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Implementation of Electronic Patient-Reported Outcomes for Symptom Monitoring in a Large Multisite Community Oncology Practice: Dancing the Texas Two-Step Through a Pandemic

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abstract

PURPOSE Among patients receiving chemotherapy, symptom monitoring with electronic patient-reported outcomes (ePROs) is associated with improved clinical outcomes, satisfaction, and compliance with therapy. Standard approaches for ePRO implementation are not established, warranting evaluation in community cancer practices. We present implementation findings of ePRO symptom monitoring across a large multisite community oncology practice network.

METHODS Patients initiating a new systemic therapy at one of the 210 practice sites at Texas Oncology were invited to use the Navigating Cancer ePRO platform, with stepped-wedge implementation from July to December 2020. Participating patients received a weekly prompt by text message or e-mail to self-report common symptoms and well-being. Severe self-reported symptoms triggered a real-time notification to nursing triage to address the symptom. Enrollment and compliance were systematically tracked weekly with evaluation of barriers and facilitators to adoption and sustainability.

RESULTS Four thousand three hundred seventy-five patients planning systemic treatment were enrolled and participated. Seventy-three percent (1,841 of 2,522) of enrolled patients completed at least one ePRO assessment. Among these individuals, 64% (16,299 of 25,061) of available weekly ePRO assessments were completed. Over a 10-week period, compliance declined from 72% to 52%. Barriers currently being addressed include lack of a second reminder text or e-mail prompt, inconsistent discussion of reported ePROs by clinicians at visits, and COVID-related changes in workflow. Facilitators included ease of use and patient and staff engagement on the importance of PROs for symptom management.

CONCLUSION ePROs can be effectively implemented in community oncology practice. Utilization of ePROs is high but diminishes over time without attention to barriers. Ongoing work to address barriers and optimize compliance are underway.

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INTRODUCTION

Patients with cancer commonly experience debilitating symptoms related to disease and treatment.[1] Symptoms that persist unmanaged can worsen contributing to diminished quality of life, emergency room visits, and hospitalizations and contribute to their early demise.[2]

Patient symptom management optimization can facilitate reduced toxicity, improved quality of life, improved medication adherence, and improved overall survival. Patient-reported outcomes (PROs) have been a way to characterize patient-reported symptom burden, but the growth of electronic PROs (ePROs) provides opportunities for real-time symptom control. ePROs have been shown to improve duration of cancer therapy and overall survival in the PRO-CTCAE trial at a large academic cancer center.[3] Small studies in multicenter trials have found this approach feasible.[4] However, broader implementation across community oncology clinics is yet to be evaluated.

Generally, quality-of-life instruments that measure patient symptoms incorporated in clinical trials are used at prespecified and infrequent intervals, but more frequent and continuous symptom monitoring offers opportunities for real-time symptom control with a

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CONTEXT

Key Objective

To determine the feasibility of real-world implementation of electronic patient-reported outcomes (ePROs) among patients with cancer at a large community oncology practice.

Knowledge Generated

Patient characteristics, ePRO collection methodology, compliance durability, and implementation facilitators and barriers are described. We demonstrate successful ePRO implementation with high and durable compliance rates in the real-world setting. Implementation and adoption were likely influenced by the COVID-19 pandemic.

Relevance

As witnessed throughout the COVID-19 pandemic, modernizing the care of oncology patients is imperative, especially when patient access to clinicians is hampered by clinician unavailability, distance, or fear of contracting a communicable disease. ePRO technology is one step toward modernization, but understanding optimal implementation in community practice is critical for digital healthcare enhancement successes. Our findings support the inclusion of ePRO symptom monitoring in routine clinical care. Long-term effectiveness of ePROs in improving health outcomes will be studied.

symptom management tool as opposed to simply a reporting instrument.

Community oncology clinics pose unique opportunities for patient symptom management. They are usually smaller clinics with 1-10 doctors in a location close to patients' homes. Their staffing models, patient workflow, and infrastructure support are different from large academic cancer centers. We sought to implement ePROs in a large multisite community oncology practice with 210 sites of service across Texas. We aim to implement this digital remote monitoring program for both patients with cancer and the clinical care team at Texas Oncology. This Texas Two-Step study, a two-part (hybrid) implementation effectiveness evaluation with a stepped-wedge design, will assess both patient-level and organization-level outcomes, according to the RE-AIM framework—reach, effectiveness, adoption, implementation, and maintenance.[5]

Health Tracker is an ePRO tool developed by Navigating Cancer with input from major cancer centers to enable frequent and regular remote symptom reporting for patients on active cancer therapy. These patient-reported records are available immediately to a care coordination dashboard and stratified by level of risk, enabling triage nurses and other healthcare providers to provide immediate care to their patients who are at high risk and require interventions. Health Tracker's symptom questionnaire is a modified version of the NCI PRO-CTCAE instrument, which asks patients to report on 14 common symptom or toxicities, with the ability for patients to add additional symptom information in a free-form text field.

As step 1 of the Texas Two-Step study, we describe findings of Navigating Cancer's Health Tracker implementation at Texas Oncology. We plan further analysis of the effectiveness of this quality intervention using process and outcome measures in the patient population, which served as step 2 of the study, such as timely response to adverse symptoms, improving symptom control, patient satisfaction, time on therapy, emergency room visits, hospitalizations, and healthcare resource utilization.

METHODS

Texas Two-Step Eligibility

Patients initiating a new systemic therapy for cancer at one of the 210 sites of service across Texas Oncology were invited to enroll in the Navigating Cancer ePRO platform, Health Tracker, by an introduction from the clinical team followed by an electronic invitation to the Health Tracker tool. Patients could be on intravenous or oral therapy or both. We sought to accrue 3,000 patients for the study.

Patient Training

After the Health Tracker application was introduced by the clinical team and the patient was invited to participate, upon acceptance of participation, they received guidance from the interface. Technical support was available to patients, and patients were encouraged to continue normal communication with the clinical team regarding adverse symptom reporting even when using the application.

Organizational Texas Two-Step Training

Implementation specialists worked with organizational operational leaders who then managed education of the clinical teams at each site preceding rollout. Technical support was also available to the clinical team. Although on-site training was planned, all training was virtual because of the COVID-19 pandemic. All training sessions were recorded and made available to staff at a later time.

Texas Two-Step Implementation

Clinical implementation occurred in a clustered stepped-wedge design[6] during the COVID-19 pandemic. The initial cluster was a single pilot location, with additional clusters composed of one to two regions across the seven regions of the Texas Oncology practice network to implement all but

one region (Cancer Centers of Central and South Texas [CCST]) every 3 weeks over a 3-month period from July 2020 to October 2020. A decision was made to delay the CCST region because of a competing electronic health record implementation. This stepped-wedge approach was necessary for logistical and practical implementation of the approximately 210 clinical sites of service that are represented throughout these seven regions.

Patient-Reported Data

For this evaluation, active patients were asked to report 14 common cancer-related symptoms each week with the ability for patients to add additional toxicities in a free-form text box. These are (1) general pain, (2) constipation, (3) cough, (4) diarrhea, (5) fatigue, (6) fever, (7) mouth or throat sores, (8) nausea, (9) numbness or tingling, (10) rash, (11) shortness of breath, (12) swelling, (13) urinary problems, and (14) vomiting. Each of the terms included in this modified PRO-CTCAE[7] item library is assessed relative to one or more distinct attributes, including presence or absence, frequency, severity, and/or interference with usual or daily activities. Responses are provided on a five-point Likert scale. The modified language for the PRO-CTCAE recall period is in the past week.

Participating patients self-reported via e-mail or text, and moderate-severe symptoms triggered a real-time notification to nursing staff to address the symptom. For patients without access to e-mail or smartphone, an option was available for symptom report collection by nursing staff. General reporting was tracked by nurse navigation and follow-up on the basis of clinical judgment. Enrollment and compliance were tracked weekly and reported. Age, race and ethnicity, type of therapy, distance from clinic, and sex are reported to understand utilization characteristics and gain insight into barriers of adoption of the platform.

Tool Implementation

Collection methodology was characterized to understand patient preference and how it affected utilization of the tool.

Organizational Feedback

Clinicians and staff had regular meetings with the implementation staff and completed surveys at 3- and 6-month postimplementation to provide ongoing feedback to optimize implementation, strengths, and weaknesses of the tool.

Patient Feedback

Patient feedback was collected through surveys at 3- and 6-month postimplementation and through feedback from the clinical team.

RESULTS

Between July 2020 and December 2020, 4,375 patients planning systemic treatment at Texas Oncology enrolled on the platform and were followed on the Texas Two-Step study.

Patient Characteristics

Enrolled patient characteristics can be seen in Figure 1 with the majority of patients being > 65 years. Seventeen percent of enrolled patients were Hispanic or Latino, and 75% reported as Non-Hispanic or Latino. Seventy-three percent of patients enrolled were White, and 7% were Black or African American.

Initial Implementation

Seventy-three percent (2,534) of patients were adherent with the platform, although there was variability of adherence rates by region throughout the state. Regional variability, patient enrollment, date of platform initiation, and number of advanced practice providers and physicians in

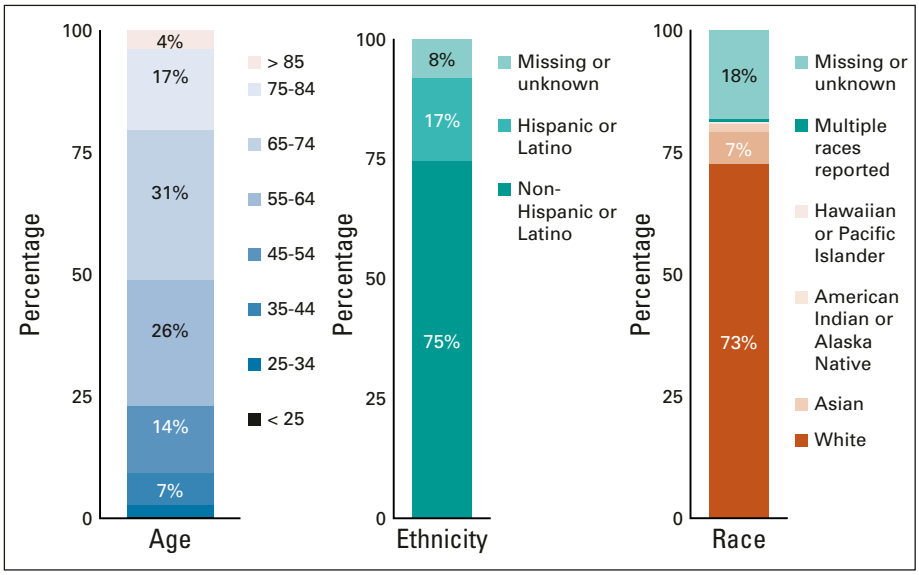

FIG 1. Baseline characteristics (age, ethnicity, and race) of the 4,375 enrolled patients.

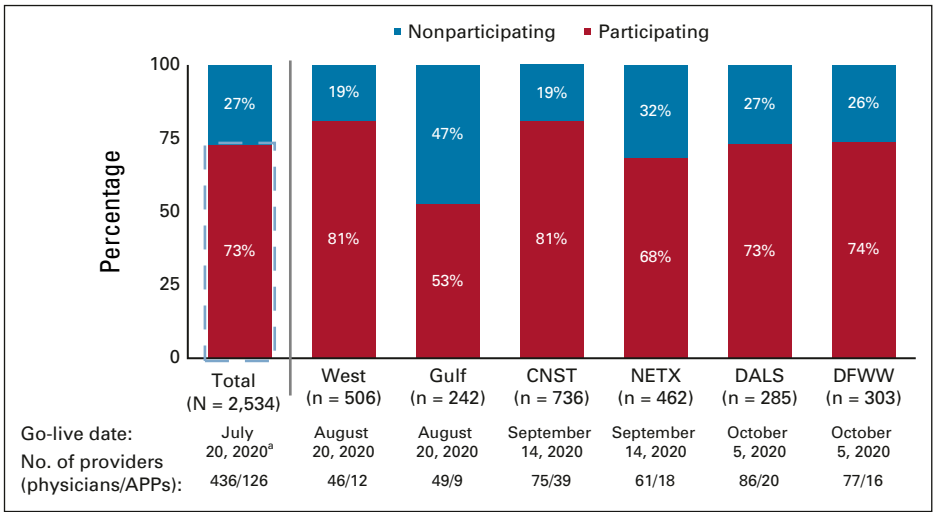

FIG 2. Participation among patients with an active enrollment status—total and by region. *x*-Axis represents geographic regions of participating Texas Oncology locations. Go-live dates and number of providers are shown below each region. *Y*-Axis represents participation and nonparticipation rates (red and blue). Participation rate is defined as the percentage of the number of patients who have completed at least one ePRO assessment divided by the total number of actively enrolled patients. Nonparticipation rate is defined as the percentage of the number of patients who have not completed any ePRO assessments divided by the total number of actively enrolled patients. [a]A single location was launched as a pilot site on July 20, 2020. APPs, advanced practice providers; CNST, Central and South Texas; DALS, Dallas Metro; DFWW, Dallas-Fort Worth West; ePRO, electronic patient-reported outcome; NETX, Northeast Texas.

each region of the practice can be seen in Figure 2. Highest compliance rates were in central and west regions of the practice.

Survey Completion Modality

Of the survey collection methods offered to the patients, short message service (SMS) text was strongly preferred to e-mail or clinical collect choices. Among active patients, 89% participated by SMS text, 6% of patients participated by e-mail, and 5% of patients presented by clinic collect. SMS text led to higher participation rates (77%), followed by e-mail (54%), and clinic collect options led to the lowest participation rates (45%), which can be seen in Figure 3.

Compliance Durability

Weekly compliance for active patients (Fig 4) remained consistent through the period studied, although among participating patients (Fig 5), the compliance fell from 73% to 52% by week 10. Compliance measured by the total number of check-ins was higher with patients on oral therapy (73%) in comparison with patients on intravenous therapy (61%) and can be seen in Figure 6.

Barriers to optimal implementation included the absence of additional reminder text or e-mail prompts or calls for nonreporting. Clinician re-enforcement of utilization of the tool was also limited largely attributed to the changes in

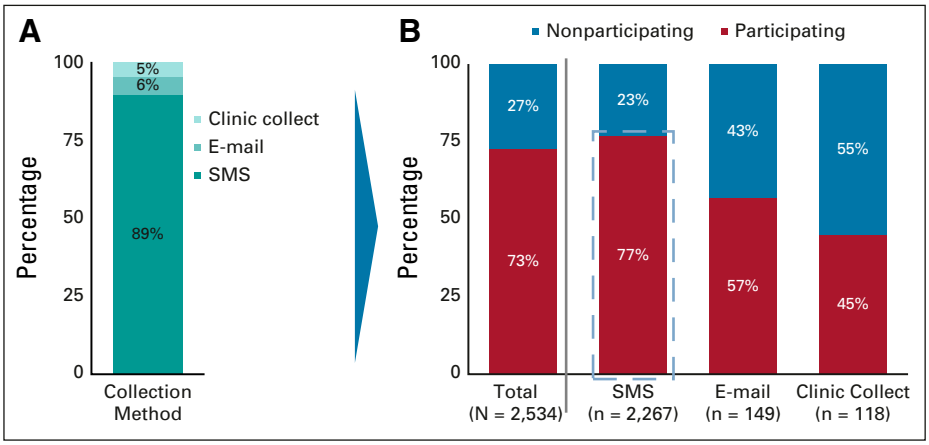

FIG 3. (A) The percentage of enrollments stratified by available collection methods, SMS (dark green), e-mail (green), or clinic collect (light green). (B) Total participation rate stratified by available collection methods. Participating patients (red) are defined as patients who have completed at least one ePRO assessment. Nonparticipating patients (blue) are defined as patients who have not completed any ePRO assessment. SMS is most frequent collection method chosen by patients and associated with the highest participation rate. ePRO, electronic patient-reported outcome; SMS, short message service (text).

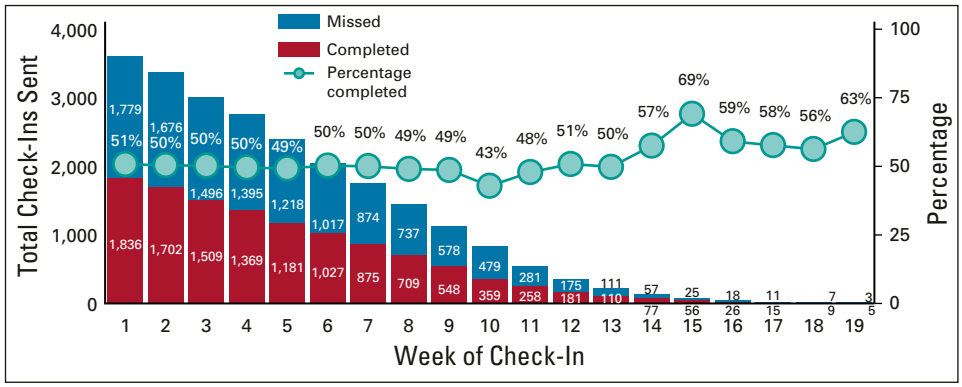

FIG 4. Compliance among all patients with an active enrollment status by week of enrollment in the ePRO digital monitoring program. *x*-Axis represents week of enrollment. Left *y*-axis represents the total number of assessments sent to patients, stratified by the number of assessments completed (red) and missed (blue). Right *y*-axis represents the compliance rate, defined as the percentage of the number of assessments completed divided by the number of assessments sent. ePRO, electronic patient-reported outcome.

workflow and work burden during the COVID-19 pandemic. Facilitators of implementation included patient and staff engagement and physician re-enforcement of the health tracker as a tool for symptom management.

DISCUSSION

ePROs can be implemented across a large community oncology practice with widespread adoption. It is evident from previous work implementing ePROs in 496 patients with cancer receiving therapy in community practices that patients largely found the ePRO systems easy to understand, easy to use, and relevant to their care. In addition, incorporating ePRO information in clinical discussions made patients feel more in control of their care.[8] Ease of tool use and data visualization in addition to identifying early adopters as physician champions to encourage engagement can be facilitators or barriers to optimal implementation.[9] It is worthwhile to have applications with a friendly user interface and ease of use, and this likely facilitated engagement in our study.

The COVID-19 pandemic certainly affected the ability to optimally implement the symptom management tool and might have affected implementation in several ways. Process workflows were altered substantially during the COVID-19 pandemic to maintain compliance with CDC guidelines. Staff were tasked with implementing screening protocols, enforcing social distancing, prioritizing and rescheduling patient visits, and treatment. Patients usually attended in-person appointments alone without caregivers to achieve lower volumes in clinic and maintain social distancing. This lack of caregiver presence introduced stress to patients and posed challenges in patient education. Patients with cancer are also burdened with multiple other concerns during their visits with their doctor that might be prioritized over tool education. Frequently, patients discuss new anxiety or depression during the pandemic, how they can safely interact with their family members because of the risk of the pandemic, if they can work outside the home, if their children can attend school, and how they can reduce their risk by modifying their cancer treatment or behavior. The increasing burden of important and new clinical concerns also adds stress and work to the clinical team who is often tasked with enforcing symptom management compliance. Because of this, likely attention to symptom tracker follow-up was deprioritized in the wake of competing priorities because of the global pandemic simply because the work burden increased substantially. We also robustly implemented telemedicine further altering process workflow and increasing staff work burden in the clinic during the study period.

It is also possible that patients might have preferred using the tool over the normal process of interacting with the clinic during the COVID-19 pandemic because of disruptions in

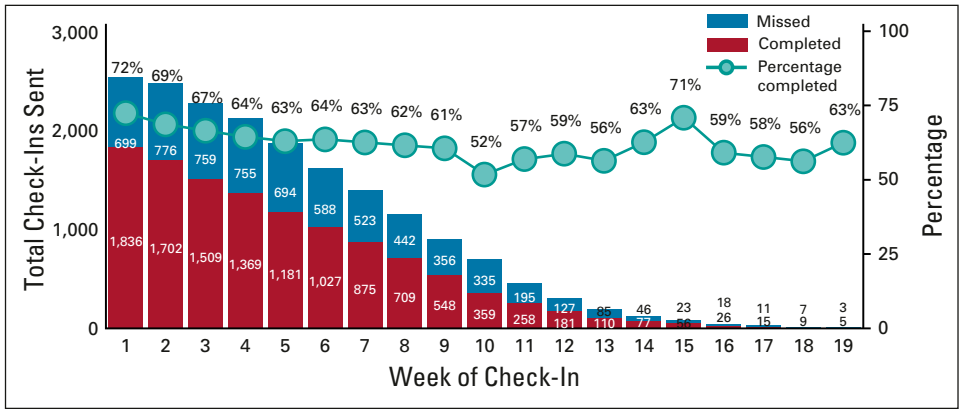

FIG 5. Compliance among all participating patients (defined as patients with an active enrollment status who have completed at least one ePRO assessment) by week of enrollment in the ePRO digital monitoring program. *x*-Axis represents week of enrollment. Left *y*-axis represents the total number of assessments sent to patients, stratified by the number of assessments completed (red) and missed (blue). Right *y*-axis represents the compliance rate, defined as the percentage of the number of assessments completed divided by the number of assessments sent. ePRO, electronic patient-reported outcome.

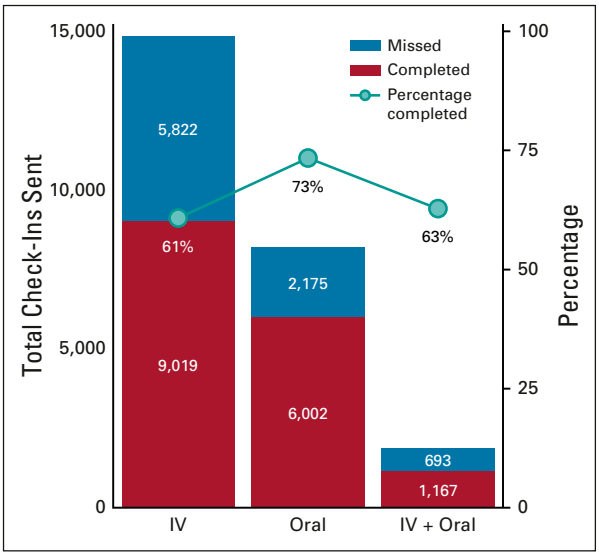

FIG 6. Compliance stratified by treatment route of administration. *x*-Axis represents treatment route of administration. Left *y*-axis represents the total number of assessments sent to patients, stratified by the number of assessments completed (red) and missed (blue). Right *y*-axis represents the compliance rate, defined as the percentage of the number of assessments completed divided by the number of assessments sent. IV, intravenous.

normal processes in the clinic or fears of presenting to the clinic in person.

We continue to obtain feedback from our teams regarding optimal implementation. There are opportunities to engage and reinforce within the clinical team and between the clinical team and patients. Attention to alert mechanisms for clinical staff and responses to patients also need to be carefully considered as alerts that are too frequent can contribute to alert fatigue and diminish engagement with the platform.

We seek to further study how to optimize engagement with populations of patients who engage less on the platform and understand optimal approaches to facilitate engagement in different populations. A planned effectiveness analysis (part 2 of this hybrid evaluation) will be conducted as a subsequent study out of this work.

Patient satisfaction, symptom control, emergency room visits and hospitalization avoidance, improved patient outcomes, and healthcare resource utilization are all important outcome measures that will be evaluated. Anecdotally, early feedback is encouraging that with early symptom relief, emergency room visits and hospitalizations are avoided through the use of these tools.

As we seek to shift cancer therapy to chronically control disease and maintain quality of life, utilization of real-time clinical informatics and digital healthcare tools can help provide just-in-time symptom management that could drive outcomes.

As we understand these tools better, incorporating them into value-based care initiatives to reduce adverse events and improve patient quality of life would align incentives to further adoption.

In conclusion, despite the limitations of the global COVID-19 pandemic on cancer practices, implementation of ePROs in digital symptom reporting across a large multisite statewide cancer practice is feasible and compliance is high.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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REFERENCES

1. Henry DH, Viswanathan HN, Elkin EP, et al: Symptoms and treatment burden associated with cancer treatment: Results from a cross-sectional national survey in the U.S. Support Care Cancer 16:791-801, 2008
2. Panattoni L, Fedorenko C, Greenwood-Hickman MA, et al: Characterizing potentially preventable cancer- and chronic disease-related emergency department use in the year after treatment initiation: A regional study. JCO Oncol Pract 14:e176-e185, 2018
3. Basch E, Deal AM, Dueck AC, et al: Overall survival results of a trial assessing patient-reported outcomes for symptom monitoring during routine cancer treatment. JAMA 318:197-198, 2017
4. Basch E, Dueck AC, Rogak LJ, et al: Feasibility of implementing the Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events in a multicenter trial: NCCTG N1048. J Clin Oncol 36:3120-3125, 2018
5. Glasgow RE, Vogt TM, Boles SM: Evaluating the public health impact of health promotion interventions: The RE-AIM framework. Am J Public Health 89:1322-1327, 1999
6. Hussey MA, Hughes JP: Design and analysis of stepped wedge cluster randomized trials. Contemp Clin Trials 28:182-191, 2007
7. Kluetz PG, Chingos DT, Basch EM, et al: Patient-reported outcomes in cancer clinical trials: Measuring symptomatic adverse events with the National Cancer Institute's Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events (PRO-CTCAE). Am Soc Clin Oncol Ed Book 35:67-73, 2016
8. Basch E, Stover AM, Schrag D, et al: Clinical utility and user perceptions of a digital system for electronic patient-reported symptom monitoring during routine cancer care: Findings from the PRO-TECT trial. JCO Clin Cancer Inform 4:947-957, 2020
9. Sandhu S, King Z, Wong M, et al: Implementation of electronic patient-reported outcomes in routine cancer care at an academic center: Identifying opportunities and challenges. JCO Oncol Pract 16:e1255-e1263, 2020