Aligning Health Care and Social Services to Reduce Hospitalizations and Emergency Department Visits

An Evaluation of the Community Care Connections Program

Kelley Akiya, MPA, Elisa Fisher, MPH, MSW,† Annie Wells, BA,‡ Yan Li, PhD,§ Christine Peck, LMSW,‡ and José A. Pagán, PhD**

Background: Integration of social services in health care delivery is increasingly recognized as a potential strategy for improving health and reducing the use of acute care services. Collaborative models that provide older adults with case management, linkages to social services, and assistance with health care navigation have emerged as promising strategies.

Objective: The objective of this study was to evaluate the Community Care Connections (CCC) program, a cross-sector collaboration designed to align social and health care services for older adults.

Research Design: We compared hospitalizations and emergency department (ED) visits 90 days after enrollment with a propensity score–matched group of non-CCC patients. Subgroup analyses were also conducted for adults with hypertension, diabetes, and high cholesterol.

Subjects: A total of 1004 patients enrolled in CCC between June 1, 2016, and November 15, 2018, and 1004 matched patients from the same metropolitan area.

Measures: Mean hospitalizations and ED visits per patient 90 days after CCC enrollment.

Results: Mean hospitalizations were lower among CCC patients 90 days after enrollment than among non-CCC adults [difference = −0.039, 95% confidence interval (CI): −0.077 to −0.001, $P = 0.044$]. They were also lower among CCC patients with hypertension (difference = −0.057, 95% CI: −0.103 to −0.010, $P = 0.017$). However, 90 days after enrollment mean ED visits were higher among CCC patients relative to non-CCC adults (difference = 0.238, 95% CI: 0.195–0.281, $P < 0.001$).

Conclusions: Connecting older adults to social services while being served by the health care system may lead to decreases in hospitalizations. Cross-sector partnerships that address social and economic needs may reduce the use of costly health care services.

Key Words: social services integration, care coordination, health care navigation, hospitalizations, hypertension

(*Med Care* 2021;59: 671–678)

From the *Department of Public Health Policy and Management, School of Global Public Health, New York University; †The New York Academy of Medicine, New York; ‡Lifespan of Greater Rochester Inc., Rochester; and §Icahn School of Medicine at Mount Sinai, New York, NY.

Support for this publication was provided by the Robert Wood Johnson Foundation through the Systems for Action National Coordinating Center, Grant ID 75162. The study sponsor did not contribute to the study design; collection, analysis, or interpretation of data; writing the report; or the decision to submit the report for publication.

The authors declare no conflict of interest.

Correspondence to: José A. Pagán, PhD, Department of Public Health Policy and Management, School of Global Public Health, New York University, 715 Broadway, 10th Floor, New York, NY 10003. E-mail: jose.pagan@nyu.edu.

ISSN: 0025-7079/21/5908-0671

The detrimental impact of unmet social and economic needs on health and well-being is well-documented.[1–8] Challenges stemming from outside the health care delivery system including food insecurity, unstable housing, lack of access to transportation, and limited social support systems both negatively influence health outcomes and increase the risk of overusing health care services.[9,10] Health care leaders and other stakeholders have called for greater focus on social and economic needs and better integration of social and health care services to improve health outcomes. Notably, the Centers for Medicare and Medicaid Services (CMS) launched the Accountable Health Communities (AHC) initiative, a 5-year, $157-million program designed to improve community capacity to meet the social needs of Medicare and Medicaid beneficiaries.[11] In addition, in 2019 the National Academies of Sciences, Engineering, and Medicine released a consensus report recommending the expansion of social services in health care settings.[12]

Responding to calls for greater integration requires collaboration among the health care and social service sectors. Despite the fact that each sector contributes directly to health and well-being, these sectors have historically operated in silos, focusing on their own missions (ie, health care focusing on clinical medicine and social services on social welfare).[13] As a result, they have separate and fragmented financing structures, goals, and incentives, which hinders effective cross-sectoral collaboration.[12,14]

New models of collaboration between health care and social services have the potential to better meet the nonmedical needs of older adults while also improving health and reducing health care spending. In particular, interventions that provide people with case management, linkages to community-based or social services, or assistance with health care navigation have emerged as promising strategies.[15–19] Older

adults are likely to benefit from these services as they are at increased risk of multiple chronic conditions and disability as they age,[20] while facing unmet social and economic needs.[21] Collaborations between health care and social service providers may also help older adults to "age in place," which is associated with reduced social isolation, increased physical function, reduced symptoms of depression and pain, and increased life expectancy.[22]

While collaboration efforts have become more common and offer great promise for older adults,[23–25] there is a need to continuously improve social care and health care delivery integration models.[26,27] For example, a recent evaluation of the AHC initiative showed that this referral and navigation model leads to high acceptance of navigation by older adults but less resolution of health-related social needs.[28] Three quarters of eligible beneficiaries accepted navigation services but only one of every 7 adults with a year of navigation services had their health-related social needs resolved. The AHC model led to the fewer emergency department (ED) visits for the intervention group than the control group but no differences in hospitalizations between the 2 groups. To help address the evidence gap and inform the development and implementation of future programs, we evaluated the Lifespan of Greater Rochester's (Lifespan) Community Care Connections (CCC) program,[29] an initiative designed to coordinate health care and social services for older adults to reduce unnecessary health care utilization and improve health outcomes.

METHODS

Lifespan is a community-based aging services provider located in upstate New York. Founded in 1971, Lifespan serves ~40,000 adults each year. It provides a range of direct services including care navigation, financial management, and caregiver support. It also partners with other local social service providers, such as Meals-on-Wheels and faith-based organizations, to provide complementary services to clients. Lifespan began implementing the CCC demonstration project in 2016 with funding from the New York State Department of Health.[29] The goal of the CCC program was to integrate social services into medical systems of care to better meet the triple aim of improving the patient experience and health while lowering health care costs.[30]

The CCC program provides intensive case management and health care coordination to older adults. The program embedded social work care managers in physician offices and established referral relationships with other local medical providers. Physicians, nurse care managers, or social workers employed in primary care offices referred older adults to CCC who were: (1) overusing ED or hospital-based medical care; or (2) struggling with a nonclinical issue that affected their health (eg, transportation or food insecurity). Medical staff either walked the patient over to meet with the embedded CCC care manager or reached out by phone directly to a CCC care manager who then connected the patient with services. Patients were referred to the program through the Geriatric Wellness Screen (GWS), a tool developed in collaboration with the University of Rochester to gather information about the health and social determinants of health of program participants. The GWS leads to an Older Americans Resources and Services (OARS) score that was then used to develop personalized care plans to address identified needs. The mix of available services was large and ranged from chronic disease classes to home meal deliveries, housekeeping, home modifications, and transportation. When necessary, licensed practical nurses, who are supervised by registered nurses, also provided clients with health care coordination services (eg, assistance with accessing health care services and adhering to treatment recommendations). Regardless of whether someone is overusing ED services or hospital-based medical care, the CCC program is designed to reduce utilization as clients would have access to multiple social services.

The CCC program enrolled 1928 patients between June 10, 2016, and March 1, 2019, and 1316 consented to participate in the research study. Lifespan staff recorded demographic, diagnosis, and service connection information on all CCC participants who enrolled and provided consent. Care managers or care coordinators recorded clients as "connected" to service after confirming that the client accessed the program or resource. To obtain data on hospitalizations and ED visits, Lifespan partnered with the Rochester Regional Health Information Organization (RHIO), an electronic health information exchange that receives data on all hospital admissions, discharges, and transfers for all health systems providing services in 13 counties in upstate New York. The RHIO linked CCC client information to clinical encounter data and identified a large group of adults with similar demographics as CCC participants with records in the exchange between January 1, 2016, and December 31, 2018. The study protocol was approved by the Institutional Review Board of the New York Academy of Medicine.

Demographic variables provided to the research team included age, sex, race, ethnicity, and county of residence. We recoded race information on CCC participants to match the categories used by the Rochester RHIO and combined the race and ethnicity variables into a single variable (non-Hispanic White, non-Hispanic Black, non-Hispanic Other Race, and Hispanic). County information was also recoded into a dichotomous variable indicating whether the person lived in Monroe County.

The CCC program enrollment date was defined as 30 days after the CCC intake date to account for lags between client assessment and the receipt of social services. The RHIO regularly provided hospital inpatient and ED encounter data for CCC program participants to Lifespan, including the date of the encounter. We first calculated the total number of hospital inpatient and ED encounters during the 90 days before and 90 days after the program enrollment date. We then divided total hospital inpatient and ED encounters by the total number of participants (ie, the average number of hospitalizations and ED visits). The 90-day follow-up interval (after the 30 d after the CCC intake date) was chosen because this is consistent with the median time it takes to open and close a case, which is 117 days. The RHIO also provided the research team with ED and hospitalization data on older adults that could serve as a comparison group. The data included the quarter during the year in which the ED or hospitalization

took place and not the actual day. The unmatched comparison group data was reorganized so that each person would contribute 10 observations, one for each quarter of the evaluation period. This is the case because we had access to 10 quarters of data for each person in the comparison group (thus, each unmatched comparison group adult could be matched to a program participant at 9 different pre/post comparison periods). For a given quarter and person, postoutcome measures were defined as the number of ED and hospitalizations occurring during the quarter, and preoutcome measures were defined as the number of ED and hospitalizations occurring during the previous quarter.

Given that we knew the exact dates for the precomparison and postcomparison periods for CCC program participants but not for the comparison group (where we only knew the number of ED visits and hospitalizations during each quarter of each calendar year), we coded each CCC program participant so that their data belonged to the post quarter that best overlapped with their program enrollment date. For example, for participants with program enrollment dates during the first half of a given quarter, the post quarter was defined as the quarter of enrollment and for CCC program participants with enrollment dates during the second half of a given quarter, the post quarter was defined as the next quarter. A total of 1123 of 1316 consented CCC participants had enrollment dates that overlapped with the 9 pre/post comparison periods and 1004 had complete data and were included in the analysis.

All data were analyzed using Stata 16.1.[31] To describe the characteristics of CCC program participants, we calculated the means and frequencies of demographic and health condition variables. We also calculated the proportion of respondents receiving each type of service linkage. To evaluate the influence of the CCC program on health care utilization, we constructed a set of comparison groups from the RHIO data using propensity score matching. CCC program participants were matched to non-CCC adults with clinical encounter data housed in the RHIO using nearest neighbor matching without replacement.[32] We used multiple Stata algorithms (*pscore psmatch pstest*) to generate matched pairs and check for the balance.[33]

We constructed separate comparison groups to analyze each of our outcomes of interest (hospitalizations and ED visits). First, we generated propensity scores using a logit regression of CCC status as a function of demographics (age, sex, race/ethnicity, county), a quarter indicator, and the number of preintervention hospitalizations or ED visits. We then used *pstest* to assess covariate balance and compared both unadjusted and propensity-matched adjusted covariate distributions between CCC and non-CCC adults. This process was repeated for adults with hypertension, diabetes, and high cholesterol, respectively. After matched pairs were identified, differences in postintervention hospitalizations and ED visits were assessed using paired *t* tests.

RESULTS

Table 1 reports the demographic and socioeconomic profile of 1004 older adults with complete data who enrolled in the CCC program between June 1, 2016, and November 15, 2018. Almost 63% of CCC program participants were female, 65% were 75 years of age or older, and 81% were non-Hispanic White. Forty percent of CCC program participants reported incomes < $1000 per month and 76% reported incomes < $2000 per month. Forty-four percent reported living alone. The most common health conditions and service linkages are listed in Table 2. The most common conditions were hypertension (42%), diabetes (27%), and high cholesterol (21%). In terms of service linkages, more than a quarter of CCC participants received caregiver support (28%) and financial benefits counseling (28%). The next most common services were transportation (20%), home health aide/personal care support (15%), health insurance counseling (15%), and assistance with Medicaid enrollment (15%).

TABLE 1. Characteristics of Community Care Connections Participants Enrolled From June 1, 2016, to November 15, 2018 (N = 1004)

Characteristics	n (%)
Age (y)	
< 65	90 (8.96)
65–74	263 (26.20)
75–84	374 (37.25)
≥ 85	277 (27.59)
Sex	
Female	630 (62.75)
Male	374 (37.25)
Race/ethnicity	
Non-Hispanic White	816 (81.27)
Non-Hispanic Black	132 (13.15)
Non-Hispanic Other Race	17 (1.69)
Hispanic	39 (3.88)
Income	
< $1000/month	402 (40.04)
$1000–$1499/month	210 (20.92)
$1500–$1999/month	154 (15.34)
$2000–$2499/month	111 (11.06)
≥ $2500/month	127 (12.65)
County	
Monroe County	783 (77.99)
Outside Monroe County	221 (22.01)
Living arrangement	
Alone	439 (43.73)
With spouse only	263 (26.20)
Other	261 (26.00)
Missing	41 (4.08)

To conduct the matched analysis, all CCC participants with a program enrollment date between June 1, 2016, and November 15, 2018, and with complete data on the matching covariates were included in the intervention sample (N = 1004). The unmatched comparison group sample included 59,081 older adults and 561,984 comparison periods with complete data. Before matching, the CCC sample and unmatched comparison sample varied significantly on all covariates. For example, relative to the unmatched comparison sample CCC participants were significantly more likely to be older, female, non-Hispanic Black, or Hispanic, and to have lived in Monroe County. Participants also had significantly higher inpatient hospitalizations and ED visits during their preintervention period. After matching, covariates were well-balanced for the comparison groups. The distribution of covariates for CCC participants and the unmatched and matched

TABLE 2. Common Health Conditions and Service Linkages Among Community Care Connections Program Participants Enrolled From June 1, 2016, to November 15, 2018 (N = 1004)

Chronic Conditions	n (%)	Service Linkages	n (%)
Hypertension	423 (42.13)	Caregiver support	280 (27.89)
Diabetes	276 (27.49)	Financial benefits counseling	279 (27.79)
High cholesterol	211 (21.02)	Transportation	199 (19.82)
Depression	204 (20.32)	Health insurance counseling	154 (15.34)
Arthritis	188 (18.73)	Home health aid	154 (15.34)
Chronic obstructive pulmonary disease	162 (16.14)	Medicaid enrollment	146 (14.54)
Dementia	147 (14.64)	Home modification	143 (14.24)
Heart disease	111 (11.06)	Personal Emergency Response Services (PERS)	131 (13.05)
Cancer	94 (9.36)	Durable medical equipment	130 (12.95)
Heart failure	87 (8.67)	Housekeeping	121 (12.05)

comparison groups are presented in Table 3. A balanced distribution of covariates was also achieved for each of the matched comparison groups for CCC participants with hypertension, diabetes, and high cholesterol. These covariate distributions are presented in Table 4.

Results of the matched analysis are presented in Table 5. Among CCC participants included in the matched sample, mean inpatient hospitalizations decreased 40% between the 90-day preenrollment period and the 90-day postenrollment period [95% confidence interval (CI): −66% to −13%, $P = 0.004$]. Hospitalizations decreased 20% among CCC participants with hypertension (95% CI: −74% to 34%, $P = 0.467$), decreased 28% among those with diabetes (95% CI: −82% to 26%, $P = 0.310$), and rose slightly (8%) among those with high cholesterol (95% CI: −62% to 77%). Postintervention, the mean number of hospitalizations per patient among all CCC participants was significantly lower (difference = −0.039, 95% CI: −0.077 to −0.001, $P = 0.044$) than among non-CCC adults. Similarly, mean hospitalizations were lower among CCC participants with hypertension relative to non-CCC adults (difference = −0.057, 95% CI: −0.103 to −0.010, $P = 0.017$). Compared with non-CCC adults, mean hospitalizations were also lower among CCC participants with diabetes (difference = −0.033, 95% CI:−0.099 to 0.034, $P = 0.336$) and high cholesterol (difference = −0.071, 95% CI: −0.153 to 0.010, $P = 0.087$), but these differences were not statistically significant.

TABLE 3. Baseline Characteristics of CCC Participants Enrolled From June 1, 2016, to November 15, 2018, and Unmatched and Matched Comparison Groups

		Unmatched		Matched (Preintervention Hospitalizations)		Matched (Preintervention ED Visits)	
Characteristics	**CCC**	**Comparison**	***P****	**Comparison**	***P****	**Comparison**	***P****
N	1004	560,980		1004		1004	
Age (mean)	77.75	74.25	< 0.001	77.69	0.849	77.90	0.317
Sex (%)			< 0.001		0.890		0.611
Male	37.25	43.65		36.95		36.16	
Female	62.75	56.35		63.05		63.84	
Race/ethnicity (%)			< 0.001		0.992		0.412
Non-Hispanic White	81.27	97.02		81.37		81.47	
Non-Hispanic Black	13.15	2.25		13.35		12.05	
Non-Hispanic Other Race	1.69	0.55		1.59		1.29	
Hispanic	3.88	0.18		3.69		5.18	
County (%)			< 0.001				0.425
Monroe	77.99	20.34		78.09	0.957	76.49	
Outside Monroe	22.01	79.66		21.91		23.51	
Quarter (%)			< 0.001		1.00		0.982
2016Q3	10.06	10.00		10.26		10.96	
2016Q4	13.05	10.00		12.95		13.84	
2017Q1	11.65	10.00		11.85		12.25	
2017Q2	11.35	10.00		11.75		11.35	
2017Q3	13.75	10.00		13.45		13.25	
2017Q4	11.45	10.00		11.35		10.86	
2018Q1	9.26	10.00		9.26		8.76	
2018Q2	9.06	10.00		9.06		9.06	
2018Q3	5.78	10.00		5.78		6.08	
2018Q4	4.58	10.00		4.28		3.59	
Prequarter hospitalizations (mean)	0.10	0.06	< 0.001	0.10	0.889	—	—
Prequarter ED visits (mean)	0.39	0.05	< 0.001	—	—	0.40	0.162

CCC indicates Community Care Connections; ED, emergency department.
*P-values (2 sided) calculated using χ^2 test of independence for categorical variables and paired t test or Mann-Whitney test for continuous variables.

TABLE 4. Characteristics of CCC Participants and Matched Comparison Groups, by Chronic Health Condition*

	Hypertension					Diabetes					High Cholesterol				
		Comparison Groups					Comparison Groups					Comparison Groups			
Characteristics	**CCC**	**Hospitalizations**	***P***	**ED**	***P***	**CCC**	**Hospitalizations**	***P***	**ED**	***P***	**CCC**	**Hospitalizations**	***P***	**ED**	***P***
N	423	423		423		276	276		276		211	211		211	
Age (mean)	78.28	78.34	0.98	78.35	0.91	75.55	75.71	0.86	76.03	0.54	78.07	78.13	0.98	78.60	0.50
Sex (%)			0.83		0.72			1.00		0.86			0.92		0.76
Male	34.04	34.75		35.22		40.94	40.94		41.67		36.97	37.44		38.39	
Female	65.96	65.25		64.78		59.06	59.06		58.33		63.03	62.56		61.61	
Race/ethnicity (%)			0.97		0.86			0.99		0.94			0.99		0.56
Non-Hispanic White	78.96	79.43		78.01		72.46	72.83		72.10		80.57	81.04		83.41	
Non-Hispanic Black	16.78	16.78		17.02		20.29	20.29		19.93		14.22	14.22		10.43	
Non-Hispanic Other Race	1.89	1.89		1.65		2.54	2.17		2.17		2.37	2.37		1.90	
Hispanic	2.36	1.89		3.31		4.71	4.71		5.80		2.84	2.37		4.27	
County			0.93		0.74			1.00		0.38			0.91		0.82
Lives in Monroe	78.96	79.20		78.01		82.61	82.61		79.71		78.20	78.67		77.25	
Lives outside Monroe	21.04	20.80		21.99		17.39	17.39		20.29		21.80	21.33		22.75	
Quarter (%)			1.00		0.99			1.00		1.00			1.00		1.00
2016Q3	9.22	9.22		9.93		9.42	9.78		10.14		9.48	9.95		10.90	
2016Q4	14.89	15.37		16.08		16.30	15.94		17.75		10.43	10.43		11.85	
2017Q1	14.66	14.89		16.78		12.32	12.68		11.96		15.17	15.64		15.17	
2017Q2	13.00	13.24		12.53		11.96	11.96		10.87		14.69	14.69		14.69	
2017Q3	12.53	12.53		12.06		11.23	11.23		10.14		13.74	13.27		13.27	
2017Q4	9.93	9.93		8.75		11.23	11.23		10.87		8.53	8.53		8.53	
2018Q1	7.33	7.57		6.62		8.33	8.33		9.78		6.16	7.11		5.69	
2018Q2	8.27	7.80		8.51		9.06	8.70		9.42		8.06	7.58		8.53	
2018Q3	5.91	5.67		5.44		6.16	6.16		5.80		8.06	7.58		6.64	
2018Q4	4.26	3.78		3.31		3.99	3.99		3.26		5.69	5.21		4.74	
Preintervention hospitalizations (mean)	0.06	0.09	0.63	—		0.09	0.10	0.86	—		0.06	0.09	0.82		
Preintervention ED visits (mean)	0.37	—		0.36	0.33	0.41	—		0.46	0.58	0.35	—		0.37	0.57

CCC indicates Community Care Connections; ED, emergency department.
*P-values (2 sided) calculated using χ^2 for categorical variables, and paired t test or Mann-Whitney test for continuous variables.

Mean ED visits per patient decreased between preenrollment and postenrollment among all CCC program participants and those with each of the 3 common health conditions. However, postenrollment ED visits were significantly lower among non-CCC adults. Specifically, mean ED visits decreased 33% for all CCC participants (95% CI: −46% to −20%, $P < 0.001$), 42% among CCC participants with hypertension (95% CI: −62% to −21%, $P < 0.001$), 23% among CCC participants with diabetes (95% CI: −48% to 2%, $P = 0.073$), and 32% among CCC participants with high cholesterol (95% CI: −59% to −6%, $P = 0.018$). However, relative to non-CCC adults, postenrollment ED visits were significantly higher among the full CCC sample than non-CCC adults (difference = 0.238, 95% CI: 0.195–0.281, $P < 0.001$). When compared with non-CCC adults, postintervention ED visits were also significantly higher among CCC participants with hypertension (difference = 0.189, 95% CI: 0.126–0.252, $P < 0.001$), among CCC participants with diabetes (difference = 0.279, 95% CI: 0.187–0.371, $P < 0.001$), and CCC participants with high cholesterol (difference = 0.242, 95% CI: 0.158–0.325, $P < 0.001$).

DISCUSSION

CCC program participation was associated with fewer inpatient hospitalizations in the 90 days after program enrollment but was not associated with fewer ED visits when compared with a control group of demographically similar adults from the Rochester, New York region. In the 90 days after enrollment, CCC program participants had 40% fewer hospitalizations compared with the 90 days before the intervention, and 39% fewer hospitalizations than demographically similar non-CCC adults. Among CCC program participants with hypertension, hospitalizations decreased 20% after program enrollment and their postenrollment hospitalizations were 55% lower than non-CCC adults. Postenrollment hospitalizations were lower for CCC adults with diabetes and high cholesterol relative to non-CCC adults, but these differences were not statistically significant at a 0.05 α level.

In terms of ED visits, CCC program participants had fewer ED visits in the 90 days after program enrollment relative to the 90-day period before the intervention, but the decline among adults in the matched comparison group was

TABLE 5. Prehospitalization and Posthospitalization and ED Visits for CCC Participants and Matched Comparison Groups

	Hospitalizations				ED Visits			
Groups	90 Days Before Program Start	90 Days After Program Start	Difference (95% Confidence Interval)	*P**	90 Days Before Program Start	90 Days After Program Start	Difference (95% Confidence Interval)	*P**
All								
CCC (N = 1004)	0.101	0.061			0.394	0.263		
Comparison group (N = 1004)	0.104	0.100	–0.039 (–0.077 to –0.001)	0.044	0.403	0.025	0.238 (0.195–0.281)	< 0.001
Hypertension								
CCC (N = 423)	0.059	0.047	–0.057 (–0.103 to –0.010)	0.017	0.374	0.217	0.189 (0.126–0.252)	< 0.001
Comparison group (N = 423)	0.087	0.104			0.362	0.028		
Diabetes								
CCC (N = 276)	0.091	0.065	–0.033 (–0.099 to 0.034)	0.336	0.409	0.315	0.279 (0.187–0.371)	< 0.001
Comparison group (N = 276)	0.098	0.098			0.457	0.036		
High cholesterol								
CCC (N = 211)	0.062	0.066	–0.071 (–0.153 to 0.010)	0.087	0.365	0.246	0.242 (0.158–0.325)	< 0.001
Comparison group (N = 211)	0.085	0.137			0.374	0.005		

CCC indicates Community Care Connections; ED, emergency department.
*Paired *t* test.

greater. After program enrollment, CCC program participants had 33% fewer ED visits relative to the 90 days before the intervention, but statistically significantly higher visits than non-CCC adults. Similar trends were observed for adults with hypertension, diabetes, and high cholesterol.

The evidence of decreased hospitalizations is consistent with other studies of social care interventions[17,34] and suggests that responding to nonmedical needs by linking older adults to wraparound services may be a viable model for improving health and health system efficiency. As the population of older adults is expected to double by 2050,[35] identifying successful interventions that reduce intensive use of acute care services is critical to managing the growing health care needs of this population. Our evaluation of the CCC program using a matched control group contributes to our understanding of how the integration of social and health care systems may improve health care and health outcomes.

The lack of evidence of improved ED visits is also compelling and reflects the ongoing challenges of designing and evaluating the integration of social services in health care settings.

In general, evaluations of social care interventions and health care utilization have produced mixed results.[14] While some have found positive effects, others have found inconsistency across utilization outcomes or not shown effects after using a control group in the evaluation design.[36,37]

There are several feasible explanations for the difference in the detected effects of the CCC program and hospitalizations versus ED visits. First, limitations in the comparison group data may have influenced the success of the matching. We did not have data on the social and economic circumstances, health characteristics, nor reasons for clinical encounters of potential comparison group adults. After matching, CCC program participants may have had higher or more complex health needs than non-CCC adults or been more likely to visit the ED for reasons related to underlying health conditions or unmet social or economic needs than non-CCC adults. Future research that can match on patient health, social challenges, and/or disease-specific causes of clinical encounters would produce more reliable estimates of program impacts.

Second, other researchers have noted that integration of social services often focuses on mitigating immediate social and health needs but are not designed to address the underlying social or economic conditions that give rise to those needs.[13,38] If institutional and structural factors in the community that influence ED visits remain unchanged, then the intervention may not have been intensive enough to overcome the influence of these macro-level or meso-level factors. Last, although both hospitalizations and ED visits are costly and often avoidable, they may also be attributable to different mechanisms. Health care providers determine whether a patient is admitted to the hospital, whereas ED visits are oftentimes a response by patients. Thus, hospitalizations are sometimes more reflective of the health status of a person, whereas ED visits may also reflect the care-seeking behavior of a patient.[39]

The study has several limitations that should be considered when interpreting the findings. First, we cannot be entirely certain that the comparison group provided an appropriate counterfactual for the patients that were selected to receive the intervention. When patients are enrolled into a program during a period of high need, health care utilization may regress to the mean. Although we had access to rich, timely data to build our control group, we do

not know if patients in the control group were exactly at the same point in their trajectory of utilization. Also, although most adults in the control and matched groups were likely to be insured through Medicare, we did not know the level of access they may have to health care and social services that depend on their types of health insurance coverage (ie, some adults may have Medicare, some may have Medicare and Medicaid, and others may have access to services through an Accountable Care Organization). Second, we did not have information on the causes of a given hospitalization or ED visit, nor did we have data on the clinical characteristics and many key demographics of adults in the comparison group. Although many participants had low-income levels, most participants were also 65 years of age and over (and, thus, would have access to most health care services as anyone else that is Medicare eligible). Also, the number of preperiod ED visits for adults in the comparison group increased substantially after matching; this is a concern that we were not able to address in the matching process because we had limited variables available for matching. Third, we did not have the exact dates of ED and hospital visits for adults in the comparison group (and only knew that visits took place in a given quarter), whereas we knew the exact dates of ED and hospital visits for program participants. Fourth, we did not have information on social determinants or receipt of social services among comparison group adults. Fifth, program participants may have received care earlier through the ED and there is a chance that this may have led to fewer hospitalizations. Last, we used a relatively short follow-up period (90 d) that is consistent with the median length of social services received through CCC, but the findings may not translate to a longer postimplementation period.

Addressing the social, economic, and clinical needs of older adults is a necessary condition to shifting from volume-based to value-based medical care. Partnerships across different sectors that address nonmedical factors that impact health could also address fragmentation in the delivery of health care and social services and reduce health care utilization. Our study offers several promising insights into potential models of collaboration and integration that can be refined and expanded within the health care delivery system.

ACKNOWLEDGMENTS

The authors thank Sara Abrams, Wendy Beehner, and Andrea Richardson of the Rochester RHIO for providing support related to hospital encounter data. They are also grateful to the New York State Department of Health for funding the initial Community Care Connections (CCC) demonstration project, as well as Accountable Health Partners, the ESL Charitable Foundation, the Finger Lakes Performing Providers System, the Greater Rochester Health Foundation, and the Wegman's Foundation for their ongoing financial support of the CCC program. The authors also thank the CCC Advisory Committee and Co-Chairs, Drs Richard Gangemi and William Hall, and Sandy Schencke, CCC Program Coordinator, for their guidance and support implementing the CCC program.

REFERENCES

1. Marmot M. Social determinants of health inequalities. *Lancet*. 2005;365:1099–1104.
2. Marmot M, Bell R. Fair society, healthy lives. *Public Health*. 2012;126 (suppl 1):S4–S10.
3. McGinnis JM, Williams-Russo P, Knickman JR. The case for more active policy attention to health promotion. *Health Aff*. 2002;21:78–93.
4. Bradley EH, Taylor LA. *The American Health Care Paradox: Why Spending More is Getting Us Less*. New York, NY: Public Affairs; 2013.
5. Prus SG. Comparing social determinants of self-rated health across the United States and Canada. *Soc Sci Med*. 2011;73:50–59.
6. Braveman P, Egerter S, Williams DR. The social determinants of health: coming of age. *Annu Rev Public Health*. 2011;32:381–398.
7. Chetty R, Stepner M, Abraham S, et al. The association between income and life expectancy in the United States, 2001-2014. *JAMA*. 2016;315:1750–1766.
8. Syed ST, Gerber BS, Sharp LK. Traveling towards disease: transportation barriers to health care access. *J Community Health*. 2013;38:976–993.
9. Berkowitz SA, Kalkhoran S, Edwards ST, et al. Unstable housing and diabetes-related emergency department visits and hospitalization: a nationally representative study of safety-net clinic patients. *Diabetes Care*. 2018;41:933–939.
10. Berkowitz SA, Seligman HK, Meigs JB, et al. Food insecurity, healthcare utilization, and high cost: a longitudinal cohort study. *Am J Manag Care*. 2018;24:399–404.
11. Alley DE, Asomugha CN, Conway PH, et al. Accountable health communities—addressing social needs through Medicare and Medicaid. *N Engl J Med*. 2016;374:8–11.
12. National Academies of Sciences, Engineering, and Medicine. *Integrating Social Care into the Delivery of Health Care: Moving Upstream to Improve the Nation's Health*. Washington, DC: National Academies Press; 2019.
13. Green K, Zook M. When talking about social determinants, precision matters. Health Affairs Blog; October 29, 2019. Avaialble at: www.healthaffairs.org/do/10.1377/hblog20191025.776011/full/. Accessed January 24, 2021.
14. Fichtenberg C, Delva J, Minyard K, et al. Health and human services integration: generating sustained health and equity improvements. *Health Aff*. 2020;39:567–573.
15. Weerahandi H, Lipani M, Kalman J, et al. Effects of a psychosocial transitional care model on hospitalizations and cost of care for high utilizers. *Soc Work Health Care*. 2015;54:485–498.
16. Fraser MW, Lombardi BM, Wu S, et al. Integrated primary care and social work: a systematic review. *J Soc Social Work Res*. 2018;9:175–215.
17. Vest JR, Harris LE, Haut DP, et al. Indianapolis provider's use of wraparound services associated with reduced hospitalizations and emergency department visits. *Health Aff*. 2018;37:1555–1561.
18. Rowe JM, Rizzo VM, Shier Kricke G, et al. The Ambulatory Integration of the Medical and Social (AIMS) model: a retrospective evaluation. *Soc Work Health Care*. 2016;55:347–361.
19. Cornell PY, Halladay CW, Ader J, et al. Embedding social workers in Veterans Health Administration primary care teams reduces emergency department visits. *Health Aff*. 2020;39:603–612.
20. Centers for Disease Control and Prevention. *The State of Aging and Health in America 2013*. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2013.
21. Osborn R, Doty MM, Moulds D, et al. Older Americans were sicker and faced more financial barriers to health care than counterparts in other countries. *Health Aff*. 2017;36:2123–2132.
22. Marek KD, Popejoy L, Petroski G, et al. Clinical outcomes of aging in place. *Nurs Res*. 2005;54:202–211.
23. Rizzo V, Rowe J. Cost-effectiveness of social work services in aging: an updated systematic review. *Res Soc Work Pract*. 2016;1:1–15.
24. Stranges PM, Marshall VD, Walker PC, et al. A multidisciplinary intervention for reducing readmissions among older adults in a patient-centered medical home. *Am J Manag Care*. 2015;21:106–113.
25. Bronstein LR, Gould P, Berkowitz SA, et al. Impact of a social work care coordination intervention on hospital readmission: a randomized controlled trial. *Soc Work*. 2015;60:248–255.

26. Gottlieb LM, Wing H, Adler NE. A systematic review of interventions on patients' social and economic needs. *Am J Prev Med*. 2017;53: 719–729.
27. Valaitis RK, Carter N, Lam A, et al. Implementation and maintenance of patient navigation programs linking primary care with community-based health and social services: a scoping literature review. *BMC Health Serv Res*. 2017;17:116.
28. RTI International. Accountable Health Communities (AHC) Model Evaluation: First Evaluation Report; 2020. Available at: https://innovation.cms.gov/data-and-reports/2020/ahc-first-eval-rpt. Accessed January 24, 2021.
29. Lifespan of Greater Rochester Inc. Community Care Connections Final Report; 2018. Available at: www.health.ny.gov/health_care/medicaid/redesign/docs/2018_finalreport_commcare.pdf. Accessed January 24, 2021.
30. Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. *Health Aff*. 2008;27:759–769.
31. StataCorp. *Stata Statistical Software: Release 161*. College Station, TX: StataCorp LLC; 2020.
32. Austin PC. An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behav Res*. 2011;46:399–424.
33. Garrido MM, Kelley AS, Paris J, et al. Methods for constructing and assessing propensity scores. *Health Serv Res*. 2014;49:1701–1720.
34. Berkowitz SA, Terranova J, Hill C, et al. Meal delivery programs reduce the use of costly health care in dually eligible Medicare and Medicaid beneficiaries. *Health Aff*. 2018;37:535–542.
35. American Association of Retired Persons. The longevity economy: how people over 50 are driving social and economic value in the US; 2016. Available at: www.aarp.org/content/dam/aarp/home-and-family/personal-technology/2016/09/2016-Longevity-Economy-AARP.pdf. Accessed January 24, 2021.
36. Finkelstein A, Zhou A, Taubman S, et al. Health care hotspotting—a randomized, controlled trial. *N Engl J Med*. 2020;382:152–162.
37. Berkowitz SA, Hulberg AC, Standish S, et al. Addressing unmet basic resource needs as part of chronic cardiometabolic disease management. *JAMA Intern Med*. 2017;177:244–252.
38. Lantz PM. The medicalization of population health: who will stay upstream? *Milbank Q*. 2018;97:36–39.
39. Samuel LJ, Szanton SL, Cahill R, et al. Does the Supplemental Nutrition Assistance Program affect hospital utilization among older adults? The case of Maryland. *Popul Health Manag*. 2017;21:88–95.