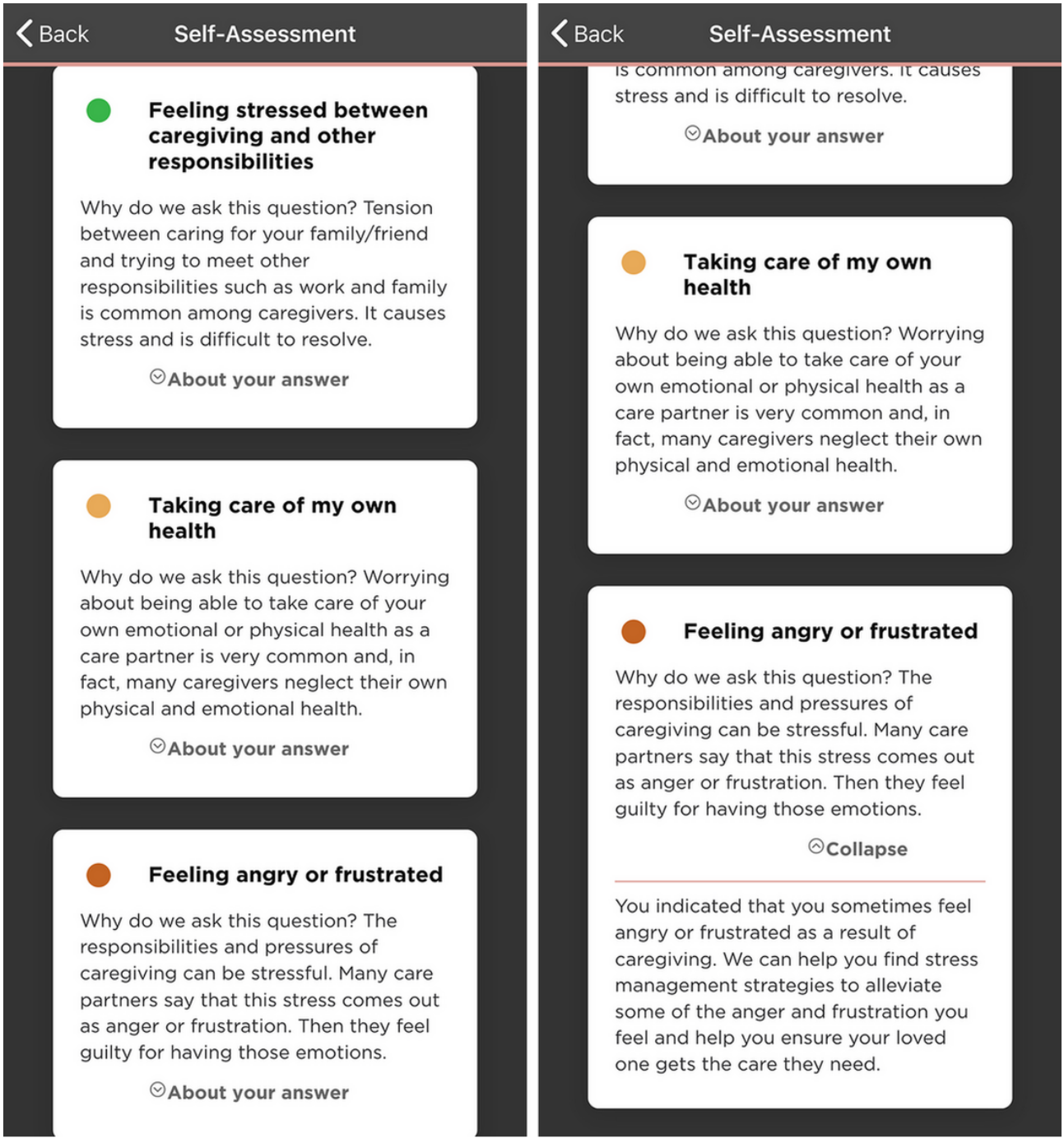
Figure 2. CareCheck thermometer report, displaying domain-specific risk levels via color-coded thermometers (green = low, yellow = elevated, red = high) to support rapid interpretation by family caregivers and staff.



The summary also included tap-accessible personalized feedback for each domain, including a brief explanation of the domain construct and why it is important to FCGs, an interpretation of the FCG's responses, affirming language, and available supports (Figure 3).

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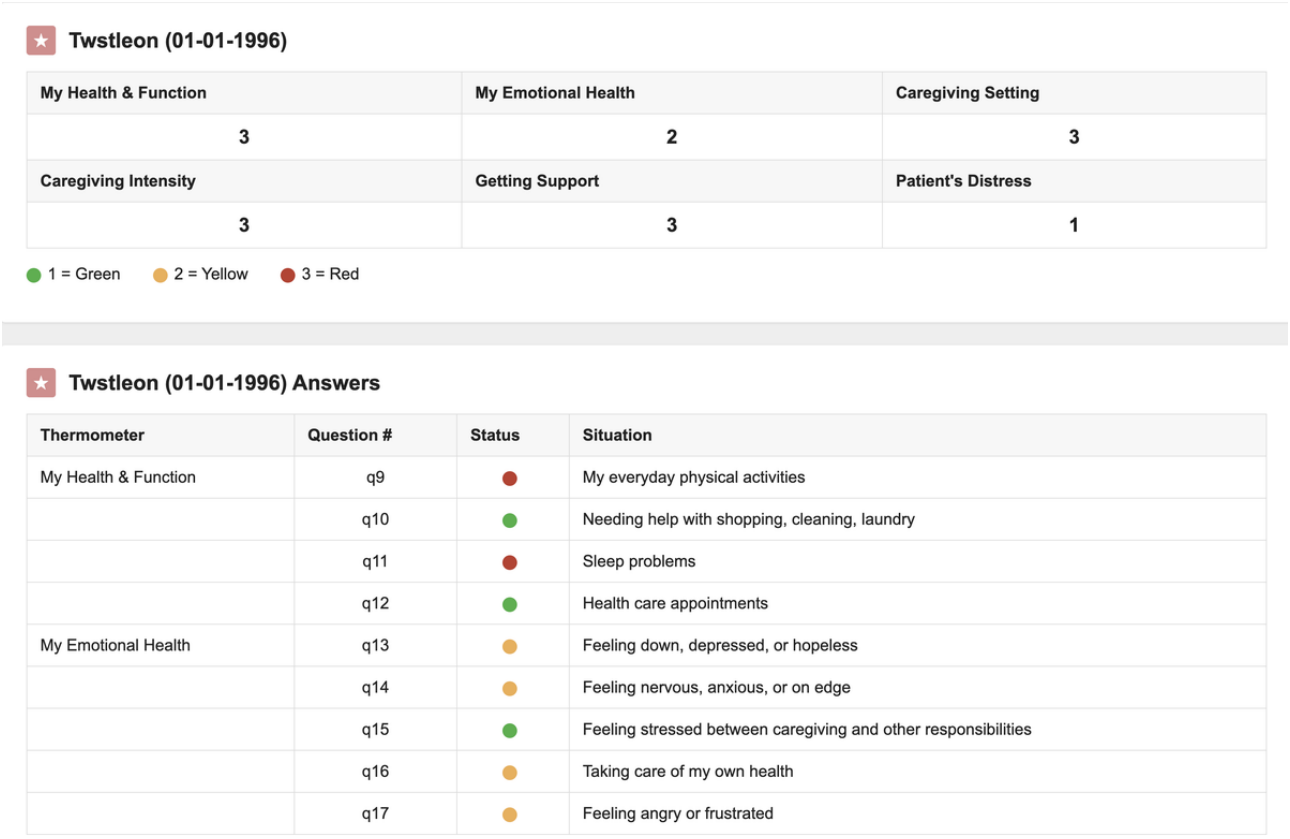
Figure 3. CareCheck feedback screens: (A) detailed domain feedback, including color-coded indicator dots and recommendations; (B) expandable view allowing family caregivers to access additional detail as needed after tapping "About your answer".



A companion clinician portal (Figure 4) enabled trained staff to remotely access CareCheck assessment results in real time, which was especially useful when multiple CARE Center members collaborated. Staff used the portal to review a participant's risk profile and determine whether intervention or follow-up was warranted. Screening and usability data were transmitted via encrypted connection and stored on a secure, HIPAA-compliant, institutionally managed cloud server. The complete details on CareCheck's item content, domain structure, and risk-scoring methodology are provided elsewhere (G Campbell, PhD, unpublished data, October 2026).

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Figure 4. Individual assessment result review on the clinician portal, enabling staff to remotely review a family caregiver's CareCheck risk profile to inform follow-up and clinical intervention decisions.



Twstleon (01-01-1996)

My Health & Function	My Emotional Health	Caregiving Setting
3	2	3
Caregiving Intensity	**Getting Support**	**Patient's Distress**
3	3	1

1 = Green 2 = Yellow 3 = Red

Twstleon (01-01-1996) Answers

Thermometer	Question #	Status	Situation
My Health & Function	q9		My everyday physical activities
	q10		Needing help with shopping, cleaning, laundry
	q11		Sleep problems
	q12		Health care appointments
My Emotional Health	q13		Feeling down, depressed, or hopeless
	q14		Feeling nervous, anxious, or on edge
	q15		Feeling stressed between caregiving and other responsibilities
	q16		Taking care of my own health
	q17		Feeling angry or frustrated

Data Collection

Quantitative usability data were collected using a modified version of the Mobile Health App Usability Questionnaire (MAUQ) [23]—a validated instrument designed to assess mHealth usability (Multimedia Appendix 1). A 5-item subset was selected and adapted in consultation with the instrument developer (L Zhou, PhD, email communication, March 22, 2023), who confirmed that partial use of the instrument was permissible with appropriate citation and that item wording could be modified to fit the study context, provided such changes did not alter the item's original meaning or intent. Items were selected to capture core usability constructs relevant to evaluating a single application module—ease of use, contextual comfort, time burden, content relevance, and communication facilitation—while minimizing participant burden in the clinical setting. The 5 MAUQ items were rated on a 7-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree). The adapted measure was tailored to the CareCheck context to assess perceived ease of use, comfort with using the tool in a clinical environment, acceptability of the time required for completion, relevance of the content to FCGs' situations, and whether the tool facilitated communication with the care team regarding needs and concerns. In this context, “care team” was intended broadly to encompass all individuals involved in supporting the FCG and care recipient, including CARE Center staff—who focus specifically on caregiver-centered support—as well as the broader oncology treatment team; CareCheck is designed to help FCGs identify and articulate needs relevant to any member of this team.

Qualitative data evaluating CareCheck's usability and implementation feasibility were derived from 4 sources: FCG feedback, trained staff feedback, intrateam communications, and documentation from weekly research team meetings that included CARE Center staff.

FCG feedback was collected by trained study personnel and staff immediately after FCGs completed the 20-item CareCheck assessment and MAUQ. Both trained study personnel and staff asked FCGs open-ended questions about their overall impressions of CareCheck and any changes they felt were needed; responses were captured as field notes rather than audio-recorded and transcribed. The exact number of FCGs who provided each type of feedback was not systematically tracked, which we note as a limitation.

Trained staff feedback was collected via email correspondence submitted to the research team throughout the entire usability testing period, addressing the tool's impact on clinical workflow, its perceived utility in identifying FCG risk and how it prompts further intervention provided to FCGs, and the barriers and facilitators anticipated to influence its implementation.

Intrateam communications consisted of emails and discussions among the trained staff and research team members; usability-relevant feedback arising from these exchanges was documented by research personnel as it occurred.

Finally, the research team held weekly meetings via Zoom throughout the study period to review emerging FCG and staff feedback and guide iterative refinements to CareCheck. Feedback on usability and any resulting updates to CareCheck

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discussed during these meetings were documented contemporaneously by research personnel; these notes served as raw data inputs into the analysis described below, with interpretation occurring during the subsequent coding process rather than during the meetings themselves.

Data Analysis

Quantitative usability data were analyzed using descriptive statistics, including frequency distributions and response patterns for each of the 5 questionnaire items. Complete-case analysis was used for the quantitative usability data.

Using an inductive qualitative content analysis approach [24], 3 members of the research team (YW, HH, RAD) independently conducted open and in vivo coding of all 4 qualitative data sources described above (FCG feedback, trained staff feedback, intrateam communications, and weekly meeting documentation). During coding, feedback from all 4 sources was compiled together but categorized into 2 overarching perspectives, FCG and trained staff, throughout the analytic process, allowing findings to be examined and reported separately by FCG and trained staff perspectives within each recommendation area. No predefined coding framework was applied; codes emerged directly from the raw data. Coding was conducted iteratively, with regular meetings to compare interpretations and resolve discrepancies through group discussion until consensus was reached; unresolved disagreements were deferred to a senior author (HSD) with expertise in family caregiving research and eHealth intervention development and evaluation. Codes were then organized into categories aligned with the study's two objectives—evaluating CareCheck's usability and examining the feasibility of its integration into clinical workflows—consistent with this study's purpose as a usability evaluation conducted within an ongoing quality improvement initiative to implement CareCheck in clinical practice.

Results

Participant Characteristics

A total of 56 FCGs completed CareCheck. Of these, 54 completed the usability questionnaire; 2 participants did not complete the MAUQ questionnaire and were excluded from the quantitative usability analysis. Participation was anonymous, and no demographic data were collected, as the assessment was administered solely for usability and implementation evaluation purposes. Additionally, 2 trained staff from the CARE Center participated in implementing and evaluating the integration of CareCheck within the clinical setting.

Quantitative Usability Questionnaire

Among the 54 FCGs who completed the MAUQ questionnaire, the modified MAUQ score demonstrated high usability, with a mean score of 6.49 (SD 1.06) on a 7-point scale. Internal consistency of the 5-item subset was good (Cronbach α=0.84). Responses were concentrated at the upper end of the scale, with the majority of participants selecting ratings of 6 or 7 across all items (Table 2). Table 2 reports item-level descriptive statistics. Fewer than 4% of respondents selected “completely disagree” (rating of 1) for any item.

Table 2. Item-level usability descriptive statistics (N=54).

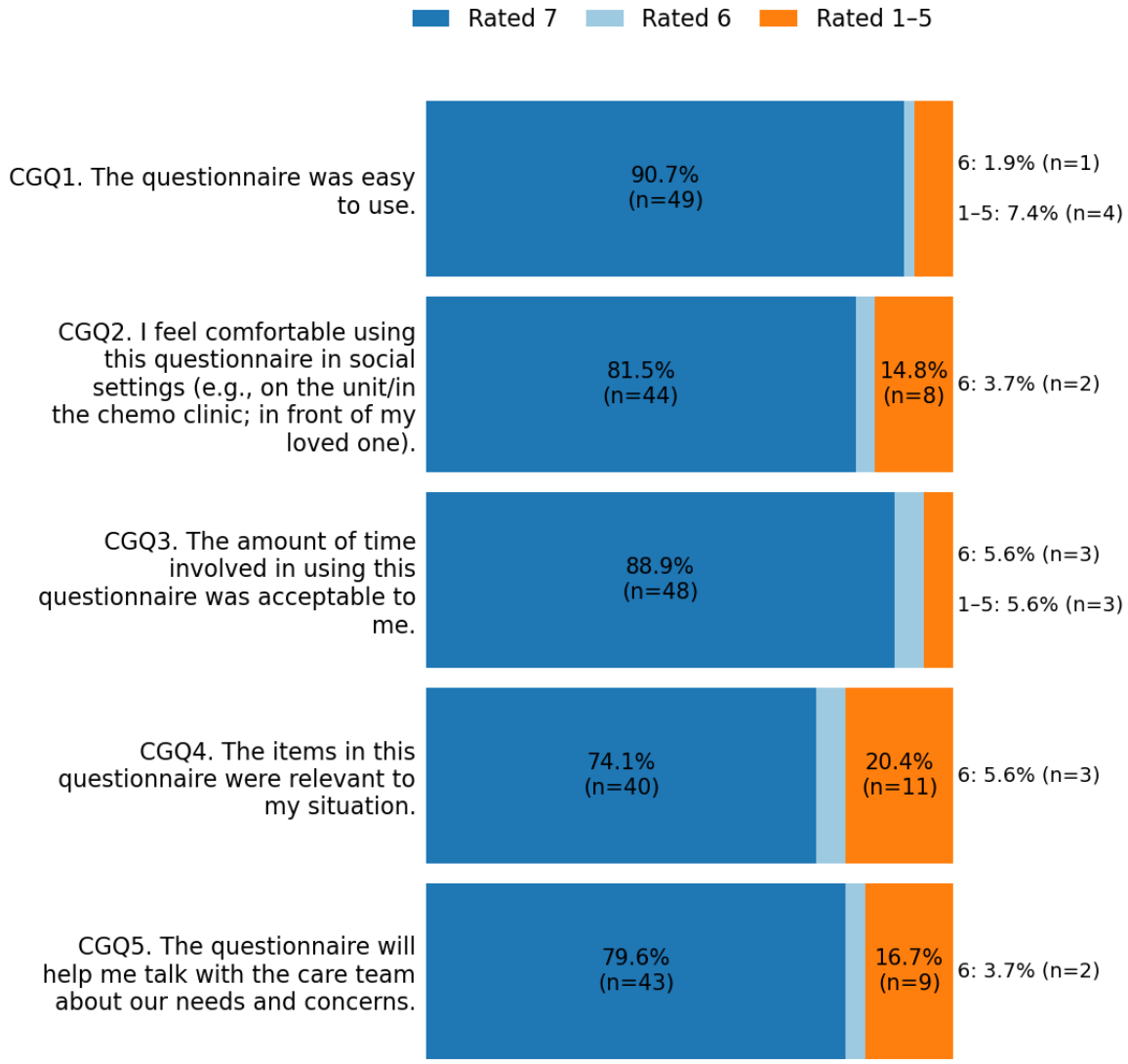
Item	Mean (SD)	Median (IQR)	Rating ≥6 (strong agreement), n (%)[a]
Q1: ease of use	6.69 (1.19)	7.00 (0.00)	50 (93)
Q2: comfort in clinical settings	6.37 (1.53)	7.00 (0.00)	46 (85)
Q3: acceptable completion time	6.69 (1.18)	7.00 (0.00)	51 (94)
Q4: perceived relevance	6.28 (1.47)	7.00 (0.75)	43 (80)
Q5: facilitate communication	6.43 (1.37)	7.00 (0.00)	45 (83)

[a]This column reports the number and percentage of respondents who rated the item 6 or 7 on the 7-point scale (strong agreement).

Figure 5 shows that strong agreement (ratings of 6 or 7) was the highest for Q3 (acceptable completion time, 51/54, 94%) and Q1 (ease of use, 50/54, 93%). Respondents also strongly agreed with Q2 (comfort using the tool in clinical settings, 46/54, 85%), Q5 (perceived ability to facilitate communication with providers, 45/54, 83%), and Q4 (perceived relevance, 43/54, 80%).

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Figure 5. Distribution of responses to the caregiver usability questionnaire (N=54). CGQ: caregiver questionnaire.



Qualitative Findings

Qualitative content analysis, integrating FCG feedback, trained staff feedback, intrateam communications, and meeting documentation, yielded findings organized into 2 recommendation areas aligned with the study's usability and clinical feasibility objectives: recommendation area 1, perceptions of CareCheck's usability and functionality; and recommendation area 2, clinical implementation considerations for CareCheck. Within each recommendation area, findings reflect the integration of both FCG and trained staff perspectives rather than a single data source. A structured summary of the recommendation areas, specific recommendations, and proposed modifications is presented in Table 3.

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Table 3. Summary of the qualitative findings.

Recommendation area, subcategory	Caregiver/staff recommendations	Changes made or for future consideration
Recommendation area 1: perceptions of CareCheck's usability and functionality		
Interpretation of Design Features	Modify thermometer color scheme (red indicator perceived as anxiety-provoking); provide explanation of color-coded indicators before viewing results; clarify ambiguous yellow indicator	Replaced red indicator with orange; added plain-language explanation of color-coded indicators prior to results display
Accessibility	Font size adjustment (increased size, zoom capability) for FCGs[a] with vision impairment or age-related visual decline	Default font size increased; pinch-to-zoom functionality added
Ease of Use	Streamlined answer review and editing with direct access to any question; clearer on-screen navigation prompts; formatting guidance for date-of-birth entry	Review function redesigned to allow direct navigation and editing of any question; on-screen instructional prompts, including date-of-birth formatting guidance, added throughout the interface
Functionality and Potential Enhancements	Reduce technical instability (freezing, slow loading); expand staff portal beyond a simple replica of participant results	Technical infrastructure reinforced for stability; staff temporarily recorded responses on paper during instances of technical disruption, later entering them into the tablet-based system; new dedicated staff portal developed (Figure 4) to support integration of CareCheck findings into clinical workflows
Recommendation area 2: clinical implementation considerations for CareCheck		
Context and Setting	Private environment to protect confidentiality; stable clinic Wi-Fi; structured action plan; dedicated staff oversight of assessment timing (pause/resume); collection of basic demographic information; contact card for further assistance	Future consideration—strategize a detailed plan to translate the assessment into clinical practice
Technology Literacy	Tutorial video to build confidence navigating CareCheck; standardized script to guide FCGs step by step	Future consideration—develop supplemental materials to guide caregivers through the assessment
Alternative Administration Modalities	Telehealth-based administration (structured phone interviews) to reduce in-clinic time burden and support FCGs facing access barriers; accommodation for FCGs unfamiliar with tablet technology; a formal paper self-report version	Structured phone-based interview protocol formalized, with staff recording responses on paper and entering them into the tablet-based platform; the same interview-and-paper-recording approach was also used for FCGs unfamiliar with tablet technology and during technical disruptions to the application; a formal paper self-report version remains a future consideration

[a]FCG: family caregiver.

Recommendation Area 1: Perceptions of CareCheck's Usability and Functionality

This recommendation area captures FCG and trained staff feedback on CareCheck's usability and functionality, including perceptions of the tool's visual design, accessibility, ease of use, and technical performance. Participants generally reported that the technology was usable and accessible, while also identifying specific opportunities for refinement.

Interpretation of Design Features

Both FCGs and trained staff provided feedback on the visual thermometer display used to communicate risk levels. FCGs suggested modifying the color scheme, specifically raising concerns about the use of red, which they reported triggered feelings of panic and unnecessary anxiety. FCGs also requested that a brief explanation of the color-coded indicators be provided prior to viewing their results. In particular, the yellow warning indicator was perceived as ambiguous, leaving respondents uncertain as to whether it signified a favorable or unfavorable outcome. Trained staff similarly noted that they required time to familiarize themselves with the thermometer display before they felt confident communicating results to FCGs, and independently echoed FCGs' concerns that the red indicator had the potential to provoke undue distress. In response, the thermometer display was modified—the red indicator was replaced with orange, and a plain-language explanation of the color-coded indicators was added prior to results display—to reduce potential distress and improve interpretability.

Accessibility

FCGs emphasized the need for robust accessibility features, particularly the ability to zoom in on text and adjust font sizes to accommodate varying visual needs. Trained staff affirmed that font size adjustability was especially important for FCGs with vision impairments or age-related visual decline. In response, the default font size was increased, and touch-based pinch-to-zoom functionality was added to the interface.

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Ease of Use

FCGs found the process of editing prior responses cumbersome, since correcting an answer required navigating sequentially through all subsequent questions before returning to the review screen; they recommended direct access to any question from the review page. Navigation between the thermometer display and feedback pages was also a source of confusion, with several FCGs inadvertently exiting the application before completing the usability questionnaire. Trained staff echoed these navigation concerns and additionally noted that the date-of-birth entry field lacked formatting guidance, leading to input errors. In response, the review function was redesigned to allow direct navigation to any question, and on-screen instructional prompts (including explicit date of birth formatting guidance) were added throughout the interface.

Functionality and Potential Enhancements

Several FCGs experienced technical instability during the usability testing, including application freezing and slow loading, which at times required staff intervention; in some of these instances, staff temporarily recorded FCG responses on paper before entering them into the tablet-based system to maintain data capture. Trained staff valued the application's privacy and security safeguards but noted that technical instability compounded workflow challenges, and that the web-based staff portal was limited to a simple replica of participant results rather than supporting care planning, documentation, or referral coordination. In response, the application's technical infrastructure was reinforced for stability, and a new, dedicated staff portal (Figure 4) was developed to support integration of CareCheck findings into clinical workflows.

Recommendation Area 2: Clinical Implementation Considerations for CareCheck

The development of CareCheck aimed to enhance its effectiveness as a screening instrument within the clinical setting. This recommendation area highlights implementation considerations for clinic integration, with trained staff identifying opportunities to optimize workflows and enhance clinical utility.

Context and Setting

FCGs preferred completing the assessment privately, away from their loved ones, to protect confidentiality, and emphasized the need for a structured action plan, such as a care plan developed by trained staff, beyond the feedback vignette alone. Trained staff agreed that privacy concerns could inhibit disclosure in shared spaces and identified additional implementation barriers: unreliable clinic Wi-Fi, the need for a pause-and-resume function or dedicated staff oversight of assessment timing, and the value of collecting basic demographic information to support meaningful follow-up. Staff also suggested providing FCGs with a contact card for accessing further assistance at their discretion.

Technology Literacy

FCGs recommended a tutorial video to build confidence navigating CareCheck, as not all were familiar with tablets or mHealth apps. Trained staff similarly observed initial resistance among some FCGs unfamiliar with technology and proposed a standardized script to guide FCGs through the assessment step by step.

Alternative Administration Modalities

Several FCGs completed CareCheck through modalities other than direct, self-administered tablet interaction. One trained staff member who worked remotely administered CareCheck as a structured telephone interview. Based on positive feedback about this approach, a formalized phone-based administration protocol was later developed, in which staff read items aloud and recorded responses on paper before entering them into the tablet-based platform to maintain consistent data capture. Two FCGs who were unfamiliar with tablet technology were similarly administered CareCheck verbally, in an interview format, with staff recording responses on paper before transcribing them into the system. Across all interview-based and technical-disruption scenarios described above, paper served only as a temporary recording step; all responses were ultimately entered into the same digital dataset used for analysis.

Discussion

Principal Findings

This study evaluated the usability and implementation feasibility of CareCheck among FCGs of patients seen in gynecologic oncology care settings, consistent with the study's two objectives: (1) evaluating CareCheck's usability and (2) examining the feasibility of its integration into routine clinical workflows. CareCheck addresses a critical gap in serious illness care. By operationalizing FCG risk identification within a digital platform that supports real-time feedback and structured follow-up, CareCheck advances efforts to move FCG support from informal recognition to systematic, data-informed practice. Overall, FCGs reported high usability and strong perceived relevance, indicating that structured digital risk screening is both acceptable and feasible within oncology care settings. Beyond usability ratings, qualitative findings identified areas for refinement, including navigation clarity, wording precision, privacy considerations, technological infrastructure, and workflow alignment. Together, these findings provide actionable guidance for optimizing clinical integration and long-term sustainability.

Existing caregiver screening initiatives provide useful context for interpreting these findings. One of the most comparable tools is Cancer Support Source–Caregiver (CSS-CG), developed by the Cancer Support Community to screen for psychosocial distress and supportive care needs among FCGs of individuals with cancer [25]. Prior implementation studies have demonstrated the feasibility of CSS-CG for identifying caregiver distress and facilitating referrals to supportive services [26]. However, CSS-CG primarily focuses on identifying caregiver distress and unmet needs as part of supportive service referral pathways. In contrast, CareCheck was designed to identify multidimensional caregiving-related risks—including functional, psychosocial, and caregiving context factors—and to generate domain-specific, actionable

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feedback for both FCGs and the trained staff within clinical workflows.

Although overall usability ratings were high, FCGs identified opportunities to enhance navigation clarity, streamline response review functions, and provide clearer guidance during completion. These findings underscore the importance of iterative, user-centered design processes. Continued engagement of FCGs through co-design workshops, usability testing cycles, and structured feedback mechanisms may further reduce cognitive burden and enhance both user satisfaction and measurement validity [27].

Beyond interface-level refinements, contextual factors emerged as central to implementation success. Privacy was a particularly salient concern. FCGs expressed a preference for completing CareCheck in private settings to facilitate candid disclosure of emotional strain and unmet needs. The presence of care recipients or others in shared clinical spaces may inhibit open reporting, potentially affecting response authenticity and the clinical utility of screening results. These findings align with broader digital health research demonstrating that confidentiality safeguards are essential to fostering trust and honest disclosure [28].

Technological infrastructure also emerged as a key determinant of feasibility. The trained staff emphasized that reliable internet connectivity is foundational for sustained integration. Technical disruptions may undermine workflow efficiency and staff willingness to adopt digital screening tools routinely. Consistent with prior mHealth implementation research [29], infrastructure readiness is not peripheral but central to successful adoption.

User engagement was also shaped by digital literacy and language. While many FCGs were comfortable completing tablet-based assessments, others required additional guidance. Because FCGs of individuals with cancer often skew toward older age groups [30-34] implementation strategies should incorporate structured onboarding, simplified navigation, and step-by-step instructions to build user confidence. Terminology sensitivity was a related factor: staff observed that some male FCGs found the term “distress” alienating, consistent with digital health equity research linking culturally and contextually tailored language to higher satisfaction and engagement among diverse populations [35]. Ongoing refinement of CareCheck's content should therefore attend to how terminology may be interpreted across gender and cultural contexts, alongside the onboarding supports noted above.

The trained staff also identified telehealth adaptation as a promising extension of CareCheck’s implementation, and a structured phone-based interview option has since been incorporated into CareCheck's ongoing clinical implementation as a complement to direct tablet administration. Integrating the screening tool into structured phone or virtual visits may provide a flexible alternative to in-clinic administration, particularly in settings where privacy concerns, scheduling constraints, or technological infrastructure limit feasibility.

More broadly, the development and implementation of CareCheck align with the US National Strategy to Support Family Caregivers, which emphasizes systematic identification of FCGs and integration of FCG needs into health care delivery [19]. Structured digital screening provides a systematic mechanism for recognizing FCG risk and standardizing follow-up processes. However, screening must function as an entry point to meaningful intervention rather than a stand-alone activity. Embedding referral pathways, educational resources, and tailored support services will be essential to translating identified risk into actionable FCG support. Without such mechanisms, the clinical impact of screening may remain limited despite high usability and feasibility. This concern is compounded by structural barriers within the current US health care system, including the general lack of reimbursement mechanisms for FCG-focused services and the uneven availability of FCG support resources across institutions [36,37]; even when CareCheck successfully flags an FCG at risk, the likelihood of connecting that FCG to a systematic, sustainable, and readily available support pathway may vary considerably depending on local resource infrastructure, as illustrated by our own institution's development of a dedicated CARE Center to help fill this gap [22]. Addressing these systemic gaps will likely require coordinated policy and reimbursement reform alongside continued tool development.

Limitations and Future Work

Several limitations should be considered when interpreting these findings, particularly related to generalizability. This study was conducted within a single academic medical center and involved a modest sample of FCGs, which may limit generalizability across health care settings with different patient populations, staffing structures, or technological infrastructure. As this usability evaluation was conducted as part of an ongoing quality improvement initiative to implement CareCheck within this clinical setting and because CareCheck was designed as a disease-agnostic screening tool, the outpatient waiting-room sample may have included FCGs caring for patients with diagnoses other than confirmed gynecologic cancer; diagnostic information was not collected to verify this. Staff participation was also limited to 2 supportive care professionals from the CARE Center, which may not fully capture perspectives from broader multidisciplinary teams involved in oncology care.

Reflecting this study's design as an anonymous quality improvement evaluation rather than a formal research protocol, several participant-level tracking gaps limit interpretation: the number of FCGs contributing open-ended feedback, the proportion completing CareCheck by phone-interview versus tablet (precluding comparison across modes), and the number and reasons for declining participation were not systematically recorded. Verbal, staff-administered completion, in particular, may have introduced social desirability bias, given that CARE Center staff administering the assessment were themselves connected to the tool being evaluated. Because CareCheck was iteratively refined throughout the study period in response to emerging FCG and staff feedback, not all participants completed an identical version, and which version each participant received was not tracked. As summarized in Table 3, these modifications were primarily editorial (eg, font size, thermometer colors, navigation prompts) rather than changes to assessment content, which was unmodified throughout the study, so they were

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unlikely to have meaningfully affected the comparability of usability ratings across participants.

Demographic and technology-literacy data were not collected, to minimize participant burden and protect confidentiality in this small, single-institution sample; as a result, we cannot assess whether usability varied by subgroup (eg, older adults, or those with visual, motor, or cognitive limitations). Staff themselves identified this as a gap worth addressing in future iterations (Results, recommendation area 2). More formal implementation evaluation methods (eg, workflow mapping) were not applied, and modifications were not formally retested with subsequent participants—consistent with this study's iterative, quality-improvement design rather than a staged validation process. Preliminary psychometric evaluation of the 20-item CareCheck has demonstrated face/content and criterion validity (G Campbell, PhD, unpublished data, October 2026); however, further validation across diverse clinical populations and settings remains warranted. The 5-item MAUQ had acceptable internal consistency here (α=0.84) but has not been formally validated as a standalone measure. Finally, as a usability and feasibility study rather than an effectiveness study, we did not collect data on sustained adoption, referral uptake, or caregiver outcomes—an important direction for future work.

Conclusions

This study provides preliminary evidence for the feasibility and acceptability of CareCheck as a structured digital screening tool for identifying caregiving-related risks among FCGs of patients seen in gynecologic oncology care settings. Findings indicate that FCGs are receptive to technology-enabled screening when it is integrated into care workflows and supported by the trained staff. By operationalizing FCG risk identification within a standardized digital platform, CareCheck offers a practical mechanism to move FCG support from informal recognition toward systematic, data-informed practice. Continued validation and implementation research will be important to determine how tools such as CareCheck can be scaled to strengthen FCG support across diverse oncology care settings.

Acknowledgments

The authors gratefully acknowledge the caregivers who generously participated in this study and shared their experiences and insights.

Data Availability

The datasets generated and analyzed during this study are not publicly available, as they were collected as part of a quality improvement initiative rather than a research study intended for public data deposition but are available from the corresponding author on reasonable request.

Funding

This research was supported by the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR; grant 90RTGE0002). NIDILRR is a center within the Administration for Community Living (ACL), US Department of Health and Human Services (HHS).

Generative AI Use

The authors declare that generative AI was not used in the preparation of this manuscript.

Authors' Contributions

Conceptualization: HSD, GC, THT, JK, YW, YJL, SET
Funding acquisition: HSD, GC
Software: HH, BP, IMAS
Formal analysis: YW, HH, RAD
Investigation: YW, KL, PJM, SET
Supervision: HSD
Writing – original draft: YW, HH, KRT, SET
Writing – review and editing: all authors

Conflicts of Interest

None declared.

Multimedia Appendix 1

Questions for the modified Mobile Health App Usability Questionnaire for family caregivers.
[DOCX File , 14 KB-Multimedia Appendix 1]

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Abbreviations

CARE: Caregiver Advocacy, Research, and Education
CSS-CG: Cancer Support Source–Caregiver
FCG: family caregiver
HIPAA: Health Insurance Portability and Accountability Act
MAUQ: Mobile Health App Usability Questionnaire
mHealth: mobile health
UPMC: University of Pittsburgh Medical Center

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Edited by A Price, J Wald; submitted 24.Apr.2026; peer-reviewed by M Reblin, G Davlyatov, V Mishra; comments to author 30.Jun.2026; revised version received 01.Oct.2026; accepted 05.Oct.2026; published 20.Nov.2026

Please cite as:
Hu H, Wang Y, Campbell G, DiLello RA, Klinger J, Lee YJ, Loughlin K, Murray PJ, Parmanto B, Senteza DT, Setiawan IMA, Heidari-Soureshjani R, Tan KR, Taylor SE, Thomas TH, Donovan HS
CareCheck, a Digital Risk Screening Tool for Family Caregivers in Gynecologic Oncology Care Settings: Usability Study
J Particip Med 2026;18:e99381
URL: https://jopm.jmir.org/2026/1/e99381
doi: 10.2196/99381
PMID:

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