Original Research

Healthcare Service Utilization under a New Virtual Primary Care Delivery Model

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Abstract

Background: Telemedicine holds great promise for changing healthcare delivery. While telemedicine has been used significantly in the direct-to-consumer setting, the use of telemedicine in a preventive primary care setting is not well studied.

Introduction: ClickWell Care (CWC) is the first known implementation of a technology-enabled primary care model. We wanted to quantify healthcare utilization of primary care by patient characteristics and modality of care delivery.

Materials and Methods: Our study population included those who completed a visit to a CWC clinic between January 1, 2015 and September 30, 2015. We compared patients based on utilization of CWCs in-person and virtual visits across the following domains: patient demographics, distance from clinic, responses to a Health Risk Assessment, and top 10 conditions treated.

Results: Thousand two hundred seven patients completed a visit with a CWC physician in 2015. Nearly three-quarters of our patients were ≤ 40 years and sex was significantly different ($p=0.015$) between visit cohorts. The greatest representation of men (47%) was seen in the virtual-only cohort. Patients' proximity to the clinic was also significantly different across visit cohorts ($p=0.018$) with 44% of in-person-only and 34% of virtual-only patients living within 5 miles of Stanford Hospital.

Discussion: We found men were more likely to engage in virtual-only care. Young patients are willing to accept

virtual care although many prefer to complete an in-person visit first.

Conclusions: Our findings suggest that a “bricks-and-clicks” care model where telemedicine is supported by a brick-and-mortar location may be an effective way to leverage telemedicine to deliver primary care.

Keywords: telehealth, telemedicine, e-health, m-health

Introduction

Primary care has gained increasing attention across the United States as healthcare spending continues to climb.¹⁻³ Public and private payors are looking for innovative new models to deliver comprehensive, easily accessible primary care, often through patient-centered medical home (PCMH) models.^{1,3-5} Evidence about the quality and cost of care of PCMHs is mixed, with some studies showing positive clinical results in high-risk or elderly populations but not in healthy young adult populations.⁶⁻⁸ As health systems move toward shared-risk population health-based models, it is increasingly important to find a way to engage young adults early in their healthcare journey to ensure long-term health of the population.

Telemedicine holds great promise for changing the way we care for both chronically ill and healthy patients.⁹ Direct-to-consumer (DTC) telemedicine has emerged as a convenient way for patients to access care. DTC telemedicine may be well suited to engaging younger populations as studies have demonstrated a higher use of such services by 18-45 year olds.^{10,11} It is still unclear, however, how to incorporate such technologies into routine primary care practice.

There are currently three models of primary care delivery, all aimed at providing outpatient clinical care.

(1) Traditional in-office primary care

Delivered during normal business hours, traditional primary care models or “brick-and-mortar practices” limit patients to in-person visits for all of their care.¹² In these practices, care coordination/follow-up often occurs through unscheduled phone calls.

(2) Traditional primary care with limited technology integration

Some primary care clinics now integrate technologies such as email and phone visits but often limit them to return patients only. Virtual visits may be conducted within the patient's own primary care practice or through the use of a third party clinical service (often within the same health system) but in urgent situations patients are often unable to see their own provider.^{13–15}

(3) Technology-centered care

Often delivered during both normal business hours and after hours, these telemedicine services allow patients to connect to a physician through email, phone, or video visits completed with a mobile device or web browser.^{16,17} These services are often episodic and address only urgent issues, not preventive primary care services.

Our group recently implemented a fourth model: technology-enabled, patient-centered care.

Stanford Medicine designed ClickWell Care (CWC) for its accountable care organization (ACO), which is limited to employees of Stanford University. This virtual primary care clinic, which has been described in detail previously¹⁸ is a “bricks-and-clicks” model that integrates primary preventive, chronic, and urgent care services with wellness coaching, all supported through technology. Each time a patient wishes to interact with CWC, they may choose how they would like to receive their care, whether in-person or through virtual means.

In this article, we describe healthcare service utilization by the CWC patient population to understand the integration of telemedicine into routine primary care. We do this by examining differences during the first year of the clinic's existence between CWC patients who completed in-person visits alone, both in-person and virtual visits, and virtual visits alone.

Materials and Methods

PATIENTS

Inclusion criteria for patients enrolled in CWC included age ≥ 18 years; ability to speak, read, and write in English; and willingness to do phone and video visits. Exclusion criteria included hospitalization in the past year for any serious chronic medical condition such as uncontrolled diabetes or hypertension, coronary artery disease, stroke, or another serious medical issue as measured by a health risk assessment (HRA) administered to all new ACO members.

The HRA (Supplementary Data S1) was a tool created within the organization to segment patients into appropriate risk categories. These categories allowed us to recommend a primary care clinic based on health risk and preference. Those with a score of 0–4 were offered CWC; a score from 5 to 11

were offered traditional primary care; and scores >12 were offered Stanford Coordinated Care, a clinic for patients requiring a higher level of care coordination.

Our study cohort consisted of all patients who enrolled in CWC between January 1, 2015 and September 30, 2015, with follow-up extending from their time of enrollment through December 31, 2015. Patients who made no visits during the year were excluded from our analyses. E-mail exchanges were excluded from consideration as most were not templated email visits. Stanford Healthcare uses Epic systems for its electronic health record. This study was approved by the Institutional Review Board of Stanford University.

PROVIDERS

CWC has a team of physicians and wellness coaches who work together to provide patients with comprehensive primary care, delivered either in-person or virtually through e-mail, phone, or video visits. Wellness coaches are certified trainers with additional training in nutrition and mindfulness-based stress reduction. They work with patients to create physical activity plans, review dietary habits, and teach mindfulness and sleep hygiene. Visits with wellness coaches are conducted only through phone or video.

OUTCOMES

We characterized and compared patients based on how they utilized CWCs services. Visits were defined as scheduled in-person office or virtual (video or phone) appointments between a patient and physician. We classified patients who had at least one CWC visit into one of four mutually exclusive cohorts based on their visit history with a CWC physician: clinic only, virtual only, and for patients with mixed visit types, clinic first and virtual first.

ANALYSIS

We summarized the number of completed visits of each type in a Venn diagram and the total number of visits across visit types using quartiles. We defined visit completion as any visit scheduled and completed with a physician that was documented in Epic. To compare patients across cohorts, we considered patient demographics (enrollment age, sex, race, and ethnicity), distance from the clinic (as geodesic distance in miles between patients' zip code geo-coordinates and our clinic), patient responses to the HRA, and top 10 conditions diagnosed or managed during CWC visits.

To identify the top 10 conditions, a list of all unique primary diagnosis codes for CWC patients was produced for each billed visit from January 1 through December 31, 2015. These codes were grouped and ranked based on their frequency. Diagnosis

groups were defined from two resources: ICD-9 codes from the National Ambulatory Medical Care Survey (NAMCS) 2012 and the Medicare Chronic Conditions Warehouse definitions for chronic conditions and potentially disabling conditions.^{19–21} NAMCS includes diagnosis code groups for acute diagnoses and some chronic conditions, and Medicare defines diagnosis code groups for chronic conditions and potentially disabling conditions only. Using both resources encompasses a combination of acute and chronic conditions, encountered in the primary care setting.

Continuous variables (enrollment age, distance from the clinic, and HRA score) were categorized, and all factors were then tabulated and compared across the four visit categories via chi-square or Fisher's exact tests at the 0.05 alpha level. To ensure sufficient cell counts, we combined the highest two age categories (51–65 and 65+), and combined the three longest distances from the clinic into one category before applying the statistical tests. For HRA responses, we collapsed the five original levels into three by combining the two levels above the middle category into one and the two below the middle category into another. All statistical tests were performed at the 0.05 level of significance, and analyses were performed using R version 3.2.^{22,23}

Results

A total of 1,207 enrolled CWC patients (60% female) completed an in-person, video, or phone visit with a CWC physician in 2015. Nearly three-quarters were ≤age 40 at time of enrollment; 1% were over age 65. The majority of patients (57%) lived within 10 miles of Stanford Hospital, with median 6.8 miles and interquartile range (IQR) (2.5–15.4) miles (*Table 1*).

Categorical age was similarly distributed across visit cohorts with a median age of 33 for the in-person and some-virtual cohorts and median age of 40 for the virtual-only cohort. Patient sex, was significantly different ($p=0.015$) across visit cohorts. The greatest representation of men (47%) was seen in the virtual-only cohort; men comprised 31%, 37%, and 41% of the virtual-first, clinic-first, and in-person-only cohorts, respectively. Patients' proximity to the clinic was also significantly different across visit cohorts ($p=0.018$). The most striking difference was between the in-person-only and virtual-only patients, with 44% of the former group and 34% of the latter group living within 5 miles of Stanford Hospital. Box plots of distance from the clinic by visit group showed a lower median for in-person-only patients than for any other group (*Fig. 1*).

The 1,207 patients completed a total of 2,573 in-person, video, and phone visits with physicians in 2015. The median

(IQR) number of completed visits per patient was 2 (1–3); the greatest number of visits was 17. The vast majority of patients (82.2%) who utilized CWC services had at least one in-person visit, followed by 42.7% with at least one phone visit and 17.5% with at least one video visit (*Fig. 2*). Five hundred fifty-nine (46.3%) patients received all of their care in-person compared with 449 (37.2%) who completed a mixture of virtual and in-person visits, and 199 (16.5%) who received all care virtually, 13.4% having only phone visits, and 3.1% having only video visits. Just over 5% of patients engaged in all three types of visits.

Eighty percent of in-person-only patients and 66% of virtual-only patients completed just a single visit. The median (IQR) number of visits completed by those who had a mixture of virtual and in-person visits was 3 (2–4). Most patients (71%) who had a combination of in-person and virtual visits had an initial in-person visit.

According to the HRAs, patients perceived their health similarly across the visit cohorts (*Table 2*). The most prevalent response was “Very Good,” while <3% in each group rated their health as “Fair” or “Poor.” We observed no differences in categorized health risk scores. Among self-reported preferences for primary care delivery, the groups differed in preference patterns for in-person contact ($p<0.001$) and video chat ($p=0.007$). A greater percentage of in-person-only patients preferred in-person contact “Always” or “Very Frequently” than did virtual-only patients (33% vs. 22%), and a greater percentage of virtual-only patients preferred video chat “Always” or “Very Frequently” than did in-person-only patients (21% vs. 14%). Kappa statistics for consistency between self-reported preference of “Always” or “Frequently” for in-person or virtual visits and ever making a visit of the preferred type indicated slight agreement, according to Landis and Koch's²³ interpretation.

We observed 722 unique ICD-9 primary diagnosis codes among patients with any encounter, and these were categorized into 38 diagnosis groups. The top 10 CWC conditions were general medical examination, spinal disorders, arthropathies and related disorders, acute upper respiratory infections (URIs) (excluding pharyngitis), rheumatism (excluding back), essential hypertension, disorders of lipid metabolism, acquired hypothyroidism, acute pharyngitis, and specific procedures and aftercare. Arthropathies and related disorders, which included arthritis, synovitis, joint derangement, and collagen disorders, was the only diagnosis group among the top 10 that was distributed differently across the four groups ($p=0.001$): nearly 13% of virtual-only patients had received this diagnosis since their enrollment, more than double that of other groups.

Table 1. Demographics of Patients Who Made a ClickWell Care Visit in 2015

	OVERALL		CLICKWELL CARE MD VISITS (N= 1,207 ^a)								p ^c
			IN-PERSON ONLY		SOME VIRTUAL				VIRTUAL ONLY ^b		
					IN-PERSON FIRST		VIRTUAL FIRST				
	N	%	N	%	N	%	N	%	N	%	
Total patients	1,207	100.	559	46.3	310	25.7	124	10.3	214	17.7	
Number of visits (median, IQR)	2	1–3	1	1–1	3	2–4	3	2–4	1	1–2	
Enrollment age group (years)											
17–30	418	34.6	191	34.2	123	39.7	41	33.1	63	29.4	0.092
31–40	471	39.0	232	41.5	115	37.1	41	33.1	83	38.8	
41–50	182	15.1	81	14.5	42	13.5	21	16.9	38	17.8	
51–65	124	10.3	52	9.3	29	9.4	18	14.5	25	11.7	
65+	12	1.0	3	0.5	1	0.3	3	2.4	5	2.3	
Sex											
Female	724	60.0	330	59.0	195	62.9	86	69.4	113	52.8	0.015
Male	483	40.0	229	41.0	115	37.1	38	30.6	101	47.2	
Race											
American Indian or Alaskan Native	4	0.3	1	0.2	0	0	1	0.8	2	0.9	0.089
Asian	251	20.8	133	23.8	65	21.0	19	15.3	34	15.9	
Black or African American	30	2.5	12	2.1	11	3.5	5	4.0	2	0.9	
Native Hawaiian or other Pacific Islander	13	1.1	7	1.3	2	0.6	2	1.6	2	0.9	
White ^d	578	47.9	259	46.3	152	49.0	56	45.2	111	51.9	
Hispanic White	29	2.4	14	2.5	6	1.9	5	4.0	4	1.9	
Non-Hispanic White	541	44.8	243	43.5	144	46.5	50	40.3	104	48.6	
White, unspecified	8	0.7	2	0.4	2	0.6	1	0.8	3	1.4	
Other	205	17.0	95	17.0	47	15.2	24	19.4	39	18.2	
Patient refused/unknown	126	10.4	52	9.3	33	10.6	17	13.7	24	11.2	
Ethnicity											
Hispanic/Latino	117	9.7	58	10.4	27	8.7	15	12.1	17	7.9	0.503
Non-Hispanic/Latino	972	80.5	453	81.0	250	80.6	93	75.0	176	82.2	
Patient refused/unknown	118	9.8	48	8.6	33	10.6	16	12.9	21	9.8	
Distance from clinic ^c											
0.7–5 miles	479	39.7	243	43.5	116	37.4	47	37.9	73	34.1	0.018
>5–10 miles	214	17.7	109	19.5	55	17.7	12	9.7	38	17.8	
>10–20 miles	306	25.4	124	22.2	83	26.8	35	28.2	64	29.9	
>20–40 miles	173	14.3	70	12.5	48	15.5	24	19.4	31	14.5	
>40–100 miles	22	1.8	4	0.7	6	1.9	6	4.8	6	2.8	
>100 miles	13	1.1	9	1.6	2	0.6	0	0	2	0.9	
	Median	Q1, Q3	Median	Q1, Q3	Median	Q1, Q3	Median	Q1, Q3	Median	Q1, Q3	
Age at enrollment (years)	33	29, 41	33	29, 40	33	28, 39	35	29, 44	40	32, 51	
Distance from clinic ^c (miles)	6.8	2.5, 15.4	6.1	2.5, 13.7	9.1	2.5, 16	10.6	2.9, 18.3	9.2	2.9, 16.9	

^aFifty-four patients had a ClickWell Care record besides in-person, phone, or video encounters and are not represented in this table.

^bVirtual refers to phone or video encounters.

^cObtained from chi-square tests for categorical covariates.

^dWhite race categorized using ethnicity data. Other races include too few Hispanics to be further categorized.

IQR, interquartile range.

Fig. 1. Distribution of distance from patient's home to the clinic. Distribution of geodesic distance from coordinates associated with residence zip codes to those associated with 94,304 for patients across four visit groups; inset figures are truncated at 100 miles for clearer view of boxplots.

Discussion

To our knowledge, this is the first study to examine the similarities and differences in a population that is offered both in-person and virtual primary care from a dedicated group of physicians. Previous studies have described only patients who participate in in-person or virtual care,^{11,17,24} and none has looked at a population that was allowed to choose whether they would receive care virtually or in-person, both for new and return visits, from the same group of physicians.

Our results suggest that CWC effectively engaged a younger subset of patients in primary care, as evidenced by the median age of 33–40 years in patients seeking care in the clinic. This is consistent with other studies demonstrating higher utilization of telemedicine by younger patients.^{11,17} This compares with an average age of 47.6 years among patients in traditional primary care clinics in our institution's local service area.²⁵ Adding telemedicine to primary care may create a care model that better engages younger populations, which is important as shared risk models emerge since young patients often tend to use emergency and urgent care centers for their non-emergent needs.^{26–29} These avenues of acute care are often costly and do not engage patients in preventive care, leaving them vulnerable to developing chronic disease while increasing costs across the health system.²⁹

We found statistically significant differences between cohorts in gender, distance between home and the clinic, preferences for types of visits, and diagnoses categorized as arthropathies compared with other diagnoses. Men were more likely than women to receive all of their care virtually. Numerous studies have documented a lower engagement in healthcare, especially preventive medicine, in men compared with women,^{30,31} despite the fact that life expectancy for men in the United States is 5 years shorter than women.³² Young men, aged 20–44 years, are more likely to avoid healthcare, not just visits to a doctor but also lower rates of visits to the pharmacy and dentist.³³ Our findings suggest that virtual care may be a more effective method to engage and deliver care to young men.

As patients in our ACO are Stanford employees, it was not surprising that the majority of patients live within 5 miles of the clinic. We found patients who conducted most of their care in-person lived closer to the brick-and-mortar clinic. Patients who were more inclined toward virtual visits lived farther from the clinic. Despite this, a large

Fig. 2. Segmentation of ClickWell Care Utilization by Visit Modality. Venn diagram depicting ClickWell Care utilization of 1,207 patients who completed at least one visit with a physician. Five hundred fifty-nine in-person-only patients are represented in the white region, 214 exclusively virtual (phone or video) patients are represented in the dark grey region, and 434 patients with both in-person and virtual visits are represented in the light grey region. VPC, virtual primary care.

Table 2. Medical History of Patients Who Enrolled in ClickWell Care from January 1, 2015 to September 30, 2015

	OVERALL		IN-PERSON ONLY		SOME VIRTUAL ^a				VIRTUAL ONLY ^a		<i>p</i> ^c
					IN-PERSON FIRST		VIRTUAL FIRST				
	<i>N</i>	% ^b	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Total patients	1,207	100.	559	100.	310	100.	124	100.	214	100.	
SHCA Health Risk Assessment survey items (<i>n</i> missing)											
Self-perception of health (<i>n</i> =130)											
Excellent	312	25.8	141	25.2	65	21	36	29	70	32.7	0.647
Very good	452	37.4	210	37.6	130	41.9	40	32.3	72	33.6	
Good	288	23.8	130	23.3	81	26.1	35	28.2	42	19.6	
Fair	23	1.9	12	2.1	5	1.6	3	2.4	3	1.4	
Poor	2	0.2	1	0.2	0	0	0	0	1	0.5	
Preference for in-person ^d (<i>n</i> =230)											
Always	134	11.1	69	12.3	41	13.2	8	6.5	16	7.5	<0.001
Very frequently	241	20	118	21.1	69	22.3	23	18.5	31	14.5	
Occasionally	494	40.9	223	39.9	124	40.0	54	43.5	93	43.5	
Rarely	106	8.8	39	7.0	22	7.1	12	9.7	33	15.4	
Never	2	0.2	1	0.2	0	0	0	0	1	0.5	
Preference for phone contact ^e (<i>n</i> =225)											
Always	139	11.5	67	12	38	12.3	9	7.3	25	11.7	0.434
Very frequently	274	22.7	114	20.4	77	24.8	38	30.6	45	21	
Occasionally	455	37.7	216	38.6	113	36.5	45	36.3	81	37.9	
Rarely	97	8	50	8.9	21	6.8	5	4	21	9.8	
Never	17	1.4	6	1.1	7	2.3	1	0.8	3	1.4	
Preference for video chat ^e (<i>n</i> =227)											
Always	59	4.9	23	4.1	18	5.8	5	4	13	6.1	0.007
Very frequently	145	12	55	9.8	37	11.9	22	17.7	31	14.5	
Occasionally	458	37.9	202	36.1	122	39.4	43	34.7	91	42.5	
Rarely	173	14.3	100	17.9	38	12.3	17	13.7	18	8.4	
Never	145	12	71	12.7	41	13.2	11	8.9	22	10.3	
Preference for email contact (<i>n</i> =226)											
Always	234	19.4	106	19	53	17.1	21	16.9	54	25.2	0.422
Very frequently	297	24.6	123	22	87	28.1	35	28.2	52	24.3	
Occasionally	385	31.9	190	34	100	32.3	38	30.6	57	26.6	
Rarely	46	3.8	27	4.8	7	2.3	4	3.2	8	3.7	
Never	19	1.6	6	1.1	9	2.9	1	0.8	3	1.4	
Health Risk Score (<i>n</i> =132)											
0	208	17.2	108	19.3	40	12.9	22	17.7	38	17.8	0.368
1–2	602	49.8	278	49.7	163	52.6	62	50.0	99	46.3	
3–4	214	17.7	85	15.2	64	20.6	24	19.4	41	19.2	
5+	51	4.2	22	3.9	14	4.5	5	4.0	10	4.7	

continued →

Table 2. Medical History of Patients Who Enrolled in ClickWell Care from January 1, 2015 to September 30, 2015 *continued*

	OVERALL		IN-PERSON ONLY		SOME VIRTUAL ^a				VIRTUAL ONLY ^a		<i>p</i> ^c
					IN-PERSON FIRST		VIRTUAL FIRST				
	<i>N</i>	% ^b	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Wellness coaching sessions ^a											
None	967	80.1	475	85.0	226	72.9	97	78.2	169	79.0	0.003
1–2 sessions	122	10.1	41	7.3	42	13.5	16	12.9	23	10.7	
3+ sessions	118	9.8	43	7.7	42	13.5	11	8.9	22	10.3	
Conditions ever diagnosed within VPC											
General medical examination	263	21.8	127	22.7	66	21.3	28	22.6	42	19.6	0.810
Spinal disorders	74	6.1	35	6.3	23	7.4	9	7.3	7	3.3	0.238
Arthropathies and related disorders	79	6.5	26	4.7	19	6.1	7	5.6	27	12.6	0.001
Acute upper respiratory infections excluding pharyngitis	80	6.6	39	7.0	21	6.8	7	5.6	13	6.1	0.936
Rheumatism excluding back	67	5.6	32	5.7	21	6.8	5	4.0	9	4.2	0.532
Essential hypertension	30	2.5	15	2.7	5	1.6	2	1.6	8	3.7	0.455
Disorders of lipid metabolism	40	3.3	20	3.6	12	3.9	4	3.2	4	1.9	0.607
Acquired hypothyroidism	25	2.1	16	2.9	4	1.3	1	0.8	4	1.9	0.393
Acute pharyngitis	41	3.4	23	4.1	11	3.5	1	0.8	6	2.8	0.307
Specific procedures and aftercare	31	2.6	17	3.0	3	1.0	4	3.2	7	3.3	0.167

^a"Virtual" and "Wellness Coaching" are limited to phone and video encounters.

^bSome patients did not complete all parts of the HRA survey, so column percents may not sum to 100. The first nonmissing response for each item was tabulated for patients with multiple HRA entries.

^c*P*-values were obtained via chi-square tests or Fisher's exact tests ("self-perception of health" and the five bottom diagnoses). Five-level ordinal covariates were first collapsed into three levels by combining the two levels above and below the middle category.

^dKappa of 0.052 for agreement between self-reported preference of "Always" or "Very Frequently" for in-person contact and ever making in-person visit.

^eKappa of 0.054 for agreement between self-reported preference of "Always" or "Very Frequently" for phone contact or video chat and ever making virtual visit.

HRA, health risk assessment; VPC, virtual primary care.

proportion of patients who participated in virtual visits lived within 5 miles of the clinic, demonstrating that telemedicine is popular with patients who live close to healthcare and those who live farther from it.

Surveys have suggested a high acceptance of virtual visits among consumers, indicating that up to 72% of consumers would choose to see a doctor virtually³⁴; one survey found that 50% of Gen Y respondents (18–36 years old) would switch doctors for one with better online access.³⁵ However, many of these surveys asked participants to hypothetically choose based on a set of symptoms or specific illnesses and did not measure actual patient practice. Our findings suggest patients' preferences for how they would like to receive care correlate with how they actively get care. Patients with a higher preference for video visits were more likely to be part of the virtual-only cohort

and those with a higher preference for in-person visits were more likely to be part of the in-person-only cohort.

Nevertheless, even those who indicated a high preference for virtual care often presented to the clinic in-person first. We suspect this preference for an initial visit in-person is due to a greater comfort level in building a primary care patient–physician relationship in-person compared with virtual care. It has been suggested that technology, which may reduce interpersonal risk during a patient–provider encounter, may consequently undermine the creation of a trusting and compassionate relationship³⁶; it is possible that this notion is implicit, manifesting in our study as a large proportion of patients seeking in-person visits initially before proceeding with care virtually. Patients may see an initial in-person encounter as a supportive way to build a stronger patient–provider relationship.

Patients who engaged in virtual-only visits were significantly more likely to have visits for arthropathies and related disorders than patients who had clinic-only or some virtual visits. Traditionally, telemedicine services have been utilized most commonly for treating URIs including acute pharyngitis. In our clinical setting, however, URIs were seen in both in-person and virtual settings.

Of note, there was no statistically significant difference between patients who used in-person, virtual, or both visit types, when seeing a physician for a general medical or annual physical exam. This category includes both adult physicals and preventive care. This finding suggests some patients are willing to receive preventive health services through virtual care, rather than solely traditional in-person means.

Telemedicine has often been used to deliver urgent care,^{11,17} but our findings suggest its use should not be limited to urgent care alone. Some preventive care can be delivered virtually, including assessing a patient's risk factors and need for additional diagnostic screening and immunizations, without requiring an in-person physical examination. As Choosing Wisely guidelines³⁷ do not recommend annual physical exams in healthy patients, telemedicine may offer patients a convenient opportunity to engage in preventive care and address health concerns.

Limitations

Our study has several limitations. First, there were a limited number of repeat visits. With the majority of patients completing only one visit in the clinic, it is difficult to assess whether the modality they chose for the one visit is truly how they will engage in healthcare in CWC longer term. This limitation will be addressed with further study within the CWC population. Second, these results may not be easily generalizable given our focused ACO population and our use of the HRA to limit the disease severity of our patients. The HRA also made it less likely for older patients to receive care through the clinic. Third, some diagnoses occur with higher prevalence in the CWC patient population compared to available NAMCS data and diagnosis groups. For example, urinary tract infection (UTI) as a single diagnosis code was not prevalent enough in CWC to make the top 10 diagnosis groups analyzed here; however, if grouped with other urinary symptoms, then UTI would be among the top 10 diagnosis groups. Finally, we were not able to compare this model to an external/existing model or to a traditional in-person primary care or urgent care-based telemedicine service.

Conclusions

Our study provides the first evaluation, to our knowledge, of the differences between patients who choose virtual versus in-person care. We found men were more likely to engage in

virtual-only care and young patients are willing to accept virtual care, although many would prefer to complete an in-person visit first. Our findings suggest that a “bricks-and-clicks” model of care where telemedicine is supported by a brick-and-mortar location may be an effective way to leverage telemedicine to deliver primary care. Given the learnings achieved from this virtual care pilot, the decision was made to integrate the clinic into the rest of primary care to scale both the learnings and aspects of the model.

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Disclosure Statement

No competing financial interests exist.

Supplementary Material

Supplementary Data 1

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