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# The future of cancer screening post-COVID-19 may be at home

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Precis: During the COVID-19 pandemic, cancer screening decreased precipitously; yet, home screening for colorectal cancer diminished less than colonoscopy, breast and cervical cancer screening in a large, academic midwestern medical center. Based on these findings, the paper highlights the promise for increasing home cancer screening alongside telemedicine.

Lay Summary: During the COVID-19 pandemic, cancer screening decreased precipitously; home screening for colorectal cancer diminished less than colonoscopy, breast and cervical cancer screening. We highlight approaches for home cancer screening alongside telemedicine.

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## The future of cancer screening post-COVID-19 may be at home

The COVID-19 pandemic has triggered dramatic and rapid actions. With shelter-in-place policies implemented throughout the U.S., and patients fearful of exposure to COVID-19 in healthcare facilities and physicians' offices, in-office visits were no longer possible, replaced by video and phone visits, as institutional support would allow. Professional societies such as the American Cancer Society issued recommendations that no one should go to a healthcare facility for routine (non-diagnostic) cancer screening until further notification.[1] Other national professional societies issued similar recommendations (The American Society of Clinical Oncology, The American Society of Breast Surgeons, American College of Radiology, and the American Society for Colposcopy and Cervical Pathology) to postpone regular cancer screening

until healthcare facilities resumed preventive visits. [2-4] Prior to the pandemic, population screening rates for breast, cervical, and colorectal cancers among age-eligible adults at average risk were rising, reaching parity among diverse population subgroups, although still not meeting the Healthy People 2020 goals. [5-7] During the pandemic, analyses of national cancer screening patterns [8] as of April 25, 2020 revealed a precipitous drop in cervical cytology and breast cancer screening of 94%, and, for colorectal cancer screening of 86%.

Other analyses of national claims data suggest that, at current positivity rates, there could be 36,000 missed or delayed diagnoses of breast cancer during the 3-month period from early March through early June. Missed diagnoses of cervical cancer are estimated at 2,500, and, for colorectal cancer, at 18,800. [9] The dramatic reductions in cancer screening have created considerable challenges for cancer detection, with later stage diagnoses, increased cancer incidence (particularly for cervical and colorectal cancer), and greater morbidity and mortality. [10-14]

The U.S. Preventive Services Task Force recommends regular screening for breast, cervical, and colorectal cancers. To date, in the U.S., cancer screening has become predominantly an office-based and physician-directed activity, with colonoscopy performed under sedation, even though effective colorectal cancer screening can be done at home. [10] In 2016, the U.S. Preventive Services Task Force (USPSTF) added Cologuard® Multitarget stool DNA testing to the other recommended home screening options, including stool guiac (gFOBT) and Fecal Immunochemical tests (FIT). In-office speculum exams for specimen retrieval are the standard of care for cervical cancer screening at present; home sampling kits for cervical cancer screening are currently under evaluation for U.S. Food and Drug Administration approval, however. Specialist-led bilateral mammography is normative for breast cancer screening. The USPSTF recommends low-dose computed tomography for lung cancer screening, but only for those age 55-80 with at least a 30-pack year history, who currently smoke or have quit within the past 15 years. Their new draft deadlines propose to drop the pack-year exposure to 20 years, and the age to start to 50, but these likely won't be finalized until next year. As this commentary discusses USPSTF-recommended cancer screening tests among those at average risk, lung cancer will not be further discussed.

While commercial analytic and electronic medical records (EMR) firms have shared national data, to date, there have been no systematic studies of the variations in the use of the individual

in-office or home screening tests, nor the implications of these changes in cancer screening within a local healthcare system. The aim of this study is to describe the patterns of cancer screening in response to a state-wide shelter-in-place executive order within a large, midwestern private medical center.



**Method**

Under a state executive order, Michigan Medicine (affiliate of the University of Michigan) closed all of its clinics to non-essential care from 3/19/20-5/9/20, and began vigorous programs in telemedicine. We evaluated the EMR of 42,974 unique adult outpatients receiving routine cancer screening across three cancers, over the past three years, between 3/19-5/9 and 5/10-6/7 in 2017, 2018, 2019, and 2020. We selected the most common cancer screens conducted for average risk individuals at the healthcare center. We chose these time periods to compare patient visits during the shelter-in-place orders, to similar time periods in the previous years, to account for secular variations. We added an additional time period to show recovery rates as restrictions were being lifted. In accord with USPSTF age-specific screening guidelines, [11, 13, 14] we evaluated men and women, age 50-75 for colorectal cancer via colonoscopy, multitarget stool DNA (mt-sDNA) test, (Cologuard®), and FIT; we assessed women, age 50-74 for breast cancer via bilateral mammography; and reviewed women, age 21-65 for cervical cancer screening via ThinPrep and/or the HPV DNA high risk profile. We used both laboratory reports for cervical cancer screening, and procedure codes for colorectal and breast cancer screening within the time periods under study. We excluded any patients who had been diagnosed with cervical, colorectal, or breast neoplasms between 2017-2020, to eliminate patients who were undergoing surveillance. We used SlicerDicer, a self-service analytics engine to collect and select the EMR data on cancer screening in EPIC. For the outpatient visits, we used regular reports from the EMR and billing claims.

**Results**

We compared cancer screening for breast, cervical, and colorectal cancers year-to year, March 19 to May 9 in 2017, 2018, 2019, 2020 and during the clinic re-opening May 10 to June 7, 2020 by comparison to a similar period in 2017, 2018, and 2019 (see Figure 1). Patterns within these time periods were relatively similar over time prior to March 19-May 9, 2020. By comparison to the same time period of March 19-May 9, 2019, prior to the shelter-in-place orders, unique

patient visits for cancer screening have decreased markedly with mammograms for breast (3339 to 6) and colonoscopy for colorectal cancer (1291 to 8; see Figure 1). Cervical cancer screening also decreased markedly during the shelter-in-place orders (4990 to 444 overall). By comparison to comparable monthly time periods in 2019 prior to the shelter-in-place orders, all family medicine outpatient in-person visits decreased by 91% (see Table 1).

By contrast, while home multitarget stool DNA (mt-sDNA) testing was less common prior to the shelter-in-place orders than colonoscopy, testing only decreased by 65% during the pandemic (109 to 38 unique patients; see Figure 1). The home-based FIT decreased from 101 to 13 unique patients (87%), however. But, it, like other recommended stool-based tests for colorectal cancer (Fecal Occult Blood test) was done at home, by the patient, so was feasible while in-office visits were limited.

After the clinic re-openings between May 10-June 7, cervical cancer screenings had increased slightly. Colonoscopy screenings increased slightly after the clinics reopened, despite their high economic value to medical centers. [15] Neither multitarget stool DNA (mt-sDNA) screening via Cologuard® nor FIT had yet increased. Screening mammograms were not resumed until June 29, 2020, at a later stage in the re-opening of the medical center, so these data reflect as-needed diagnostic mammograms. After the re-opening of the clinics in 2020, family medicine outpatient visits increased to 80% of the total between May 10-June 7, 2019, but in-person visits dropped by 88%. Concurrently, video, telephone, and portal visits have continued to follow a steep upward trajectory, far above the use of these approaches in a comparable period in 2019 (see Table 2).

**Discussion**

We observed an abrupt drop between March 19 and June 9, 2020, in in-office breast, cervical, and colorectal cancer screening via colonoscopy, in accord with (unpublished) national claims data. [16] But, we observed a more modest decrease in home screening for colorectal cancer via the multitarget stool DNA (mt-sDNA) and FIT. Since we captured both the ordering and the performance of these tests within the time periods under study, the at-home tests occurred during the suspension of non-essential services. Data from Kaiser Permanente Washington suggest that the median time from ordering to return of FIT among those who adhere is two

weeks. [17] This suggests the generalizability of our findings regarding at-home testing during the pandemic.

With the post-COVID-19 re-openings, all cancer screenings, both in-office and in-home are beginning to trend upward. But, the number of cancer screening visits are still vastly below those in previous years during the same period of time.

Nonetheless, these data reveal a potential path forward for home-based cancer screening post-pandemic, alongside telemedicine. Perhaps at-home testing is more immune to the impacts of a pandemic—and its after-effects—on the use and access to primary health care.

Based on the evidence for multitarget stool DNA (mt-sDNA) test and FIT, and the emerging findings on cervical self-screening, home-based, patient screening is both accessible and acceptable to patients, [18-22] across diverse populations, reducing the embarrassment that often accompanies these tests in a medical office. [23-27] There are cost differences, however; Cologuard®, a multitarget stool DNA (mt-sDNA) test, is lower cost per screening than colonoscopy, but the screening intervals are more frequent, so the overall cost per patient is higher. [28, 29] Cologuard® is 99% effective for the general asymptomatic population, however, comparing favorably to other similar tests. [30, 31] Further, although not yet FDA-approved, a number of studies have found primary HPV testing by self-sampling nearly as effective as speculum-based specimen retrieval. [32, 33]

Home self-screening can be taught, and can be performed by patients. [34, 35] Home screening can be integrated with primary care provider workflow, [36, 37] for effective screening follow up that is critical to earlier cancer detection, hence reducing morbidity and mortality. Over time, as clinically-relevant biomarkers emerge for the early detection of breast cancer (e.g., [38]), these tests, too, may be conducted at home. Home screening for more than one cancer (e.g., colorectal and cervical) may significantly boost detection, particularly among populations that have limited access to medical care such as rural-dwelling Native Americans, those living in frontier areas, as well as many minority communities that experienced increased morbidity and mortality after the COVID-19 pandemic. We are conducting studies at present to test this hypothesis.

Michigan Medicine only treated about 500 patients diagnosed with COVID-19. Nonetheless, the healthcare system quickly increased the use of remote visits; developed centralized management structures, and specialized clinical sites. Some of this structural flexibility remains in the organization post-COVID-19. But, the institution, like many other medical centers nation-wide, is still struggling to regain the patient visits that are key to healthcare settings. [39] And, in rural areas, fewer primary care offices are reopening post-COVID-19 (Michigan Center for Rural Health, personal communication). The rapid transformation that the healthcare institution underwent during the pandemic demonstrates that changes can be made in work flow, provider training, and patient engagement to facilitate growth in self-screening for cervical and colorectal cancer, however.

There are several limitations to this descriptive study. Most important, the cancer screening tests are age-specific counts, but are not necessarily up-to-date screening. To reduce this limitation, we excluded patients diagnosed with neoplasms from the analyses. While year-to-year screening was relatively stable, we limited our analyses to within-screening test comparisons. We evaluated a limited set of tests for colorectal cancer screening within one institution, although colonoscopy is the most common test for colorectal cancer nationwide, and this is a major medical center with a diverse and large patient population. [5] Cologuard®, that had the lowest decrease in adherence during the clinic closings, has demonstrated adherence of 71% in a Medicare population. [40] Nonetheless, the baseline testing rates for both mt-sDNA and FIT were low relative to colonoscopy, and continued to decline after the clinics reopened. This likely reflects both the high value of colonoscopy to the medical center, [15] and physician preference for colonoscopy when all choices are available. [41,42,43] No formal statistical tests were conducted; the changes in screening that were depicted, however, were clinically relevant.

Cancer screening in the US is opportunistic, so, to enhance its effectiveness across populations, it is optimally supported by multi-level intervention approaches, from policy, healthcare organization, physicians, provider teams, and patients. [44] At a time when resources (staff, equipment, and supplies) are devoted to fighting the covid-19 pandemic, and preparing for potential further rebounds, coordinated public health policy, and multi-level approaches to implementation are warranted to support continued cancer screening in healthcare settings. As examples, organized national screening programs for breast, colorectal, and cervical cancers across Europe and England have also generally yielded reductions in cancer-related mortality; yet, implementation is still incomplete, and participation rates vary. [45-47] Nonetheless, during a

pandemic, these organized, nationally-supported programs can still systematically offer cancer screening.

A positive outcome from the devastation of the virus could be a growth in home cancer screening for two cancers: colorectal and cervical. Longer term study of these changes in cancer screening on patient health post-COVID-19 is our future.



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Figure Legend:

Figure 1. Colorectal, cervical, and breast cancer screening pre-, during- and post- COVID-19 shelter-in-place orders in Michigan.

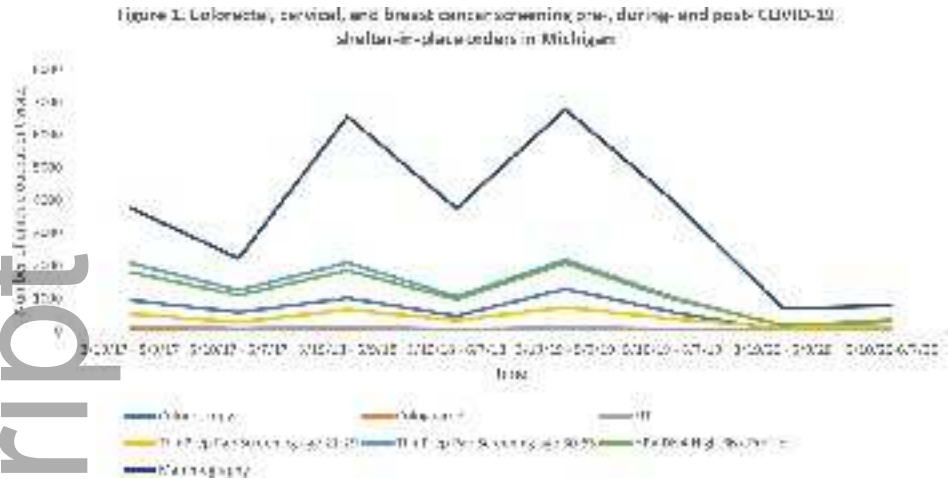
| Type of Visit | 3/19/17-5/9/17 | % | 5/10/17-6/7/17 | % | 3/19/18-5/9/18 | % | 5/10/18-6/7/18 | % | 3/19/19-5/9/19 | % | 5/10/19-6/7/19 | % | 3/19/20-5/9/20 | % | 5/10/20-6/7/20 | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| In person | 21,123 | 99.7 | 11,723 | 99.9 | 21,891 | 99.9 | 11,844 | 99.9 | 22,667 | 99.9 | 12,514 | 99.9 | 2120 | 15 | 1,492 | 15 |
| Video | 2 | < 0.1 | 1 | < 0.1 | 6 | < 0.1 | 8 | < 0.1 | 11 | < 0.1 | 5 | < 0.1 | 4462 | 31 | 3,519 | 35 |
| Phone | 46 | 0.2 | 6 | < 0.1 | 5 | < 0.1 | 0 | | 1 | < 0.1 | 3 | < 0.1 | 6997 | 48 | 4,551 | 45 |
| Patient Portal[c] | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 833 | 6 | 459 | 5 |
| Total Visits | 21,171 | 100 | 11,730 | 100 | 21,902 | 100 | 11,852 | 100 | 22,679 | 100 | 12,522 | 100 | 14,412 | 100 | 10,021 | 100 |

**Table 1. Number of Family Medicine outpatient visits in comparable months pre-, during-, and post-COVID-19** [a,b]

[a] Only completed visits that can be assigned to a specific provider are reported. Over time, visit types changed, for example, with the addition of a nurse practitioner care navigator.

[b] Source: The electronic medical record, EPIC

[c] Source: Michigan Medicine billing reports.



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