

CHCS

Center for
Health Care Strategies, Inc.

ROI Evidence Base:
Studies on Congestive Heart Failure

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This set of studies is part of the *ROI Evidence Base*, which was developed by the Center for Health Care Strategies and Mathematica Policy Research, Inc. to help policymakers identify intervention strategies with the potential to both improve quality and reduce health care costs. For the full *ROI Evidence Base*, visit www.chcs.org.

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Congestive Heart Failure (CHF) Studies Reporting Decreases in Cost/Utilization - Summary Table

Clinical Focus	Author/ Year	Target Population	Intervention Strategies	Evaluation Timeframe	Cost/Utilization Outcomes	Quality of Evidence
CHF	Naylor, 2004	Adults (elderly)	Advanced practice nurses provided education, care management, and individualized plans of care to patients and caregivers and collaborated with patients' physicians on patient care and management	52 weeks	36% reduction in total number of re-hospitalizations	A
CHF	Krumholz, 2002	Adults	Cardiac care nurse provided education on early signs and symptoms, information on when and how to seek physician care, and telemonitoring through regular phone contact with patients.	12 months	39% decrease in total number hospital readmissions	A
CHF	Sisk, 2006	Adults	Nurses managed patients by phone and sent patients' clinicians notes on contacts with recommendations on medication changes or subsequent examinations	18 months	21% decrease in total hospitalizations over 12 months; 24% decrease in total hospitalizations in months 12 to 18	A
CHF	Koelling, 2005	Adults	A one time one-on-one 60 min educational session prior to hospital discharge	6 months	35% reduction in hospital costs	A
CHF	Dunagan 2005	Adults	Regularly scheduled telephone contacts by special study nurses for education and support, home visits if necessary. Adjustment of diuretic dosage if previously authorized by primary physician.	12 months	31% decrease in total number of re-hospitalizations at 6 months	A
CHF	Hilleman 2004	Adults	Hospital pharmacists sent letters or called patients' primary care physicians following patients' hospital discharge with recommendations for lipid management.	2 years	35% reduction in proportion hospitalized for myocardial ischemia	B
CHF	Riegel, 2002	Adults (elderly)	Nurses provided telephonic case management, ensured physician follow-up, sent reports to physicians on patient progress and guidelines for treatment	6 months	45.5% decrease in inpatient costs at 6 months	B
CHF	Fonarow 2004	Adults	Implementation of a detailed treatment algorithm for lipid management for all patients hospitalized with coronary artery disease.	1 year	60% reduction in proportion with acute myocardial infarction 45% reduction in proportion with rehospitalization	C
Heart Disease	Wheeler 2003	Adult women	Weekly group meetings for 4 weeks with participants developing their own solutions to specific health problems following an approach taught by the program. Program provided reimbursement for transportation costs and a toll-free number for participants to call program staff with questions.	2 years	49% reduction in inpatient charges	A

Wherever possible, impacts on service utilization (such as hospital admissions or ER visits) are expressed as percentage reductions in the number of services per person per unit time. If the article does not present numbers of services per person per unit time but does provide the total number of services, service use/person/time is estimated by dividing the number of services by the sample size, without accounting for variable lengths of follow up or for mortality. In cases where only numbers or proportions of people with any (one or more) service use are reported, service use impacts are expressed as percentage reductions in the proportion with any service use.

Detail for Selected Study - Naylor 2004

Characteristic	Description
Author and Year of Publication	Naylor 2004
Clinical Focus	CHF
Target Population	Adults 65 and older who were hospitalized with heart failure
Intervention Strategies	Use of advanced practice nurses to provide transitional care intervention, education, care management strategies and individualized plans of care to patients and caregivers and to collaborate with patients' physicians regarding patient care and management. Nurses visited with patients in the hospital and eight additional times at patients' homes to identify changes in health status and provide support.
Additional Targeting Criteria	None stated
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	37.3% (239 out of 641 screened)
Geographic Location	Philadelphia, Pennsylvania
Type of Community	Urban
Health Care Setting	Six academic and community hospitals
Health Insurance	HMO (42% of intervention group); Medicare (13%); Medicare + Medicaid (9%); Medicare + supplemental (54%)
Quality of Evidence	A
Study Design	Randomized Controlled Trial
Sample Size	239 total; intervention group = 118, control group = 121
Evaluation Timeframe	52 weeks
Cost/Utilization Outcomes	34% reduction in re-hospitalizations per patient per year (T = 1.18, C = 1.79, p < .001); 52% reduction in cost of re-hospitalization from months 0 to 3 (T = \$236,144, C = \$489,420, p = .01); 55% reduction in cost of re-hospitalization from months 0 to 6 (T = \$381,725, C = \$841,164, p < .03); Reduction in cost of re-hospitalization months 0-12 was not statistically significant
Full Citation	Naylor, Mary. Brooten, Dorothy. Campbell, Roberta. Maislin, Greg. McCauley, Kathleen. Schwartz, Sanford. "Transitional Care of Older Adults Hospitalized with Heart Failure: A Randomized, Controlled Trial." <i>Journal of American Geriatrics Society</i> . 52(5): 675-684, 2004 May.

Detail for Selected Study - Krumholz 2002

Characteristic	Description
Author and Year of Publication	Krumholz 2002
Clinical Focus	CHF
Target Population	Adults 50 or older who met clinical criteria for presence of HF on admission to hospital
Intervention Strategies	Use of cardiac care nurse to provide education on early signs and symptoms, information on when and how to seek physician care, and telemonitoring through regular phone contact with patients. The first contact was an in-person meeting either at the hospital or at the patient's home (if patient couldn't travel to the hospital). Contact continued with weekly phone calls that gradually were scaled back to bi-weekly and then monthly calls.
Additional Targeting Criteria	None stated
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	23% (88 out of 390 screened)
Geographic Location	New Haven, Connecticut
Type of Community	Urban
Health Care Setting	Hospital and patient home
Health Insurance	Not stated
Quality of Evidence	A
Study Design	Randomized Controlled Trial
Sample Size	88 (T= 44, C=44)
Evaluation Timeframe	12 months
Cost/Utilization Outcomes	39% decrease in number of all-cause hospital readmissions (T = 49, C= 80 [roughly T=1.1 per person per year, C=1.8 per person per year] ^a p=0.06); 48% reduction in number of readmissions for heart failure (T = 22, C= 42, [roughly T=0.5 per person per year, C=0.95 per person per year] ^a p=0.07); 47% reduction in number of readmissions for heart failure or CVD (T = 35, C=66, [roughly T=0.8 per person per year, C=1.5 per person per year] ^a p=0.03);
Full Citation	Krumholz, Harlan. Amatruda, Joan. Smith, Grace. Mattera, Jennifer. Roumanis, Sarah. Radford, Martha. Crombie, Paula. Vaccarino, Viola. "Randomized Trial of an Education and Support Intervention to Prevent Readmission of Patients with Heart Failure." <i>Journal of the American College of Cardiology</i> . 39(1): 83-89, 2002 January.

^acalculated from information provided in the paper as the total number of events in each group divided by the sample size of that group, without taking into account variations in lengths of follow-up for patients or patients who died.

Detail for Selected Study - Sisk, 2006

Characteristic	Description
Author and Year of Publication	Sisk, 2006
Clinical Focus	CHF
Target Population	Adults, African American and other non-white populations; documented systolic dysfunction in cardiac tests
Intervention Strategies	Use of nurses to counsel and manage patients by phone (on diet, adherence, etc.) and coordinate with patients' clinicians by sending them notes on contact with patients and recommendations on medication changes or subsequent examinations. Nurse work was supervised by an internist at the hospital.
Additional Targeting Criteria	None stated
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	26% (406 out of 1555 initially screened)
Geographic Location	Harlem, New York
Type of Community	Urban
Health Care Setting	1 large private academic medical center, 2 municipal hospitals, 1 small private community hospital
Health Insurance	Not stated
Quality of Evidence	A
Study Design	Randomized Controlled Trial
Sample Size	406 (T= 203, C=203) up to 12 months; 254 (T=174, C=174) between 12 and 18 months
Evaluation Timeframe	18 months
Cost/Utilization Outcomes	20% decrease in number of all-cause hospitalizations per person over 12 months (T=.74, C=.93, p=.05) 24% decrease in number of all-cause hospitalizations per person in the period between months 12 and 18 (T=.63, C=.83, p=.05)
Full Citation	Sisk, Jane. Hebert, Paul. Horowitz, Carol. McLaughlin, Mary Ann. Wang, Jason. Chassin, Mark. "Effects of Nurse Management on the Quality of Heart Failure Care in Minority Communities." <i>Annals of Internal Medicine</i> . 145(4): 273-284, 2006 August.

Detail for Selected Study - Koelling, 2005

Characteristic	Description
Author and Year of Publication	Koelling, 2005
Clinical Focus	CHF
Target Population	Adult hospital inpatients admitted with a diagnosis of heart failure and with documented left ventricular systolic dysfunction
Intervention Strategies	60 minute long, one-on-one teaching session with a nurse educator before discharge. Topics covered included causes of heart failure, rationale for drug therapies, mechanisms of diuretic medications, importance of and specific instruction on dietary restriction of sodium and free water intake, importance of and instruction in daily weight monitoring, smoking cessation, avoidance of heavy alcohol intake and non-steroidal drugs, and action plans for worsening of symptoms. Printed materials in laymen's terms.
Additional Targeting Criteria	Exclusion for non-cardiac illness likely to increase 6 month mortality or hospitalization risk, and if undergoing evaluation for cardiac transplantation
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	38% (223 out of 590 initially screened)
Geographic Location	Ann Arbor, MI
Type of Community	Urban/suburban
Health Care Setting	Academic medical center--University of Michigan Hospital
Health Insurance	Not stated
Quality of Evidence	A
Study Design	Randomized Controlled Trial
Sample Size	223 (T= 107, C=116)
Evaluation Timeframe	6 months
Cost/Utilization Outcomes	35% reduction in hospital costs (T=\$5369, C=\$8,292, p=0.034). Adjusted relative risk of combined endpoint of all-cause re-hospitalization or death=0.65 (p=0.018). Since there was a non-significant difference in mortality rate (T=6.5%, C=8.6%), this is approximately equivalent to a 35% reduction in the proportion with any all cause hospitalization. Adjusted relative risk of heart failure hospitalization was 0.56 (p=0.065), or a 44% reduction in the proportion with any heart failure hospitalization. Estimated cost of the intervention was \$100 per participant based on \$50/hour nursing time.
Full Citation	Koelling, Todd M., Monica L. Johnson, Robert J. Cody, and Keith D. Aronson. "Discharge Education Improves Clinical Outcomes in Patients with Chronic Heart Failure." <i>Circulation</i> , vol. 111, January 18, 2005, pp. 179-185.

Detail for Selected Study – Dunagan, 2005

Characteristic	Description
Author and Year of Publication	Dunagan 2005
Clinical Focus	CHF
Target Population	Adult hospital inpatients admitted with a diagnosis of heart failure
Intervention Strategies	Education by specially trained study nurses during index hospitalization and/or by telephone after discharge; regularly scheduled telephone contact, with frequency individualized by nurses (weekly to start). Home visits and bathroom scales if deemed appropriate (20 and 18 patients respectively). Telephone calls emphasized self-management skills, appropriate diet, and medication adherence. Screening for signs or symptoms of decompensation at each contact. If worsening, advice to take extra diuretics if physician had previously granted permission for program to adjust, or to call primary physician if not.
Additional Targeting Criteria	Documented left ventricular systolic dysfunction, and meeting clinical criteria for moderate HF severity. English fluency, absence of severe cognitive or psychological impairments, and not homeless
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	55% (151 of 276 meeting all inclusion/exclusion criteria)
Geographic Location	St. Louis, MO
Type of Community	Urban
Health Care Setting	Academic medical center (Barnes-Jewish Hospital)
Health Insurance	Group Health Advanta (Medicare HMO), Medicaid, FFS Medicare, no insurance
Quality of Evidence	A
Study Design	Randomized Controlled Trial
Sample Size	151 (T=76; C=75)
Evaluation Timeframe	12 months
Cost/Utilization Outcomes	At six months, 31% decrease in number of hospitalizations per person per 6 months (T=0.9, C=1.3, p=0.01). At six months, 17% reduction in hospital costs (T=\$695,777, C=\$841,893, p=0.012). Differences in hospitalizations and costs at 12 months were not statistically significant, however.
Full Citation	Dunagan, William Claiborne, Benjamin Littenberg, Gregory A. Ewald, Catherine A. Jones, Valerie Beckham Emery, Brian M. Waterman, Daniel C. Silverman, and Joseph G. Rogers. "Randomized Trial of a Nurse-Administered, Telephone-Based Disease Management Program for Patients with Heart Failure." <i>Journal of Cardiac Failure</i> , vol. 11, no. 5, June 2005, pp. 358-365

Detailed for Selected Study – Hilleman, 2004

Characteristic	Description
Author and Year of Publication	Hilleman 2004
Clinical Focus	Coronary Artery Disease
Target Population	Adults hospitalized with coronary disease
Intervention Strategies	Hospital pharmacists sent letters or called patients' primary care physicians at 2, 8, 12, 24, and 52 weeks after hospital discharge with recommendations for lipid testing and medication therapy based on the National Cholesterol Education Program guidelines.
Additional Targeting Criteria	Patients admitted to the Coronary Care Unit with coronary disease documented or confirmed during the hospitalization
Opt-in/opt-out, if available	Not applicable
Enrollment rate, if available	Not applicable
Geographic Location	Omaha, NE
Type of Community	Rural
Health Care Setting	Rural primary care practices and Creighton University Medical Center
Health Insurance	Not stated (84% with prescription coverage)
Quality of Evidence	B
Study Design	Quasi-randomized study: treatment patients were hospitalized from Jan. 1 1999 – Mar. 31, 1999; control patients were hospitalized Oct. 1, 1998 – Dec. 31, 1998.
Sample Size	612 (T=303, C=309)
Evaluation Timeframe	2 years
Cost/Utilization Outcomes	35% reduction in proportion hospitalized for myocardial ischemia (T=15%, C=23%, p<0.05); 45% reduction in proportion with acute myocardial infarction (T=6%, C=11%, p<0.05); 43% reduction in proportion with any coronary revascularization (T=12%, C=21%, p<0.05); 36% reduction in proportion with percutaneous coronary intervention (T=9%, C=14%, p<0.05)
Full Citation	Hilleman, Daniel E., Michele A. Faulkner, and Michael S. Monaghan. "Cost of a Pharmacist-Directed Intervention to Increase Treatment of Hypercholesterolemia." <i>Pharmacotherapy</i> , vol. 24, no. 8, pp. 1077-1083.

Detail for Selected Study – Riegel, 2002

Characteristic	Description
Author and Year of Publication	Riegel 2002
Clinical Focus	CHF
Target Population	Elderly adults who were hospitalized at one of two Southern California hospitals and had a confirmed clinical diagnosis of heart failure
Intervention Strategies	Use of nurses to provide telephonic case management, educate patients, ensure contact with physicians is made, send reports to physicians on patient progress and guidelines for treatment. Nurses also arranged for supply of medications if necessary. Each patient received an average of 17 phone calls, which decreased in length over time, and about 16 hours of case management time.
Additional Targeting Criteria	None stated
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	31% (358 out of 1145 screened)
Geographic Location	Southern California
Type of Community	Not stated
Health Care Setting	Patient home-- nurses provided telephonic case management
Health Insurance	Not stated
Quality of Evidence	B
Study Design	Cluster Randomized Controlled Trial
Sample Size	281 physicians; 358 patients (T = 130, C = 228)
Evaluation Timeframe	6 months
Cost/Utilization Outcomes	47% decrease in average number of accumulated hospital days due to heart failure at 3 months (T = .85, C= 1.6, p= .054); 48% decrease in average number of accumulated hospital days due to heart failure at 6 months (T = 1.1, C= 2.1, p= .03); 45.5% decrease in inpatient costs at 6 months (T = \$1,192, C= \$2,186, p=.04); Results on inpatient costs at 3 months were not statistically significant
Full Citation	Riegel, Barbara. Carlson, Beverly. Kopp, Zoe. LePetri, Barbara. Glaser, Dale. Unger, Alan. "Effect of a Standardized Nurse Case-Management Telephone Intervention on Resource Use in Patients with Chronic Heart Failure." <i>Archives of Internal Medicine</i> . 162: 705-712, 2002 March.

Detail for Selected Study – Fonarow, 2004

Characteristic	Description
Author and Year of Publication	Fonarow 2004
Clinical Focus	Coronary Artery Disease
Target Population	Adults hospitalized with acute myocardial infarction
Intervention Strategies	Implementation of a detailed treatment algorithm for all patients hospitalized with coronary artery disease with guidelines for lipid testing and treatment (as well as for treatment with aspirin, beta-blockers, ACE inhibitors; and for patient education on smoking, diet, and exercise).
Additional Targeting Criteria	Not stated
Opt-in/opt-out, if available	Not applicable
Enrollment rate, if available	Not applicable
Geographic Location	Los Angeles
Type of Community	Urban
Health Care Setting	Academic Medical Center (UCLA Medical Center)
Health Insurance	Not stated
Quality of Evidence	C
Study Design	Pre- post design at the program level (patient cohorts from 1994 – 1995, after program implementation, compared to those from 1992 – 1993, before the program)
Sample Size	558 (T=302, C=256)
Evaluation Timeframe	1 year
Cost/Utilization Outcomes	60% reduction in proportion with acute myocardial infarction (T=3.1%, C=7.8%, $p<0.05$); 45% reduction in proportion with rehospitalization (T=7.6%, C=14.8%, $p<0.05$)
Full Citation	Fonarow, Gregg C., Anna Gawlinski, Samira Moughrabi, and Jan H. Tillisch. "Improved Treatment for Coronary Heart Disease by Implementation of a Cardiac Hospitalization Atherosclerosis Management Program (CHAMP)." <i>American Journal of Cardiology</i> , vol. 87, April 1, 2001, pp. 819-822.

Detail for Selected Study – Wheeler, 2003

Characteristic	Description
Author and Year of Publication	Wheeler 2003
Clinical Focus	"Heart Disease" (angina, myocardial infarction, arrhythmia, and valvular disease)
Target Population	Women 60 years or older
Intervention Strategies	Weekly group meetings of 6-8 women, each lasting 2.5 hours, for 4 weeks, led by a health educator and by a peer leader. Participants received "Women take PRIDE" workbooks, videotapes, and self-monitoring tools (logs, pedometers). Participants selected their own topics to work on as a group and as individuals (e.g., exercise, taking medications, diet), using the "Women take PRIDE" process (Problem Identification, Researching one's routine, Identifying a management goal, Developing a plan to reach it, Expressing one's reactions and establishing rewards for goal achievement) under the guidance of the group leaders. Program provided reimbursement for transportation costs and a toll-free number for participants to call program staff with questions.
Additional Targeting Criteria	exclusions for terminal illness or memory deficits
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	48%
Geographic Location	Ann Arbor, MI and southeastern Michigan
Type of Community	suburban/urban
Health Care Setting	not based in health care setting
Health Insurance	not stated
Quality of Evidence	A
Study Design	Randomized, controlled trial
Sample Size	443 (T=227, C=216)
Evaluation Timeframe	24 months (21 months after 3 month intervention period)
Cost/Utilization Outcomes	49% reduction in inpatient charges (p=.10) 41% reduction in cardiac hospitalizations (p=0.05)
Full Citation	Wheeler, John R.C. "Can a Disease Self-Management Program Reduce Health Care Costs? The Case of Older Women with Heart Disease." <i>Medical Care</i> , vol. 41, no. 6, pp. 706-715.

Congestive Heart Failure (CHF) Studies Reporting No Changes or Increases in Cost/Utilization - Summary Table

Clinical Focus	Author/Year	Target Population	Intervention Strategies	Evaluation Timeframe	Cost/Utilization Outcomes	Quality of Evidence
CHF	DeBusk, 2004	Adults	Nurse care management to provide structured telephone surveillance, treatment for heart failure, and coordination of patients' care with primary care physicians	12 months	No statistically significant difference in number of rehospitalizations for heart failure	A
CHF	Galbreath, 2004	Adults	Telephonic disease management administered by a registered nurse with specialized cardiac training	18 months	No statistically significant decrease in CHF-related office or ED visits, or hospitalizations	A
CHF	Goldberg, 2003	Adults	Daily reporting of weight and symptoms by patients to physicians using home telehealth-based heart failure monitoring system	6 months	No statistically significant difference in number of cardiovascular related rehospitalizations	A
CHF	Riegel, 2006	Adults (elderly)	Telephone case management delivered by a bilingual/bicultural Mexican-American registered nurse with special training in HF	6 months	No statistically significant group differences were found in HF hospitalizations	A
CHF	Ross, 2004	Adults	Use of patient-accessible online medical record, SPPARO (System Providing Access to Records Online) to improve patient care and clinic operations	12 months	No statistical significance in number of hospitalizations	A
CHF	Tierney, 2003	Adults	Evidence-based cardiac care suggestions, approved by a panel of local cardiologists and general internists, were displayed on computers to physicians and pharmacists as they cared for enrolled patients	12 months	No statistically significant differences in the number of cardiac-specific ED visits or hospitalizations	A

Detail for Selected Study - DeBusk, 2004

Characteristic	Description
Author and Year of Publication	DeBusk 2004
Clinical Focus	CHF
Target Population	Patients who were hospitalized with a provisional diagnosis of heart failure.
Intervention Strategies	Physician-directed, nurse-managed program. The telephone mediated intervention included the following elements: initial educational session, including videotape; baseline telephone counseling session; nurse-initiated follow-up telephone contacts; pharmacologic management; and nurse-initiated communication with physicians. Nurse-patient phone follow-ups were scheduled at weekly intervals for 6 weeks; biweekly for 8 weeks; monthly for 3 months; bimonthly for 6 months; and as needed to monitor patients' medications, symptoms, and other medical problems throughout the 12 month period of the intervention.
Additional Targeting Criteria	New-onset or worsening heart failure on the basis of 1) shortness of breath (dyspnea at rest, including orthopnea or paroxysmal nocturnal dyspnea) and 2) at least 1 corroborating clinical sign (pulmonary congestion on examination, including rales, crackles, or wheezes) or radiologic abnormality (pulmonary congestion on chest radiograph) consistent with heart failure.
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	55% (462/835 eligible were randomly assigned)
Geographic Location	Northern California
Type of Community	Various communities
Health Care Setting	Kaiser Permanente medical centers in San Francisco, Vallejo, Walnut Creek, Sacramento, and Roseville, California
Health Insurance	Not Stated
Quality of Evidence	A
Study Design	Randomized controlled trial
Sample Size	199 in intervention group, 191 in control group
Evaluation Timeframe	12 months
Cost/Utilization Outcomes	No statistically significant difference in the number of all-cause rehospitalizations (T = 237; C = 232; p > 0.2); No statistically significant difference in the number of rehospitalizations for heart failure (T = 76; C = 86; p > 0.2); Rate of first rehospitalization for heart failure was similar in both groups (proportional hazard, 0.85 [95% CI, 0.46 to 1.57])
Full Citation	DeBusk, R F. N H. Miller, K M. Parker, A. Bandura, H C. Kraemer, D J. Cher, J A. West, M B. Fowler, and G. Greenwald. "Care management for low-risk patients with heart failure: a randomized controlled trial." <i>Ann Intern Med</i> , vol. 141, no. 8, 2004, pp. 606-13.

Detail for Selected Study - Galbreath, 2004

<u>Characteristic</u>	<u>Description</u>
Author and Year of Publication	Galbreath 2004
Clinical Focus	CHF
Target Population	Patients ≥ 18 years of age with symptoms of CHF.
Intervention Strategies	Disease management (DM) program was administered telephonically by a disease manager who was a registered nurse with specialized cardiac training. DM managers provided patient education and medication management in conjunction with the PCP. Initial call frequency was weekly, with a transition to monthly for the duration of the intervention. Frequency of calls was also adjusted for acuity or need.
Additional Targeting Criteria	Systolic or echocardiographically confirmed diastolic heart failure.
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	1069 enrolled in study
Geographic Location	South Texas
Type of Community	Urban, suburban, and rural settings
Health Care Setting	Medical centers
Health Insurance	Not stated
Quality of Evidence	A
Study Design	Randomized controlled trial
Sample Size	Total of 502 patients assessed at 18-month follow-up for ejection fraction
Evaluation Timeframe	18 months
Cost/Utilization Outcomes	No statistically significant decrease in total and CHF-related healthcare utilization, including medications, office or emergency department visits, procedures, or hospitalizations; No statistically significant differences in healthcare cost by group.
Full Citation	Galbreath, A D. R A. Krasuski, B. Smith, K C. Stajduhar, M D. Kwan, R. Ellis, and G L. Freeman. "Long-term healthcare and cost outcomes of disease management in a large, randomized, community-based population with heart failure." <i>Circulation</i> , vol. 110, no. 23, 2004, pp. 3518-26.

Detail for Selected Study - Goldberg, 2003

<u>Characteristic</u>	<u>Description</u>
Author and Year of Publication	Goldberg 2003
Clinical Focus	CHF
Target Population	Patients hospitalized with New York Heart Association (NYHA) class III or IV heart failure, with a left ventricular ejection fraction, measured within 6 months of enrollment.
Intervention Strategies	Nurses administered heart failure care and patient education about heart failure, including advice on daily weights, dietary restrictions including sodium and fluid, and signs and symptoms of a heart failure decompensation. Patients were advised to report changes in weight and symptoms to their physician. Patient also received the technology-based remote monitoring system, AlereNet, to monitor weight and symptoms daily and provide direct nurse-to-patient contact. AlereNet included an electronic scale and an individualized symptom response system.
Additional Targeting Criteria	Treatment with a diuretic and vasodilator; weight <400 pounds; ability to stand for at least 20 seconds without holding the wall; speak either English or Spanish; available phone line within patient's home.
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	280 enrolled in study
Geographic Location	16 medical centers throughout continental United States.
Type of Community	Unclear. Patients referred from clinical sites throughout continental United States.
Health Care Setting	Cardiac transplant centers and community-based cardiology practices.
Health Insurance	Not stated
Quality of Evidence	A
Study Design	Randomized controlled trial
Sample Size	138 in intervention group, 142 in control group (with 32 lost to follow-up and 37 lost to death)
Evaluation Timeframe	6 months
Cost/Utilization Outcomes	No statistically significant difference in number of all-cause rehospitalizations (Average utilization T = 0.19 ± 0.46; C = 0.20 ± 0.30; P = 0.28); No statistically significant difference in number of cardiovascular related rehospitalizations (Average utilization T = 0.08 ± 0.24; C = 0.11 ± 0.26; P = 0.28); 56% decrease in mortality (P < 0.003).
Full Citation	Goldberg, L R. J D. Piette, M N. Walsh, T A. Frank, B E. Jaski, A L. Smith, R. Rodriguez, D M. Mancini, L A. Hopton, E J. Orav, E. Loh, and WHARF Investigators. "Randomized trial of a daily electronic home monitoring system in patients with advanced heart failure: the Weight Monitoring in Heart Failure (WHARF) trial." <i>Am Heart J</i> , vol. 146, no. 4, 2003, pp. 705-12.

Detail for Selected Study - Riegel, 2006

Characteristic	Description
Author and Year of Publication	Riegel 2006
Clinical Focus	CHF
Target Population	Elderly patients (72 ± 11 years) who self-identified as being Hispanic and were hospitalized with a primary or secondary diagnosis of HF.
Intervention Strategies	Telephone case management delivered by a bilingual/bicultural Mexican-American registered nurse with special training in HF. Registered nurses who were guided by a decision-support software program - <i>At Home with Heart Failure</i> - monitored patient symptoms and provided guidance and education on self-care skills. Printed educational material in the desired language was mailed to patients monthly and as needed when specific information was requested. Nurse case managers telephoned physicians as needed and mailed reports on patient progress at regular intervals.
Additional Targeting Criteria	Lived in the community (i.e., not institutionalized); planned to return to the community after hospital discharge; spoke Spanish or English
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	60% (135/225 of eligibles agreed to be randomized)
Geographic Location	Southern California
Type of Community	Unclear
Health Care Setting	Community Hospitals
Health Insurance	10.4% Medicaid, 59.7% Medicare, 23.9% HMO, 32.0% uninsured
Quality of Evidence	A
Study Design	Randomized controlled trial
Sample Size	69 in intervention group, 65 in control group
Evaluation Timeframe	6 months
Cost/Utilization Outcomes	No statistically significant difference in number of all-cause hospitalizations (Average utilization T = 1.06 ± 1.3 [95% CI 0.74-1.4]; C = 1.08 ± 1.4 [CI 0.75-1.4]); No significant group differences were found in HF hospitalizations at 6 months (T = 0.55 ± 1.1 [CI 0.32-0.78]; C = 0.49 ± 0.81 [CI 0.25-0.73]); No significant group differences in proportion with HF readmissions at 6 months (T = 31.9%; C = 33.8%); No significant group differences in HF cost of care (T = \$5567 ± \$13137 [CI \$2009-9126]; C = \$6151 ± \$16650 [CI \$2485-9818]).
Full Citation	Riegel, B. B. Carlson, D. Glaser, and T. Romero. "Randomized controlled trial of telephone case management in Hispanics of Mexican origin with heart failure." <i>J Card Fail</i> , vol. 12, no. 3, 2006, pp. 211-9.

Detail for Selected Study - Ross, 2004

<u>Characteristic</u>	<u>Description</u>
Author and Year of Publication	Ross 2004
Clinical Focus	CHF
Target Population	Patients >18 y.o. with heart failure who were followed in the specialty clinic for heart failure at the University of Colorado Hospital.
Intervention Strategies	Patients given access to SPPARO (System Providing Access to Records Online) and a written user guide to the system. SPPARO provided patients with their medical record, an educational guide, and a messaging system that allowed patients to exchange messages with the nursing staff in the practice.
Additional Targeting Criteria	Spoke English; used a Web browser before.
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	27% (107/394 of eligibles agreed to be randomized)
Geographic Location	Denver, Colorado
Type of Community	Urban
Health Care Setting	Specialty clinic at the University of Colorado Hospital
Health Insurance	19% on Safety-Net Insurance Program
Quality of Evidence	A
Study Design	Randomized controlled trial
Sample Size	38 in intervention group, 43 in control group
Evaluation Timeframe	12 months
Cost/Utilization Outcomes	No statistical significance in number of hospitalizations (T = 22; C = 21; P = 1.00); 14% increase in number of emergency room visits (T = 20; C = 8; P = 0.03); No significant group differences in HF practice visits (T = 324; C = 325; P = 0.66).
Full Citation	Ross, S E. L A. Moore, M A. Earnest, L. Wittevrongel, and C T. Lin. "Providing a web-based online medical record with electronic communication capabilities to patients with congestive heart failure: randomized trial." <i>Journal of Medical Internet Research</i> , vol. 6, no. 2, 2004, pp. e12.

Detail for Selected Study - Tierney, 2003

<u>Characteristic</u>	<u>Description</u>
Author and Year of Publication	Tierney 2003
Clinical Focus	CHF
Target Population	Patients with heart failure who had evidence of left ventricular dysfunction on an echocardiogram or cardiac scintigram report.
Intervention Strategies	Evidence-based care suggestions concerning drugs and monitoring were delivered to physicians (general internists and internal medicine residents) and outpatient pharmacists when writing orders or filling prescriptions using computer workstations. 2 x 2 factorial randomization resulted in 4 groups of patients: physician intervention (P), pharmacist intervention (PH), both interventions (B), and controls (C).
Additional Targeting Criteria	Patients with ischemic heart disease eligible with 1 of the following: 1) inpatient, outpatient, or ED diagnosis of coronary artery disease, angina, or myocardial infarction; 2) definitive diagnostic test; or 3) more than 2 prescriptions for long-acting nitrates.
Opt-in/opt-out, if available	Opt-in
Enrollment rate, if available	81% (706/870 of eligibles were enrolled, randomization at practice and pharmacists level)
Geographic Location	Indianapolis, IN
Type of Community	Urban
Health Care Setting	Indiana University Medical Group - Primary Care (IUMG-PC)
Health Insurance	Not stated
Quality of Evidence	A
Study Design	Randomized controlled trial
Sample Size	142 in P group, 107 in PH group, 113 in B group, 119 in C group
Evaluation Timeframe	12 months
Cost/Utilization Outcomes	No statistically significant effect from either P or PH intervention on whether patients' cardiac care was compliant with the suggestions ($P > 0.8$ across the 4 intervention groups, $P > 0.7$ and $P > 0.4$ for P and PH interventions separately); No statistically significant differences between groups in the total number of cardiac-specific ED visits or hospitalizations (ED visit rates: $P = 0.2 \pm 0.4$; $PH = 0.2 \pm 0.6$; $B = 0.1 \pm 0.4$; $C = 0.2 \pm 0.5$); No statistically significant intergroup differences in outpatient, inpatient, or total health care costs ($P = 6302 \pm 10928$; $PH = 7387 \pm 13206$; $B = 7639 \pm 16921$; $C = 7025 \pm 17024$); No effect on physicians' adherence to the care suggestions ($T = 23\%$; $C = 22\%$).
Full Citation	Tierney, W M. J M. Overhage, M D. Murray, L E. Harris, X H. Zhou, G J. Eckert, F E. Smith, N. Nienaber, C J. McDonald, and F D. Wolinsky. "Effects of computerized guidelines for managing heart disease in primary care." <i>J Gen Intern Med</i> , vol. 18, no. 12, 2003, pp. 967-76.