Background: Social distancing has been recommended by the Centers for Disease Control and Prevention to avoid exposure to SARS-CoV-2 (Epidemiol Prev 2020;44:353–362). Cancer patients on or after active therapy seem to be more prone to COVID being symptomatic and life-threatening. When evaluating cancer patients’ risk of acquiring COVID, it is essential to know the behavior of cancer patients that will affect their risk of exposure. However, it is not known to what degree social distancing is practiced by cancer patients compared with noncancer patients and what factors lead to the decision to distance oneself.

Method: After a pilot phase using patients’ MyChart messaging, links to the electronic questionnaires were texted to patients using Twillo. Responses were stored on REDCap (Vanderbilt University, Nashville, TN). Six questions about their social distancing behavior and mask wearing were posed and responses were compared between cancer and noncancer patients. Demographics, comorbidities, and a questionnaire about anxiety (Generalized Anxiety Disorder 7-item scale) were recorded. To assess differences between cancer and noncancer groups, Bonferroni-corrected χ² tests and proportions confidence intervals were used.

Results: The pilot survey was sent in mid-2020 and the full survey followed in January 2021 during a high community COVID incidence. Three hundred eighty-seven cancer patients (32.4% responded) and 503 noncancer patients (22.9% responded) completed the survey. Questions about leaving their houses, driving, shopping, friends, and family indicated that patients with cancer are more cautious (P < 0.001). Cancer patients were up to 20% more likely to distance themselves. No difference was seen in wearing a mask—both groups wore approximately 90% of the time. Most respondents were female (63% versus 71%). Cancer patients were older (>60 y, 69% versus 45%) and less likely to work (52% versus 31%) or less likely to be White collar workers (21% versus 38%). In both groups, 54% marked “not at all anxious.”

Conclusions: Cancer patients’ responses revealed a distancing behavior that would likely lower the risk exposure to SARS-CoV-2. It is unclear which of the demographic differences would account for this behavior, although remarkably anxiety was not a clear motivating factor. The high acceptance of masks is encouraging. Early publications during the pandemic and patient education suggesting a higher COVID risk for cancer patients may have reduced risk prone behavior. Considering COVID’s impact on the vulnerable cancer population and uncertainty in immunosuppressed patients about clearing the virus or adequately responding to a vaccine, further studies about social distancing among actively treated cancer patients should be conducted.

Key Words: social distancing, COVID, cancer, communication, survey

Social distancing has been recommended by the Centers for Disease Control and Prevention (CDC, March 26, 2020) to avoid exposure to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus causing the pandemic disease COVID-19. The recommendation is as follows: Avoid other people as much as possible (social distancing). Avoid leaving home as much as possible. Maintain a distance of at least 6 feet (2 m) between you and nonhousehold members. If you must leave home, avoid places where people congregate. Have supplies and food delivered to your home.1

Preliminary studies from China suggested that cancer patients on or after active therapy seem to be more prone to severe COVID-19 progressing to life-threatening. These reports estimated a 3.5 × higher risk of intensive care unit admission with COVID-19 infection.2 The authors assume that the underlying cause for the higher risk is a suppressed immune system, although only a minority of the patients in the study were on chemotherapy or had advanced stage cancer.

Meanwhile, these early warnings of a higher risk for cancer patients have been confirmed.3 When evaluating cancer patients’ risk of acquiring COVID-19, we felt that it would be important to clinicians to know the behavior of cancer patients related to being exposed to SARS-CoV-2. Cancer patients have already experienced changes in the way cancer center staff have reorganized care routines to protect their patients from exposure. Almost all aspects of cancer care have been affected by the SARS-CoV-2 pandemic, from screening to timing of diagnostic tests and treatments, accessibility to providers and caregivers, as well as assessing treatment toxicity and effectiveness.4

These changes in the patients’ cancer care would likely affect their personal decisions about their behavior and their commitment to social distancing. It is unknown to what degree social distancing has been practiced by either group. The assumption underlying this study therefore is that cancer patients would distance themselves more than noncancer patients.

Our hypothesis was that cancer patients’ acceptance and compliance toward the CDC-recommended social distancing would be higher than those of noncancer patients. Attitudes toward the CDC guidelines and acceptance of them in real-world circumstances have varied in our community because of political beliefs and peer pressures. Crisis communication and perceptions based on cultural and educational factors have influenced individual risk management, especially in the era of social media.5 While our hope was that our cancer patients would accept the CDC guideline, observe the changes we made in their care routines, and begin to practice social distancing, there has not been a formal estimation of cancer patients’ adherence to the CDC guidelines.

Over the last year, it also became more apparent that social isolation impacts not only lifestyle but also physical and mental health, particularly sedentariness, alcohol consumption, tobacco smoking, anxiety, and sleep quality.6–8

The primary objective of this study was to compare the attitudes about social distancing among actively treated cancer patients compared with noncancer patients or long-term cancer survivors.
The secondary objective of this study was to assess anxiety levels of cancer and noncancer patients during the COVID pandemic. To test the hypothesis that cancer patients were distancing themselves socially more in our community than noncancer patients, we developed a survey to describe and compare the responses with regard to social distancing in a cancer and noncancer population. The survey also included a validated instrument with questions to detect anxiety levels and describe any possible correlation with the responses about social distancing.

Our purpose was to assess cancer patients' attitudes about social distancing to help guide clinicians about needed COVID-19 exposure prevention education. We also suspected that these data may inform clinicians about the actual risk of SARS-CoV-2 infection in this vulnerable population.

METHODS

In April 2020, the investigators developed a short survey on distancing behaviors (leaving the house and the proximity to friends and families), which have been affected by the March 2020 CDC recommendations. As far as we know, there is no standardized survey on social distancing. Some of the questions were suggested by the Pandemic Footprint Questionnaire about personal and social habits. The questionnaire was initially conducted in a pilot survey using a short questionnaire developed in a REDCap (Vanderbilt University, Nashville, TN) database to test for consistency (missing answers, i.e., on wearing masks, clarification “alone” versus “with spouse”). We limited the answers to 3 categories (not at all/less/same). This pilot included 400 cancer patients and 500 noncancer patients and was sent to patients via MyChart (Epic Systems, Verona, WI) to evaluate the adherence to social distancing in cancer patients on or after active therapy, long-term cancer survivors, and patients with benign illnesses (i.e., immune thrombocytopenia, anemia.). The anonymously conducted pilot questionnaire consisted of 2 sections:

1. Patient demographics and distancing behavior
2. Addresses social distancing and a measure of anxiety (Generalized Anxiety Disorder [GAD-7] 7-item scale)

The pilot survey was initiated after institutional review board approval. The pilot survey was sent out through MyChart to approximately 500 current cancer patients and 500 control patients. We obtained responses from 87 cancer-positive patients responded and 49 cancer-negative patients. Because the low response rate limited our analysis, we revised our plan for contact with potential participants.

Our revised study plan included use of the GAD-7, a validated instrument for collection of data regarding anxiety. We also used EPIC SlicerDicer (Epic Systems, Verona, WI) to identify a larger potential pool of participants from our institution’s electronic health record. Our institution is a network of hospitals in the Northern Kentucky/Cincinnati, Ohio, region, serving a population of 400,000 in a mixed urban/rural setting. SlicerDicer is a self-service reporting tool that allows clinicians and researchers ready access to clinical data that are customizable by patient populations. We selected a large internal medicine group practice that was willing to participate and sent questionnaires to all patients seen between March 15, 2020, and January 15, 2021. We contacted this larger potential participant list using the Twilio (Twilio Company, San Francisco, CA) platform to text our survey directly to participants’ cell phones. Participants were invited to consent by phone and complete the REDCap survey directly from their cell phones. Twilio is an application programming interface that allows 2 applications to talk to each other. Twilio works as a third-party web service, which is integrated into REDCap. It

Survey on Social Distancing in Cancer and Non-Cancer Patients

We send a survey to the patients of our hospital to get a sense how the recent COVID epidemic has affected social distancing.

“Social Distancing” is defined as:
Avoiding other people as much as possible. Maintaining a distance of at least 6 feet.
Your answers will help us and our colleagues to understand the spread of the virus better.
Please go over the questions below and mark your answer.

My age:
- younger than 40
- between 40 and 60
- older than 60

My gender:
- Male
- Female

Wearing:
- Alone
- With spouse/family

1. I leave my house
- a. not at all anymore
- b. less frequently
- c. every day

2. I meet my friends in person
- a. not at all anymore
- b. less frequently
- c. the same frequency

3. I shop for groceries at the store
- a. not at all anymore
- b. less frequently
- c. the same frequency

4. I get gas for my car
- a. not at all anymore
- b. less frequently
- c. the same frequency

5. I stay in the room with my family members
- a. not at all anymore
- b. less frequently
- c. the same frequency

6. I wear a face mask
- a. not at all
- b. rarely
- c. most of the time

7. My highest education is
- a. Some High School
- b. High School
- c. Bachelor’s Degree
- d. Master’s Degree
- e. PhD or higher
- f. Trade School
- g. Prefer not to say

8. My work is
- a. Blue Collar
- b. White Collar
- c. Academic
- d. Not working
- e. Prefer not to say

FIGURE 1. Social distancing in cancer and noncancer patients survey.
was used by our team to send survey invites/messages to our participants via text. Our revised plan included storage of all participant data in REDCap (names, emails, phone numbers). Twilio is used to send out the text and survey link concurrently to more than 3258 potential participants, 1554 in noncancer patients, and 1707 cancer patients. A Cochrane Review has confirmed the equivalence of SMS based surveys, if the setting compared with other formats remains the same.10 When the participant received the text message and touched the link on their smart phone, the browser opens, and they may then complete the survey in the secure REDCap Web site. The text message was developed by the study team and submitted to the St Elizabeth Institutional Review Board for review and approval along with all other study materials. No personal information was allowed in the body of the text message.

The revised survey was released to participants in mid-January 2021.

The survey questions are presented below in Figure 1:

- When possible (for questions that could reasonably be easily reduced to binary response), cancer and noncancer groups were compared using 2-sample proportions testing and Bonferroni-corrected 95% confidence intervals. Because it is quite unlikely people would do things “more” during COVID, we chose “same frequency” as the anchor point for most questions. Two levels of difference from the anchor point (“same”), “less,” and “not at all” were dichotomized.
- $\chi^2$ tests for association were used for questions for which the analysis of 3 or more possible responses was needed.

RESULTS

Five pieces of demographic information were collected: sex, living arrangements, age, level of education, and working status. Summary information for each of these is provided in the Table 1 for reference. The information indicates that the samples are relatively similar across most demographics with some small differences that most likely relate to age. Because the cancer patient population is slightly older, they are also less likely to have a higher level of education and less likely to be employed.

Response rates were as expected for Medicare/Medicaid populations.11 From 3258 potential participants, we received 389 responses from cancer-positive participants (22.86%) and 504 responses (32.43%) from cancer-negative participants.

Most respondents were female (67%) and more than half older than 60 (56%).

Most study participants lived with a spouse or family members, with only 15% living alone.

The education level of the respondents was a mix of high school and college graduates, with 27% reporting advanced degrees beyond the bachelor’s level. Survey questions about work status revealed that 54% of all respondents were working, with the majority working in white collar jobs.

The study showed that cancer patients were up to 20% more likely to distance themselves during the COVID-19 pandemic. It is estimated that cancer patients (as compared with noncancer) left their houses between 3% and 20% less often, met their friends in person up to 10% less often, shopped for groceries between 8% and 25% less often, bought gas between 3% and 20% less often, and stayed in the room with family members between 2% and 20% less often (Table 2). There was no evidence of a difference in wearing a mask, worn in both groups approximately 90% of the time.

Although there was evidence of more social distancing among cancer patients, there were no differences in anxiety levels or negative feelings (Table 3, all $P^s > 0.05$). A majority of both groups indicated that had no issues with these things, and the distribution of sampled responses was similar for both the cancer and noncancer groups.

DISCUSSION

The study reflects the high level of awareness about COVID among cancer patients and the effect on their social distancing.

Cancer patients in our survey did not show a higher rate of anxiety than noncancer patients.

How the COVID pandemic has affected the anxiety in cancer patients has not been sufficiently studied yet. There may be a correlation with sex (females > males), type of cancer (breast cancer > other cancers), intent of treatment (curative < palliative), and age (younger than 65 > older than 65).12

Cancer patients are more susceptible to symptomatic infections with SARS-CoV-2.

In recent meta-analyses, the risk of severe COVID infection requiring intensive care unit admission is at least 3 times higher in cancer patients (adjusted for age and smoking) and the risk of dying in the hospital is also at least 3 times the risk compared with noncancer patients.13

In more than one way, cancer patients are at risk for detrimental health outcomes as affected by SARS-CoV-2, the fatal and destructive consequences of COVID itself, and the risk of delaying or missing the treatment for their cancer.

Consequently, the study data revealed that cancer patient respondents distanced themselves socially more, by leaving their homes less frequently. They went out less for shopping and used their car less, which in a car-dependent community is an indirect sign of distancing. They also had fewer meetings with family and friends.

Social distancing has multiple effects on the patients’ daily lives, including their psychological and social well-being. This

TABLE 1. Demographic Information

| Variable                  | CA+ Group          | CA- Group         |
|---------------------------|--------------------|-------------------|
| Sex                       |                    |                   |
| Male                      | 109 (28.2%)        | 184 (36.6%)       |
| Female                    | 278 (71.8%)        | 319 (63.4%)       |
| Living arrangements       |                    |                   |
| Alone                     | 63 (16.0%)         | 69 (13.8%)        |
| With spouse/family        | 325 (84.0%)        | 432 (86.2%)       |
| Age, y                    |                    |                   |
| <40                       | 18 (5.7%)          | 80 (15.9%)        |
| 40–60                     | 100 (26.0%)        | 196 (39.1%)       |
| >60                       | 267 (69.3%)        | 226 (45.0%)       |
| Education                 |                    |                   |
| Some high school          | 16 (4.2%)          | 5 (1.0%)          |
| High school               | 143 (37.2%)        | 149 (30.0%)       |
| Bachelor’s                | 105 (27.4%)        | 187 (37.6%)       |
| Master’s                  | 55 (14.3%)         | 85 (17.1%)        |
| PhD                       | 9 (2.3%)           | 14 (2.8%)         |
| Trade school              | 37 (9.6%)          | 39 (7.9%)         |
| Prefer not to say         | 19 (5.0%)          | 18 (3.6%)         |
| Work status               |                    |                   |
| Blue collar               | 54 (14.1%)         | 82 (16.4%)        |
| White collar              | 84 (21.9%)         | 195 (38.9%)       |
| Academic                  | 19 (4.9%)          | 46 (9.2%)         |
| Not working               | 202 (52.6%)        | 160 (31.9%)       |
| Prefer not to say         | 25 (6.5%)          | 18 (3.6%)         |
results in overburdening of their caregivers, increased loneliness and increased alcohol intake, smoking, weight gain, and, unfortunately, distancing from health care providers.14 Especially, cancer patients undergoing active treatment show a high concern for treatment delays due to COVID, including hospital policies and visitor restrictions.15

The high number of respondents in both groups wearing masks is remarkable and different than what was actually observed outside the hospital environment in the general community.

A limitation to rely on these high percentages is that they are self-reported and not externally validated behavior. However, other studies were able to confirm a correlation of self-reported face masks and a correlation with COVID incidence.16 Most responses about face masks also occurred in January 2021, when the region was suffering from a high incidence of COVID infections. Nevertheless, the fact that the survey was sent out through the hospital system, which mandated patients to wear masks, may have influenced the answers.

This study is limited by the fact that it is a single institution experience. The pilot survey data, which informed the main study, were collected at a time point when the prevalence of COVID in the community was moderate. At the time of the actual survey that generated the study data reported here, community prevalence was high. The responding cancer patients also tended to be older and less likely to be working, which could potentially confound the tendency to distance themselves.

Providers and health educators have to be aware of the effect of the pandemic on their cancer patients. Official recommendations and mandates clearly affect the public’s behavior and outcomes and among them the cancer patients’ outcomes. The New York and Massachusetts mandate was shown to effectively decrease the incidence of COVID17

In this study, the responsiveness of cancer patients to public health messages and their willingness to share their behavior and level of anxiety by a remote access application using Twilio and REDcap have been demonstrated.

The technical ability to capture rapid feedback to surveys on health behavior from a broad part of the population by the use of handheld devices will be a valuable tool to quickly gather data about how public health messages are perceived. A recent survey study about the acceptance of a variety of hypothetical vaccines also used an online platform and found acceptance of SARS-CoV-2 vaccination driven by public messaging.18

In May 16, 2021, the CDC changed the recommendation about wearing masks and social distancing for vaccinated persons. Fully vaccinated persons are not required to wear masks or distance themselves unless required by local guidance.19 However, reports about vaccination being less effective in patients on immunosuppressive therapy have now been confirmed.20–22

Since September 2021, a booster shot for the Pfizer/Moderna vaccines is recommended by the CDC and Food and Drug Administration for cancer patients, based on preclinical data of decreased T-cell responses and based on increasing cases of infections after vaccinations.23,24

To clarify the recommendation of social distancing after vaccination, the CDC recommends now that social distancing and masking continue for patients with a weakened immune system.25

### TABLE 3. Group Comparison for Survey Questions 7 Through 13

| Question                                           | CA− Group, % (95% CI) | CA+ Group, % (95% CI) | P for Difference | 99.5% CI for Difference in Percentage |
|----------------------------------------------------|-----------------------|-----------------------|------------------|--------------------------------------|
| Feeling nervous, anxious, or on edge               | CA− 54%               | CA+ 54%               | 28%              | 10%                                  | 8%                                  | 1.772                              | 0.621                              |
|                                                   |                       |                       |                  |                                      |                                     |                                    |
| Not being able to stop or control worrying         | CA− 66%               | CA+ 63%               | 21%              | 8%                                   | 5%                                  | 1.407                              | 0.704                              |
|                                                   |                       |                       |                  |                                      |                                     |                                    |
| Worrying too much about different things           | CA− 54%               | CA+ 53%               | 31%              | 9%                                   | 6%                                  | 1.975                              | 0.807                              |
|                                                   |                       |                       |                  |                                      |                                     |                                    |
| Trouble relaxing                                   | CA− 57%               | CA+ 54%               | 27%              | 11%                                  | 5%                                  | 2.034                              | 0.807                              |
|                                                   |                       |                       |                  |                                      |                                     |                                    |
| Feeling afraid as if something might happen        | CA− 63%               | CA+ 63%               | 23%              | 9%                                   | 5%                                  | 2.034                              | 0.807                              |

CA, cancer.
The messages and recommendations for cancer patients and their providers have been uncertain and unclear at times with regard to social distancing, masking, who is fully vaccinated and just whose immune system is considered weakened.

There is obvious concern that the multiplicity of recommendations and their modifications over short periods decrease the effectiveness of the message and lower patients’ adherence and safety. This study confirms a higher degree of social distancing among cancer patients during the SARS-CoV-2 pandemic. This reflects a significant awareness of cancer patients’ susceptibility and their risk for severe and fatal consequences acquiring COVID-19. The study also confirmed the utility of text-based surveys within a urban/rural mixed health system. This convenient electronic feedback mechanism can be used to evaluate and assure patients’ response to health-related recommendations.

Based on measuring an equal level of anxiety in cancer and noncancer groups, the difference in behavior is therefore driven more by information and education rather than anxiety.

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