

Patient-Centered Communication and Outcomes in Heart Failure

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An estimated 6.5 million individuals in the United States live with heart failure (HF),¹ and its prevalence is expected to further increase.² Although the management of HF has improved, hospitalizations remain quite frequent and survival is 50% at 5 years.^{1,3-5} Patients with HF are often elderly and have multiple comorbidities; these patients account for a large proportion of hospitalizations.^{4,6}

Patient-centered communication is defined by acknowledgment of patients' needs, preferences, and experiences. It provides opportunities for patients to participate in their care and supports the patient-provider relationship. In the past decades, growing attention has been paid toward this construct,^{7,8} and more efforts have been invested in teaching the basics of patient-centered communication to physicians in training⁹ with the hope that involving the patient in their care and in medical decisions will foster disease self-management and ultimately improve outcomes.^{7,8} Self-management is particularly important in HF, a chronic disease that requires complex management including diet, weight monitoring, and, when applicable, glycemic control and physical exercise.¹⁰ Although the effect of patient-centered communication on outcomes is conceptually plausible, to the best of our knowledge these associations have not been studied in HF.

To address this gap in knowledge, we aimed to determine whether there is an association between patient-centered communication and outcomes (survival and hospitalizations) in a population-based community cohort of patients with HF.

METHODS

Study Setting and Design

The present study was conducted in a geographically defined area of southeast Minnesota, which includes 11 counties (Dodge, Fillmore, Freeborn, Goodhue, Houston, Mower, Olmsted, Rice, Steele, Wabasha, and Winona; 2010 US Census population: 491,684 residents). These counties are included in the Rochester Epidemiology Project (REP), which is a medical records linkage system that collects all health care utilization among residents of this area.¹¹⁻¹⁴ This study was

ABSTRACT

OBJECTIVES: To measure the impact of patient-centered communication on mortality and hospitalization among patients with heart failure (HF).

STUDY DESIGN: This was a survey study of 6208 residents of 11 counties in southeast Minnesota with incident HF (first-ever *International Classification of Diseases, Ninth Revision* code 428 or *International Classification of Diseases, Tenth Revision* code I50) between January 1, 2013, and March 31, 2016.

METHODS: Perceived patient-centered communication was assessed with the health care subscale of the Chronic Illness Resources Survey and measured as a composite score on three 5-point scales. We divided our cohort into tertiles and defined them as having fair/poor (score < 12), good (score of 12 or 13), and excellent (score ≥ 14) patient-centered communication. The survey was returned by 2868 participants (response rate: 45%), and those with complete data were retained for analysis (N = 2398). Cox and Andersen-Gill models were used to determine the association of patient-centered communication with death and hospitalization, respectively.

RESULTS: Among 2398 participants (median age, 75 years; 54% men), 233 deaths and 1194 hospitalizations occurred after a mean (SD) follow-up of 1.3 (0.6) years. Compared with patients with fair/poor patient-centered communication, those with good (HR, 0.70; 95% CI, 0.51-0.97) and excellent (HR, 0.70; 95% CI, 0.51-0.96) patient-centered communication experienced lower risks of death after adjustment for various confounders ($P_{\text{trend}} = .020$). Patient-centered communication was not associated with hospitalization.

CONCLUSIONS: Among community patients living with HF, excellent and good patient-centered communication is associated with a reduced risk of death. Patient-centered communication can be easily assessed, and consideration should be given toward implementation in clinical practice.

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TAKEAWAY POINTS

Excellent and good patient-centered communication, as measured by a survey, was found to be associated with a reduced risk of death among a community cohort of patients with heart failure.

- ▶ Patients with excellent patient-centered communication were younger and had higher educational attainment than those with good and fair/poor communication.
- ▶ Patients with excellent and good patient-centered communication had reduced risk of death after adjustment for confounders.
- ▶ Patient-centered communication can be easily assessed, and consideration should be given toward implementation in clinical practice.

approved by Mayo Clinic and Olmsted Medical Center Institutional Review Boards.

Case Identification and Survey Administration

Residents 18 years and older with a first-ever *International Classification of Diseases, Ninth Revision* code 428 or *International Classification of Diseases, Tenth Revision* code 150 for HF within the REP records of the 11-county area between January 1, 2013, and March 31, 2016, were identified. A survey was mailed to each identified patient to evaluate their perceived patient-centered communication, health literacy, and other questions of interest. To increase the response rate, a mixed-mode (mail and phone) design was used to conduct the survey. Patients were mailed a packet with an introductory letter, the survey, and a Health Insurance Portability and Accountability Act form. Participants were given the option to complete the survey via mail or via phone. A second packet was mailed to the nonresponders 1 month from the first mailing, and a telephone contact was attempted with the remaining nonresponders 1 month after the second packet was mailed.

Patient-Centered Communication

Patient-centered communication was measured using the health care subscale of the Chronic Illness Resources Survey (CIRS).^{15,16} This subscale is composed of 3 questions that evaluate shared decision-making, active listening, and efforts to ensure understanding: (1) Has your doctor involved you as an equal partner in making decisions about illness management strategies and goals? (2) Has your doctor or other health care adviser listened carefully to what you had to say about your illness? and (3) Has your doctor or other health care provider thoroughly explained the results of tests you had done (eg, cholesterol, blood pressure, or other laboratory tests)? The response options were “not at all,” “a little,” “a moderate amount,” “quite a bit,” and “a great deal,” with points ranging from 1 to 5, respectively, for each response. The patient-centered communication score ranges from 3 to 15, where higher scores indicate better patient-centered communication. We divided our cohort into tertiles and defined them as having fair/poor (score < 12), good (score of 12 or 13), and excellent (score ≥ 14) patient-centered communication. To be included in the analysis, patients had to complete all 3 questions of the health care subscale of the CIRS. The Cronbach α for the 3 questions in our study was 0.82.

We also analyzed 2 questions included in our survey adopted from the National Health and Aging Trends study to evaluate whether family and/or friends attended health care visits with the patient and the reliance on family/friends in the management of care.^{17,18} This was done because it has been reported that the presence of family and friends can influence communication with the health care provider and confound the association.¹⁹ These questions were: (1) In the past year, did anyone (family, friend) sit in with you and your doctor during the visit?

(response options: yes or no) and (2) People today are asked by their doctors and other health care providers to do many things to stay healthy or treat health problems—for example, manage medicines, get tests and lab work done, watch weight and blood pressure, or have yearly exams. How do you usually handle these things? (Response options: handle mostly by self, handle together with family or close friends, family or close friends mostly handle these things, or it varies.) If the patient answered yes to the first question, we classified the patient as being accompanied to medical visits. For the second question, participants were categorized into patients who self-manage (response: handle mostly by self), comanage (response: handle together with family or close friends), and delegate (response: family or close friends mostly handle these things or it varies).¹⁷

Other Patient Characteristics

Education, marital status, and health literacy were collected from the survey. Health literacy was evaluated with a short screener composed of 3 validated questions: (1) How confident are you filling out forms by yourself? (2) How often do you have someone (like a family member, friend, hospital/clinic worker, or caregiver) help you read hospital materials? and (3) How often do you have problems learning about your medical condition because of difficulty reading hospital materials?^{20,21} Each question generates a score from 1 to 5, the sum of which gives a final score that could range from 3 to 15, with lower scores indicating inadequate health literacy.

Age, sex, and Charlson Comorbidity Index (CCI) score^{22,23} were electronically obtained through the REP.

Outcomes

Participants were followed from recruitment through March 31, 2017 (mean [SD] follow-up, 1.3 [0.6] years). Mortality was obtained through the REP, which collects information from death certificates from the state of Minnesota. Hospitalization was retrieved through the REP, which comprehensively collects this health care information for the area included in the study. In-hospital transfers were considered as 1 event.

Statistical Analysis

The response rate was calculated according to the guidelines of the American Association for Public Opinion Research using formula 2,

which is calculated by dividing the number of complete and partial surveys by the total number of complete and partial surveys, refusals, noncontacts, others, and cases of unknown eligibility.²⁴ Baseline characteristics and survey measures were presented as mean (SD) or median (interquartile range) for continuous variables, as appropriate, and as frequency (percentage) for categorical variables. Baseline characteristics were compared among the patient-centered communication scores using linear regression for continuous variables and the Wilcoxon rank sum and Kruskal-Wallis tests for categorical variables. Mortality was presented as cumulative incidence (1 minus the Kaplan-Meier estimate), whereas cumulative mean numbers of hospitalizations by categories of patient-centered communication were plotted using a nonparametric estimator.²⁵ Cox proportional hazards regression was used to estimate the HRs and 95% CIs for mortality, and Andersen-Gill modeling²⁶ was used for hospitalizations to allow analysis of recurrent events. In addition, because standard survival models might produce biased estimates in the presence of competing risks, Fine-Gray competing risk models were used to analyze hospitalizations with death treated as a competing risk.²⁷ The proportional hazards assumption was evaluated and found to be valid. Multivariable analyses adjusting for age, sex, marital status, educational attainment, CCI score, and mode of survey completion (mail, phone) were conducted. Age, sex, educational attainment, and CCI score were compared between survey responders and nonresponders. A level of significance of 0.05 was used for all analyses. All analyses were performed using SAS JMP version 14.1 and SAS version 9.4 (SAS Institute Inc).

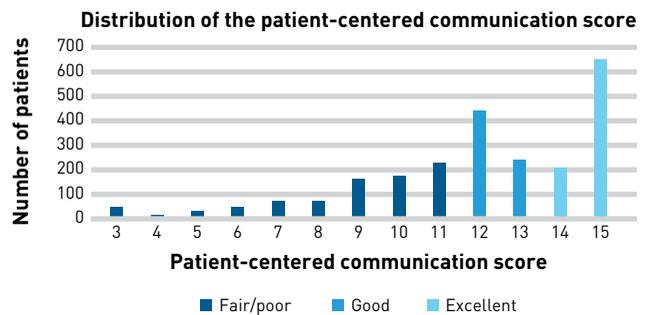
RESULTS

The survey was mailed to 6344 patients, and 2868 patients responded (response rate: 45%). Responders and nonresponders were similar in age (responders: mean [SD] age, 72 [13] years; nonresponders: mean [SD] age, 73 [15] years; $P = .112$), but responders were more likely to be male ($P = .027$) and have more comorbidities ($P < .001$). Among 2868 survey responders, 2398 had complete information for the characteristics of main interest and were retained for analysis. The median patient-centered communication score was 12, and the distribution of the score was skewed (Figure 1). There was no difference in the mean score among the 11 counties ($P = .281$).

Patients reporting excellent patient-centered communication were younger, had higher educational attainment, had higher health literacy, and were more likely to complete the survey via mail. Moreover, these participants were more likely to report self-managing their health (Table 1).

After a mean (SD) follow-up of 1.3 (0.6) years, 233 deaths occurred, equating to a mortality rate of 7% in the first year of follow-up. Patients with good and excellent patient-centered communication had a large reduced risk of death compared with patients with worse patient-centered communication (Figure 2). Adjustment for age, sex, marital status, CCI score, education, and mode of survey completion only slightly attenuated the association (Table 2).

FIGURE 1. Patient-Centered Communication Score Distribution as Measured by the Health Care Subscale of the CIRS



CIRS, Chronic Illness Resources Survey.

Further adjusting for being accompanied to medical visits or reliance on family and friends in managing health did not change the results. Moreover, adjusting for health literacy did not significantly change the point estimate nor the statistical significance (good: HR, 0.70; 95% CI, 0.51-0.97; excellent: HR, 0.70; 95% CI, 0.51-0.96; $P_{\text{trend}} = .020$).

During follow-up, 1194 hospitalizations occurred among 633 patients. Of these, 374 (59%) had 1 hospitalization, 120 (19%) had 2 hospitalizations, and 139 (22%) had 3 or more hospitalizations. There was no association between patient-centered communication and hospitalizations either before or after adjusting for age, sex, marital status, education, CCI score, mode of survey completion, and health literacy (Figure 2 and Table 3). Results were similar when hospitalizations were analyzed with death treated as a competing risk (Table 3).

In ancillary analyses we analyzed the association between patient-centered communication as a continuous score and death. For each increase of 1 unit in the score, patients had a 5% lower risk of mortality (HR, 0.95; 95% CI, 0.91-0.99; $P = .009$). After adjusting for age, sex, marital status, education attainment, CCI score, mode of survey completion, and health literacy, the association was similar (HR, 0.95; 95% CI, 0.91-1.00; $P = .030$).

To investigate whether these results could be influenced by measurement bias (in particular, straightlining, whereby responders rush through the survey and choose the same answer for all questions), we retested the association between patient-centered communication and outcomes after excluding those with the highest score from the analysis (score of 15, $n = 651$). The association between patient-centered communication and death using fair/poor as the reference was similar after adjustment for age, sex, marital status, education attainment, CCI score, mode of survey completion, and health literacy (good: HR, 0.72; 95% CI, 0.52-0.99; excellent: HR, 0.65; 95% CI, 0.37-1.14; $P_{\text{trend}} = .027$), whereas there was no association with hospitalization before or after adjustment.

DISCUSSION

In the present study, we demonstrated that among patients with HF in the community, patients with excellent and good patient-centered

TABLE 1. Baseline Characteristics^a

Characteristic	Total cohort (N = 2398)	Patient-centered communication			P _{trend}
		Fair/poor (n = 853)	Good (n = 686)	Excellent (n = 859)	
Demographics					
Age in years, mean (SD)	73.3 (12.6)	75.4 (12.0)	73.2 (13.1)	71.4 (12.4)	<.001
Male sex	1287 (53.7)	478 (56.0)	361 (52.6)	448 (52.2)	.107
Education					<.001
Non-high school graduate	277 (11.6)	113 (13.3)	91 (13.3)	73 (8.5)	
High school graduate	845 (35.2)	322 (37.8)	238 (34.7)	285 (33.2)	
Some college/college degree	1005 (41.9)	324 (38.0)	296 (43.2)	385 (44.8)	
Graduate school	271 (11.3)	94 (11.0)	61 (8.9)	116 (13.5)	
Married	1412 (58.9)	494 (57.9)	403 (58.8)	515 (60.0)	.391
Clinical characteristics					
CCI score					.252
0	213 (8.8)	87 (10.2)	48 (7.0)	78 (9.1)	
1-2	936 (39.0)	340 (39.8)	266 (38.8)	330 (38.4)	
≥3	1249 (52.1)	426 (49.9)	372 (54.2)	451 (52.5)	
MI	384 (16.0)	149 (17.5)	106 (15.5)	129 (15.0)	.167
PVD	858 (35.8)	318 (37.3)	248 (36.2)	292 (34.0)	.156
CVD	339 (14.1)	124 (14.5)	95 (13.9)	120 (14.0)	.737
COPD	766 (31.9)	257 (30.1)	227 (33.1)	282 (32.8)	.232
Renal disease	559 (23.3)	205 (24.0)	158 (23.0)	196 (22.8)	.552
Diabetes	805 (33.6)	283 (33.2)	258 (37.6)	264 (30.7)	.282
Cancer	383 (16.0)	120 (14.1)	123 (17.9)	140 (16.3)	.209
Sociobehavioral characteristics					
Survey completed by mail	1511 (63.0)	583 (68.4)	415 (60.5)	513 (59.7)	<.001
Health literacy score, ^b median (IQR)	12 (10-14)	12 (10-14)	12 (10-14)	13 (11-15)	<.001
Accompanied to medical visits by family/friend	1870 (78.8)	642 (76.2)	549 (81.1)	679 (79.7)	.075
Reliance on family/friends in the management of care					.042
Self-manage	1266 (53.3)	453 (53.9)	340 (49.8)	473 (55.5)	
Comanage	801 (33.7)	250 (29.7)	265 (38.8)	286 (33.5)	
Delegate	310 (12.9)	138 (16.2)	78 (11.4)	94 (10.9)	

CCI, Charlson Comorbidity Index; COPD, chronic obstructive pulmonary disease; CVD, cardiovascular disease; IQR, interquartile range; MI, myocardial infarction; PVD, peripheral vascular disease.

^aAll values are presented as n (%) unless otherwise noted.

^bMissing in 48 patients.

communication with their providers are associated with nearly a 30% lower risk of death, independent of age, sex, marital status, education, CCI score, mode of survey completion, and health literacy, whereas no association was found with hospitalization.

We relied on the health care subscale of the CIRS to measure perceived patient-centered communication.^{15,16} The CIRS is a validated instrument to evaluate different resources needed by patients for self-management. This tool has been used by others to evaluate patients with different diseases,²⁸ but to our knowledge the validity of the CIRS has yet to be studied in HF. The health care subscale of the CIRS is composed of 3 questions, making this instrument appealing and easy to implement clinically. This set of questions evaluates

shared decision-making, active listening, and understanding, which are all components of patient-centered communication as described by Epstein and Street.^{29,30} Those with fair/poor and good patient-centered communication are older, have lower educational attainment, have lower health literacy, and are more dependent on family and friends in the management of care compared with those who reported excellent patient-centered communication. Therefore, this suggests that patients who reported fair/poor and good patient-centered communication have distinct needs compared with those who experience excellent patient-centered communication with their provider.

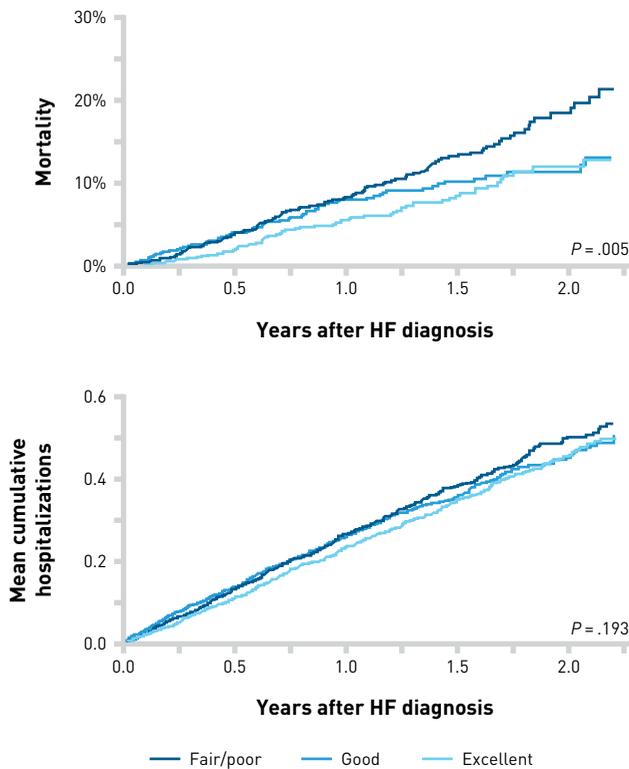
It has been reported that communication needs of patients with HF are not always met by providers.³¹ Ineffective communication has been described as a possible explanation for worse outcomes among patients with limited health literacy.³² In fact, studies have shown that an inadequate level of health literacy leads to an increased risk of mortality³³⁻³⁵ and hospitalization.³⁵ Indeed, in our cohort, patients who report fair/poor patient-centered communication have lower health literacy. Therefore, our data highlight the need to further study patient-centered communication and the nature of its association with outcomes.³⁶ Finally, we cannot exclude the possibility that a lower score in perceived patient-centered communication could be due to distress related to more severe disease. In this case, patients who experienced fair/poor patient-centered communication would be at increased risk of death because of the severity of the underlying condition. Although this is possible, our cohort of patients is composed of incident cases with no differences in numbers of comorbidities among the tertiles, making this hypothesis less probable.

Perceived patient-centered communication was not associated with hospitalizations. Patients with HF are elderly and the decision to hospitalize a patient is driven by many factors including residence in a nursing home, presence of an in-home nurse, and social support. Therefore, this finding may reflect residual confounding. Thus, further studies are needed to understand this finding.

Limitations, Strengths, and Clinical Implications

As with any research using surveys, we cannot rule out nonresponder bias. However, our response rate is in line with those of other national surveys, as rates have been steadily declining over the past few decades.^{37,38} For example, the median state response rate

FIGURE 2. (A) Mortality and (B) Mean Cumulative Hospitalizations by Patient-Centered Communication



HF, heart failure.

was 62% for the Behavioral Risk Factor Surveillance System in 1997 and has declined to 49% in 2014.³⁸ Furthermore, a larger proportion of survey participants had a higher education level,³⁹ but we would expect this to bias our results toward the null. Indeed, in our study, we found a significant association between patient-centered communication and mortality, thus the true association may even be stronger. However, we did not find a significant association between patient-centered communication and hospitalizations, and we cannot rule out that this may be due to the larger proportion of responders with a higher education level.

Measurement bias must also be considered whereby patients who have the maximum score may not have completed the survey honestly (straightlining). Because excluding patients with the highest score did not change the point estimate, we believe that measurement bias is limited. To the best of our knowledge, there are no standardized cut points in the literature to define adequate patient-centered communication as measured by the health care subscale of the CIRS; therefore, we divided our cohort into tertiles. Because the distribution is skewed toward higher values, those in the fair/poor tertile comprise a rather large spectrum of different patient-centered communication. The population studied includes mostly Caucasian individuals; thus, replication in other populations

TABLE 2. HR (95% CI) for Associations Between Patient-Centered Communication and Death in Patients With Heart Failure

Communication	HR	95% CI	<i>P</i> _{trend}
Unadjusted			
Fair/poor	1.00		.002
Good	0.72	0.53-0.99	
Excellent	0.61	0.45-0.84	
Model 1^a			
Fair/poor	1.00		.010
Good	0.73	0.53-1.00	
Excellent	0.67	0.49-0.92	
Model 2^b			
Fair/poor	1.00		.020
Good	0.70	0.51-0.97	
Excellent	0.70	0.51-0.96	

^aAdjusted for age, sex, marital status, education, Charlson Comorbidity Index score, and mode of survey completion.

^bAdjusted for age, sex, marital status, education, Charlson Comorbidity Index score, mode of survey completion, and health literacy.

TABLE 3. HR (95% CI) for Associations Between Patient-Centered Communication and Hospitalizations in Patients With Heart Failure

Communication	Cox regression model			Competing risk model ^a		
	HR	95% CI	<i>P</i> _{trend}	HR	95% CI	<i>P</i> _{trend}
Unadjusted						
Fair/poor	1.00		.237	1.00		.159
Good	1.07	0.85-1.34		1.08	0.86-1.34	
Excellent	1.14	0.92-1.42		1.17	0.94-1.45	
Model 1^b						
Fair/poor	1.00		.523	1.00		.398
Good	1.00	0.80-1.25		1.00	0.80-1.24	
Excellent	1.07	0.86-1.34		1.10	0.88-1.36	
Model 2^c						
Fair/poor	1.00		.433	1.00		.363
Good	0.98	0.78-1.23		0.98	0.79-1.22	
Excellent	1.09	0.88-1.36		1.11	0.89-1.37	

^aTreating death as a competing risk.

^bAdjusted for age, sex, marital status, education, Charlson Comorbidity Index score, and mode of survey completion.

^cAdjusted for age, sex, marital status, education, Charlson Comorbidity Index score, mode of survey completion, and health literacy.

is needed to confirm our findings. Finally, as in any observational study, we cannot rule out the effect of residual confounding.

This study has several important strengths. This is a population-based community study made possible by the REP,¹¹⁻¹³ which enables comprehensively retrieving data on comorbidities and outcomes in a large geographically defined region of southeast Minnesota. Additionally, the sample size of the present study is quite large, and we utilized validated instruments to evaluate patient-centered communication and health literacy. The 3 questions from the health care subscale of the CIRS constitute an efficient approach to assess

perceived patient-centered communication, which could be easily implemented clinically to identify patients who have communication barriers with care providers and to customize a tailored intervention. In fact, according to the Expanded Chronic Care model, improved outcomes may be a consequence of an effective interaction with the health care provider.⁴⁰ Finally, this study evaluates the communication between the health care provider and the patient as perceived by the patient with HF, but we do not have information on how the health care provider perceives the same interaction. It would be of interest in future studies to understand the level of concordance in the evaluation of patient-centered communication by the doctor-patient dyad.

CONCLUSIONS

Among community patients with HF, better patient-centered communication was associated with increased survival. Patient-centered communication can be easily assessed, and consideration should be given toward implementation in the clinical practice. ■

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REFERENCES

- Benjamin EJ, Blaha MJ, Chiuve SE, et al; American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2017 update: a report from the American Heart Association. *Circulation*. 2017;135(10):e146–e603. doi:10.1161/CIR.0000000000000485
- Heidenreich PA, Albert NM, Allen LA, et al; American Heart Association Advocacy Coordinating Committee; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Cardiovascular Radiology and Intervention; Council on Clinical Cardiology; Council on Epidemiology and Prevention; Stroke Council. Forecasting the impact of heart failure in the United States: a policy statement from the American Heart Association. *Circ Heart Fail*. 2013;6(3):606–619. doi:10.1161/HHF.0b013e318291329a
- Gerber Y, Weston SA, Redfield MM, et al. A contemporary appraisal of the heart failure epidemic in Olmsted County, Minnesota, 2000 to 2010. *JAMA Intern Med*. 2015;175(6):996–1004. doi:10.1001/jamainternmed.2015.0924
- Roger VL. The changing landscape of heart failure hospitalizations. *J Am Coll Cardiol*. 2013;61(12):1268–1270. doi:10.1016/j.jacc.2013.01.011
- Roger VL, Weston SA, Redfield MM, et al. Trends in heart failure incidence and survival in a community-based population. *JAMA*. 2004;292(3):344–350. doi:10.1001/jama.292.3.344
- Dunlay SM, Redfield MM, Weston SA, et al. Hospitalizations after heart failure diagnosis: a community perspective. *J Am Coll Cardiol*. 2009;54(18):1695–1702. doi:10.1016/j.jacc.2009.08.019

- Street RL Jr, Spears E, Madrid S, Mazor KM. Cancer survivors' experiences with breakdowns in patient-centered communication. *Psychooncology*. 2018;28(2):423–429. doi:10.1002/pon.4963
- Naughton CA. Patient-centered communication. *Pharmacy (Basel)*. 2018;6(1):E18. doi:10.3390/pharmacy6010018
- Wild D, Nawaz H, Ullah S, Via C, Vance W, Petraro P. Teaching residents to put patients first: creation and evaluation of a comprehensive curriculum in patient-centered communication. *BMC Med Educ*. 2018;18(1):266. doi:10.1186/s12909-018-1371-3
- Yancy CW, Jessup M, Bozkurt B, et al; American College of Cardiology Foundation; American Heart Association Task Force on Practice Guidelines. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147–e239. doi:10.1016/j.jacc.2013.05.019
- St Sauver JL, Grossardt BR, Yawn BP, et al. Data resource profile: the Rochester Epidemiology Project (REP) medical records-linkage system. *Int J Epidemiol*. 2012;41(6):1614–1624. doi:10.1093/ije/dys195
- St Sauver JL, Grossardt BR, Leibson CL, Yawn BP, Melton LJ III, Rocca WA. Generalizability of epidemiological findings and public health decisions: an illustration from the Rochester Epidemiology Project. *Mayo Clin Proc*. 2012;87(2):151–160. doi:10.1016/j.mayocp.2011.11.009
- Rocca WA, Yawn BP, St Sauver JL, Grossardt BR, Melton LJ III. History of the Rochester Epidemiology Project: half a century of medical records linkage in a US population. *Mayo Clin Proc*. 2012;87(12):1202–1213. doi:10.1016/j.mayocp.2012.08.012
- Rocca WA, Grossardt BR, Brue SM, et al. Data resource profile: expansion of the Rochester Epidemiology Project medical records-linkage system (E-REP). *Int J Epidemiol*. 2018;47(2):368–368. doi:10.1093/ije/dyx268
- Glasgow RE, Toobert DJ, Barrera M Jr, Strycker LA. The Chronic Illness Resources Survey: cross-validation and sensitivity to intervention. *Health Educ Res*. 2005;20(4):402–409. doi:10.1093/her/cyg140
- Glasgow RE, Strycker LA, Toobert DJ, Eakin E. A social-ecologic approach to assessing support for disease self-management: the Chronic Illness Resources Survey. *J Behav Med*. 2000;23(6):559–583. doi:10.1023/a:1005507603901
- Wolff JL, Boyd CM. A look at person- and family-centered care among older adults: results from a national survey [corrected]. *J Gen Intern Med*. 2015;30(10):1497–1504. doi:10.1007/s11606-015-3359-6
- Wolff JL, Boyd CM, Gitlin LN, Bruce ML, Roter DL. Going it together: persistence of older adults' accompaniment to physician visits by a family companion. *J Am Geriatr Soc*. 2012;60(1):106–112. doi:10.1111/j.1532-5415.2011.03770.x
- Troy E, Doltani D, Harmon D. The role of a companion attending consultations with the patient: a systematic review. *Ir J Med Sci*. 2018;188(3):743–750. doi:10.1007/s11845-018-1920-0
- Chew LD, Bradley KA, Boyko EJ. Brief questions to identify patients with inadequate health literacy. *Fam Med*. 2004;36(8):588–594.
- Chew LD, Griffin JM, Partin MR, et al. Validation of screening questions for limited health literacy in a large VA outpatient population. *J Gen Intern Med*. 2008;23(5):561–566. doi:10.1007/s11606-008-0520-5
- Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis*. 1987;40(5):373–383. doi:10.1016/0021-9681(87)90171-8
- Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol*. 1992;45(6):613–619. doi:10.1016/0895-4356(92)90133-8
- Standard definitions: final dispositions of case codes and outcome rates for surveys. American Association for Public Opinion Research. 2016. Accessed December 13, 2019. https://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf
- Nelson WB. *Recurrent Events Data Analysis for Product Repairs, Disease Recurrences, and Other Applications*. Society for Industrial and Applied Mathematics; 2003.
- Andersen PK, Gill RD. Cox's regression model for counting processes: a large sample study. *Ann Stat*. 1982;10(4):1100–1120.
- Fine JP, Gray RJ. A proportional hazards model for the subdistribution of a competing risk. *J Am Stat Assoc*. 1999;94(446):496–509. doi:10.2307/2670170
- Mann EG, Harrison MB, LeFort S, VanDenKerkhof EG. What are the barriers and facilitators for the self-management of chronic pain with and without neuropathic characteristics? *Pain Manag Nurs*. 2017;18(5):295–308. doi:10.1016/j.pmn.2017.04.006
- Street RL Jr, Elwyn G, Epstein RM. Patient preferences and healthcare outcomes: an ecological perspective. *Expert Rev Pharmacoecon Outcomes Res*. 2012;12(2):167–180. doi:10.1586/erp.12.3
- Epstein RM, Franks P, Fiscella K, et al. Measuring patient-centered communication in patient-physician consultations: theoretical and practical issues. *Soc Sci Med*. 2005;61(7):1516–1528. doi:10.1016/j.socscimed.2005.02.001
- Harding R, Selman L, Beynon T, et al. Meeting the communication and information needs of chronic heart failure patients. *J Pain Symptom Manage*. 2008;36(2):149–156. doi:10.1016/j.jpainsymman.2007.09.012
- Paasche-Orlow MK, Wolf MS. The causal pathways linking health literacy to health outcomes. *Am J Health Behav*. 2007;31(suppl 1):S19–S26. doi:10.5555/ajhb.2007.31.supp.519
- Peterson PN, Shetterly SM, Clarke CL, et al. Health literacy and outcomes among patients with heart failure. *JAMA*. 2011;305(16):1695–1701. doi:10.1001/jama.2011.512
- McNaughton CD, Cawthon C, Kripalani S, Liu D, Storrow AB, Roumie CL. Health literacy and mortality: a cohort study of patients hospitalized for acute heart failure. *J Am Heart Assoc*. 2015;4(5):e001799. doi:10.1161/JAHA.115.001799
- Fabbri M, Yost K, Finney Rutten LJ, et al. Health literacy and outcomes in patients with heart failure: a prospective community study. *Mayo Clin Proc*. 2018;93(1):9–15. doi:10.1016/j.mayocp.2017.09.018
- Horstman MJ, Stewart DE, Naik AD. Improving patients' postdischarge communication: making every word count. *Circulation*. 2014;130(13):1091–1094. doi:10.1161/CIRCULATIONAHA.114.010621
- Czajka JL, Beyler A. Declining response rates in federal surveys: trends and implications (background paper). Mathematica Policy Research. June 15, 2016. Accessed March 27, 2020. <https://www.mathematica-mpr.com/our-publications-and-findings/publications/declining-response-rates-in-federal-surveys-trends-and-implications-background-paper>
- Groves R, Fowler FJ Jr, Couper M, Lepkowski J, Singer E, Tourangeau R. *Survey Methodology*. 2nd ed. John Wiley & Sons, Inc; 2009.
- Simssek I, Manemann SM, Yost KJ, et al. Participation bias in a survey of community patients with heart failure. *Mayo Clin Proc*. 2020;95(5):911–919. doi:10.1016/j.mayocp.2019.11.028
- ICIC's Expanded Chronic Care Model. Improving Chronic Illness Care. Accessed March 27, 2020. http://www.improvingchroniccare.org/index.php?p=ICIC_Expanded&s=156

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