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Electronic Population Health Tools Enhance Preventive Care for Older Adults

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INTRODUCTION

By 2030, those ages 45 and older will constitute 43% of Americans, vastly outnumbering those 18 and younger.[1] Older individuals are at particularly high risk for solid malignancy and vaccine preventable illness. As such, the US Preventive Services Task Force (USPSTF) and Centers for Disease Control and Prevention (CDC) have published guidelines to maximize their well-being. Unfortunately, uptake of these recommendations is suboptimal and health disparities exist. For example, California currently has a lung cancer screening rate of 1% of eligible adults (national average is 5%), which ranks 49th of 50 states.[2] Further, Blacks experience the highest rates of lung cancer mortality compared with other races.[3]

Electronic health records will capture approximately 0.4 terabytes of clinical data over the lifetime of an individual.[4] But methods of harnessing this big data have not yet been optimized. The coronavirus disease 2019 (COVID-19) pandemic has changed the way in which health care is delivered but plays into the strength of a fully electronic approach, which may eliminate the need for face-to-face contact. Here we report the first-year results of Enhancing Electronic Health Systems to Decrease the Burden of Colon Cancer, Lung Cancer, Obesity, Vaccine-Preventable Illness, and LivER Cancer (CLOVER), an application of electronic population health tools that were tailored to increase uptake of preventive health services, especially cancer screenings and vaccinations, among older adults.

METHODS

We piloted the use of Healthy Planet, an Epic Systems population health module, in a large, suburban, primary care clinic located in Sacramento County, California, which is staffed by 5 primary care providers who specialize in internal or family medicine. During the same time of our intervention, data were also collected at a control (noninterventional) clinic within our health system that was comparable in age and gender to our intervention clinic. This control clinic is in Placer County, which is adjacent to Sacramento County, and is staffed by 7 primary care providers who specialize in internal or family medicine.

Electronic Population Health Module

We used Epic Healthy Planet to create custom reports for patients ages 50 and older, which determine "care gaps" in the following health care maintenance areas: colon cancer screening, lung cancer screening, tobacco counseling, obesity counseling, pneumonia vaccination, shingles vaccination, and hepatitis C screening. Therefore, our general approach was to increase USPSTF-recommended uptake of cancer screening, mitigate known risk factors for malignancy (tobacco usage and obesity), and increase vaccination among older adults. Unlike a traditional clinical care encounter, these reports capture data on a population level so that appropriate action can be administered to multiple patients simultaneously. Given limited resources, we prioritized improving the 3 lowest performing care gaps at

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Table 1 Population Health Registry Interventions to Increase Preventive Health Services

Care Gap	USPSTF/CDC Criteria	Health Service	Barriers to Uptake	Interventions
Shingles Vaccination (SV)	Age ≥ 50	Shingrix vaccine	• Cost coverage for Medicare D recipients • Tracking of vaccines administered at outside pharmacies	• Bulk ordering of vaccines and messaging • Telephone consultation • Electronic SV reconciliation with retail pharmacies
Lung Cancer Screening (LCS)*	• Age 55-80 • 30 pack-year smoking • Active smoker or quit within 15 years	Low-dose computed tomography (CT) lung	• Complex criteria (physician and patient knowledge gap) • Need for shared decision-making	• Telephone consultation and CT ordering prior to PCP appointment • PVP-initiated shared decision-making or referral to comprehensive LCS program
Obesity Counseling (OC)	Body Mass Index ≥ 30	• Weight and nutrition group classes • One-on-one consultation with registered dietician	• Patients unaware of their diagnosis or they are aware and are reluctant to seek help • Physician reluctance to discuss diagnosis and management	• Bulk messaging of "wellness letter" detailing OC resources • Patient education videos imbedded in bulk messages • PCP-focused OC education

CDC = Centers for Disease Control and Prevention; PCP = primary care provider; PVP = previsit planner; USPSTF = United States Preventive Services Task Force.

*2013 USPSTF lung cancer screening criteria was used due to concerns for insurance coverage of screening for new criteria which was published March 9, 2021.

baseline first. These were shingles vaccination, lung cancer screening, and obesity counseling.

Previsit Planning Workflow

A nonphysician previsit planner accessed the Epic Healthy Planet Reporting Workbench to view health care maintenance reports and determine care gaps. Each care gap presented unique challenges and, therefore, had a distinct workflow (Table 1). For shingles vaccination, privately insured patients may obtain their vaccine without charge in clinic. Therefore, the clinic asked us to focus on the more difficult task of vaccinating patients with Medicare Part D insurance, which only covers the cost of vaccination at retail pharmacies. To increase shingles vaccination adherence, vaccinations were bulk ordered to a local retail pharmacy partner. The previsit planner would send bulk electronic messages and call patients by telephone to remind them of their need for shingles vaccination. The previsit planner would then follow up to ensure completion of the vaccine series and automated vaccination reconciliation was implemented

Lung cancer screening is difficult to achieve due to complex age and smoking history criteria and need for shared decision-making, which is time-consuming and often scuttled. To overcome this, the previsit planner was trained in lung cancer screening shared decision-making and contacted patients prior to their primary care provider appointments. Alternately, if patients desired to consult with a physician, we would refer to our institutional Comprehensive Lung Cancer Screening Program, but this would require an additional clinical encounter. Once the patient agreed to be screened, low-dose computed tomography (CT) of the lung was ordered, and results were followed by the previsit planner.

For obesity counseling, the previsit planner sent bulk messages weekly informing patients with upcoming primary care provider appointments of free weight loss classes and formal video consultation with registered dieticians. Patient-facing educational videos (Emmi) regarding nutrition and exercise were embedded in these bulk messages for patients to review on their own time. In addition, the use of validated primary care provider-facing obesity counseling education was piloted.[5]

When multiple care gaps required closure, the previsit planner sought to close them in one encounter ("bundling"). Video visits (ExtendedCare Telehealth) were preferred and fully integrated applications on smartphone and tablets. In addition, our reports filter by race and ethnicity allowing us to perform targeted outreach to high-risk populations. For

Table 2 Relative Change in Adherence to CLOVER Care Gaps (INTERVENTION)

Care Gap	Health Service	#Eligible	#Adherent(July 2020)	#Adherent (June 2021)	Relative Change (95% CI)
Tobacco Use	Counseling	418	310	313	1% (0%-3%)
Pneumonia	PCV13 or PPSV23 Vaccination	3,500	2,212	2,317	5% (4%-6%)
Hepatitis C	Hepatitis C Antibody Screening	4,495	2,827	2,854	1% (1%-1%)
Colon Cancer	Colonoscopy, FIT, or Stool DNA	4,495	2,805	2,908	4% (3%-4%)
Shingles	Shingrix Vaccination	7,257	1,350	1,821	35% (31%-39%)
Lung Cancer	Low Dose CT Scan Lung	280	17	53	212% (119%-378%)
Obesity	Counseling	1,662	50	113	126% (87%-183%)

the pilot, we focused specifically on contacting Blacks eligible for lung cancer screening.

Statistical Analysis

For each recommendation, we computed the proportion of eligible patients who were adherent in July 2020 (baseline) and the proportion adherent as of June 2021 at the CLOVER intervention clinic and control clinic, which was comparable in age and gender. The relative change in adherence was computed as the ratio of the difference in proportion adherent divided by the proportion adherent at baseline; a 95% confidence interval (CI) was estimated, and the clinics were compared with respect to change in adherence using a multinomial model with generalized logit link. Statistical significance was assessed at the 0.05 level (2-sided).

RESULTS

At our intervention clinic, baseline adherence of the CLOVER care gaps was 74% (tobacco counseling), 63% (pneumonia vaccination), 63% (hepatitis C screening), 62% (colon cancer screening), 19% (shingles vaccination), 6% (lung cancer screening), and 3% (obesity counseling). As mentioned previously, we chose to focus on the lowest 3 performing care gaps (shingles vaccination, lung cancer screening, and obesity counseling). For these, we improved adherence by 35% (95% CI 31%-39%), 212% (95% CI 119%-378%), and 126% (95% CI 87%-183%), respectively (Table 2) at the intervention clinic. All 5 Black patients eligible for lung cancer screening were contacted, and 2 of 2 who were deemed appropriate based on age and smoking history completed screening.

The intervention clinic (53% were ages 50-80 and 57% were female) and control clinic (57% were ages 50-80 and 58% were female) were comparable in age and gender. The relative changes in adherence for shingles vaccination, lung cancer screening, and obesity counseling at the control clinic were 39% (95% CI 36%-43%), 40% (13%-128%), and 6% (4%-11%), respectively (Table 3). Compared to control, the intervention clinic had significantly larger increases in adherence to lung cancer screening (212% vs 40%, $P = .012$), obesity counseling (126% vs 6%, $P < .0001$), and colon cancer screening (4% vs 1%, p<.0001), but significantly smaller increases in tobacco counseling (1% vs 7%, $P = .0053$) and pneumonia vaccination (5% vs 8%, $P = .0003$). There were no statistically significant differences in adherence to hepatitis C screening (1% vs 1%, $P = .5243$) and shingles vaccination (35% vs 39% $P = .0945$) between the 2 clinics.

DISCUSSION

CLOVER is an efficient and effective model for increasing preventive health services uptake. It deploys a small team that can improve the well-being of thousands of patients by harnessing big data. When compared to the control clinic, statistically and clinically significant increases in lung cancer screening and obesity counseling have resulted despite the COVID-19 pandemic. There was no statistically significant difference in shingles vaccination between the 2 clinics despite our intervention. This could have been due to concurrent COVID-19 vaccination campaigns during the time of our study, which made patients and primary care providers more aware of vaccine deficiencies in general. Statistically significant differences in colon cancer screening, tobacco counseling, and pneumonia vaccination were also

Table 3 Relative Change in Adherence to CLOVER Care Gaps (CONTROL)

Care Gap	Health Service	# Eligible	#Adherent(July 2020)	#Adherent (June 2021)	Relative Change (95% CI)
Tobacco	Counseling	192	102 (53%)	109 (57%)	7% (3%-15%)
Pneumonia	PCV13 or PPSV23 Vaccination	3884	2226 (57%)	2394 (62%)	8% (6%-9%)
Hepatitis C	Hepatitis C Antibody Screening	3958	2375 (60%)	2402 (61%)	1% (1%-2%)
Colon Cancer	Colonoscopy, FIT, or Stool DNA	4040	2666 (66%)	2688 (67%)	1% (1%-1%)
Shingles	Shingrix Vaccination	6432	1415 (22%)	1973 (31%)	39% (36%-43%)
Lung Cancer	Low Dose CT Scan Lung	138	10 (7%)	14 (10%)	40% (13%-128%)
Obesity	Counseling	3305	248 (7.5%)	264 (8%)	6% (4%-11%)

found in between the 2 clinics, but the absolute differences were small and less clinically significant than the care gaps that we specifically focused on improving. Due to relatively high baseline adherence, we did not directly intervene on addressing the colon cancer screening, tobacco counseling, and pneumonia vaccination care gaps, so it is unclear what clinic level changes were responsible for these small differences.

The CLOVER model is limited by the accuracy of data recorded in the electronic health record and currently has difficulty capturing events occurring outside of our institution. As shown, CLOVER's workflow may serve as a model to alleviate the strain on primary care providers and ultimately allow them to spend more impactful time with their patients.[6] Due to this early success, this model will be disseminated within our health system and multiple federally qualified health centers in the coming year.

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