

# The Effects of Guided Care on the Perceived Quality of Health Care for Multi-morbid Older Persons: 18-Month Outcomes from a Cluster-Randomized Controlled Trial

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**BACKGROUND:** The quality of health care for older Americans with chronic conditions is suboptimal.

**OBJECTIVE:** To evaluate the effects of “Guided Care” on patient-reported quality of chronic illness care.

**DESIGN:** Cluster-randomized controlled trial of Guided Care in 14 primary care teams.

**PARTICIPANTS:** Older patients of these teams were eligible to participate if, based on analysis of their recent insurance claims, they were at risk for incurring high health-care costs during the coming year. Small teams of physicians and their at-risk older patients were randomized to receive either Guided Care (GC) or usual care (UC).

**INTERVENTION:** “Guided Care” is designed to enhance the quality of health care by integrating a registered nurse, trained in chronic care, into a primary care practice to work with 2–5 physicians in providing comprehensive chronic care to 50–60 multi-morbid older patients.

**MEASUREMENTS:** Eighteen months after baseline, interviewers blinded to group assignment administered the Patient Assessment of Chronic Illness Care (PACIC) survey by telephone. Logistic and linear regression was used to evaluate the effect of the intervention on patient-reported quality of chronic illness care.

**RESULTS:** Of the 13,534 older patients screened, 2,391 (17.7%) were eligible to participate in the study, of which 904 (37.8%) gave informed consent and were cluster-randomized. After 18 months, 95.3% and 92.2% of the GC and UC recipients who remained alive and eligible completed interviews. Compared to UC recipients, GC recipients had twice greater odds of rating their chronic care highly (aOR=2.13, 95% CI=1.30–3.50, p=0.003).

**CONCLUSION:** Guided Care improves self-reported quality of chronic health care for multi-morbid older persons.

**KEY WORDS:** quality of care; chronic illness; older.

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## INTRODUCTION

A recently published research agenda emphasized the need to develop and evaluate more effective models of health care, recognizing that the often fragmented, uncoordinated, and inefficient current delivery system does not meet the needs of older Americans who require complex care for multiple chronic conditions<sup>1–3</sup>. Putative remedies such as disease-specific guidelines, care management, and disease management programs may be ineffective or impractical<sup>4,5</sup>. As a result, many chronically ill patients and their families experience suboptimal quality of care, many primary care physicians are dissatisfied, and Medicare incurs unnecessarily high expenses<sup>6</sup>. Multimorbid older patients seek and need individualized, patient-centered, easily accessible care, supported by a single coordinator, and associated with a clearly communicated health plan<sup>7</sup>.

The Chronic Care Model (CCM) postulates that achieving this goal will require redesign of the current delivery system, enhancement of decision support, improvement of clinical information systems, encouragement for self-management, and access to community resources<sup>8</sup>. In accordance with the CCM, we developed “Guided Care” (GC)<sup>9</sup>. GC is comprehensive care that incorporates evidence-based processes and patient preferences to attempt to improve outcomes for patients 65 years or older with chronic conditions and complex health-care needs<sup>9</sup>. GC is provided by a practice-based registered nurse who works closely with two to five primary care physicians and other members of the practice staff. This team provides comprehensive, coordinated, chronic health care to a panel of 50–60 of the practice’s high-risk older patients. Results of a pilot study of Guided Care conducted during 2003–2004 suggested that Guided Care may improve the patient-reported quality and efficiency of chronic care<sup>10,11</sup>.

GC was designed to improve several outcomes including patients’ health-related quality of life and functional independence, as well as the quality and efficiency of their health care. The purpose of the present analysis is to measure the effect of

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18 months of GC on patients' perceptions of the quality of the care they receive for their chronic conditions. We used the Patient Assessment of Chronic Illness Care (PACIC) instrument to measure patient-reported quality of chronic care<sup>12</sup>. The PACIC is associated with use of self-management resources, self-management behaviors, and quality of life<sup>13</sup>. Preliminary data from the first 6 months of this cluster-randomized controlled trial (cRCT) of GC indicated that the odds of rating overall chronic care as "high-quality" were twice as high in patients who had received GC compared to patients who had received usual care (aOR=2.03, p=0.006)<sup>14</sup>.

In the present analysis, we test the hypothesis that, compared to usual care, 18 months of GC is associated with higher perceived quality of chronic care among multi-morbid older patients with complex health-care needs. We explore whether the effect of GC is consistent across patients with high and low pre-intervention PACIC scores.

## METHODS

In 2006, we launched a cRCT of GC in eight community-based primary care practices in urban and suburban neighborhoods in the Baltimore-Washington DC metropolitan area. Three practices were operated by Kaiser Permanente, a group-model managed care organization; four were operated by Johns Hopkins Community Physicians, a statewide network of community-based practices; one was operated by Medstar Physician Partners, a multi-site group practice. Additional study details have been published previously<sup>14</sup> (ClinicalTrials.gov ID# NCT00121940). The study was approved by the Institutional Review Boards of the Johns Hopkins Bloomberg School of Public Health, Kaiser-Permanente Mid-Atlantic States, and MedStar Physician Partners.

### Recruitment of Physicians

Teams of primary care physicians were eligible if they cared for at least 650 patients age 65 years or older, expressed willingness to participate, and agreed to provide an on-site office for a Guided Care Nurse (GCN). Fourteen eligible teams were invited and agreed to participate. Individual primary care physicians (board-certified internists and family physicians) were eligible to participate if they worked at least 70% time on these teams. All eligible physicians were informed about the requirements of the study; all gave written informed consent to participate (n=49).

### Recruitment of Nurses

To recruit nurses for the GCN role, we placed advertisements in local newspapers, human resources websites of participating delivery systems, and a regional nursing journal. To be eligible, applicants had to be licensed registered nurses with at least 3 years of practice experience. Applicants with strong communication skills, flexible approaches to complex problem-solving, cultural competence, comfort with interdisciplinary team care, experience in geriatric and community nursing, and enthusiasm for coaching patients and caregivers in self-management were preferred. Successful applicants gave written informed consent to serve as research subjects as well as providers of health care (n=7).

### Recruitment of Patient Participants

Patients of the participating physicians were eligible for initial screening if they were 65 years or older and covered by fee-for-service Medicare Parts A and B, a Kaiser-Permanente Medicare health plan, or TriCare/USFHP (a Medicare-like insurance plan for military retirees). Potential participants' insurance claims for health care during the previous 12 months were screened by their insurers using the Hierarchical Condition Category (HCC) predictive model<sup>15,16</sup>, which estimates a person's risk for incurring high health-care costs during the coming year. Patients were considered "high-risk" if their HCC risk ratios were in the highest quartile of the population of older patients covered by their primary health-care insurer.

Beginning in December 2005, high-risk patients received introductory letters advising them that they might be eligible for the study and offering them the opportunity to "opt out" by returning a card in a pre-addressed, stamped envelope. Beginning in February 2006 and ending in March 2007, a professional interviewer attempted to telephone each person who did not "opt out" to describe the study, answer questions, and offer an in-home meeting to provide additional information. Potential participants were deemed ineligible for the study if they did not have a telephone, did not speak English, were planning extended travel during the following 2 1/2 years, or failed a brief cognitive screen and did not have a proxy who could provide informed consent. The cognitive screen involved asking potential participants to spell their names and state their addresses and ages. If there were any mistakes, the interviewer probed to allow an opportunity for correction. If the potential participant was unable to do this successfully, a proxy was sought. Proxies were accepted if they were legal guardians or close family relatives.

Professional interviewers then visited the homes of eligible patients to describe the study in detail, answer questions, offer participation, and obtain written informed consent. Patients who provided consent then completed in-home baseline interviews.

### Randomization

Within the 8 participating practices, we identified 14 teams, each of which consisted of 2–5 primary care physicians and their consenting high-risk patients. The study's statistician, blinded to the identities of the teams, randomly allocated each team of physician and their high-risk patients to either GC (7 teams) or UC (7 teams).

### Intervention

Before joining their assigned teams in May 2006, the GCNs completed an educational curriculum designed to prepare them to provide the clinical services of GC. During the following 6–8 months, each GCN established a case load of 50–60 patients and provided them with eight clinical services: a comprehensive assessment at home, creation and maintenance of an evidence-based "Care Guide" (care plan) and an "Action Plan" (patient's self-care plan), monthly monitoring, coaching for self-management, smoothing transitions into and out of hospitals, coordinating all providers of care, educating and supporting family caregivers, and accessing community resources<sup>9</sup>.

To track the nurses' performance of the essential activities of GC, such as completing monthly monitoring and coaching

calls and facilitating patients' transitions from hospitals, the study team produced monthly reports of the GCNs' documented performance of these activities. Throughout the study, members of the study team, nurse managers and the GCN's met monthly to review and discuss these performance reports and to troubleshoot challenges in implementing the GC model.

## Measures

Face-to-face interviews were conducted to assess participants' baseline socio-demographic characteristics, health and functional status, chronic conditions, satisfaction with health care<sup>14</sup>. Included in the baseline and 18-month interviews was the Patient Assessment of Chronic Illness Care (PACIC) instrument, which assesses patients' perceptions of the quality of the care they have received for their chronic conditions. The 18-month interviews were conducted by telephone by rigorously trained, supervised professional interviewers who were masked to group assignment, used computer-assisted interviewing technology, and underwent 10% reliability testing.

The PACIC is a validated measure of patients' experience of chronic care<sup>12</sup>. It consists of 20 questions that inquire about important elements of chronic care received by a patient from his or her health-care team, e.g., being asked about one's health habits, being given a list of things to do to improve one's health, having one's health care well organized, receiving a copy of one's treatment plan, and being asked for one's ideas when making a treatment plan. Respondents indicate how often, during the past 6 months, they have experienced each of the 20 elements: "almost always" (5), "most of the time" (4), "sometimes" (3), "generally not" (2), or "almost never" (1). The 20 items constitute an aggregate scale and five subscales: goal setting, coordination of care, decision support, problem solving, and patient activation.

## Analysis

As described in detail previously, we imputed values for missing baseline interview responses<sup>14</sup>. We computed all scale scores as recommended by the originators of the scales and analyzed all data according to the "intention-to-treat" principle. To the extent possible, we used site-stratified testing procedures to evaluate baseline differences between the GC and UC groups. For very rare (ethnicity) or very common (insurer) baseline factors, we used unstratified testing procedures.

To test our hypothesis, i.e., that the quality of care for people who received GC exceeds the quality of care for people who received UC, we compared the two groups' 18-month PACIC scores. From each respondent's raw PACIC data, we computed a continuous score for each subscale and for the aggregate PACIC instrument by summing responses to individual items and dividing by the number of items in the subscale or instrument. To create corresponding categorical outcome variables, we recoded continuous scores as "high-quality" (score = 4–5), "medium-quality" (score  $\geq 3$  or  $< 4.0$ ), or "low-quality" (score  $< 3$ ). To compare with our previous analysis of PACIC outcomes at 6 months, we also created dichotomous variables for "high-quality" (score = 4–5) and "low to medium quality" (score  $< 4$ ) chronic care.

To estimate the effect of group assignment (i.e., GC or UC) on quality of care, we constructed multivariate linear and

logistic regression models of 18-month PACIC aggregate and subscale scores. Included in these models were covariates that adjusted for characteristics that we defined *a priori* as possible confounders: socio-demographic characteristics (i.e., age, race, sex, educational level, financial status, habitation status), health status (i.e., HCC score), functional ability (i.e., Short Form-36 physical component and mental component summary scores), subscale specific baseline PACIC scores, and satisfaction with health care. The models also included site indicators to account for clustering, i.e., for patients' tendency to resemble more closely patients at their site than those at other sites.

To determine whether the effects of GC varied according to the quality of care patients were receiving at baseline, we stratified the study participants and constructed multivariate linear regression models of 18-month PACIC subscale and aggregate scores. One set of models was based on data from patients who had rated the quality of their care at baseline as "low" (i.e.,  $< 3.0$ ) and the other on data from patients who had rated the quality of their care at baseline as "medium or high" (i.e.,  $3.0$ – $5.0$ ). Low quality was defined for each domain and for aggregate score. Logistic regression models were also constructed to estimate the effect of the intervention on quality of care among the subgroup of patients who rated the quality of their care as low at baseline for each domain of the PACIC and overall. All analyses were performed on Stata Version 9<sup>®</sup> statistical software (StataCorp, College Station, TX).

## RESULTS

We screened the insurance claims of 13,534 older patients of the participating physicians to identify 3,692 (27.3%) at high risk for incurring high health-care costs during the following year. Of these, 2,391 were alive, accessible, and eligible; 904 (37.8%) consented to participate. After 18 months, 96.5% and 94.2% of the GC and UC participants who were alive and eligible to participate responded to follow-up interviews: 12.7% of patients died, 3.2% refused to continue their participation in the study, 2.3% could not be located, 6.4% were ineligible because they were no longer receiving care from a participating practice, and 1.2% declined the interview.

The two treatment groups had similar demographic characteristics and chronic disease burdens at baseline, but they differed in marital status, finances, self-rated health and functional status, quality of care, satisfaction with care, insurer, and risk of incurring high health-care costs during the following year (Table 1).

Eighteen months after baseline, the mean quality of care scores of the GC recipients were higher than the mean scores of the UC recipients in the aggregate and on all five PACIC subscales. In linear regression models that adjusted for multiple covariates, five of these six differences were statistically significant at the  $p < 0.05$  level (Table 2).

Eighteen months after baseline, the odds that a GC recipient rated his or her aggregate quality of care as "high-quality" were twice as great (aOR=2.13, 95% CI=1.30, 3.50,  $p=0.003$ ) (Table 3). Similarly, GC recipients had significantly greater odds of rating two specific elements of their care as "high-quality": coordination of care (aOR=1.80, 95% CI=1.12, 2.90,  $p=0.016$ ) and decision support (aOR=1.49, 95% CI=1.05, 2.11,  $p=0.025$ ). Although not statistically significant at the  $p < 0.05$  level, GC recipients also

Table 1. Characteristics of Participants (n=904) at Baseline

	Guided Care (n=485)	Usual care (n=419)	p value
<b>Socio-demographic factors</b>			
Age, mean years (range)	77.2 (66–106)	78.1 (66–96)	0.46
Sex (% female)	54.2	55.4	0.39
Race (%)			
Caucasian	51.1	48.9	0.924
African- American	45.6	46.3	
Other	3.3	4.8	
Ethnicity (% Hispanic)	1.9	1.4	0.26 <sup>a</sup>
Marital status (%)			
Married	46.0	48.5	<0.001
Divorced/separated	11.6	10.7	
Widowed	37.9	37.0	
Never married	4.5	3.8	
Education (% with >12 years)	46.4	43.4	0.24
Finances at end of month (%)			
Some money left over	57.9	51.1	0.004
Just enough money left over	32.8	34.2	
Not enough money left over	9.3	14.7	
Habitation status (% living alone)	32.0	30.6	0.94
Type of Medicare insurance (%)			
HMO-A	26.2	16.0	0.001 <sup>a</sup>
Fee-for-service	31.7	36.5	0.90 <sup>a</sup>
HMO-B	42.1	47.5	Ref
<b>Health and functional status</b>			
HCC score, mean (SD) range	2.07 (1.07) 0.8–7.8	1.96 (1.05) 0.8–9.7	<0.001
Self-rated health (%)			
Excellent	2.5	3.1	<0.001
Very good	20.0	13.6	
Good	37.7	36.5	
Fair	30.1	32.2	
Poor	9.7	14.6	
Number of self-reported conditions, mean (range)	4.3 (0–13)	4.3 (0–12)	0.12
Self-reported diseases / conditions (%)			
Hypertension	79.2	81.4	0.64
Angina	28.7	27.2	0.77
Congestive heart failure	18.6	19.3	0.33
Myocardial infarction	23.9	22.7	0.73
Other heart problems	39.6	42.7	0.23
Stroke	20.0	21.2	0.46
Chronic obstructive pulmonary disease	22.3	19.3	0.48
Arthritis	70.1	70.2	0.08
Sciatica	19.4	14.8	0.28
Diabetes	48.4	50.4	0.17
Cancer	26.6	29.1	0.18
Osteoporosis	20.0	17.0	0.33
Hip fracture	8.0	5.5	0.56
Alzheimer's disease	3.9	5.3	0.35
Falls in the last 6 months	0.8	0.7	0.22
Difficulty with 1+ ADL (%)	32.2	30.6	0.27
Difficulty with 2+ IADL (%)	23.5	29.6	0.03
Receives help from a person (%)	45.2	54.9	0.003
SF-36 score, mean (SD) range			
Physical component summary	38.7 (10.5) 13.8–63.0	38.1 (10.8) 6.7–63.1	<0.001
Mental component summary	50.3 (11.8) 6.4–70.0	48.7(12.3) 13.7–71.9	0.005
Cognition, mean SPMS (SD) range	0.9 (1.1) 0–6	1.0 (1.3) 0–7	0.07
% with high-quality health care on the PACIC <sup>b</sup>			
Aggregate score	5.9	2.9	<0.001
Patient activation subscale	15.1	10.1	0.10
Decision support subscale	24.9	21.5	0.33
Goal-setting subscale	9.0	5.0	<0.001
Problem-solving subscale	19.2	12.1	0.26
Coordination subscale	5.0	4.2	<0.001
<b>Satisfaction with health care</b>			
From regular care team (%)			
Very satisfied	57.0	48.5	0.008
Satisfied	35.2	42.0	
Unsatisfied	3.7	3.8	
Very unsatisfied	4.2	5.8	

Table 1. (continued)

	Guided Care (n=485)	Usual care (n=419)	p value
From all care providers (%)			
Very satisfied	47.0	43.7	0.12
Satisfied	45.6	45.6	
Unsatisfied	3.9	5.0	
Very unsatisfied	3.5	5.7	

SPMS = Short Portable Mental Status, range = 0 (no errors) to 10 (10 errors)

HCC = hierarchical condition category, 1 = average risk of high future health-care costs

ADL = Activities of Daily Living

IADL = Instrumental Activities of Daily Living

SF-36 = Short-Form 36, range = 0 (poor function) to 100 (excellent function)

PACIC = Patient Assessment of Chronic Illness Care

<sup>a</sup>Comparisons between the groups' ethnicity and type of insurance were unstratified

Multinomial regression used to compare race, marital status, and type of insurance; ordinal regression used to compare finances at end of month; self-rated health and satisfaction with health care

<sup>b</sup>High-quality health care: % with PACIC scale score of 4-5 (who reported on the PACIC survey that care process occurred "most of the time" or "almost always")

tended to have greater odds of rating their care as "high-quality" in goal setting (aOR=1.53, 95% CI=0.99, 2.37), problem solving (aOR=1.33, 95% CI=0.90, 1.95), and patient activation (aOR=1.28, 95% CI=0.87, 1.89).

Within each of the two subgroups of participants (low baseline quality, medium or high baseline quality), the effect of GC on the aggregate 18-month quality of care was significantly positive (p<0.05) (Table 4). Of the participants with low scores at baseline, those receiving GC had nearly twice greater odds to rate the aggregate quality of their care as medium or high compared to those receiving UC (aOR 1.98, 95%CI=1.27-3.07).

## DISCUSSION

The results of this study support the hypothesis that GC improves important dimensions of the quality of chronic health care experienced by multi-morbid older persons. Health-care processes that were improved significantly as measured by patient report include goal setting, coordination of care, problem solving, and patient activation. In general, these effects were consistent among patients who rated their pre-study chronic care as "medium to high quality" and those who rated their pre-study chronic care as "low quality."

Tools for evaluating the quality of chronic illness care for older adults with multi-morbidity are still under development and discussion. The limited applicability of disease-specific guidelines and tools for measuring the quality of health care for older adults with several chronic illnesses has been previously described<sup>4</sup>. Patients with morbidity similar to those enrolled in this cRCT of GC are often excluded from the denominators of quality standards for specific diseases, thus excluding their care from measurement and, perhaps, from improvement<sup>17,18</sup>. Yet, such multi-morbid patients experience the negative effects of a fragmented chronic care system at high rates, suggesting that evaluating their care with process measures not linked to specific diseases is especially important<sup>2,19,20</sup>.

In this study, we employed the PACIC because it is a validated measure based on important elements of the CCM and because it is relevant to all chronically ill patients, regardless of their specific diagnoses and levels of co-morbidity. Higher PACIC scores indicate that elements of chronic care occur more often. The mean aggregate PACIC score at 18 months of 3.14 in the GC group indicates that, on average, goal setting, coordination of care, decision support, problem solving, and patient activation occurred "sometimes" to "most of the time." The mean aggregate PACIC score of 2.85 in the UC group indicates that, on average, these elements "generally did not occur" or occurred "sometimes." To our knowledge,

Table 2. Effect of Guided Care on Patient-Reported Quality of Chronic Illness Care (PACIC) Scores After 18 Months

PACIC scales	Guided care (mean)	Usual care (mean)	Crude treatment effect (β) <sup>a</sup>	95% CI	Adjusted treatment effect <sup>a</sup> (β) <sup>a</sup>	95% CI	p value (adjusted effect)
Goal setting (n=649)	2.94	2.68	0.28	0.10, 0.45	0.19	0.03, 0.35	0.02
Coordination of care (n=645)	2.96	2.57	0.37	0.20, 0.54	0.34	0.18, 0.50	<0.001
Decision support (n=655)	3.66	3.51	0.18	0.03, 0.33	0.09	-0.05, 0.24	0.21
Problem solving (n=641)	3.25	2.92	0.33	0.15, 0.52	0.22	0.04, 0.39	0.01
Patient activation (n=656)	3.10	2.83	0.29	0.11, 0.47	0.20	0.02, 0.37	0.02
Aggregate quality (n=642)	3.14	2.85	0.29	0.15, 0.44	0.20	0.07, 0.33	0.002

<sup>a</sup>β = beta coefficients from unadjusted and adjusted linear regression models. Adjusted for participants' baseline socio-demographic characteristics, i.e., age, race, sex, educational level, financial status, habitation status, HCC score, functional ability (i.e., SF-36 physical component summary and mental component summary scores), subscale-specific baseline PACIC score, satisfaction with health care, and practice site

CI = Confidence interval

HCC = hierarchical condition category, 1 = average risk of high future health-care costs

SF-36 = Short-Form 36, range = 0 (poor function) to 100 (excellent function)

Table 3. Effect of Guided Care on Patient Reported “High-Quality” Health Care After 18 Months

PACIC scales	Guided Care (%)	Usual care (%)	Crude odds ratio	95% CI	Adjusted odds ratio <sup>a</sup>	95% CI	p value (adjusted odds ratio)
Goal setting (n=649)	23.1	15.3	1.65	1.09, 2.49	1.53	0.99, 2.37	0.05
Coordination of care (n=645)	19.8	12.7	1.68	1.08, 2.61	1.80	1.12, 2.90	0.01
Decision support (n=655)	45.1	36.2	1.54	1.11, 2.14	1.49	1.05, 2.11	0.02
Problem solving (n=641)	32.4	23.6	1.52	1.06, 2.18	1.33	0.90, 1.95	0.14
Patient activation (n=656)	28.7	22.6	1.40	0.97, 2.01	1.28	0.87, 1.89	0.20
Aggregate quality (n=642)	20.3	11.0	2.03	2.28, 3.21	2.13	1.30, 3.50	0.003

<sup>a</sup>Adjusted for participants' baseline age, race, sex, educational level, financial status, habitation status, HCC score, functional ability (i.e., SF-36 physical component summary and mental component summary scores), subscale-specific baseline PACIC score, satisfaction with health care, and practice site

PACIC = Patient Assessment of Chronic Illness Care

CI = Confidence interval

HCC = hierarchical condition category, 1 = average risk of high future health-care costs

SF-36 = Short-Form 36, range = 0 (poor function) to 100 (excellent function)

however, no published research has established the magnitude of difference between mean PACIC scores that can be regarded with confidence as clinically significant. While higher levels of these elements of chronic care have been shown to be related to better health outcomes, it also remains unclear how frequently these elements must be provided to improve these outcomes. We currently do not have data to measure the association of perceived quality of care and other indicators of quality of care. Future analyses of GC insurance claims may provide some insight into this relationship.

To help quantify the effects of GC, we compared the proportions of the GC and UC groups that received elements of high-quality care “almost always” or “most of the time.” The resulting multiple logistic regression model suggests that recipients of GC had 2.13 times the odds as UC recipients to report high-quality care (Table 3). Importantly, compared to the UC group, a significantly greater proportion of patients in the GC group who rated the quality of their care as “low” before

the intervention reported a higher quality of care score 18 months later.

The GC model was designed to provide comprehensive, coordinated, patient-centered care. Possibly one of the most important components of this model is the accessibility of the nurse. A caseload of 50–60 patients allows the nurse to devote the time necessary to patients. As an example of this improved accessibility, GC patients were 70% more likely to rate the time they had to wait for an appointment when sick as “excellent” or “good” compared to usual care patients. Similarly, they were 50% more likely to rate the ability to get phone advice as “excellent” or “good.”

There are several limitations to the study. First, only 38% of the patients who were high-risk consented to participate. A portion of these patients opted out of the study initially, and others declined an in-home visit to provide consent when contacted by telephone. For privacy reasons, we were unable to collect any health or demographic information on people who

Table 4. Effect of Guided Care on Patient Reported Quality of Chronic Illness Care (PACIC) Scores After 18 Months Stratified by Baseline Reports of Quality

PACIC scales	n	Guided Care mean	Usual care mean	Adjusted treatment effect ( $\beta$ ) <sup>a</sup>	95% CI	p value
“Low” quality of care reported at baseline						
Goal setting	456	2.64	2.48	0.15	-0.05, 0.35	0.13
Coordination	454	2.67	2.33	0.30	0.11, 0.49	0.002
Decision support	222	3.22	3.15	0.06	-0.23, 0.35	0.67
Problem solving	347	2.84	2.60	0.32	0.06, 0.58	0.01
Patient activation	413	2.73	2.63	0.12	-0.11, 0.35	0.29
Aggregate quality	437	2.83	2.65	0.18	0.02, 0.35	0.02
“Medium to high” quality of care reported at baseline						
Goal setting	193	3.59	3.22	0.26	-0.03, 0.55	0.08
Coordination	191	3.60	3.20	0.42	0.10, 0.74	0.01
Decision support	433	3.85	3.74	0.11	-0.06, 0.29	0.20
Problem solving	294	3.66	3.38	0.14	-0.10, 0.38	0.25
Patient activation	243	3.64	3.25	0.26	-0.03, 0.56	0.07
Aggregate quality	205	3.68	3.40	0.25	0.03, 0.48	0.03

<sup>a</sup> $\beta$  = beta coefficients from linear regression models adjusted for participants' baseline socio-demographic characteristics, i.e., age, race, sex, educational level, financial status, habitation status, HCC score, functional ability (i.e., SF-36 physical component summary and mental component summary scores), subscale-specific baseline PACIC score, satisfaction with health care, and practice site

PACIC = Patient Assessment of Chronic Illness Care

CI = Confidence interval

HCC = hierarchical condition category, 1 = average risk of high future health-care costs

SF-36 = Short-Form 36, range = 0 (poor function) to 100 (excellent function)

refused to participate and who could not be located. It is likely that refusers had worse health than consenters, so the generalizability of the results reported here may be limited.

Second, the provision of GC to patients in one team within a practice could have “contaminated” the care provided to patients in the UC team within the practice. Although we saw no evidence that this occurred, it has the potential to reduce the measured differences between the GC and UC groups throughout the study. Theoretically, the unblinded design of the study also could have influenced the quality of the health care provided to the participants, although this is unlikely to have had a significant influence on the teams’ health-care processes.

The range in participants’ HCC risk ratios is the result of differences in the completeness with which practices entered diagnoses on their insurance claims. Less complete entry produced lower HCC risk ratios. In order to identify the patients with highest quartile of HCC risk ratios in practices where this was done, we had to include some patients with HCC ratios of less than 1.0. This may have led to the inclusion of some healthier people in our sample than we originally anticipated, among control and experimental participants.

We accepted proxies’ ratings of some participants’ quality of health care (5% at baseline, 11% at 18 months). Although the concordance between patients’ and proxies’ PACIC scores has not been reported, most of the proxies in this study were family caregivers who were well positioned to report the frequency with which the PACIC’s 20 elements of chronic care had occurred.

Our analyses assumed a common treatment effect across teams within each practice. While some teams may have implemented GC more effectively than others, this study was not powered to evaluate such heterogeneity. Strengths of this study include its enrollment of a large, diverse group of multi-morbid older adults who received care in different health-care delivery systems and were covered by three different health insurance plans, as well as its high rate of follow-up and its rigorous data collection and analytic methods.

In conclusion, these findings add support for the expanded use of GC to improve important elements of the quality of chronic health care for older people with multi-morbidity. Previously published papers have suggested that GC may produce short-term improvements in the quality of chronic care<sup>21</sup>, reductions in family caregivers’ strain<sup>22</sup>, and net cost savings for health insurers<sup>23</sup>. Future work will study longer term health and cost outcomes.

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