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Use of a web-based app to improve postoperative outcomes for patients receiving gynecological oncology care: A randomized controlled feasibility trial

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HIGHLIGHTS

- An app-based postoperative intervention is feasible for gynecological oncology patients.
- Use of the web-based app after surgery was higher with reminders.
- App use associated with higher mental health scores but lower physical health scores.

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ABSTRACT

Objective. Nearly 1 in 5 patients hospitalized for ovarian cancer surgery are readmitted for complications that may have been prevented with monitoring. We conducted a randomized controlled feasibility trial to evaluate a postoperative web-based app intervention to provide real-time symptom monitoring among patients diagnosed or with suspected gynecological cancer who had open bilateral salpingo-oophorectomy surgery.

Methods. Participants were randomized into two groups: (1) App + Reminder: had access to the app, and use was encouraged with daily and/or weekly reminders; (2) app: had access to the app but received no reminders. The app displayed discharge instructions and queried symptoms. Patients' self-reported health information was integrated into their electronic health records. Outcomes above a predetermined threshold triggered alerts that indicated a patient may need medical intervention. Participants completed a questionnaire at baseline and 30-day follow-up. They were also invited to provide qualitative, post-intervention feedback.

Results. We screened 35 patients, with high rates of recruitment (74%, N = 26) and completion (93%, N = 24). Participants in the App + Reminder group had more frequent app use relative to the app group ($p = 0.05$). Using differences-in-differences (DID) analysis for quality of life, the App + Reminder group had relative increase in the mental health score (DID = 7.51, $p = 0.15$) but decrease in the physical health score (DID = −7.49, $p = 0.13$). Participant feedback suggested the relative decrease in physical quality of life was attributable to the app activating patients' focus on physical symptoms, not the intervention.

Conclusion. The pilot established feasibility, acceptability, and some potential benefits of a new web-based app intervention for gynecological oncology postoperative care.

1. Introduction

Approximately 110,000 women are estimated to be newly diagnosed with gynecological cancers in 2018, including 22,000 with ovarian cancer [1]. Ovarian cancer is often diagnosed in later stages [2];

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thus surgical interventions are often warranted [3]. Recovery from ovarian cancer surgery is particularly complex; surgical patients are at a high risk for morbidity and mortality [4]. Treatments for gynecological cancers can adversely affect a patient's physical and mental health status [5]. Further, inadequate postoperative monitoring can result in complications and higher hospital readmission rates [4]. Advanced stage patients are more likely to have comorbidities such as diabetes, hypertension, or obesity [6] that increase operative risk and complicate postoperative management, resulting in higher risk for unscheduled hospital readmissions [4]. Nearly 1 in 5 patients hospitalized for ovarian cancer surgery are readmitted within 30 days of discharge, resulting in a 50% increase in one-year mortality rates and significantly increased costs of care [4]. In addition, many of the conditions and complications that lead to readmission are potentially avoidable with more frequent post-surgical follow-up [4]. High readmission rates following ovarian cancer surgery are dangerous for patients and costly for providers.

Web-based platforms can effectively and efficiently connect patients with their healthcare team and have been shown to improve treatment adherence and reduce avoidable ER visits and hospitalizations [7]. Leveraging connected health technologies to improve patient healthcare access and engagement has been proposed by the Institute of Medicine and the American Society of Clinical Oncology as a method for reducing medical errors and improving healthcare quality [8–10]. Web-enabled devices offer convenient ways to increase patient-provider communication and reduce indirect costs of care, including travel to medical facilities and pharmacies and work time lost [7, 11]. This added convenience may be especially beneficial for patients recovering from surgery who often need more intense monitoring and communication but may be temporarily less mobile. In 2012, 75% of U.S. adults expressed interest in having mobile-based access to their health records and healthcare team [12, 13]. The increasing penetration of web-enabled devices, including smartphones, across every segment of the population can be leveraged by the healthcare community as a way to further engage patients in order to improve care quality and health outcomes [14].

For patients recovering from surgery, the ability to report concerning symptoms via an app and engage in treatment-related communication with their healthcare providers outside of clinic visits could provide a wide-reaching, cost-effective way to reduce preventable complications and improve outcomes. Moreover, ensuring patient-reported information is seamlessly integrated into a patient's medical record may be critical to minimize clinical workflow disruption and ensure the information is used in clinical care.

In this study, we conducted a randomized controlled feasibility trial to test the use of a web-based communication application (app) designed for gynecologic oncology patients who had open surgery. The app, which allowed patients to report concerning symptoms after surgery while recovering at home, included built-in alerts sent to patients' care teams. Data reported through the app were automatically linked to the patient's electronic health record (EHR). Participants were randomized into two groups: (1) app only: had access to the app; (2) App + Reminder: app access plus reminders to use it. In addition, we also collected qualitative participant feedback during 30-minute telephone interviews and an in-person focus group discussion to gain a more nuanced understanding of participants' experiences. While the long-term goal of the app intervention is to reduce preventable postoperative complications and hospital readmissions, our primary outcomes for this feasibility trial were app use, trends in quality of life, and user experience (via qualitative data). We hypothesized that App + Reminder participants would use the app more frequently and experience relative improvements in quality of life compared to app only participants.

2. Methods

2.1. Setting

Participants were recruited from the West Cancer Center (WCC) in Memphis, Tennessee. For more than fifteen years, patients at the WCC have routinely completed a comprehensive assessment of physical and psychological cancer-related symptoms, quality of life, and satisfaction as part of their routine care using the Patient Care Monitor™ (PCM), Vector Oncology Solutions, Memphis TN. The PCM is an electronic, tablet-based patient engagement platform used to collect patient-reported treatment side effects, physical and emotional symptoms, and functional status at the point of care. Patient responses are included in their EHR, and summary reports highlight significant changes as well as elevated symptom severity that may require further evaluation and treatment during clinic visits.

Our study used the new feature of the existing PCM platform, with which WCC patients and providers are familiar, to engage participants through smartphones, iPads, or any web-enabled device at their convenience outside of clinic visits. We used this new platform to remind participants of discharge instructions, assess adherence to treatment regimens, and evaluate symptoms of clinical interest.

2.2. Study population

Adult female WCC patients (age ≥ 18) with diagnoses (or suspected diagnoses) of ovarian, fallopian, or primary peritoneal cancer (any stage) that were scheduled for open surgery for staging procedure for bilateral salpingo-oophorectomy between July 2016 and April 2017 were screened for this study. To be included, patients also had to have a smartphone with a data plan or a home computer with an Internet connection, have a valid email address, and be willing to complete brief reports of symptoms on their device during the 30 days following their hospital discharge. Patients unable to communicate in English and/or those with a concomitant diagnosis of endometrial or breast cancer were excluded from the study.

Informed consent was obtained from all individual participants included in the study. Specifically, participants in the intervention trial provided written informed consent prior to randomization to one of two groups. Verbal consent was also obtained from each participant prior to her participation in a 30-minute telephone interview and written consent prior to the in-person focus group. The University of Tennessee Health Science Center Institutional Review Board approved the study protocol. This trial is registered at ClinicalTrials.gov, number NCT02932098.

Fig. 1 shows the CONSORT diagram. Briefly, of the 35 participants who were assessed for eligibility, 2 were eligible and declined to participate, 29 were eligible and randomized, 27 began the intervention, and 24 completed the intervention; 1 participant did not complete the follow-up survey. While this pilot study was not powered to detect statistically significant differences in patient outcomes, our results will be used to inform power estimates and provide effect size information for a larger, adequately powered future trial.

2.3. Study design

We conducted a prospective randomized controlled trial to evaluate the feasibility of using a web-based app for patients to review and share information on a real-time basis with their oncology team while at home recovering from surgery. The app reminded patients of their discharge instructions and asked about potentially concerning symptoms (e.g., fever, vaginal bleeding, swelling, pain). All symptoms reported using the app were integrated into the patient's EHR. WCC gynecological oncologists informed development of alert thresholds for symptom reports that would generate alerts. Outcomes above

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