Gynecologic Oncology 167 (2022) 239–246

Contents lists available at ScienceDirect

Gynecologic Oncology

journal homepage: www.elsevier.com/locate/ygyno

Usability and acceptability of the electronic self-assessment and care (eSAC) program in advanced ovarian cancer: A mixed methods study

Mihkai Wickline [a,*], Seth Wolpin [a], Susie Cho [a], Holly Tomashek [b], Tanya Louca [c], Tori Frisk [d], Janna Templin [e], Alison Loechl [a], Barbara Goff [f], Donna Berry [a]

[a] University of Washington School of Nursing, BOX 357260, University of Washington, Seattle, WA 98195, United States of America
[b] University of Washington Medical Center – Montlake, Gynecologic Oncology, United States of America
[c] North York General Hospital, Toronto, Canada
[d] EvergreenHealth, United States of America
[e] Microsoft Health and Life Sciences, United States of America
[f] Department of Obstetrics and Gynecology, University of Washington, Seattle, United States of America

HIGHLIGHTS

- The eSAC program was successfully implemented in an advanced ovarian cancer ambulatory setting.
- The eSAC program was useful for both patients and clinicians for promoting quality-of-life conversations.
- The eSAC program was especially helpful with providing entrée into conversations around sexuality and palliative care.
- Both clinicians and patients found the eSAC program to be acceptable and user-friendly.
- Clinicians and patients offered practical suggestions for improving future iterations of the eSAC program.

ARTICLE INFO

Article history:
Received 7 July 2022
Received in revised form 7 September 2022
Accepted 9 September 2022
Available online 21 September 2022

Keywords:
Electronic patient-reported outcomes
Advanced ovarian cancer
Usability
Acceptability
Mixed methods
Patients and clinicians.

ABSTRACT

Objective. To determine usability and acceptability of the electronic self-assessment and care (eSAC) web-based, patient reported outcome (PRO) program for people with advanced ovarian cancer.

Methods. Patient participants recruited from a single ambulatory site were prompted by email to answer symptom/quality of life items prior to each clinic visit. Patient participant acceptability was measured with the Acceptability *E*-Scale Score (AES). Usability was measured among a subset of patient participants using semi-structured interviews. Clinician participant acceptability and usability were measured via survey and semi-structured interviews. Quantitative data were analyzed with descriptive statistics. Qualitative data were analyzed using thematic content analysis. A mixed methods analysis was performed.

Results. Of 163 eligible patients approached, 143 (87.7%) provided written consent. Patient participants ($n = 71$) who created an eSAC report prior to at least 3 clinic visits, rated eSAC as acceptable with a mean AES score of 26.19 ± 3.36 (out of 30). Interview data from patient participants ($n = 33$) revealed that eSAC was easy to use and important to the clinic visit conversation. Data from clinician surveys ($n = 8$) and focus groups ($n = 3$) revealed that the eSAC program was acceptable and useful for clinicians. Qualitative analysis suggested process improvements from patients and clinicians for effectiveness in the advanced ovarian cancer setting. Mixed methods analysis demonstrated no major discrepancies between quantitative and qualitative findings, with the qualitative data broadening understanding of quantitative ratings.

Conclusion. eSAC was useful and acceptable in this setting. This PRO is a promising strategy for enhancing patient-centered care for people with advanced ovarian cancer.

* Corresponding author.
E-mail address: mihkai@uw.edu (M. Wickline).

https://doi.org/10.1016/j.ygyno.2022.09.010
0090-8258/

1. Introduction

Ovarian cancer is the deadliest female cancer, responsible for 2.5% of all female cancers and 5% of all female cancer deaths, with nearly 80% of ovarian cancers diagnosed in advanced stages [1–3]. Treatment for advanced ovarian cancer can be intense, resulting in high symptom burden and adverse effects on patient quality of life (QoL) [1]. Excellent communication between the patient and care team is essential for optimum decision-making, treatment adherence, and symptom control. Patient reported outcomes (PROs) are one way to facilitate patient-centered communication [4].

Patient reported outcomes comprise standardized data directly reported from the patient to the clinician and commonly include disease symptoms, treatment side effects, various aspects of functioning (e.g. physical, mental, sexual), and QoL [5]. Patient reported outcomes are commonly reported via electronic surveys that the patient does at home with summaries and alerts provided to clinicians in real-time for opportune intervention, especially for dangerous or distressing symptoms [6,7]. Electronic PROs are becoming increasingly popular as they have shown to improve outcomes such as symptom management, QoL, and even survival [3,6–10]. Benefits of PROs on patient and clinician communication and on the patient-clinician relationship have been described [4,11–13]. A recent systematic review listed the mechanisms through which PROs in cancer care influence patient-care team communication as increasing symptom awareness, prompting discussion, streamlining consultation, and facilitating inter-professional communication [7]. In addition to individual patient benefits of PROs, system level benefits of PROs can be realized by aggregating PRO data to look at the impact of treatment among a cohort, or as a performance measure to assess care quality [14].

There is momentum to implement the use of PROs more broadly in the ovarian cancer setting both for clinical care and research [3,5,15]. Given the emerging directive for increased PRO use, it is critical to have clarity around evaluating usability and feasibility of PRO programs. A recent systematic review about home based electronic symptom reporting systems in cancer patients revealed that availability of compatible devices and technologic support, interactive system features, information accessibility, privacy, questionnaire quality, patient physical and psychosocial health, and patient age were all associated with patient acceptance [16]. There is a clear role for mixed methods research for evaluating PRO usability and feasibility to gain a more nuanced understanding than can be obtained through quantitative- or qualitative-only methods [10,17]. Additionally, collecting perspectives from both patients and clinicians is critical to a broader understanding of acceptance than by asking one group alone [10].

The electronic self-assessment and care (eSAC) study introduced eSAC to patients with advanced ovarian cancer in an NCCN-designated cancer center. The primary objective of this study was to describe the feasibility and processes of eSAC implementation in an ambulatory setting, particularly regarding promotors and barriers to clinician acceptance, patient access and completion rates as compared to historical data, and patient and clinician acceptability and usability as compared to historical data.

2. Methods

2.1. Design and setting

A single arm, longitudinal design study was conducted in the Gynecologic Oncology outpatient clinic at the University of Washington Medicine – Montlake campus. The facility is the major regional referral center for ovarian cancer in the Pacific Northwest region. To capture a broad perspective, mixed methods were employed; Fig. 1 details the study schema.

2.2. Patient participants

Adult, English-speaking people with stage III/IV and recurrent ovarian cancer were eligible to participate in the study. We excluded cognitively impaired and emotionally unstable patients (identified by provider assessment). All procedures and protocols were approved by the Human Subjects Division at the University of Washington (STUDY00009756).

2.3. Clinician participants

Clinician participants for the eSAC study were recruited from the same clinic. The sole eligibility was having viewed an eSAC report for an enrolled patient participant during patient care.

2.4. Procedures and measures

2.4.1. The eSAC Intervention

Briefly, the eSAC intervention is an electronic, web-based self-reporting system where patients can report and track their symptoms, quality of life measures, and decision-making preferences during cancer therapy. The eSAC program also delivers self-care instructions targeted to reports of moderate-severe symptoms and provides tips on how and when to communicate with clinicians about symptoms. This program has been shown in prior studies to reduce symptom distress and improve communication between cancer patients and their health care team [12]. The eSAC is a next generation build of the electronic self report assessment-cancer (ESRA-C) and is specific to people with ovarian cancer. The ESRA-C was developed [18–20] and tested [12,21,22] over two decades and has established usability, acceptability, and efficacy for many types and stages of cancers with regard to promoting patient-clinician communication as well as reducing symptom distress and depressive symptoms.

The research team met with clinicians prior to patient recruitment, providing training on the procedures. The patient-facing educational materials were made available to clinicians on paper and electronically on a project website.

2.5. Demographics and eSAC usage

Patient participants self-reported demographic information about age, race, ethnicity, personal relationship status, employment status and educational attainment. The eSAC software was queried for usage metrics.

2.6. Device choice

Given the extensive usability and acceptability testing conducted on the earlier ESRA-C legacy program [18–20], evaluative measures of usability were collected on subsets of the total sample, reducing participant burden. This study used a “Bring Your Own Device” method for accessing the eSAC program; collecting user device preferences and comfort level with technology were important as these factors influence people's ability to engage with an mHealth application. Early in the study enrollment, we explored participant device choice. Study staff interviewed a subset of participants as soon as possible after consent. Interviews included semi-structured questions and observations to collect device choice data.

2.7. Usability

At nine weeks after enrollment when participants had the opportunity to make three eSAC reports, usability interviews were conducted by telephone for a subset of patient participants. Semi-structured questions obtained information about the usability experiences of participants. The goals were two-fold: to learn about eSAC usability and

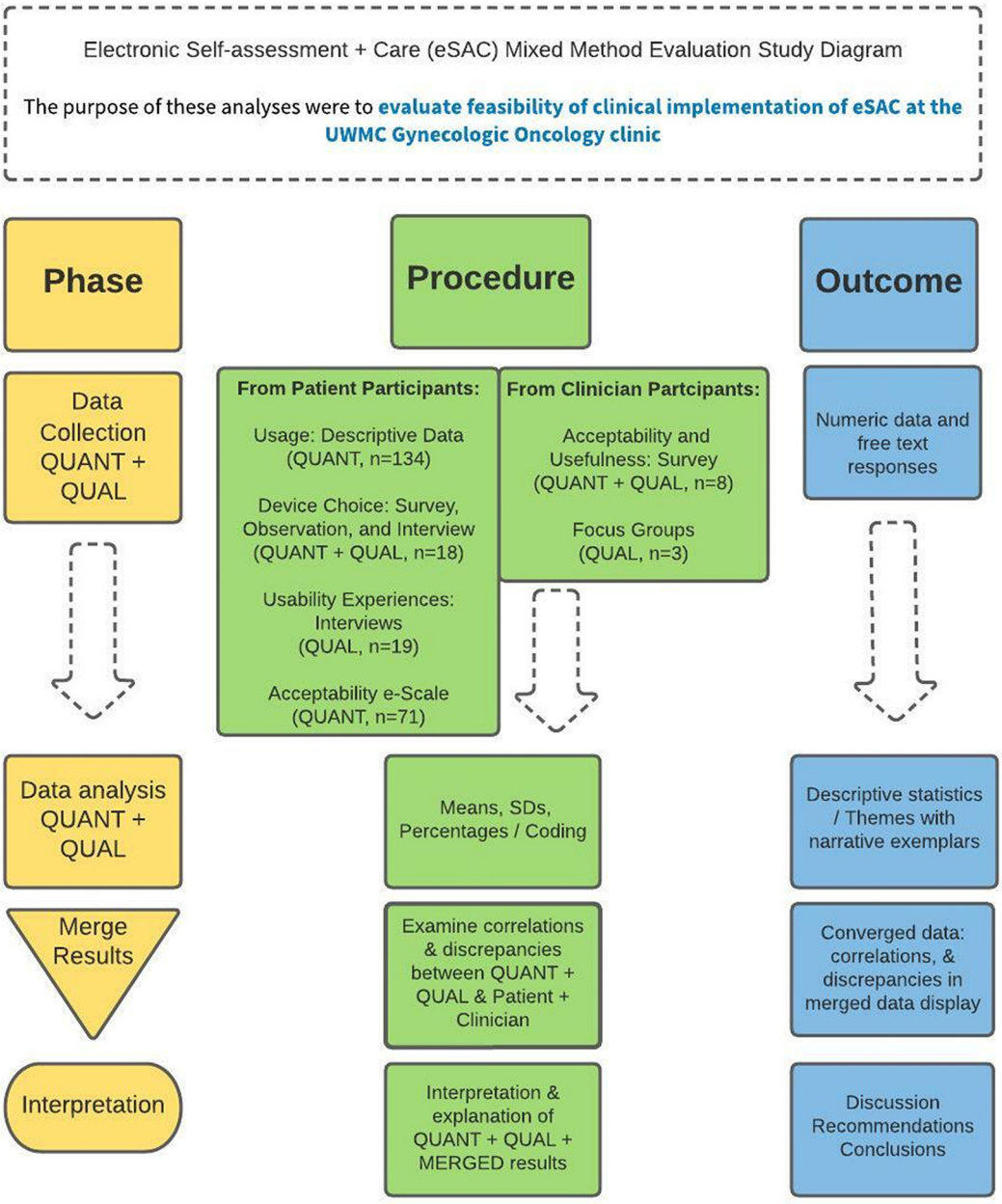

Fig. 1. Study diagram.

acceptability from participants and to uncover any technological difficulties that could be corrected. Once the data collected were redundant, we ended the 9-week interviews.

2.8. Acceptability

The Acceptability *E*-scale (AES) has been validated for assessing the acceptability and usability of mHealth applications in oncology settings [8]. This 6-item ordinal scale measures the difficulty of use, understandability of questions, enjoyment of use, helpfulness of the application, acceptability of time to use application, and overall satisfaction of using a computerized health-related program [18]. Each item is given a score of 1–5, with higher scores indicating better acceptability. The highest AES sum score is 30, with mean sum scores ≥24 indicating that the mHealth application is considered acceptable by users [8]. The AES has been used in multiple settings and has been translated to other languages. [8,18,23–28] In order to capture the experience of making a report and a clinician reviewing the report showing change over 2 visit periods, the AES was administered automatically in this study to participants immediately after completing the third eSAC report.

2.9. Clinician survey and focus groups

Physicians, nurse practitioners, physician's assistants, and registered nurses were invited by email to participate in an on-line survey and focus groups to explore eSAC acceptability and usefulness for clinicians. The anonymous, on-line clinician eSAC survey contained 6 quantitative questions about appropriateness and helpfulness of the information within the eSAC reports for various clinical activities and one open-ended qualitative question soliciting any feedback about eSAC reports for clinicians. The items were adapted from a prior ESRA-C clinician survey [12].

The clinician focus groups were conducted by a graduate student who had not taken part in deployment of the study. Semi-structured

questions were used to elicit information about the implementation and use of eSAC for ovarian cancer patients from clinicians who had interfaced with patient participant eSAC reports. Focus group audio was digitally recorded and transcribed verbatim. The transcripts were then analyzed for unique responses and implications for future eSAC intervention implementation. The overall goal of these sessions was to gather end-user feedback for future use of eSAC in the clinical setting.

2.10. Data analyses

Patient participant demographic data were analyzed using frequencies and descriptive statistics. Device choice interview data were analyzed using descriptive statistics for quantitative data and content analysis for identifying themes for qualitative data from interview notes. Transcripts from the usability interviews were analyzed using directed content analysis [29] to identify themes.

Sum scores from the AES were analyzed using descriptive statistics and were compared to historic data from the ESRA-C study comprised of participants with various cancers and stages. Only participants who completed every AES item were included in the analysis. Participant access and usage were analyzed using descriptive statistics and compared to historic data from the ESRA-C study.

Quantitative data from the on-line clinician eSAC survey were analyzed using descriptive statistics, and responses to the open-ended item were summarized and presented as unique responses. Qualitative data from the focus groups were analyzed by coding the unique responses and describing the implications of future eSAC implementation based on the unique responses. Finally, the quantitative and qualitative analyses from patient participants and clinician participants were combined and presented in a mixed methods visual matrix to broaden the understanding of the study findings.

3. Results

3.1. Study enrollment and sample

Between September 2020 and February 2022, a total of 250 patients were screened and met study eligibility criteria. Contact was made with 163 eligible patients who were invited to participate in the study, with 143 (87.7%) providing written consent. Of the 20 who declined participation, four did so lacking confidence in their technologic abilities, three were not having symptoms and did not see benefit, and other reasons varied. Participants were given a *url* that led to a study registration web page instructing to create an account with email and password. The next click led to the eSAC questions and educational components.

3.2. Demographics and eSAC use

Demographic data from the entire patient participant sample along with the subsamples that completed the Device Choice Interviews and Usability Interviews are presented in Table 1. The sample comprised largely non-Hispanic white women who were partnered (67%), aged 60 or older (66%), college or post-college graduates (59%), and retired (46%). Demographic data from the subsamples who participated in the interviews were similar to the total sample, with slightly older participants with lower overall educational attainment in the interviewed subsamples. Of the total sample, 19 participants (13.3%) withdrew from the study; more than half of these withdrew involuntarily due to death or illness so severe that the participant did not return to the clinic. Of 143 consented participants, 134 (93.7%) created an eSAC account and of those, 120 (90%) made at least one report, typically the day of enrollment. Participants were prompted to complete reports prior to subsequent clinic visits and 100 (75%) submitted at least one additional report. In the most recent ESRA-C randomized clinical trial [21], participants were only enrolled if they had completed one report (100%). However, only 34.8% of participants completed a subsequent remote, voluntary report. These usage metrics indicate higher report submission rates for eSAC than in our prior trial.

Table 1
Demographics of patient participants.

	Total Sample ($N = 134$)	Device Interview Sample ($n = 18$)	Usability Interview Sample ($n = 19$)
Age			
20–29	1 (<1%)	0	0
30–39	1 (<1%)	0	1 (5%)
40–49	14 (10%)	2 (11%)	2 (11%)
50–59	29 (22%)	2 (11%)	1 (5%)
60+	89 (66%)	13 (72%)	15 (79%)
Race			
White/Caucasian	116 (87%)	16 (89%)	17 (89%)
Asian	9 (7%)	0	2 (11%)
Hawaiian/Pacific Islander	2 (1.5%)	0	0
Black/African American	4 (3%)	0	0
American Indian/Native Alaskan	3 (2%)	0	0
Ethnicity			
Spanish/Hispanic/Latino	6 (4%)	0	1 (5%)
Work			
Full-time			
Part-time	13 (10%)	2 (11%)	3 (16%)
At home	6 (4%)	0	0
On medical leave	7 (5%)	2 (11%)	2 (11%)
Not working	23 (17%)	5 (28%)	4 (21%)
Retired	61 (46%)	8 (44%)	8 (42%)
Student	1 (<1%)	0	0
Education			
8th grade or less	0	0	0
9-12th grade	19 (14%)	4 (22%)	4 (21%)
2-year college	14 (10%)	3 (17%)	3 (16%)
4-year college	39 (29%)	5 (28%)	7 (37%)
Graduate degree	40 (30%)	2 (11%)	4 (21%)
Relationship			
Single	33 (25%)	1 (6%)	6 (32%)
Married/Partnered	90 (67%)	15 (83%)	13 (68%)
Separated	6 (4%)	0	0

(Numbers may not add up to 100% as some demographic information was missing for some participants)

3.3. Device choice

On the day of consent, 18 participants were invited to and did complete device choice interviews. The most common device participants planned to use for making eSAC reports was a smartphone (either iPhone or Android), with 14 of the 18 participants selecting such a device. The remaining four participants planned to use a laptop or desktop computer to make their reports. All participants indicated familiarity with using their preferred device for other activities (phone calls, texting, emailing, web browsing, banking, shopping, etc.) although only three had ever used their device for an activity similar to the eSAC application. Participants who agreed were observed as they set up their eSAC account and made the first report. After minor initial mistakes by four participants to set up an account, participants had no issues navigating the eSAC program or making a report. A few participants suggested that it would be easier to have a native smartphone application instead of the web-based application and mentioned that the verification emails to log into the browser sometimes were hard to find in Gmail accounts. Beyond the device choice subset, of the 120 participants who created an account, only two contacted the help desk email.

3.4. Usability

We contacted 59 eSAC participants by email and invited them for a phone interview about usability; 19 responded and all 19 were interviewed. The majority of participants (89.5%) who partook in the usability interviews reported that they were actively using the eSAC

program. Only 10.5% of the participants had created an account without making a report. Most of the participants (84.2%) recalled getting email prompts to log in and make a report within five days of their next scheduled clinic visit. Around half of the participants (47.4%) stated that the eSAC application was useful for symptom management. More than half of the participants (57.9%) stated that it was not obvious their clinician was using the eSAC reports during the clinician visits, but the same number stated that the eSAC program enhanced patient-clinician communication. Participants described examples of how eSAC was useful for provider-clinician communication by helping them prepare for appointments, facilitating conversations about sexuality, and serving as a conversation starter with their clinician regarding quality-of-life issues. Several participants (21.1%) felt that the eSAC program would have been more useful at the earlier stages of their diagnosis, when they were getting used to navigating healthcare around their diagnosis and treatment and managing treatment-related symptoms. Overall, 89.5% of participants were comfortable with their ability to use the eSAC program.

3.5. Acceptability E-scale

Only the patient participants who had completed three eSAC reports were presented with the Acceptability E-scale (AES). Of the 82 participants eligible to complete an AES, 71 (86.6%) did so. The AES sum score mean and standard deviation was 26.19 ± 3.36 (out of 30). This is above the traditional threshold of 80% of the possible score to be considered acceptable by users of a computerized health application. The median item scores are presented in Table 2. The AES was administered to all participants in the first ESRA-C clinical trial [12]. An analysis of acceptability for the first 324 participants in this mixed gender study revealed almost exactly the same mean sum score (26.15) as with eSAC [18].

3.6. Clinician survey

Clinicians who worked in the gynecologic oncology clinic were sent a link to an anonymous, on-line survey to provide feedback about their experience with eSAC reports. Of 19 potential participants, eight (42%) completed a survey. Overall, the six MD and two ARNP respondents ranked the six surveyed items favorably (Table 3). In addition to quantitative survey items, clinicians were prompted, "Please tell us anything else you would like to say about the eSAC report for clinicians." Five participants provided feedback to this open-ended query. Three respondents offered concise feedback about particular eSAC-related issues, one commented that the free text section in which patients could write about their concerns and questions was the most helpful aspect of eSAC, one mentioned that they did not remember seeing information about palliative care on the reports, and one stated that the reports would be more helpful if they were integrated into the electronic medical record. Two of the respondents provided lengthier observations. One detailed how the reports were helpful to guide the conversation when patients would report significant symptoms on the eSAC reports but when asked verbally how they were feeling would paint a more positive picture, perhaps in an effort to present themselves as doing well during treatment to avoid side effect-driven therapy pauses. This clinician described how eSAC became an important tool that helped the clinician address the "hidden" symptoms that were bothering the patient. The other clinician communicated that the reports were not as helpful as they had hoped largely because the reports seemed outdated by the time they saw the patient with issues in the eSAC report having been already resolved.

Table 2
Acceptability *E*-scale score, $N = 71$.

Mean sum score (SD)	26.19 (3.36)	
	Median Score	Range of Scores
How easy was this Internet program (eSAC) for you to use?	5	3–5
How understandable were the questions?	5	4–5
How much did you enjoy using this Internet program (eSAC)?	4	2–5
How helpful to you was this Internet program (eSAC) in describing your symptoms and quality of life?	4	2–5
Was the amount of time it took to complete this Internet program (eSAC) acceptable?	5	1–5
How would you rate your overall satisfaction with this Internet program (eSAC)?	4	2–5

SD = standard deviation; eSAC = electronic self-assessment and care.

Table 3
Clinician Survey, $N = 8$.

	Median Score	Range of Scores
The eSAC reports identified appropriate areas of symptom and quality of life concerns or deficits	4	4–5
The eSAC reports appropriately identified shared treatment decision-making role preferences of the patient	4.5	1–5
The eSAC reports appropriately identified information specific to palliative care of the patient	4	3–5
The information in the reports was helpful in promoting communication between clinician and patient	4	3–5
The information in the reports was helpful in identifying areas of need for intervention or referral	4	3–5
The method of receiving the reports was helpful	4	2–5

3.7. Clinician focus group

Three clinicians participated in a focus group, out of 12 invited clinicians. Two nurse practitioners and one physician attended the focus group, all identified as female, and had varied experience (one each of 5 to <10 years, 10 to <15 years, and >20 years). Unique responses, implications for future eSAC deployment, and exemplar quotes are provided in Table 4. Ideas discussed by multiple focus group participants included: the helpfulness of a research team member in clinic during patient enrollment, the helpfulness of the eSAC reports to provide entrée into difficult conversations (sexual function and palliative care), the desire to have the eSAC reports available on paper and electronically in the electronic health record, and the need to check in with patient participants periodically to iron out technical issues.

3.8. Mixed methods results

Overall, the quantitative data were consistent with the qualitative data with no major discrepancies. The data collected through qualitative methods broadened the overall understanding of eSAC usability, acceptability, clinical utility, and implementation feasibility by providing experiential accounts of patients and clinicians who used the eSAC application. Collecting quantitative and qualitative measures from both patients and clinicians provided extensive evaluation of eSAC implementation in the gynecologic-oncology ambulatory setting. Fig. 2 illustrates a visual data display of the merged findings.

4. Discussion, practice implications, and conclusion

4.1. Discussion

Our findings suggest that the implementation of the eSAC program was feasible and acceptable to both patient and clinician participants. Acceptability scores exceeded those of prior work. This study applied lessons learned from prior research as well as formative feedback from clinicians. Participants completed their eSAC reports at home, which has been shown to increase response rate and user satisfaction over completing the reports in clinic [30]. Additionally, the email reminders were appreciated by participants in this study, as shown in

Table 4
Clinician Focus Group, $N = 3$.

Question	Unique Responses	Implications for Future eSAC Implementation	Exemplar Quotes
What facilitated eSAC implementation in clinic?	Collaboration between Principal Investigators and the Head Nurse to ensure that clinicians had eSAC reports for clinic visits Having the free text option for patients to enter narrative about their symptoms opened the door for helpful conversations Having a member of the research team in clinic to remind/assist with recruitment and enrollment (especially with co-occurring studies with overlapping eligibility and at beginning of study) Having a printed eSAC report available for clinic visits (but would also be helpful to have the eSAC report available online in EMR with a reminder)	Continue to nurture collaborative relationship between research team and clinical team Continue to have free-text option available in eSAC program for patients to provide narrative summary Deploy a member of the research team to the clinic when eligible patients will be approached to participate especially at the beginning of the study Explore having the eSAC report embedded in the electronic medical record Explore having an electronic reminder that the patient is on the eSAC study	"I also found the free text option… extremely helpful and probably used that more to facilitate conversations than… the other items they had selected 'better' or 'worse' (be)cause I thought people could just really tell me what was going on and what their worries were in the moment." "Having someone in person was a good visual reminder for me to ask patients if they wanted to be participants, so it's helpful to have someone there initially when we were getting this onboarded." "I would agree having the paper was helpful… (be)cause you could see the whole shot… I wonder, you know, it's electronic so… I'm kind of like well, 'why not deliver the output electronically so that you can have it both up on the screen and in the patient's chart?'"
What got in the way of successful implementation of eSAC?	Patient participants sometimes had tech issues with accessing the eSAC program Having the reports as only paper copies sometimes led to missed opportunities Patient participants voiced frustration at having to click through all the items to get to the free text option to provide narrative Difficult to know who was on the eSAC study if no paper report so could not help patients troubleshoot or triage tech issues Sometimes visits went over time or clinician would forget to ask if patients wanted to participate in the study Sometimes the patient's moderately or severely ranked symptom did not align with clinical priorities (i.e., patient may rank fatigue or impact on sexual activities as causing severe distress, but the clinician needed to order a blood transfusion for anemia or dose reduce their chemotherapy for peripheral neuropathy) which created angst for the clinician who wanted to address patient priorities	Check in with patients to see if they are having tech issues with the eSAC program Have an electronic version of eSAC reports available to clinicians Consider having the free text box for patient narrative comments available at any time while making an eSAC report Have a flag on the EMR for eSAC study patients Find multiple opportunities to approach patients to participate in study if a certain visit runs over without time to discuss enrollment Provide anticipatory guidance to clinicians that it may not be possible to address the patient's highly ranked symptoms at each visit especially if the patient's clinical presentation demands prioritization of pathophysiologic issues	"I did hear from some patients that they would get frustrated because they just wanted to use… the free text option but had to… click through everything else first to get to that point." …if I didn't have a paper printout of their results, there was nothing that flagged them as being in the study for me to ask them like, 'How's it going? Do you find it helpful or are you having any trouble?'" "If there was a moderate or severe symptom, I felt very obligated to address that, but, sometimes in the moment, it might not have been the thing that was the most pressing to me about the patient visit."
What would improve how eSAC is used in the clinic?	The warm handoffs between RN and provider at time of paper eSAC report delivery preferred over leaving the report on provider's desk Research team should check in with participants periodically to iron out tech problems Reports should be available for telehealth visits (not just in-clinic visits) Make the communication preferences and treatment-decision-making preferences part of EHR as these are very helpful Providers should have access to teaching sheets that are pushed to patients (these were available in hard copy in provider workroom and as a weblink sent to providers via email at study onset)	Warm handoffs of paper reports when possible Explore ways to electronically "deliver" reports to providers Designated person to prospectively help patients with eSAC tech concerns Explore ways of making treatment and communication preferences part of the EHR Remind providers periodically about the teaching sheets and direct them to where to find	"if I just found a report on my desk that wasn't as helpful as if somebody brought it to me and said 'Hey, please remember to speak to so-and-so, it looks like they mentioned they have a concern about XYZ.'"" …maybe we learned this way back when the study started, but I can't remember… if the patient checked the boxes as moderate to severe then they were pushed information on those particular symptoms. Do we have access to know what information was being pushed to them?"
What was successful about the eSAC intervention?	The flagging system for when a patient met threshold for palliative care referral The palliative care "flags" gave permission to approach the topic with the patient and helped with patient acceptance of the referral The palliative care "flags" reminded the provider that a patient would benefit from palliative care Increased palliative care referrals Increased communication between providers and patients Gave patients a way to make sure uncomfortable topics were addressed in clinic by shifting burden of verbal initiation of topic to the provider Increased conversations around sexual function Guides discussion to what patients flag as important Provided a way for provider to see symptoms over time	Highlight how report summary can give entrée to difficult topics, including palliative care and impact on sexual activities Highlight benefit of seeing results longitudinally Highlight benefit of eSAC reports assisting with prioritizing clinic discussions between prover and patient Highlight benefit of raised awareness of patient decision-making preferences Highlight opportunity for patients to participate in research, which can provide focus and purpose	"...it just felt like eSAC was kind of the permission sometimes that the patients needed to… accept that referral from us, in some cases… and it was a good reminder to the provider that… if we haven't already offered it, that the patient would be a good candidate." "I think it did increase communication between providers and patients and gave patients a way to, especially if they had a question they were not as comfortable asking in person, they could kind of slip it into the eSAC report and let us know that it was something they were worried about so that we would bring it up in clinic versus them having to bring it up."" …review of sexual functioning may not be something that's always…, I'm using it as an example, but you may not always get to it, and so when patients have the opportunity to flag it as

Table 4 (*continued*)

Question	Unique Responses	Implications for Future eSAC Implementation	Exemplar Quotes
	Provided a way to see subjective symptoms "objectively" Longitudinal symptom assessment helpful to guide treatment modification Raised provider awareness of patient communication and decision-making preferences Patients enjoyed participating in research Study gave participants a sense of purpose and something on which to focus Participants able to live out their altruism through research		something you… make sure to talk about it." "I think it helped them have a sort of sense of purpose, and I think it was helpful for them. It gave them something to focus on. I do think that is always something for our cancer patients that is helpful, and they feel like they're giving back in some way."

prior studies [10,16]. Future considerations could be made based on patient feedback to send text reminders in addition to email reminders, feedback that was also provided by participants in a study with PRO use in melanoma among mixed-gender patients [10]. These reminders could be sent within 5 days of the appointment and offer the intervention on two platforms, a native application and a web application

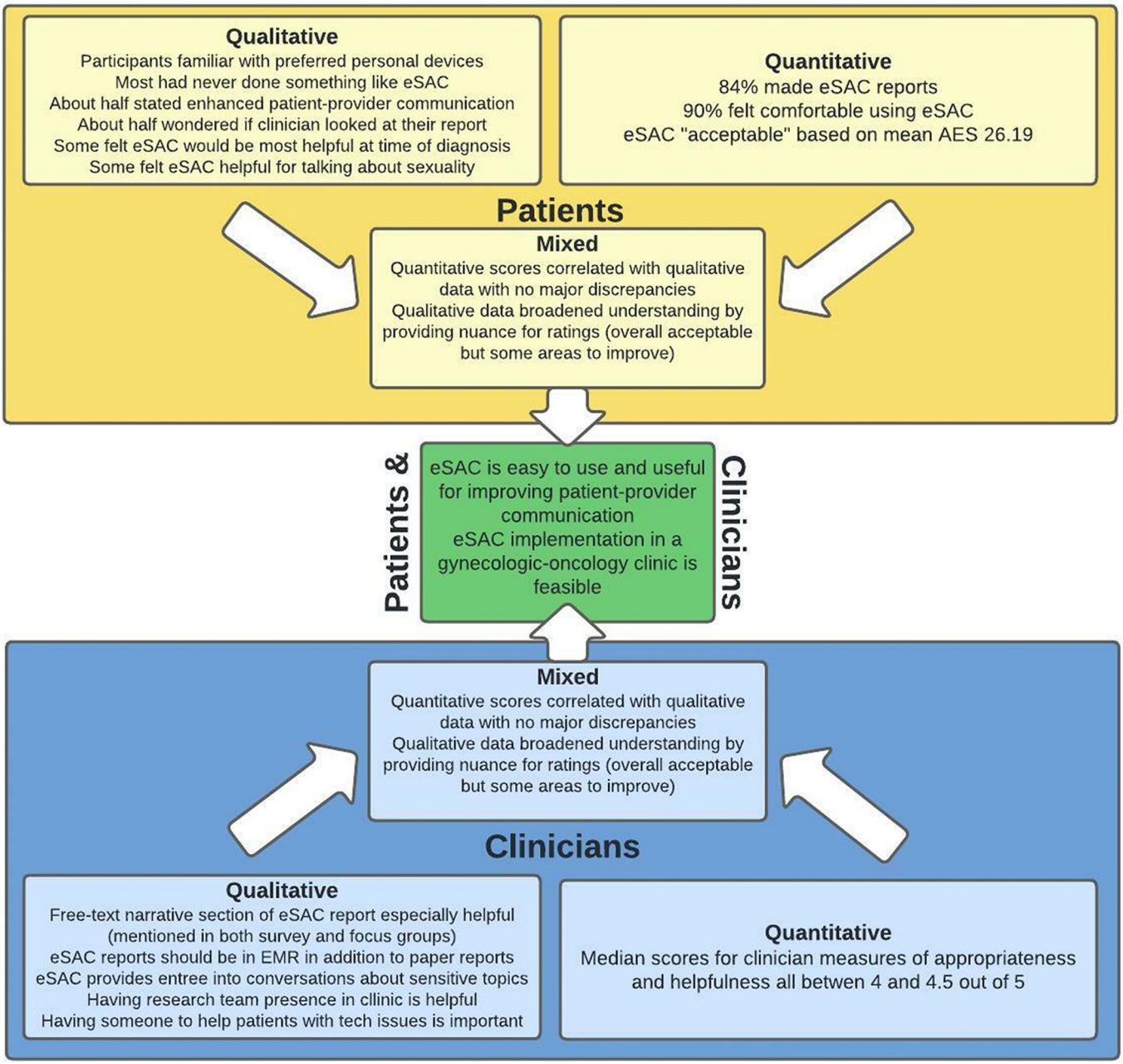

Fig. 2. Visual data display of merged findings.

platform. Additionally, future considerations could be made based on clinician feedback to schedule staff check-ins with patients requiring technological assistance to use the application, embed the eSAC reports within the electronic health record, and make eSAC reports available for telehealth visits as well as in-person visits.

Our findings cannot be generalized outside of a predominately white, non-Hispanic population in an ambulatory care setting and are limited to relatively educated people with advanced ovarian cancer. The AES was not offered to participants who completed fewer than three reports, thereby missing potentially more negative appraisals. The AES scores and utilization rates were compared to historical data in a study sample comprised of all cancer diagnoses and stages. It is unknown what feedback participants who did not participate in interviews would have added to this topic. The response rates for the clinician surveys (8/19) and the participation rate for the clinician focus groups (3/12) were low. Focus group attendance was likely impacted by COVID-19 restrictions in the health care setting as well as clinician absences and schedules. The low return and attendance rates again raise the question of whether the data from non-participants would have provided different insights.

4.2. Practice implications

Patient-reported outcomes are becoming standard in clinical and research settings where patients with ovarian cancer are treated. Researchers and clinicians who implement electronic patient-reported outcome programs should utilize best evidence about patient and clinician preferences in implementing PRO interventions that will be acceptable and useful.

4.3. Conclusion

This study examined the implementation of the eSAC program for clinicians and patients in the gynecologic oncology clinic setting using mixed methods. Usage was superior and acceptability rates were in line with our previous research. Factors that led to successful implementation of electronic patient reported outcomes were collaboration among the multidisciplinary team, delivering PRO data to clinicians in an efficient and useful manner, providing technical support to patients, having a free-text option readily available to patients for narrative responses, and offering ongoing training for clinicians. Using PROs in a setting where patients with advanced ovarian cancer receive care was helpful for "creating permission" to talk about sensitive topics such as sexuality and palliative care. The results of this study will be helpful for future eSAC implementation as well as more broadly for others seeking to implement electronic PRO programs within the research or clinical setting.

Funding

This study is supported by the National Comprehensive Cancer Network (NCCN) through a grant provided by AstraZeneca.

Author contribution statement

Study conception and design: Donna Berry, Barbara Goff, Seth Wolpin; Data collection: Mihkaila Wickline, Susie Cho, Holly Tomashek, Tanya Louca, Tori Frisk, Janna Templin, Alison Loechl; Analysis and interpretation of results: Mihkaila Wickline, Donna Berry, Tanya Louca, Tori Frisk, Janna Templin; Draft manuscript preparation: Mihkaila Wickline, Donna Berry. All authors reviewed the results and approved the final version of the manuscript.

Declaration of Competing Interest

The authors have no conflicts of interest to disclose.

References

[1] A. Chandra, C. Pius, M. Nabeel, et al., Ovarian cancer: current status and strategies for improving therapeutic outcomes, Cancer Med. 8 (16) (2019) 7018–7031.
[2] L.R. Ledford, S. Lockwood, Scope and epidemiology of gynecologic cancers: an overview. Paper presented at: Seminars in oncology nursing, 2019.
[3] F. Hilpert, A. Du Bois, Patient-reported outcomes in ovarian cancer: are they key factors for decision making? Expert. Rev. Anticancer. Ther. 18 (sup1) (2018) 3–7.
[4] E.E. Takeuchi, A. Keding, N. Awad, et al., Impact of patient-reported outcomes in oncology: a longitudinal analysis of patient-physician communication, J. Clin. Oncol. 29 (21) (2011) 2910–2917.
[5] M. Friedlander, M. King, Patient-reported outcomes in ovarian cancer clinical trials, Ann. Oncol. 24 (2013) x64–x68.
[6] E. Basch, L. Barbera, C.L. Kerrigan, G. Velikova, Implementation of patient-reported outcomes in routine medical care, Am. Soc. Clin. Oncol. Educ. Book. 38 (2018) 122–134.
[7] L.Y. Yang, D.S. Manhas, A.F. Howard, R. Olson, Patient-reported outcome use in oncology: a systematic review of the impact on patient-clinician communication, Support Care Cancer 26 (1) (2018) 41–60.
[8] J.D. Tariman, D.L. Berry, B. Halpenny, S. Wolpin, K. Schepp, Validation and testing of the acceptability E-scale for web-based patient-reported outcomes in cancer care, Appl. Nurs. Res. 24 (1) (2011) 53–58.
[9] D.L. Berry, F. Hong, B. Halpenny, et al., Electronic self-report assessment for cancer and self-care support: results of a multicenter randomized trial, J. Clin. Oncol. 32 (3) (2014) 199.
[10] L.K. Tolstrup, H. Pappot, L. Bastholt, A.-D. Zwisler, K.B. Dieperink, Patient-reported outcomes during immunotherapy for metastatic melanoma: mixed methods study of patients' and clinicians' experiences, J. Med. Internet Res. 22 (4) (2020), e14896.
[11] R.J. Lordon, S.P. Mikles, L. Kneale, et al., How patient-generated health data and patient-reported outcomes affect patient–clinician relationships: a systematic review, Health Inform. J. 26 (4) (2020) 2689–2706.
[12] D.L. Berry, B.A. Blumenstein, B. Halpenny, et al., Enhancing patient-provider communication with the electronic self-report assessment for cancer: a randomized trial, J. Clin. Oncol. 29 (8) (2011) 1029.
[13] S.B. Detmar, M.J. Muller, J.H. Schornagel, L.D. Wever, N.K. Aaronson, Health-related quality-of-life assessments and patient-physician communication: a randomized controlled trial, JAMA. 288 (23) (2002) 3027–3034.
[14] A. Gilbert, D. Sebag-Montefiore, S. Davidson, G. Velikova, Use of patient-reported outcomes to measure symptoms and health related quality of life in the clinic, Gynecol. Oncol. 136 (3) (2015) 429–439.
[15] M. Friedlander, R. Mercieca-Bebber, M. King, Patient-reported outcomes (PRO) in ovarian cancer clinical trials—lost opportunities and lessons learned, Ann. Oncol. 27 (2016) i66–i71.
[16] Y. Cho, H. Zhang, M.R. Harris, Y. Gong, E.L. Smith, Y. Jiang, Acceptance and use of home-based electronic symptom self-reporting Systems in Patients with cancer: systematic review, J. Med. Internet Res. 23 (3) (2021), e24638.
[17] G. Moore, S. Audrey, M. Barker, et al., Process evaluation of complex interventions, UK Med. Res. Council (MRC) Guidance. (2014) 1–133.
[18] S. Wolpin, D. Berry, M. Austin-Seymour, et al., Acceptability of an electronic self report assessment program for patients with cancer, Computers Inform. Nurs. CIN. 26 (6) (2008) 332.
[19] S. Wolpin, M. Stewart, A deliberate and rigorous approach to development of patient-centered technologies. Paper presented at: Seminars in oncology nursing, 2011.
[20] S.E. Wolpin, B. Halpenny, G. Whitman, et al., Development and usability testing of a web-based cancer symptom and quality-of-life support intervention, Health Inform. J. 21 (1) (2015) 10–23.
[21] D.L. Berry, T.M. Blonquist, R.A. Patel, B. Halpenny, J. McReynolds, Exposure to a patient-centered, web-based intervention for managing cancer symptom and quality of life issues: impact on symptom distress, J. Med. Internet Res. 17 (6) (2015), e4190.
[22] J.R. Fann, F. Hong, B. Halpenny, T.M. Blonquist, D.L. Berry, Psychosocial outcomes of an electronic self-report assessment and self-care intervention for patients with cancer: a randomized controlled trial, Psycho-Oncology. 26 (11) (2017) 1866–1871.
[23] M.L. Underhill, F. Hong, T. Jones, et al., Feasibility and acceptability of a web site to promote survivorship care in survivors of Hodgkin disease, JCO Clin. Cancer Inform. 1 (2017) 1–10.
[24] R. Fredericksen, B. Harding, S. Ruderman, et al., Patient acceptability and usability of a self-administered electronic patient-reported outcome assessment in HIV care: relationship with health behaviors and outcomes, AIDS Care 1-11 (2020).
[25] M. Bueno, B. Stevens, M. Rao, et al., Usability, acceptability, and feasibility of the implementation of infant pain practice change (ImPaC) resource, Paediatric Neonatal Pain. 2 (3) (2020) 82–92.
[26] J.-A. Micoulaud-Franchi, A. Sauteraud, J. Olive, P. Sagaspe, S. Bioulac, P. Philip, Validation of the French version of the acceptability E-scale (AES) for mental E-health systems, Psychiatry Res. 237 (2016) 196–200.
[27] M.G. Görlach, T. Schrage, C. Bokemeyer, et al., Implementation analysis of patient reported outcomes (PROs) in oncological routine care: an observational study protocol, Health Qual. Life Outcomes 18 (1) (2020) 1–7.
[28] L.A. Jibb, B.J. Stevens, P.C. Nathan, et al., Implementation and preliminary effectiveness of a real-time pain management smartphone app for adolescents with cancer: a multicenter pilot clinical study, Pediatr. Blood Cancer 64 (10) (2017), e26554.
[29] H.-F. Hsieh, S.E. Shannon, Three approaches to qualitative content analysis, Qual. Health Res. 15 (9) (2005) 1277–1288.
[30] J. Yamada, A. Kouri, S.-N. Simard, S.A. Segovia, S. Gupta, Barriers and enablers to using a patient-facing electronic questionnaire: a qualitative theoretical domains framework analysis, J. Med. Internet Res. 22 (10) (2020), e19474.