# InSight Care Pilot Program: Redefining Seeing a Patient

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**QUESTION ASKED:** Do patients with cancer who are starting antineoplastic treatment and are at high risk of requiring a preventable acute care episode, and their clinicians, find the InSight Care digital health tool feasible, acceptable, and of perceived value to monitor and address symptoms?

**SUMMARY ANSWER:** Within 6 months of treatment initiation, nearly all patients enrolled displayed symptoms that required follow-up. Qualitative interviews suggested that patients and providers found value in the InSight Care program. A digital, remote management system such as InSight Care is feasible and acceptable and has the potential to aid in the management of these patients.

**WHAT WE DID:** A pilot program was initiated to explore the use of InSight Care at a regional location of Memorial Sloan Kettering Cancer Center. All patients initiating antineoplastic treatment were evaluated by a risk-prediction model, and patients at high risk were offered enrollment in InSight Care. Physicians made the final decision about enrollment. A dedicated team helped monitor and manage symptoms reported by patients.

**WHAT WE FOUND:** One hundred patients (29% of new treatment starts) were enrolled and were observed for 6 months. The program was feasible, as demonstrated by a daily symptom assessment response rate of 56%. The prevalence of patients generating a severe symptom alert requiring follow-up was 93%. Patients and providers with a high volume of enrolled patients perceived value in the program, and archetypes were developed for program improvement. There was an early indication that enrolled patients were less likely to use acute care than were other high-risk patients.

**BIAS, CONFOUNDING FACTORS, DRAWBACKS:** A matched control group was not included in the assessment of unplanned care use because this was a pilot project designed to test feasibility and acceptability. The cost benefit of this intervention in its current form is also unclear. From a staffing perspective, we plan to refine this operating model over time as we learn more about the volume and nature of symptom data being generated and the corresponding interventions.

**REAL-LIFE IMPLICATIONS:** A digital, remote symptom management system was feasible, acceptable, and perceived to be of value by patients and providers.

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CARE DELIVERY

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**PURPOSE** Early detection and management of symptoms in patients with cancer improves outcomes. However, the optimal approach to symptom monitoring and management is unknown. InSight Care is a mobile health intervention that captures symptom data and facilitates patient-provider communication to mitigate symptom escalation.

**PATIENTS AND METHODS** Patients initiating antineoplastic treatment at a Memorial Sloan Kettering regional location were eligible. Technology supporting the program included the following: a predictive model that identified patient risk for a potentially preventable acute care visit; a secure patient portal enabling communication, televisits, and daily delivery of patient symptom assessments; alerts for concerning symptoms; and a symptom-trending application. The main outcomes of the pilot were feasibility and acceptability evaluated through enrollment and response rates and symptom alerts, and perceived value evaluated on the basis of qualitative patient and provider interviews.

**RESULTS** The pilot program enrolled 100 high-risk patients with solid tumors and lymphoma (29% of new treatment starts *v* goal of 25%). Over 6 months of follow-up, the daily symptom assessment response rate was 56% (the goal was 50%), and 93% of patients generated a severe symptom alert. Patients and providers perceived value in the program, and archetypes were developed for program improvement. Enrolled patients were less likely to use acute care than were other high-risk patients.

**CONCLUSION** InSight Care was feasible and holds the potential to improve patient care and decrease facility-based care. Future work should focus on optimizing the cadence of patient assessments, the workforce supporting remote symptom management, and the return of symptom data to patients and clinical teams.

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## INTRODUCTION

Complications of therapy have rapidly increased emergency department (ED) visits by patients with cancer, growing 5.5-fold faster than overall ED visits from 2006 to 2015.[1] At the same time, potentially preventable admissions for patients with metastatic cancer grew by 34% in the United States.[2] The Department of Health and Human Services identified the care of patients receiving antineoplastic treatment as an area of health care needing improvement and cited the root causes of care gaps as (1) the delayed onset of chemotherapy symptoms that patients must manage at home, (2) patients assuming little can be done and not seeking assistance until their symptoms worsen, and (3) limited access to and communication with providers who can tailor care to individual patient needs.[4]

Innovations in care delivery have sought to close these care gaps. Proactive symptom reporting increased quality of life, reduced ED visits, and improved overall survival.[5,6] Providing high-risk patients with enhanced access and care coordination decreases ED visits, hospitalizations, and intensive care unit admissions.[7,8] Connected health efforts to intensively monitor high-risk patients have been promoted as another solution.[9] There is an opportunity for new models of care delivery that provide proactive, coordinated, and participatory care to patients receiving antineoplastic treatment through digital management and engagement.

We describe a technology-enabled program called InSight Care,[10] which identifies patients initiating antineoplastic therapy at high risk of a potentially preventable acute care visit (PPACV), monitors the

symptoms of enrolled patients daily, and intervenes as necessary. We assess enrollment characteristics, response rates, symptom alerts, and patient and provider perceptions. In an exploratory analysis, we also compare acute care use for InSight Care–enrolled patients with high-risk patients not enrolled in the program.

## PATIENTS AND METHODS

This study received a waiver of informed consent from the Memorial Sloan Kettering Cancer Center (MSK) Institutional Review Board.

### Program Description, Participants, Enrollment

We conducted a single-arm pilot study in the medical oncology clinics at MSK Westchester between October 15, 2018, and July 10, 2019. Eligible patients (1) were 18 years of age or older; (2) had a diagnosis of a solid tumor or lymphoma; (3) were starting intravenous antineoplastic therapy, including a cytotoxic, immunologic, or biologic agent, that was initial therapy or had been at least 6 months since their last treatment; (4) had access to a smartphone, tablet, or computer; (5) were enrolled in the patient portal; and (6) were identified by our risk stratification model or clinical criteria as at high risk of a PPACV. The risk stratification model, described elsewhere,[11] used data from the electronic medical record (EMR) to prospectively estimate the risk of a PPACV within the next 6 months for patients starting intravenous therapy. The top quartile of patients identified by this model were categorized as "high risk" and were offered enrollment in the program. Patients in the other 3 quartiles could be enrolled if they possessed 1 or more of the following clinical criteria for high risk identified by their clinical team: (1) comorbidities that increased the risk of a treatment complication; (2) provider-identified barriers to care; (3) non-MSK ED visits or hospitalizations; (4) inability to aliment sufficiently; (5) high tumor burden or site of metastasis concerning for symptom elicitation; (6) high psychosocial distress or multiple symptomatic complaints; (7) dose reduction with initial antineoplastic treatment; or (8) combined modality therapy. These criteria were developed on the basis of discussions with clinicians about relevant risk factors and were features missed by the predictive model because representative EMR data were lacking at treatment start. Patients were excluded if they were in a therapeutic clinical trial or if they could not speak English.

At their first treatment visit, patients received an orientation to the InSight Care program (approximately 30 minutes), which included completing a baseline patient-reported outcome (PRO) symptom assessment and viewing an informational video.[12] The purpose of the orientation was to provide a program overview, introduce the technology interface, and emphasize the role of the symptom assessments in their care.

### Symptom Monitoring

A dedicated team of oncology registered nurses (RNs) and nurse practitioners (NPs), the InSight Care team, monitored and managed the symptoms reported. These clinicians were based at MSK Westchester and acted as an extension of the primary oncology team, assisting with patient management exclusively through the digital platform without ambulatory clinic visits. If symptoms required evaluation, they referred patients to the appropriate health care setting. These clinicians were recruited from MSK oncology practice nursing and the Supportive Care Service and received additional training in the technology platform used in this program. Two RNs and 1 NP actively monitored and managed patient symptoms from 7 AM to 7:30 PM. After-hours calls were taken as home calls by an InSight NP. Care was documented for all clinical teams to access in the AllScripts EMR in a specifically designed InSight Care templated note that allowed for the incorporation of patient-reported outcomes (PROs) and portal secure messages.

### Technology Support

***riskExplorer and enrollment decision support.*** The MSK Web application known as riskExplorer was integrated into the InSight Care digital platform to display the top 10 features contributing to each patient's estimated risk of a PPACV within 6 months of therapy initiation.

***Messaging and televisit platform.*** The Portal Secure Messaging via the MSK patient portal facilitated asynchronous, bidirectional communication between the patient and the InSight Care team and sent patients prompts to complete daily symptom assessments. Interaction also occurred by phone or televisit when appropriate (Appendix Fig A1, online only).

***Symptom assessments and symptom alerts.*** Starting the day of treatment initiation, enrolled patients received daily electronic symptom assessments through the MSK patient portal. Survey questions were based on the Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events and the ongoing Electronic Patient Reporting of Symptoms During Cancer Treatment (PRO-TECT) trial.[13,14] Assessments focused on symptoms driving PPACVs for MSK patients receiving antineoplastic treatment and included pain, activity, anorexia/dehydration, nausea, vomiting, constipation, diarrhea, dyspnea, anxiety, and depression.[15]

The survey was designed for a 1-time daily interaction that could range from less than a minute to several minutes, depending on the patient's symptoms. Purposeful design elements of the survey included (1) completion via mobile device or desktop computer; (2) branching logic for reported symptoms to ask additional questions about extent, severity, and interference with daily activities; (3) cross-question consistency (eg, patients with constipation were not asked about diarrhea); (4) an avatar to localize pain symptoms; (5) prior day responses prepopulated so only

**TABLE 1.** Sociodemographic and Clinical Characteristics of Enrolled Patients

| Characteristic | Enrolled Patient Population (n = 100) |
|---|---|
| Age, years, median (range) | 66 (31-87) |
| Sex | |
|     Male | 55 (55) |
|     Female | 45 (45) |
| Ethnicity | |
|     White | 88 (88) |
|     Black or African American | 8 (8) |
|     Asian | 2 (2) |
|     Other | 2 (2) |
| Marital status: | |
|     Partner | 74 (74) |
|     Single | 12 (12) |
|     Divorced | 7 (7) |
|     Widowed | 7 (7) |
| Work status | |
|     Employed (includes disability/sick leave) | 35 (35) |
|     Retired/not working | 65 (65) |
| Disease: | |
|     Thoracic | 30 (30) |
|     GI | 22 (22) |
|     Head and neck | 22 (22) |
|     Gynecologic | 8 (8) |
|     Genitourinary | 8 (8) |
|     Breast | 7 (7) |
|     Lymphoma | 3 (3) |
| Initial intravenous antineoplastic agent | |
|     Chemotherapy only (includes cytotoxic, antibodies) | 81 (81) |
|     Immunotherapy only | 6 (6) |
|     Combination chemotherapy/immunotherapy | 13 (13) |
| Radiation in 14 days before/after antineoplastic | 26 (26) |
| Treatment intent | |
|     Curative | 50 (50) |
|     Palliative | 50 (50) |

NOTE. Data are presented as No. (%) unless indicated otherwise.

changes needed to be entered; and (6) a free text box for additional symptom information.

Logic was developed to generate alerts, red for severe symptoms and yellow for mild/moderate symptoms, which were sent via portal messaging to the InSight Care team; red alerts required an immediate response often within minutes of submission. Red alerts also generated the following response to the patient: "You have a symptom that your care team will help manage. During evenings, call your

doctor's office and say you are part of InSight Care. In an emergency, call 911 or go to your local ER."

**Symptom tracker.** We developed an internal Web-based application that assisted the InSight Care team in trending symptom data. This application indicated the patient's last antineoplastic therapy and included tabs to other EMR data such as pathology and radiology to provide clinical context for symptoms (Appendix Fig A1).

## Feasibility

The program was designed to care for the quartile of patients most likely to require a PPACV on the basis of the predictive model and clinician-identified risk. Feasibility was defined as the enrollment of ≥ 25% of patients starting antineoplastic therapy. Model risk scores and clinical risk criteria for patients not in the top risk quartile were recorded. Response rate was evaluated as the proportion of daily assessments completed, with a goal of > 50% survey completion in the 6 months after treatment start. We also tracked the type of symptoms reported and the number of red and yellow alerts generated.

## Acceptability and Perceived Value

Acceptability and perceived value were assessed through qualitative interviews and observations by the MSK Design Innovation Group, composed of designers skilled in ethnographic-style research; affinity mapping; and identifying social, experiential, and systems insight to guide care delivery innovation. Ten patients enrolled in InSight Care; 7 follow-up clinic visits and 3 clinic days and 1 nonclinic day were observed. Eleven patients, 10 participating medical oncologists, and 7 oncology practice nurses were interviewed. These assessments were used to develop insights about the challenges faced and whether the program met patient and primary oncology team needs. Archetypes of patients' perceptions of the program were created to further the development of patient-centric value propositions.

## Acute Care Usage

Staffed 24/7, the MSK Urgent Care Center (UCC) is the central point of entry for unplanned hospital admissions. Visit rates to the UCC by enrolled patients were compared with rates among nonparticipating high-risk patients.

## RESULTS

From October 15, 2018, to July 10, 2019, there were 342 patients with eligible intravenous antineoplastic therapy starts at MSK Westchester; 100 (29%) were enrolled. The average age of the enrolled patients was 66 years (range, 31-87 years), and 45% were female. Thirty percent of the patients had a thoracic malignancy, followed by GI (22%), head and neck (22%), and other malignancies (26%; Table 1). Most patients entered the program through clinician identification of high-risk criteria (74%), with multimodality therapy (39%), high tumor burden or

**TABLE 2.** Prevalence of Symptoms Reported at Moderate and Severe Levels on 1 or More Days (n = 100)

| Symptom | Moderate (%) | Severe (%) |
|---|---|---|
| Pain | 73 | 74 |
| Anxiety | 71 | 21 |
| Depression | 70 | 14 |
| Functional status | 66 | 53 |
| Diarrhea | 62 | 12 |
| Decreased oral intake | 61 | 18 |
| Nausea | 58 | 25 |
| Dyspnea | 38 | 22 |
| Emesis | 24 | 9 |
| Constipation[a] | 85 | Not applicable |
| Additional[b] | 94 | Not applicable |

[a]Constipation is reported as whether patient had a bowel movement that day and does not have an associated red alert.

[b]Additional represents use of a free text box in the daily symptom assessment to provide information on other symptoms or additional details on reported symptoms.

site of metastasis concerning for symptom elicitation (39%), and high psychosocial distress or multiple symptomatic complaints (30%) the most common clinical criteria. Reasons patients were not enrolled in InSight Care included logistic reasons (n = 17; did not complete program onboarding before their initial treatment), could not access technology (n = 7), declined to participate (n = 5), did not speak English (n = 3), and other reasons (n = 1). Providers could select multiple reasons per patient (n = 28 model-identified high-risk patients did not enroll). Six months after enrollment, 59 enrolled patients exited the program and 41 remained. Patients exited for the following reasons: 24 completed treatment, 21 died or transitioned to hospice, 11 chose to stop participating, and 3 transitioned care to another team or institution. The average enrollment duration of the exited patients was 90 days.

Response rate (completion of daily assessments) in the first 30 days of the program was 67%, and it decreased gradually with time in the program. Response rate in days 31 to 90 of the program was 60% and in days 91 to 180 of the program, 56%. Ninety-three percent of patients generated at least 1 red alert, with 74% of patients generating a red alert for pain, 53% for activity, and 25% for nausea (Table 2). The most frequent moderate/mild symptoms were constipation (85%), pain (73%), and activity (66%). Ninety-four percent of patients made use of the free text box, mainly to add details about their symptoms. The In Sight Care team and enrolled patients shared 5,010 symptom-related portal messages during the 6-month follow-up period.

Patient interviews suggest that they valued the following:

1. Speedy responses: Patients appreciated rapid responses after submitting a survey reporting issues.

"One time I included this issue in my survey, they reached out in 5 minutes. Nothing but good." – Patient
2. The feeling of having a safety net: Patients were reassured by having 24/7 access to clinicians. "The best part is I don't feel alone in this. They [InSight Care Team] have been a lifesaver for me." – Patient
3. Convenience: Patients appreciated the ability to address issues without an in-person visit. "That was good. I didn't have to get dressed and go to another doctor's appointment."– Patient

We created archetypes of the patients on the basis of these interviews (Fig 1), showing (1) motivators for completing the survey; (2) value drivers; (3) barriers to participation; (4) impact of program reinforcement from the primary oncologist; and (5) met and unmet patient needs. The archetypes helped us identify improvement areas, which include additional patient education, reinforcement by primary oncologists, and assessment usability.

Providers with a high proportion of their patients enrolled in InSight Care saw tangible benefits of the program and expressed that InSight Care acts like an extension of the nurse and provides continuity in care. Office practice nurses felt like InSight Care reduced some of their workload, especially since the program focused on high-risk patients. In contrast, providers with fewer patients enrolled in the program indicated that they received too many updates on only a few patients in their clinic and were concerned about fragmentation of care with a centralized team. Nurses felt a lack of clarity in roles and responsibilities between themselves and the InSight Care nurses.

Presentation rates to the MSK UCC within 6 months of enrollment were 22% (22 of 100) in the InSight Care cohort and 39% (11 of 28) for model-identified high-risk patients who did not enroll. Although this pilot was not designed as an effectiveness study, it does provide an early signal that the intervention may reduce acute care visits.

## DISCUSSION

The InSight Care pilot was developed to extend provider interactions with patients receiving antineoplastic therapy wherever and whenever they were needed. Our results show that a dedicated clinical team can monitor symptoms using a digital platform and can manage care. The pilot was feasible, acceptable, and perceived to be of value by high-risk patients and primary oncology teams with a high proportion of enrolled patients.
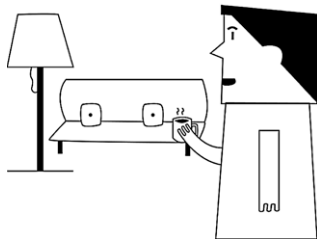
This program has 2 key areas of innovation. The first is the focus on medical oncology patients at high risk of a PPACV, identified using a risk stratification model and clinical criteria. The second is our leveraging of a digital platform to enable staff to collect and visualize clinical and patient-reported information and then to connect with patients with minimal barriers.

## INSIGHT CARE PATIENT ARCHETYPES
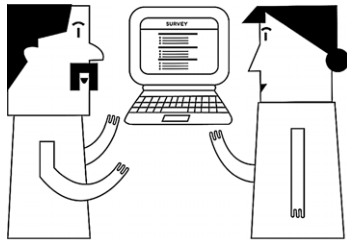


### The Promise Keeper

The Promise Keeper is retired and is living with his two daughters who are his caregivers. He does his assessments every day with the help of his daughters, and he initially did them because he promised his doctor that he would. His doctor is the one who introduced the program to him. However, as time passed, doing the assessment made him realize other values of Insight Care. He appreciates the speedy responses from Insight Care, and finds their interventions valuable. When he is at MSK for his appointments, his doctor shows him his symptom trend and explains what he could be doing to better take care of himself. This reinforcement from his doctor motivates him to participate in the program even more. He appreciates the transparency and also believes that such data could be used in the future to take care of other patients.

### The Data Tracker

The Data Tracker is proactive about her health. She does all the assessments herself. Filling out the assessment has become a tracking mechanism for her, and it allows her to take better care of herself. She makes a list of questions she has and brings them to her doctor's appointment, and clarifies them with the doctor. When it comes to Insight Care, she is extremely appreciative of the speedy responses from the Insight Care team and is very thankful for their interventions when she had symptoms. Another advantage for her is the ability to do remote consultations, as she doesn't have to get dressed and come to the hospital.

### The Unengaged

The Unengaged was introduced to Insight Care by his doctor, who wasn't entirely sure of the program value and goals and therefore didn't explain it with the most clarity. As a result, he didn't start off fully grasping the value of Insight Care. He feels that he doesn't really need symptom related care as he is not experiencing many symptoms. In his follow-up visits, his doctor has not mentioned or brought up Insight Care which makes him feel even more that it's not important to his overall care.

### The Overwhelmed

The Overwhelmed works full time and doesn't find time to do her assessments. When she does fill them out, it's usually after work hours and as a result, her symptoms are only reviewed the next morning. She finds the Insight Care calls burdensome, especially if they call in the morning while she is at work. She has been experiencing psychosocial distress due to cancer and feels "pissed" about the overall situation. She feels that her symptoms can't be helped, and this discourages her from submitting her daily assessments. As her doctor does not mention Insight Care in follow-up appointments, she does not get any reinforcements.

**FIG 1.** InSight Care patient archetypes.

This pilot has raised additional research questions about operationalizing PROs and remote monitoring strategies:

1. Patient identification: Previous studies have shown that identifying high-risk patients and providing them with intensive attention reduces their acute care use and can improve survival.[5-8] PPACVs frequently arise during treatment initiation, so recognition of high-risk patients must occur early.[16] Predictive analytic models can focus resources on those most in need; however, few have been implemented in clinical practice.[11] We found that risk stratification models must work in collaboration with the clinician. Most patients were enrolled in the program on the basis of clinical risk criteria and not their model-predicted high-risk status. Future work should focus on understanding the individual contributions, and/or synergy, of the risk

model and clinical judgment in identifying patients who benefit from programs such as InSight Care.

2. PRO cadence: There is a balance between the patient burden of completing assessments, including the psychological stress of daily reminders of their disease and the value of frequent check-ins to identify symptoms before they intensify. We saw that the response rate declined with time but remained more than 50% (every other day completion) at 6 months of enrollment. In interviews, patients did not view the daily assessment as a burden and valued it as an ability to connect with the team. However, the optimal delivery of symptom assessments, including whether this should be customized to each patient, requires additional evaluation and becomes increasingly important, because the Centers for Medicare and Medicaid Innovation recently announced that electronic PROs would be mandated for practices participating in the Oncology Care First Model.[17]

3. Workforce: Multiple models have been implemented for monitoring and managing symptoms reported through PROs. Mooney et al[19] found that symptom outcomes improved when assessments were received by a dedicated advanced practice provider. Basch et al[6] found that returning PRO assessments to the primary oncology team improved outcomes. In our pilot, we found that the optimal staffing model must provide knowledgeable, disease-specific, real-time responses and care coordination to patients, but how best to leverage advanced practice providers, oncology nurses, and other clinic staff is unclear, and variations in this care delivery have been proposed.[19a]

4. Return of information: The mechanisms by which monitoring PROs extend life and reduce acute care use are unknown. Our symptom tracking tools were developed for the dedicated InSight Care team. Effectively communicating symptom data to the primary clinical team will require summarization and integration into their workflow. Earlier detection of symptoms by the primary team could result in modification of treatment or earlier scans to identify disease progression. It also may be valuable to provide symptom data to patients. The ability of patients to view PROs may improve patient activation, self-realization, and coping by providing more transparency regarding their symptoms. There might also be an opportunity to share symptom reports of other patients to help patients understand symptom norms.[19b] Optimally integrating PROs into the patient's treatment is an area of active exploration for future iterations of InSight Care.

This was a pilot feasibility and acceptability study without a control arm conducted at a single site. We did not attempt to establish efficacy. A future study is planned with a larger patient population and a matched control group to accurately measure the effect of InSight Care on acute care use. The cost-benefit of this intervention in its current form is also unclear. From a staffing perspective, we plan to refine this operating model over time as we learn more about the volume and nature of symptom data being generated and the corresponding interventions. The cost-effectiveness analysis would need to include the staffing costs for the InSight Care team, as well as savings from prevented acute care and potential redeployment of nursing from symptom calls to more clinic-based encounters.

This pilot has raised significant research questions about the optimal implementation of predictive analytics and remote monitoring of high-risk patients through a digital platform. This becomes increasingly important in a post-COVID-19 environment; with initial data suggesting that patients with cancer are twice as likely to become infected and are at high risk of severe clinical events, there is a greater need to minimize their facility-based encounters and to provide more care through remote methods.[20,21] As more care is shifted to virtual encounters,[22] creating a digital platform that allows patients with cancer to feel seen, have their symptom needs met, and connect to their oncology teams is crucial, all while ensuring that the implementation optimizes clinical workflows.

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**EQUAL CONTRIBUTION**

B.D. and G.K. are co-first authors of this work.

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## AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

**InSight Care Pilot Program: Redefining Seeing a Patient**

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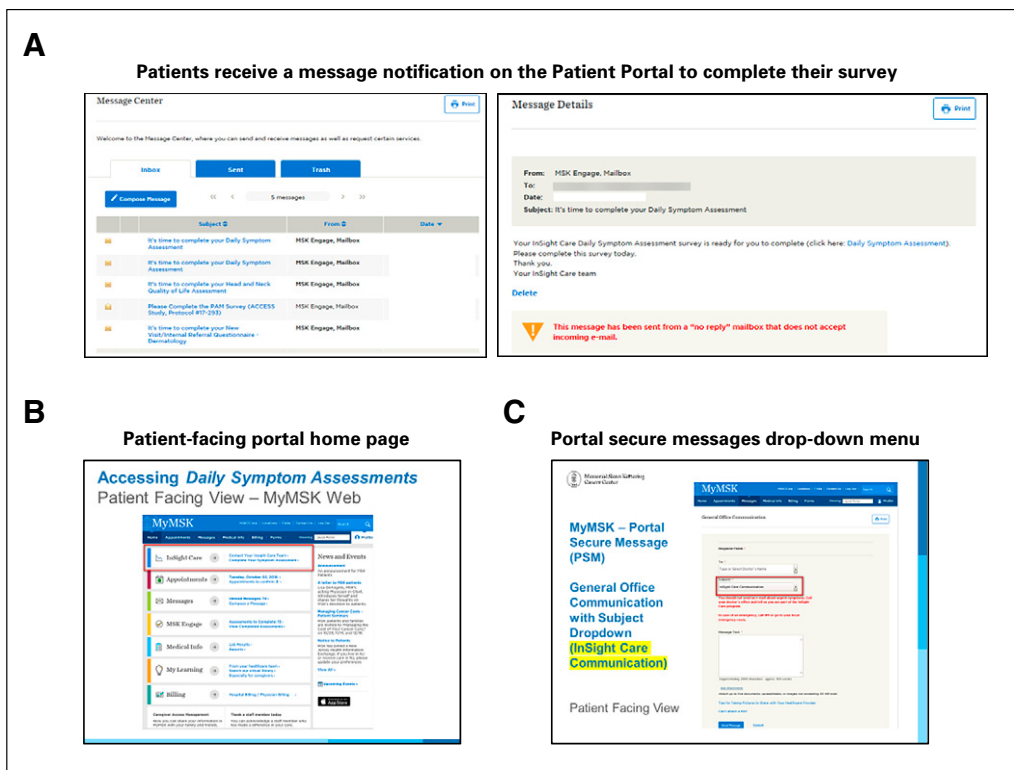No other potential conflicts of interest were reported.

**FIG A1.** Patient-facing interface for receiving notifications and communication with InSight Care team. (A) Patients receive a message notification on the Patient Portal to complete their survey. Bidirectional, self-directed communication is provided through telephone, televisits, and the Patient Portal. Design elements include the following: the notifications patients receive to complete their daily symptom survey, a tab allowing patients direct communication with the InSight Care team on the Patient Portal's home page, and general communication drop-down that routes the patient to the InSight Care team. (B) Patient-facing portal home page. (C) Portal secure messages drop-down menu. (D–E) Clinician-facing interfaces to support clinical work. (D) Symptom data on the symptom tracker. The InSight Care clinicians can trend symptom data as shown, which allows the team to notice gradual changes in symptoms over time. (E) Portal secure message (PSM) alerts for a fictional patient. Both the InSight Care team and the Primary Oncology Teams receive PSMs with the patient's survey responses once complete, as well as any other communications about symptoms made by the patient to the InSight Care team.
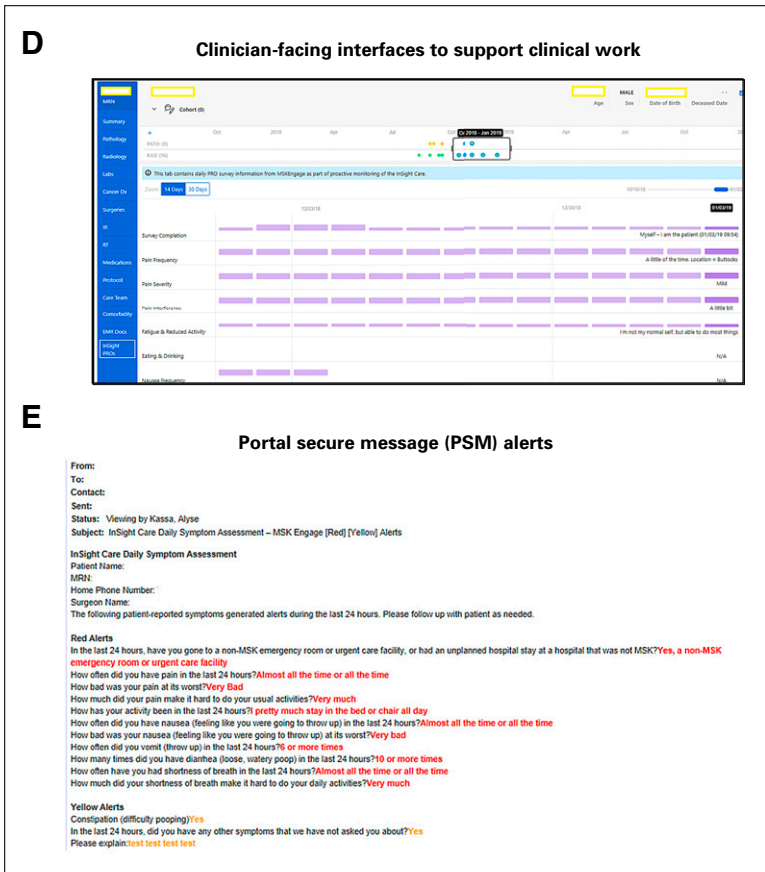
**FIG A1.** (Continued).