

WORKING P A P E R

Review of the Current Literature on Outcome Measures Applicable to the Medicare Population for Use in a Quality Improvement Program

Project Deliverable 2a, 2b

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Abstract

Aim

We reviewed measures that have been used to assess quality improvement programs in Medicare or equivalent populations.

Methods

We searched MEDLINE for evaluations of quality improvement programs for applicable populations in US settings published between 2000 and October 2010. The definition of a quality improvement program we adopted was “a change in how routine care is delivered.” Available publications reporting on effects of interventions with concurrent control groups, or before-and-after studies, were eligible for inclusion in the review. We used methods to minimize reviewer error and bias throughout to provide a reliable, valid, and transparent overview, but this scoping review does not constitute a comprehensive systematic review.

Results

The search identified 2,786 publications, of which 690 were considered potentially relevant based on the title and abstract. Of these, 539 were obtained and screened as full text publications. In all, 180 publications met inclusion criteria and were abstracted. The study details are documented in an evidence table. Studies reported on patient health status outcomes, other patient and caregiver measures such as satisfaction with care, and provider and organizational measures such as costs or quality indicators satisfied. Commonly assessed were quality of life, mortality, functional status, depression, pain, diabetes, activities of daily living, pressure ulcer incidence, and falls, as well as ‘health,’ hospitalizations, and emergency department visits. Studies used the Short Form Health Survey (e.g., SF-20), blood pressure, Hemoglobin A1c (HbA1c), low-density lipoprotein, Center for Epidemiological Studies Depression Scale, Geriatric Depression Scale (GDS), Minimum Data Set, Katz Index of Independence in Activities of Daily Living, Symptom Checklist, Mini-Mental Status Exam, Sheehan Disability Scale, Barthel Index of Self Care Abilities, Enforced Social Dependency Scale, Instrumental Activities of Daily Living, and Minnesota Living with Heart Failure Questionnaire. Studies varied in their use of general outcomes (e.g., quality of life, hospitalizations, patient satisfaction), common but population-correlated outcomes (falls, pressure ulcers), or condition-specific outcomes (e.g., HbA1c, GDS); as well as in their use of particular data sources for outcome measures (e.g. patient self report; medical record).

Conclusions

The existing literature demonstrates a wide variety of potential outcome measures, each with inherent advantages and disadvantages. Thus, a transparent and valid strategy is needed to select measures that will be useful for evaluating quality improvement programs applicable to the Medicare population.

(378)

Objective

This review aims to identify previously used outcome measures applicable to the Medicare population for use in a quality improvement program as outlined in the statement of work of the project.

Background and Scope

We set out to identify published evaluations of quality improvement approaches and to document the measures that had been applied in these studies, with the goal of obtaining outcome measures potentially applicable for use in a quality improvement program. The literature review, carried out by the Southern California Evidence-based Practice Center (EPC), was designed to produce a reliable and valid, but not exhaustive, overview of the current literature. We applied standard evidence-based practice center methods (Agency for Healthcare Research and Quality, 2007) as modified to fit the timeline and resources for this project.

The literature search focused on interventions aiming to improve the quality of care for the target population. Quality improvement interventions aim to change how routine care is delivered. For this review we considered a very inclusive definition of quality improvement approaches: “An effort to change/improve the clinical structure, process, and/or outcomes of care by means of an organizational or structural change,” as proposed by Danz et al. (2010). The literature search focused on publications that reported research aimed at improving the quality of care for Medicare patients or participant samples equivalent to this population (e.g., participants 65 years of age and older) to ensure that identified measures are applicable to the majority of the target population.

Because elderly individuals utilize healthcare services more frequently than younger individuals (Bernstein, Hing, Moss, Allen, Siller, & Tiggle, 2003), they are more likely than younger persons to be affected by poorer quality care. Thus, quality improvement programs for health services might potentially affect the Medicare population more than their younger counterparts. However, documenting potential success or failure of quality improvement programs requires measures that provide empirical evidence for the intended improvement. The selection of outcome measures for all research studies depends on many factors, such as the feasibility of obtaining the information, the reliability of the measure (whether the measurement method produces consistent and reliable results), and the validity of the measure (whether the measure is capturing what it purports to measure). However, in this population, not all available or common measures may be suitable to document effects of interventions. For example, elderly participants may struggle with complex written survey questions or interviews. Also, the effects of the intervention must be differentiated from potential general health decline; hence measures have to be carefully selected.

For this review we set out to document how researchers are currently measuring the effects of interventions in comparable target populations. The National Quality Measure Clearinghouse (AHRQ, 2011) differentiates the domains access to care, outcome of care, patient experience of care, population health, process of care, structure of care, and use of services and all domains

could be targeted to improve the quality of care. Outcome of care measures are here defined as the health state of a patient resulting from health care. In order to identify outcome measures relevant to the outlined project purpose the review targeted studies reporting patient health status outcomes as well as other selected measures to document improvement such as satisfaction with care or utilization of care.

Quality improvement evaluations utilize diverse study designs (Rubenstein et al., 2008). The gold standard design for evaluating an intervention is the randomized controlled trial; however many studies may be limited to less rigorous designs for evaluating change (e.g., before-after studies). We considered studies that reported empirical evidence of intervention effects when compared to a control group or to the status before the intervention, without further restrictions on study design. To ensure applicability of outcome measures, we limited the literature overview to studies carried out in the US. To capture current approaches to outcome measurement, we considered only evaluations published in the last 10 years.

Methods

Prior to undertaking the review, we developed a protocol outlining the scope of the review, the search strategy, the inclusion criteria, and a draft of the evidence table and submitted this protocol to CMS.

Search strategy

We designed an electronic search strategy to identify relevant publications. A preliminary search indicated a large research volume. We restricted the search to English language publications and US settings and used filters to capture the applicable age group. Previous work on search filters has shown that a combination of free text terms for quality improvement, restrictions to applicable MeSH terms, common intervention components such as audit and feedback, and terms representing approaches to initiate change in organizations (e.g., Plan-Do-Study-Act [PDSA] cycles) is useful to identify relevant publications (Hempel et al., in preparation); thus, such a combination was used to maximize the sensitivity and specificity of the search. The search strategy was approved by CMS prior to the search execution. The database MEDLINE was searched to maximize the yield of studies relevant to the review questions. The search date was October 2010; the exact search strategy is documented in the appendix.

Inclusion Criteria

We established inclusion criteria based on the scope of the review.

- Participants
 - Studies in Medicare samples or samples of elderly participants were eligible for inclusion in the review. Elderly samples were defined as those restricted to participants of at least 65 years of age or samples with a mean age of at least 65 years.
- Intervention
 - Studies reporting on the effects of quality improvement interventions (a change in how routine care is delivered) in a US setting were eligible for inclusion in the review. Comparisons of Medicare's health maintenance organization (HMO) and fee-for-service (FFS) programs, comparisons between care plans (e.g., Veterans Health Administration and Medicare Advantage Plans) and studies of effects of mandatory work-hour restrictions were excluded, as these changes are not consistently labeled 'quality improvement.'
- Comparator / Design
 - Studies reporting empirical data on the effects of an intervention as compared to results in a control group or the status before the intervention was implemented were eligible for inclusion in the review (randomized controlled trials, controlled trials, and controlled and uncontrolled before-after studies).
- Outcome
 - Patient health status outcomes, patient or caregiver satisfaction, utilization of care, costs, indicators of continuity and processes of care were eligible for inclusion in

the review. Studies reporting only on provider satisfaction, provider knowledge or provider's opinions of the intervention were excluded.

- Other criteria
 - English language studies published since 2000 were eligible for inclusion in the review.

Data abstraction and documentation

We systematically abstracted relevant information from publications, summarizing information on the study design, the specific healthcare setting, the target population and prominent clinical condition where applicable, the quality improvement intervention, and the authors' conclusion(s).

All measures used in the included studies were extracted, with the exception of data on provider satisfaction, provider knowledge, provider's opinions of the intervention, and rates of provider participation in the intervention or educational sessions about the intervention. The abstraction form provided for a broad categorization of measures into patient health status outcomes; other patient or caregiver measures such as satisfaction; and provider or organizational measures, including process measures, adherence to guidelines, and costs. Quality of life was abstracted as a participant health status outcome as scales often include disease / functional status aspects. Hospital length of stay was abstracted as a provider / organizational measure as this outcome depends on organizational factors as well as patient health status. In order to allow a concise overview of studies and to place more emphasis on outcomes measured at the patient level, we summarized adherence to an extensive list of quality indicators.

Where applicable, we extracted the construct that was measured (e.g., depression) followed by the specific measure used to assess the construct (e.g., Geriatric Depression Scale [GDS]). For those studies that did not use a published instrument or used only parts of published instruments, we abstracted available details (e.g., 1-item question).

We abstracted the source of information for the data, e.g., administrative data, hospital records, chart review, healthcare provider assessment, patient or caregiver interview, or questionnaire. Where reported in the original publications, it was noted whether patient or caregiver data were obtained by telephone or written questionnaire rather than in-person interaction.

In addition, we indicated which outcome measures improved according to the authors. However, quantitative results must be viewed in context, i.e., the study design, the comparator, the potential alternative predictors for the result, the employed statistical tests, and the quality of the study; hence this indicator has to be interpreted with caution.

The abstracted information was documented in an evidence table to enable a concise overview (see appendix).

Procedure

Two literature reviewers independently screened the titles and abstracts of the identified publications. Full-text versions of publications deemed potentially relevant by at least one reviewer were sought. Due to the restricted timeline, the review focused on open access articles and publications readily available through RAND library journal subscriptions; the RAND library subscribes to approximately 30,000 journals.

Publications were screened by one reviewer and checked by a second reviewer using the predefined inclusion criteria to provide an overview with reproducible results. One reason for exclusion was recorded for each publication although many studies would fail to meet several inclusion criteria. Exclusion criteria were considered in this sequence: not English language, publication year before 2000, not US setting, ineligible participants, other than quality improvement intervention or no intervention, ineligible design, and ineligible outcome measure.

Data were abstracted by one reviewer using a standardized form and checked by a second reviewer to reduce reviewer errors and bias but were not abstracted in duplicate due to the restricted timeline.

Results

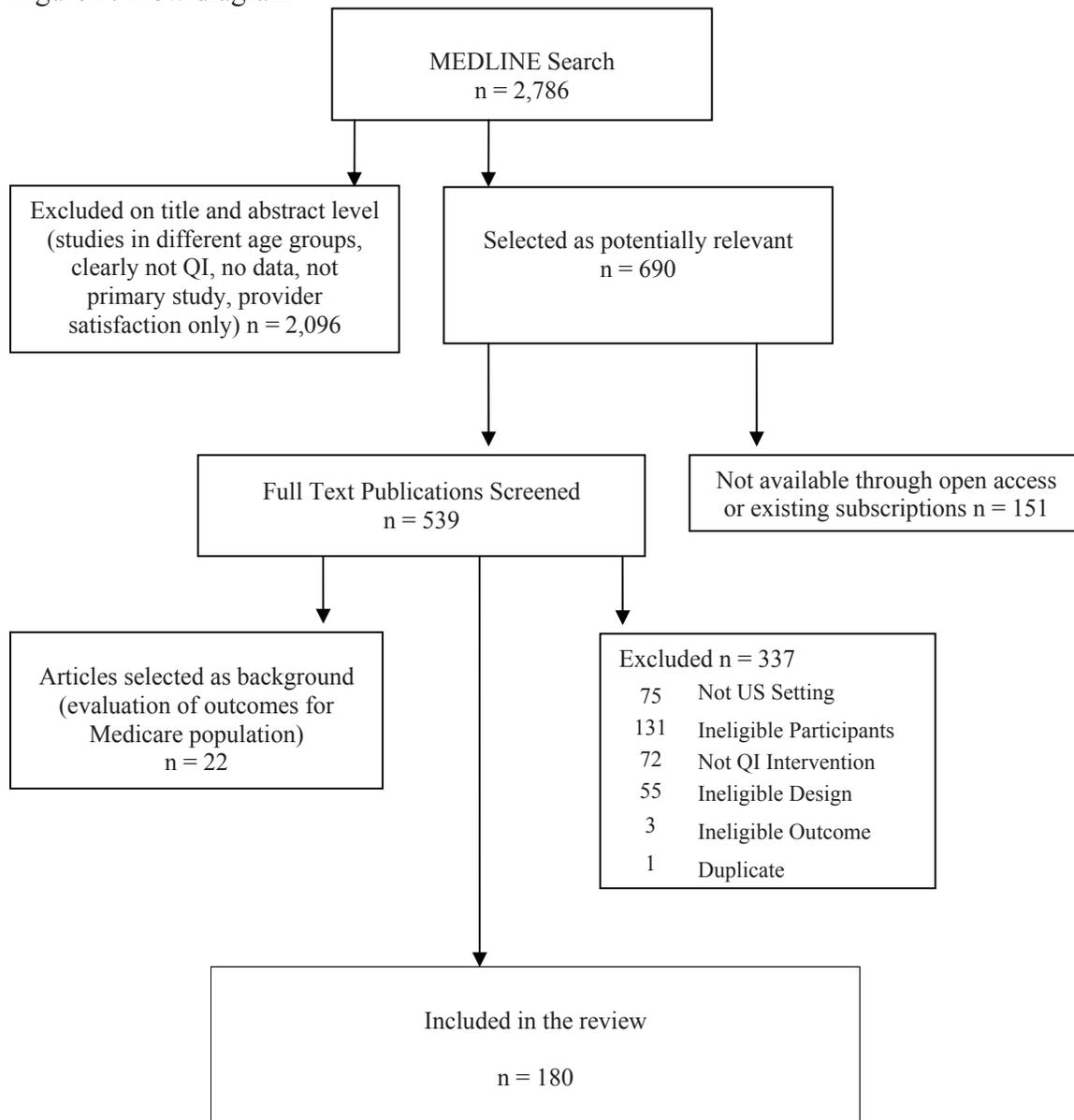
The search identified 2,786 publications, of which 690 were considered potentially relevant based on the title and abstract; thus, we excluded 2,096 publications because they clearly included ineligible participant groups, evaluated other interventions than quality improvement interventions or described no interventions, employed ineligible study designs such as reviews or descriptions without data, or used inadequate outcome measures such as provider satisfaction or knowledge only.

Of the 690 publications selected as potentially relevant, 539 were obtained and screened as full text publications. In all, 151 publications were not available for relevance screening as outlined in the procedure section and were not considered for the review. The citations of all studies selected as potentially relevant but not obtained are documented in the appendix.

In all, 336 out of 539 screened full-text publications were excluded. The citations of the excluded papers together with the reason for exclusion are documented in the appendix. The most common reason for exclusion was the study participant characteristics (not elderly or Medicare participants). In this order, the setting (not US), the intervention (not quality improvement or no intervention took place), the study design (no primary data), and the outcome measure (provider satisfaction or knowledge) were the most common reasons for the exclusion. An additional 22 publications were classified as background papers. The citations of the background papers are documented in the appendix.

Of the 539 publications screened as full text articles, 180 publications met inclusion criteria and the information was abstracted. The study flow is outlined in the figure below.

Figure 1: Flow diagram



Study description

Of the included studies, 63 studies randomized participants to treatment groups (RCT), 40 studies were not randomized but used concurrent controls with or without before-after data (CC), and 77 used an uncontrolled before-after design (B-A).

The most common setting within the included studies was a hospital (53 studies). Thirty-two included studies aimed to improve care of nursing home or long-term care facility residents. Primary care clinics or community samples made up the bulk of the remainder. Twenty-two settings were medical centers. Of all studies, 18 targeted care in Veterans Affairs facilities. Several studies addressed multiple hospitals, primary care settings, or nursing homes (e.g.,

Lapane, Hughes & Quilliam, 2007; Stevenson, McMahon, Harris, Hillman, & Helgerson, 2000) while other studies reported on a single facility or individual units only (e.g., Agostini, Zhang & Inouye, 2007; Burkitt, Mor, Jain, Kruszewski, McCray, Moreland, Muder, Obrosky, Sevick, Wilson, & Fine, 2009). A few studies implemented interventions at the plan level, i.e., targeting all included facilities. Maue, Rivio, Weiss, Farrelly, and Brower-Stenger (2002) targeted primary care practices in a large physician network HMO (AvMed Health Plan). Sidorov, Shull, Girolami and Mensch (2003) focused on improving care for patients with congestive heart failure enrolled in a large HMO (Geisinger Health Plan). Smith, Perrin, Feldstein, Yang, Kuang, Simon, Sittig, Platt and Soumerai (2006) tested the effect of an intervention affecting a HMO (Kaiser Permanente).

The study populations varied from general populations under the care of an organization such as primary care participants, nursing home residents, or all patients currently hospitalized, to patient groups with specific conditions. The following clinical conditions were explicitly targeted (alone or in combination): Alzheimer's disease (1 study), cancer (10 studies), coronary conditions (30 studies), cognitive impairment and dementia (9 studies), depression or dysthymia (7 studies), diabetes (16 studies), drug-related problems (1 study), fractures (mainly hip fractures, 5 studies), hypertension (2 studies), incontinence (3 studies), osteoporosis (2 studies), peptic ulcer disease (1 study), pressure ulcers (4 studies), respiratory symptoms (18 studies), stroke and thromboembolic conditions (6 studies). Other studies addressed 'elderly,' 'geriatric,' or 'frail' participants, or targeted the age group of interest without specifying clinical conditions.

The studies reported on evaluations of diverse quality improvement approaches. Some were large initiatives (e.g., an organized program to initiate lifesaving treatment in hospitalized participants with heart failure [OPTIMIZE-HF], and the Get With The Guidelines [GWTG] program), whereas others appeared to be local improvement approaches by individual organizations.

For each study, the authors' conclusion is also documented in the evidence table. Most conclusions were positive and highlighted one or two improvements.

Measures of improvement

The measures that were used in the individual studies are documented in the evidence table in the appendix. We differentiated the measures into the following broad categories: patient health status outcomes, other patient or caregiver measures, and provider or organizational measures.

Provider and organizational measures

Most studies, 146 in total, reported on at least one organizational measure, e.g., quality of care indicators, process and performance measures at the provider level, costs, or length of stay, which depends on patient and organizational variables. Most of the measures assessed whether a recommended care process was taken up in clinical practice. This quality check was often closely linked to the intervention, e.g., an intervention targeting provider prescribing practices

using a computerized clinical reminder was assessed by verifying the actual prescription practices.

Many of the studies were aimed at developing quality indicator sets for the care of patients with a particular clinical condition, e.g., Alzheimer's disease; addressed a specific symptom, e.g., pressure ulcers; or focused on a particular setting, e.g., several studies targeted improvement in nursing homes using the Minimum Data Set (MDS). These measures show whether participants receive the recommended quality of care; whether these processes are effective in directly affecting patients' health is a different question.

Patient measures other than health

Some studies did not target the health status of participants but measured other participant variables. The majority of these variables were measures of satisfaction with care received or with care providers; these measures were elicited from the patient or the caregiver. The next most common category was knowledge about the particular condition the patient was being treated for; measurement areas addressed patients as well as caregivers, and included confidence with managing the condition, self-efficacy, and self-assessed skills. An additional group of selected measures within this category targeted caregivers, assessing caregiver burden, negative caregiving consequences, and also caregiver mental and physical health, including quality of life. A few of the included studies assessed the economic burden of the condition for the patient (and the caregiver). Individual studies also reported on other outcome measures such as emotional needs, loneliness, spiritual well-being, satisfaction with social relationships, and preparedness for death.

Of note is that results pertaining to satisfaction need not correspond to those regarding health improvement; Subramanian, Fihn, Weinberger, Plue, Smith, Udris, McDonell, Eckert, Temkit, Zhou, Chen and Tierney (2004) reported that intervention participants were more satisfied with their physicians and primary care visits but had more all-cause hospitalizations at six and 12 months after implementation of a computerized care suggestion intervention for providers.

Patient health status measures

Most studies reported at least one patient health status outcome measured at the patient level (119 included publications, or 122 when also including length of stay). The included studies employed a large number of diverse patient outcomes, as the evidence table demonstrates. All MDS 3.0 categories (cognitive patterns, mood, behavior, preferences for customary routine and activities, functional status, bladder and bowel, active disease diagnosis, health conditions, swallowing and nutritional status, skin conditions, special treatment and procedures, restraints, participation in assessment and goal setting) except hearing /speech / vision were addressed in at least one study through either patient health status outcomes or other patient measures. However, most individual studies targeted only a single category.

Common patient health status measurement areas were quality of life (31 studies), mortality (28 studies), functional status or functional impairment (22 studies), depression (19 studies), pain (10 studies), activities of daily living (8 studies), incidence or status of pressure ulcers (6 studies),

and falls (5 studies). Diabetes was addressed in several studies, 10 measured HbA1c (see below). Eight studies assessed health status directly, rather than through quality of life or functional status, often through a one-item self-report question. Other common outcome measures were hospitalizations or rehospitalizations (33 studies) and emergency department visits (11 studies). The measurement areas are not mutually exclusive as, for example, some measures of quality of life also contain items on functional status.

Measurement scales and tests

Studies varied in how they assessed or operationalized the measurement areas of interest. A large number of studies used measures such as hospitalizations as indicators of health. Other studies assessed more complex constructs. The specific measures or tests were often not identical with the constructs they aimed to measure, e.g., the construct depression can be measured in different ways. A high test score on a depression scale is not the same as a clinical diagnosis of depression but it is a good indicator and a way to quantify the severity of the condition; however there are many alternative scales to choose from. Similarly, HbA1c is a widely used indicator of diabetes, even though it is not identical to a clinical diagnosis of diabetes, but other laboratory values may not be as well established and validated.

The following individual measurement scales and tests were used in more than one study: Short Form Health Survey (primarily SF-20 but in various versions and item selections, 16 studies), blood pressure (14 studies), HbA1c (10 studies), low-density lipoprotein (7 studies), Center for Epidemiological Studies Depression Scale (CES-D, 7 studies), Geriatric Depression Scale (GDS, 5 studies), MDS (5 studies), Katz Index of Independence in Activities of Daily Living (4 studies), Symptom Checklist (SCL-20, 4 studies), Mini-Mental Status Exam (MMSE, 3 studies), Sheehan Disability Scale (SDS, 3 studies), Barthel Index of Self Care Abilities (2 studies), Enforced Social Dependency Scale (ESDS, 2 studies), Instrumental Activities of Daily Living (2 studies), and Minnesota Living with Heart Failure Questionnaire (MLHFQ, 2 studies).

For all specific measures that were used in the included studies, the conceptual overlap with the underlying construct, the validity and clinical significance, and the importance to patients needs to be carefully evaluated to ensure that measures are meaningful.

Specificity of measures

Within measurement areas, studies varied greatly in the specificity of the measures used. The health status outcome measures ranged from general health outcomes, to outcomes targeting common but population-group-specific outcomes, to condition-specific outcomes.

Examples of general outcomes selected in included studies were mortality, hospitalizations, emergency department visits, quality of life, safety indicators, and patient satisfaction.

Examples of population-specific outcomes associated with general health status but not necessarily associated with specific conditions were admissions to nursing homes, activities of daily living, pain, falls, and incidence of pressure ulcers. Most Outcome and Assessment Information Set (OASIS) outcome measures (Shaughnessy, Crisler, Schlenker et al., 1994;

Shaughnessy, Hittle, Crisler, Powell, Richard, Kramer, Schlenker, Steiner Donelan-McCall, Beaudry, Mulvey-Lawlor and Engle, 2002) are not specific to clinical conditions but tailored towards assessment of home care participants. In addition, several end-of-life measures are not condition specific, such as the presence of do-not-resuscitate orders.

Examples of identified condition-specific outcomes were HbA1c (diabetes), depression (e.g., CES-D), dyspnea, dementia status, delirium rate, respiratory measures, pulmonary exacerbations, severity of pneumonia, days of ventilator support, pressure ulcer healing, and presence of carcinoma.

Source of information

Patient health status data were obtained from patients (participants), caregivers, and provider assessments, either directly or from administrative data. Some studies, e.g., studies in patients with dementia, used exclusively caregiver assessments, whereas other studies accepted data from caregivers where patients were unable or unwilling to complete measures. Several studies used physiological or clinical measures from provider assessments rather than any self-reported measures. Many factors affect whether a particular source of information is adequate for the assessment of health, which is a complex concept. The MDS 2.0 was criticized because it did not include items that require direct questioning of residents (see Saliba, Buchanan, et al., 2008; Kane, 2000).

The source of the outcome measure and the potentially corresponding resources needed to obtain the information varied greatly across included studies (patient self report; medical record). Some studies based the evaluation on routine data, but the majority of published articles in the review appear to have collected additional data as part of the improvement program. Data collection was often limited to phone interviews rather than face-to-face assessments.

Susceptibility to change / improvement potential

Most author-reported improvements occurred in the provider or organizational measure category. Several interventions appear to have successfully improved processes of care: Participants were more likely to receive recommended treatments after the intervention or compared to a control group. In several cases, measurement of adherence to recommended care processes was indistinguishable from fidelity assessments (evidence that the intervention was successfully implemented). However, as stated previously, although process improvement may be a necessary condition to improve patients' health, it is not a sufficient one.

Fewer improvements were reported for the "other patient measure" category, predominantly patient experiences measures such as satisfaction with care. Again, satisfaction measures cannot replace health status outcome measures, but satisfaction is frequently easier to address.

In terms of patient health status outcomes, the evidence table indicates which outcome was successfully improved according to the authors of the study. The following outcomes were reported as improved in more than one of the included studies: activities of daily living, blood pressure, cholesterol values, depression, dyspnea, emergency department visits, functional status,

HbA1c, hospitalizations, hospital readmissions, mood, mortality, pain, pressure ulcer incidence or healing, and quality of life. This list of improved outcomes is not exhaustive, as several outcomes were reported in only one study, and it is likely that there are additional outcomes in the universe of potential outcomes that can be improved but were not chosen in the included studies.

Of note, we identified a number of before-after studies. A majority of these studies compared two different participant samples under the care of the organization at two different time periods. In studies following a particular cohort of elderly participants, intervention effects on health outcomes might be masked or overshadowed by the overall declines in health associated with the aging process over time, particularly where incurable conditions are concerned. The OASIS survey (Shaughnessy, Crisler, Schlenker et al., 1994; Shaughnessy, Hittle, Crisler, Powell, Richard, Kramer, Schlenker, Steiner Donelan-McCall, Beaudry, Mulvey-Lawlor and Engle, 2002) differentiates outcome improvement from outcome stabilization (i.e., a cessation of decline).

Selection approach and implications

The literature review provides a snapshot of measures that have been used for the target population. The existing literature demonstrates a wide variety of potential outcome measures. The evidence table provides an overview of the measures that have recently been applied by researchers and practitioners. The documented measures have been used successfully, meaning that they were chosen by the research team, the data collection and analysis appeared to be feasible in the target population, and the measures provided insight into the evaluation of improvement. Regarding the universe of items that can be considered for this population, the documented measures are possible candidates. However, consideration of the choice of outcome measures should go beyond feasibility.

Overall, most studies included in the literature review provided very little information regarding the reason for choosing particular measures or did not comment on the selection process for the assessed domain or measurement area. In contrast, the study reported by Shaughnessy et al. (2002) described a sophisticated selection process that fed into Outcome-Based Quality Improvement (OBQI) trials. An initial set of more than 500 patient health-status outcomes was reviewed in a consensus finding process involving a number of pertinent experts. The measures were field tested and revised as necessary and resulted in the 107-item OASIS set.

A number of identified publications selected quality indicators based on concurrent or previous efforts to establish a valid set of pertinent care processes such as indicators used in the Medicare quality improvement program or the MDS (e.g., Colon-Emeric, Lyles, House, Levine, Schenck, Allison, Gorospe, Fermazin, Oliver, Curtis, Weissman, Xie, & Saag, 2007; Rantz, Vogelsmeier, Manion, Minner, Markway, Conn, Aud, & Mehr, 2003). The majority of these quality indicators were process measures intended for monitoring the performance of providers, rather than patient health status measures. Kiefe, Allison, Williams, Person, Weaver and Weissman (2001) explicitly stated that the developed indicators were designed to assess processes of care for quality improvement, were not intended to serve as standards of care (“achievable benchmarks”),

and were considered amenable to simple quality improvement measures. Some of the selected quality indicator sets were tailored towards the participant cohort and the predominant condition, the interventions, or both. Some of the indicator sets explicitly differentiated the assessment and the treatment process; other studies differentiated prevention and treatment aspects of care, and some put special emphasis on the care of high-risk patients (e.g., Baier, Gifford, Lyder, Schall, Funston-Dillon, Lewis, & Ordin, 2003). The dementia indicators described by Vickrey, Mittman, Connor, Pearson, Della Penna, Ganiats, DeMonte, Chodosh, Cui, Vassare, Duan, and Lee (2006) cover assessment, treatment, education and support, and safety.

The identified studies also included evaluations based on Assessing Care of Vulnerable Elders (ACOVE) measures (e.g., Counsell, Callahan, Clark, Tu, Buttar, Stump, & Ricketts, 2007; Reuben, Roth, Frank, Hirsch, Katz, McCreath, Younger, Murawski, Edgerly, Maher, Maslow, & Wenger, 2010; Wenger, Roth, Shekelle, Young, Solomon, Kamberg, Chang, Louie, Higashi, MacLean, Adams, Min, Ransohoff, Hoffing and Reuben, 2009). The ACOVE measures have been shown to be associated with patients' survival (Higashi, Shekelle, Adams, Kamberg, Roth, Solomon, Reuben, Chiang, MacLean, Chang, Young, Saliba, Wenger, 2005) which was cited as one of the reasons for applying the set (e.g., Counsell et al., 2007).

The experience with quality indicators has shown that the methods employed to establish a set of measures are crucial (e.g., Campbell, Braspenning, Hutchinson, & Marshall, 2002) and a similar complex process needs to be adopted for any selection of outcome measures intended to be applicable to the Medicare population for use in a quality improvement program.

Recommendations

From our review of the identified evaluations, we are not able to recommend specific outcome measures, either on the construct level of the measurement area or on the level of specific measurement scales or tests used to measure the construct. The choice of measure in the included studies may have depended on many factors; the measures were typically restricted to selected indicators and were often closely linked to the intervention or to a single clinical condition. Identified studies also did not indicate whether some measures were superior or more appropriate than others to document improvement. Rather, the existing literature points to the need to develop and apply a transparent and valid selection strategy to identify useful outcome measures for the purpose in question.

A selection strategy may consider the following:

- The need for tailoring the measures towards the intervention. Where programs target to improve specific care processes, the selection should ensure that most relevant measures are included. In several included studies does the choice of measure appear to have been closely linked to the intervention. Typical continuous quality improvement methods such as PDSA approaches are guided by three questions: ‘What are we trying to accomplish?’ ‘How will we know whether a change is an improvement?’, and ‘What changes can we make?’ (Berwick, 1998; Langley, Nolan, Nolan, Norman, Provost, 1996). However, the patient safety literature shows it is also pertinent to check for unexpected or incidental results (e.g., Ganz, Wenger, Roth, Kamberg, Chang, MacLean, Young, Solomon, Higashi, Min, Reuben, & Shekelle, 2007).
- The need for sampling according to clinical conditions present in the target population. The selected outcome measures should ensure that they are relevant to a large number of participants. One approach may be to choose outcome measures representative of the conditions present in the target population. Studies included in the literature review primarily targeted selected conditions, e.g. diabetes, and were limited in their range of measurement areas and selected measures. Few systems currently exist to comprehensively assess the quality and effectiveness of care for programs (e.g., OASIS; Shaughnessy, Crisler, Schlenker et al., 1994), settings (e.g., the MDS), or across clinical conditions (e.g., ACOVE).
- The usefulness of including measures not specific to particular clinical conditions. These outcome measures may be global measures such as quality of life but also include non-disease-specific measures related to common adverse participant events. The presented study by Bailey, Burgio, Woodby, Williams, Redden, Kovac, Durham and Goode (2005) investigated the documentation of 13 symptoms that were described as common end-of-life symptoms in a study that aimed to improve the quality of care provided for patients dying in an acute care inpatient setting (no further detail was reported on the selection process). The symptom selection included the following: pain, dyspnea, cough, asthenia, anorexia, nausea, constipation, skin integrity, continence, delirium, depression, anxiety, and insomnia.
- The need to sample measures that can be improved or at least maintained in the target population. In an elderly participant group, the mortality rates may not be directly influenced by quality improvement programs, but end-of-life measures such as pain control or respecting do-not-resuscitate choices may be amenable to improvement.. A

few studies (e.g., Ell, Unutzer, Aranda, Gibbs, Lee, & Xie, 2007) reported that the chosen measure was selected because it had been shown to be sensitive to change. Similarly, Rantz, Popejoy, Petroski, Madsen, Mehr, Zwygart-Stauffacher, Hicks, Grando, Wipke-Trevis, Bostick, Porter, Conn, and Maas (2001, also Rantz, Mehr, Conn, Hicks, Porter, Madsen, Petroski & Maas, 1996) reported that 13 MDS patient outcome and process quality indicators were chosen for a nursing home intervention because the indicators had previously shown sensitivity to clinical interventions and sufficient variation in scores to detect changes.

- The need to sample measures that can be influenced by the target organization (see e.g., Kiefe et al., 2001; Rantz et al, 1996; 2001). One selection criterion may be whether there is empirical evidence that the selected outcome measure can be improved through provider- and plan-level quality improvement programs or translate to improvements in health status.
- The feasibility of data collection with regard to the target population. Because self report may not be applicable to some proportion of the target population, the use of proxies can be considered. The reliance on healthcare providers to collect data about participants is problematic (see also Saliba, Buchanan et al., 2008). Crogan, Alvine, and Pasvogel (2006) for example chose the Alzheimer's disease specific Quality of Life-AD scale over the SF-36 because it can be successfully administered to nursing home residents suffering from cognitive changes or dementia.
- The relative costs of obtaining the information. This criterion takes into account which routine data are already measured by the organization and determines where a lack of pertinent information exists. As outlined, the data source and their potentially associated costs varied greatly across identified studies. Some publications described that a short form was used rather than a full test, often to allow phone surveys (e.g., Arbaje, Maron, Yu, Wendel, Tanner, Boulton, Eubank, & Durso, 2010).
- The reliability of available tests to measure the intended construct. This criterion would consider whether there is sufficient evidence that the selected test or measure yields reliable data, or whether potential measures could be ranked according to their reliability. A number of identified publications cited the previously established reliability or psychometric properties of the measure as the reason for choosing it.
- The validity of the available tests to measure the intended construct. This criterion considers whether there is sufficient evidence that the selected test or measure is measuring what it set out to measure, and whether the measure is a sufficient indicator of the disease or an established surrogate measure. A few identified studies stressed that the chosen measure had been validated in the target population (e.g., Piatt, Anderson, Brooks, Songer, Siminerio, Korytkowski, & Zgibor, 2010).
- The frequency of measurable events. The prevention of rare events (e.g., Never Events) may be pertinent to the target population; however rare events present considerable measurement difficulties. The review did not identify studies primarily focusing on the prevention of rare events.
- The organization's priority. The choice of outcome measure may also correspond to organizational priorities regarding the need for improvement. Such outcomes may include costs as well as patient satisfaction with care received, regardless of the effects on patients' health. The identified publications addressed very different measurement areas but rarely described specific organizational goals.

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Appendix

Appendix: Search Strategy

Database: MEDLINE (Ovid interface)

Search #1 (QI text word, simple)

1. (Quality and improv* and intervention*).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier] (Quality and improv* and intervention*).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
2. limit 1 to (yr="2000 -Current" and "all aged (65 and over)")
3. limit 2 to humans
4. united states.cp.
5. 3 and 4

Search #2 (QI text word, synonyms plus MeSH terms)

1. (quality adj5 (improv* or enhance*) adj5 (interven* or strategy or program or programme or collaborative* or process)).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
2. ((process adj improvement) or (improvement adj collaborative*)).mp.
3. 1 or 2
4. (quality of health care or quality assurance, health care or quality indicators, health care or health plan implementation).sh. or organizational change.mp. or organizational structure.mp. or organizational innovation/ [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
5. 3 and 4
6. limit 5 to (yr="2000 -Current" and "all aged (65 and over)")
7. limit 6 to humans
8. united states.cp.
9. 7 and 8

Search #3 (Intervention components plus MeSH terms)

1. exp *education, continuing/
2. (education\$ adj2 (program\$ or intervention? or meeting? or session? or strateg\$ or workshop? or visit?)).tw.
3. (behavio?r\$ adj2 intervention?).tw. or pamphlets/ or (leaflet? or booklet? or poster? or pamphlet?).tw.
4. (((written or printed or oral) adj information) or (information\$ adj2 campaign)).tw.
5. (education\$ adj1 (method? or material?)).tw.
6. advance directives/ or outreach.tw. or ((opinion or education\$ or influential) adj1 leader?).tw.
7. (facilitator? or academic detailing or consensus conference?).tw. or *guideline adherence/ or practice guideline?.tw.
8. (guideline? adj2 (introduc\$ or issu\$ or impact or effect? or disseminat\$ or distribut\$)).tw.
9. ((effect? or impact or evaluat\$ or introduc\$ or compar\$) adj2 training program\$).tw.
10. *reminder systems/ or reminder?.tw. or (recall adj2 system\$).tw. or (prompter? or prompting).tw. or algorithm?.tw.
11. *feedback/ or feedback.tw. or chart review\$.tw. or ((effect? or impact or records or chart?) adj2 audit).tw.
12. (compliance or marketing).tw.
13. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12

14. exp *reimbursement mechanisms/
15. fee for service.tw. or *capitation fee/ or *"deductibles and coinsurance"/ or cost shar\$.tw.
16. (copayment? or co payment? or (prepay\$ or prepaid or prospective payment?)).tw.
17. *hospital charges/ or formular\$.tw. or fundhold\$.tw. or *medicaid/ or *medicare/ or blue cross.tw.
18. 14 or 15 or 16 or 17
19. *nurse clinicians/ or *nurse midwives/ or *nurse practitioners/ or (nurse adj (rehabilitator? or clinician? or practitioner? or midwi\$)).tw.
20. *pharmacists/ or clinical pharmacist?.tw. or paramedic?.tw. or *patient care team/ or exp *patient care planning/ or (team? adj2 (care or treatment or assessment or consultation)).tw.
21. (integrat\$ adj2 (care or service?)).tw.
22. ((care adj2 (coordinat\$ or program\$ or continuity)) or (case adj1 management)).tw.
23. exp *ambulatory care facilities/ or *ambulatory care/
24. 19 or 20 or 21 or 22 or 23
25. *home care services/ or *hospices/ or *nursing homes/ or *office visits/ or *house calls/
26. *day care/ or *aftercare/ or *community health nursing/ or (chang\$ adj1 location?).tw.
27. (domiciliary or (home adj1 treat\$) or day surgery).tw. or *medical records/ or *medical records systems, computerized/ or (information adj2 (management or system?)).tw.
28. *peer review/ or *utilization review/ or exp *health services misuse/
29. 25 or 26 or 27 or 28
30. *physician's practice patterns/ or quality assurance.tw. or *process assessment/ [health care]
31. program evaluation/ or *length of stay/ or (early adj1 discharg\$).tw. or discharge planning.tw.
32. (((offset or triage).tw. or exp *"Referral and Consultation"/) and "consultation"/) or *drug therapy,computer assisted/
33. near patient testing.tw. or *medical history taking/ or *telephone/ or (physician patient adj (interaction? or relationship?)).tw.
34. *health maintenance organizations/ or managed care.tw. or (hospital? adj1 merg\$).tw.
35. 30 or 31 or 32 or 33 or 34
36. ((standard or usual or routine or regular or traditional or conventional or pattern) adj2 care).tw.
37. (program\$ adj2 (reduc\$ or increas\$ or decreas\$ or chang\$ or improv\$ or modify\$ or monitor\$ or care)).tw.
38. (program\$ adj1 (health or care or intervention?)).tw.
39. ((effect? or impact or evaluat\$ or introduc\$ or compar\$) adj2 treatment program\$).tw.
40. ((effect? or impact or evaluat\$ or introduc\$ or compar\$) adj2 care program\$).tw.
41. ((effect? or impact or evaluat\$ or introduc\$ or compar\$) adj2 screening program\$).tw.
42. ((effect? or impact or evaluat\$ or introduc\$ or compara\$) adj2 prevent\$ program\$).tw.
43. (computer\$ adj2 (dosage or dosing or diagnosis or therapy or decision?)).tw.
44. ((introduc\$ or impact or effect? or implement\$ or computer\$) adj2 protocol?).tw.
45. ((effect? or impact or introduc\$) adj2 (legislation or regulations or policy)).tw.
46. 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45
47. (randomized controlled trial or controlled clinical trial).pt. or intervention studies/ or experiment\$.tw.
48. ((time adj series) or (pre test or pretest or posttest or post test)).tw.
49. random allocation/ or impact.tw. or intervention?.tw. or chang\$.tw. or evaluation studies/ or evaluat\$.tw. or effect?.tw.
50. comparative study.pt.
51. 47 or 48 or 49 or 50
52. animal/
53. human/
54. 52 not (52 and 53)
55. 51 not 54
56. 13 or 18 or 24 or 29 or 35 or 46

57. 55 and 56
58. limit 57 to review
59. 57 not 58
60. meta-analysis.pt.
61. 59 not 60
62. (quality of health care or quality assurance, health care quality indicators, health care or health plan implementation).sh. or organizational change.mp. or organizational structure.mp. or organizational innovation/
63. 61 and 62
64. limit 63 to (yr="2000 -Current" and "all aged (65 and over)")
65. limit 64 to humans
66. united states.cp.
67. 65 and 66

Search #4 (CQI terms plus MeSH terms)

1. pdsa.ti,ab. or plan-do-study-act.mp. or plan do study act.mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
2. pdca.ti,ab. or plan-do-check-act.mp. or plan do check act.mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
3. define-measure-analyze-improve-control.mp. or dmaic.ti,ab. or dmadv.ti,ab. or define-measure-analyze-design-verify.mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
4. ((iterative adj cycle) or (rapid adj cycle) or (small adj test adj2 change)).mp. or deming.ti,ab. or taguchi.ti,ab. or kansei.ti,ab. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
5. (six-sigma or (six adj sigma)).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
6. total quality management.ti,ab.
7. ((quality adj function adj deployment) or (house adj2 quality) or (quality adj circle) or (breakthrough adj series)).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
8. ((institute adj2 healthcare adj improvement) or (iso adj "9004") or (iso adj "15594*")).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
9. kaizen.ti,ab. or (toyota adj production adj system).mp. or (toyota adj a3).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
10. ((lean adj manufacturing) or (lean adj production) or (lean adj healthcare) or (lean adj health adj care) or (lean adj health adj service) or (lean adj healthcare adj service) or (lean adj health adj care adj service)).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]

11. ((inventive adj problem adj solving) or (inventive adj problem-solving) or (inventive adj problemsolving) or (business adj process adj reengineering) or (business adj process adj re-engineering)).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
12. (business adj process adj engineering).ti,ab.
13. (IHI or (Institute adj Healthcare adj Improvement)).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
14. (system* adj redesign).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
15. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14
16. (quality of health care or quality assurance, health care or quality indicators, health care or health plan implementation).sh. or organizational change.mp. or organizational structure.mp. or organizational innovation/ [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
17. 15 and 16
18. limit 17 to (yr="2000 -Current" and "all aged (65 and over)")
19. limit 18 to humans
20. united states.cp.
21. 19 and 20

10/4/2010 – when all 4 searches combined = 2786 citations

Appendix: Citations of included publications

Abel RL, Warren K, Bean G, Gabbard B, Lyder CH, Bing M, et al. Quality improvement in nursing homes in Texas: results from a pressure ulcer prevention project. *J Am Med Dir Assoc*. 2005 May-Jun;6(3):181-8.

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Appendix: Evidence table

Author Year Design	Setting	Population and Condition	Intervention Summary	Patient Health Outcome	Other Patient Measures	Provider / Organization Measures	Author's Conclusion
Abel, et al. 2005 B-A	20 Nursing homes	Nursing home residents at risk for pressure ulcers	Tools and education to prevent pressure ulcers	-Pts w/ pressure ulcers, medical record -Pressure ulcer incidence*, medical record -Proportion of low-risk pts w/ facility-acquired PU, medical record -Proportion of high-risk pts w/ facility-acquired PU, medical record	n/a	-10 pressure ulcer quality indicators*, medical record	In collaboration with a quality improvement organization, nursing homes improved their processes of care; opportunities for further improvements remain.
Agostini, et al. 2006 B-A	Academic medical center	Hospitalized pts ≥ 65	Computer-based reminder for physicians to prescribe non-pharmacological sleep protocols	n/a	n/a	-Frequency of sedative-hypnotic medications (diphenhydramine, diazepam, lorazepam, and trazodone)*, hospital pharmacy records	Using real-time computer-based reminders may improve sedative-hypnotic prescribing for older persons in acute care.
Akosah, et al. 2002 CC	Integrated health-care center	Outpatients w/ congestive heart failure	Post-discharge multispecialty disease management	-Mortality -Event-free survival* -Rehospitalization* -Time to rehospitalization*, all from pt charts	n/a	-LOS, pt charts -Time from discharge to first outpatient visit* -# of follow-up visits* -# of telephone calls to providers in the first 30 day* -ACEI or ARB rate and dosage* all from pt records	The intervention resulted in fewer rehospitalizations and improved event-free survival.
Alkema, et al. 2006 RCT	Community sample	Pts ≥ 65 enrolled in Medicare managed care plan w/ high health care utilization	Care Advocate Program designed to link high health care utilizers w/ local services	-Mortality*, administrative data	n/a	n/a	Advocate model of care management reduced mortality during program but did not affect mortality following completion; individualized care, consumer choice,

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							and better communication links contributed to the success.
Allen, et al. 2003 B-A	Community teaching hospital stroke unit	Stroke pts	Adaptation of the Acute Care for Elders (ACE) model w/ stroke interdisciplinary team, evidence-based stroke protocols, and environment redesign	-Mortality, medical record -Pneumonia, medical record -Rehospitalization*, medical record	-Discharge destination (e.g. home, nursing home)*, medical record	-LOS*, medical record	The intervention successfully created a disease specific program for stroke pts and has potential to improve process of care and stroke outcomes.
Andrews, et al. 2001 CC	Nonprofit hospital	Geriatric pts	Addition of geriatric subacute unit operated by interdisciplinary team to hospital	-QoL*, QoL Visual Analogue, pt survey -Depression*, Center for Epidemiological Studies Depression Scale (CES-D), pts survey	n/a	-LOS*, medical record -Cost*, medical record -Disposition*, medical record	The addition of a subacute unit is competitively rational decision.
Arbaje, et al. 2010 RCT	Academic medical center	Hospitalized pts ≥ 70	Geriatric Floating Interdisciplinary Transition Team; pt assessment, management of geriatric syndromes, staff education, pt self-management, communication w/ primary care, and pt follow ups	n/a	-Satisfaction (4 item), pt phone survey	-Care transition quality, Care Transitions Measure (CTM-3) survey, researcher administered	The intervention is associated with a slight, though statistically insignificant, improvement in quality care transitions and greater inpatient satisfaction.

Author Year Design	Setting	Population and Condition	Intervention Summary	Patient Health Outcome	Other Patient Measures	Provider / Organization Measures	Author's Conclusion
Areán et al. 2005 RCT	18 Primary care clinics from 8 health care organizations	Pts \geq 60 w/ major depression or dysthymia	Improving Mood-Promoting Access to Collaborative Treatment (IMPACT): collaborative care, depression care manager, stepped care	-Depression*, Symptom Checklist (SCL-20) -Health-related functional impairment, Sheehan Disability Scale, all from pt interview, some or all by phone	-Satisfaction w/ mental health services*, pt interview	-Guideline concordant depression service use (antidepressants, psychotherapy), Cornell Service Use Index, pt survey	Collaborative care for depressed older adults is significantly more effective than usual care, regardless of their ethnicity.
Baier, et al. 2003 B-A	29 Nursing homes	Nursing home residents at risk for pressure ulcers	Review of clinical guidelines and quality improvement principles, sharing of best practices, and mentorship to implement quality improvement and data collection	-Pressure ulcers not present in high-risk residents*, in situ assessment	n/a	-Adherence to quality indicators*, pt charts, in situ assessment	Process of pressure ulcer care improvement is possible following intervention.
Bailey, et al. 2005 B-A	Tertiary care Veterans Affairs Medical Center	Dying pts	Staff education and support to identify dying pts and initiate comfort care plans	n/a	-Family present at death, medical record	-Opioids order* -Do-not-resuscitate order* -Location -Nasogastric tube -Restraints* -Resuscitated attempts* -Hospice care offer, Palliative care consultation, Pastoral services - Documentation of 13 symptoms* and care plan*, all from medical record	The palliative care program improved end-of-life care.

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Bakitas, et al. 2010 RCT	Rural cancer center, affiliated outreach clinics, and a Veterans Affairs medical center	Pts w/ advanced cancer	Nurse-led, palliative care-focused intervention addressing physical, psychosocial, and care coordination	-QoL*, Functional Assessment of Chronic Illness Therapy for Palliative Care -Symptom intensity*, Edmonton Symptom Assessment Scale -Mood*, CES-D -ICU or ED visit, all from medical record	n/a	-LOS, medical record	Intervention participants had higher scores for QoL and mood, but did not have improvements in symptom intensity scores or reduced days in the hospital, ICU or ED department visits.
Bartels, et al. 2005 CC	13 Community mental health agencies	Mental health pts \geq 60	Integrated system of clinical assessment, service planning, and outcome measurement	n/a	n/a	- Assessment of 9 symptoms (e.g. depression)*, 7 functioning (e.g., daily living skills)*, and supports and safety (e.g. caregiver burden)* all from clinician interview and pt charts	Intervention increased rates of routine assessments and improved specificity of treatment planning.
Barton, et al. 2006 B-A	Veterans Affairs Nursing Home Care Unit	Pts consecutively admitted to nursing home unit	Low-cost and easy-to-implement educational activities, strategies to document cognitive status, and consultation w/ dementia professionals	n/a	n/a	-Identified etiology*, pt charts -Presence of a physician management plan*, pt charts -Presence of multidisciplinary care plan*, pt charts -Presence of pharmacological and non-pharmacological treatment strategies, pt charts	The intervention is associated w/ increased identification of pts with cognitive impairment.
Bass, et al. 2003 RCT	Large managed care system	Pts \geq 55 w/ dementia or memory loss	Integrating Alzheimer's Association care consultation service w/ health care services offered by a large managed	-Hospitalization -Emergency room visit -Dementia* -Memory function*, all from caregiver interviews, pt charts, and administrative records	-Caregiver satisfaction w/ type and quality of services* -Caregiver satisfaction w/ information* -Caregiver	-Physician visits -Case management visits* -Direct community care use* -Non-Association and support service use*, all from caregiver	Care consultation delivered within a partnership between a managed care health system and an Alzheimer's Association is a promising strategy

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			care system		depression* -Caregiver relationship strain* -Caregiver health deterioration -Caregiver role captivity, all from caregiver survey	interviews, pt charts, and administrative records	for improving selected outcomes for pts w/ dementia and their caregivers.
Berner, et al. 2003 RCT	21 Acute care hospitals	Hospital pts w/ unstable angina	Unstable Angina guidelines adherence improvement intervention; physician opinion leader, traditional Health Care Quality Improvement Program, educational presentations of guidelines and hospital-specific data	n/a	n/a	-ECG w/in 20 min of arrival -Antiplatelet therapy w/in 24 hrs of admission* -Antiplatelet therapy at discharge -Appropriate heparin use Appropriate beta-blocker use, all from pt charts	The influence of physician opinion leaders was unequivocally positive for only 1 out of 5 quality indicators.
Bland, et al. 2003 RCT	41 Internal medicine and family medicine community practices	Pts \geq 60	Education course, training in management of urinary incontinence, patient education materials, and on-site physician and office support	-Urinary incontinence status, pt telephone survey -QoL, Health Related Quality of Life for Public health Surveillance, pt telephone survey	n/a	-Screening rate for urinary incontinence, pt telephone survey -Management of existing urinary incontinence rate, pt telephone survey -Urinary incontinence treatment and practice patterns, physician survey	Attempts at increasing screening and management of urinary incontinence by primary care physicians based on standardized guidelines using a multifaceted system of educational and logistical support were not successful and may not be the best approach.

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Bond, et al. 2010 RCT	Community sample	Diabetes pts	Web-based intervention plus usual care, nurse contacted pts by email or instant messenger and/or chat when there were changes in blood glucose patterns	-Depression*, Center for Epidemiological Studies Depression Scale (CES-D) -Emotional functioning / QoL*, Problem Areas in Diabetes (PAID), all pt reported	-Social support*, Diabetes Support Scale -Self-efficacy*, Diabetes Empowerment Scale (DES), all pt reported	n/a	These findings support the conclusion that a web-based intervention is effective in improving the psychosocial well-being of participants at a 6 months follow-up.
Borson, et al. 2006 B-A	4 Primary care clinics in university-affiliated primary care network	Pts \geq 65	Routine cognitive screening during primary care visits by medical assistants	-Dementia diagnosis rate*, administrative data	n/a	-Clinic visits, administrative data -Specialty referrals*, administrative data -Medication prescribing*, administrative data	The intervention is feasible in practice and has measurable effects on physician behavior but additional efforts are needed to help physicians follow up appropriately on information suggesting cognitive impairment.
Boult, et al. 2008 RCT	8 Primary care practices	Pts \geq 65 w/ multiple morbidities	Guided Care program incorporated a registered nurse into care practice to provide comprehensive chronic care	n/a	-Quality of care / satisfaction (goal setting*, coordination of care*, decision support*, problem solving, patient activation), Patient Assessment of Chronic Illness Care (PACIC), face-to-face and telephone follow-up interview	-Time spent on chronic care management tasks, provider phone interview -Change in care coordination, provider phone interview	The intervention improved aspects of quality of health care for the study group.

Author Year Design	Setting	Population and Condition	Intervention Summary	Patient Health Outcome	Other Patient Measures	Provider / Organization Measures	Author's Conclusion
Boyd, et al. 2008 CC	Community primary care practice	Chronically ill, community dwelling, members of capitated health plan ≥ 65	Primary care approach incorporating chronic care innovations, delivered by registered nurse and primary care physicians (Guided Care)	n/a	-Quality of primary care experiences (communication*, comprehensive knowledge, integration of care, interpersonal treatment, trust), all from Primary Care Assessment Survey (PCAS), pt questionnaire	n/a	The intervention appeared to improve the quality of primary care experiences for study population.
Bravata, et al. 2002 CC	Medical wards in 2 community hospitals	Hospital pts on the medicine ward teaching service	Ward team restructured into a firm that included two interns, three residents, and four private practice internists	-Hospital mortality* -Illness severity, 3M All Patient Refined-Diagnosis Related Groups (APR-DRGs) -Hospitalization, all from hospital administrative data	-Medical charges, hospital administrative data	-LOS, hospital administrative data	Firm structures with educational and patient care advantages can be instituted in multisite residencies.
Brock, et al. 2001 B-A	Acute care hospitals	Medicare beneficiaries hospitalized w/ peptic ulcer disease	Quality improvement project w/ data feedback to improve practice by encouraging compliance w/ national guidelines	-All-cause mortality w/in 1 yr of discharge, administrative claims data -Rehospitalization for peptic ulcer disease, administrative claims data	n/a	-Screening for Helicobacter pylori infection*, medical record -Treatment for H-pylori infection*, medical record -Screening for non-steroidal anti-inflammatory drug (NSAID) use, medical record -Counseling about NSAID use, medical record	This quality improvement program resulted in increased screening for H. pylori and increased treatment of H. pylori infection but no difference in counseling about NSAID use.
Brown, et al. 2008 RCT	Community sample	Medicare pts w/ chronic condition	Nurse-led, telephone-based pt education	-Mortality -Preventable hospitalization -Health status and well-being, pt survey	-Knowledge and behaviors, pt survey -Satisfaction w/ care, pt survey	-Quality of care indicators -Medicare service use and expenditures, Medicare Standard	Few programs enhanced pt behaviors, health, or quality-of-care, treatment groups

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						Analytic File, Medicare National Claims History File	had significantly fewer hospitalizations in just one program and no program decreased expenditures; effects may be seen at 4-year follow-up.
Browne, et al. 2003 B-A	7 Hospital facilities	Hospital pts	Redesign of an IP fall risk program using a computerized information system	-Fall rates, fall records -Fall injury rates, fall records	n/a	n/a	The ADAPT Tool automates fall assessment, individualizes fall protection, and enables fall risk communication without increasing workload.
Brumley, et al. 2003 CC	Home health department	Palliative care enrollees	Care management, aimed at providing symptom control and pain relief, emotional and spiritual support, and education	n/a	-Satisfaction*, Reid-Gundlach Satisfaction w/ Services, pt telephone interviews	-Cost of care*, administrative data -Medical service use including days on hospice*, ER*, physician*, hospital, skilled nurse*, home health*, and palliative care visits*, administrative records	The intervention increased satisfaction and likelihood of dying at home while lowering acute care use.
Burkitt, et al. 2009 B-A	Veterans Affairs Medical Center surgical unit	Surgical pts	Toyota Production System intervention; "ground-up" rather than "top-down" approaches to solving system problems to reduce nosocomial methicillin-	n/a	n/a	-LOS, medical record -Appropriateness of perioperative antibiotic therapy*, medical record	The intervention is correlated with an increase in the appropriateness of perioperative antibiotic therapy among pts but did not affect LOS.

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			resistant Staphylococcus aureus infections				
Burns, et al. 2000 RCT	Veterans Affairs Medical Center	Veterans \geq 65	Interdisciplinary outpatient geriatric evaluation and management	-Mortality*, medical record -Hospitalization -Cognition, MMSE* -Health perception* -ADL, Katz Scale -Instrumental ADL*, IADL -Functional status, social activity* -QoL*, CES-D -Well-being*, RAND GWB Inventory, all pt interview	-Global life satisfaction*	-Clinic visits*, pt interview	The intervention may improve outcomes among targeted older adults significantly and these outcomes may continue to improve over time.
Callahan, et al. 2006 RCT	2 University-affiliated health care system primary care practices	Alzheimer's disease pts and a self-identified caregiver	Care management by an interdisciplinary team led by an advanced practice nurse	-Mortality -Cognition, MMSE, pt phone interview -Neuropsychiatric Inventory* (NPI) -Activities of daily living, ADL Inventory for Alzheimer's disease -Depression, CSDD, all but MMSE from caregiver telephone interview	-Neuropsychiatric Inventory* (NPI) for caregiver, Patient Health Questionnaire-9 used for caregiver -Healthcare resource use questionnaire (incl. hospitalizations) -Satisfaction w/ care (1 item), all from caregiver telephone interview	-Frequency of initiation of 8 protocols for caregiver education and nonpharmacological management of behavioral symptoms*, caregiver telephone interview	Significant improvement in quality of care, and behavioral and psychological symptoms among dementia pts and their caregivers.

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Caruso, et al. 2007 B-A	Geriatric ambulatory practice at medical center	Pts w/ cardiovascular disease, type 2 diabetes, or both	Multifaceted intervention based on the Chronic Care Model; disease registry, electronic medical record, pt education, physician education, feedback, and protocol implementation	-HbA1c* -Blood pressure <140/90 mmHG* -LDL cholesterol, all from paper or electronic medical record	n/a	-Diabetic foot examination*, paper or electronic medical record -Lipid profile*, paper or electronic medical record	Using the chronic care model as a quality improvement framework can improve clinical measures for older urban minority populations with cardiovascular disease and diabetes.
Castle 2003 CC	Nursing homes	Nursing home residents	Provision of outcomes information on quality of care measures	-Contractures*, medical record -Pressure ulcers, medical record	n/a	-Physical restraint use*, medical record Urethral catheterization, medical record -Psychotropic medication use*, medical record -Certification survey quality of care deficiencies*, medical record	The intervention may provide evidence that outcomes initiatives improve care quality.
Chu, et al. 2003 CC	20 Hospitals	Medicare inpatients w/ pneumonia	Quality improvement project w/ onsite feedback, presentations to the medical staff, samples of performance improvement materials, and comparative measures of performance of predefined quality indicators	-Mortality, medical record	n/a	-LOS -Sputum cultures ordered w/in 4 hrs of arrival* -Blood culture obtained w/in 4 hrs of arrival* -First dose of empirical antimicrobial agents w/in 4 hrs* -First antibiotic dose in ER*, all from medical record	This study demonstrated the effectiveness of quality improvement activities in very small hospitals.

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Chumbler, et al. 2005 CC	Veterans Affairs hospitals	Pts w/ 2 or more hospitalizations or ED visits for diabetes in previous year	Patient-centered care coordination/home-tele-health program	-HbA1c, medical record	n/a	-Health care service use, medical record	The intervention appears to improve older veterans' ability to receive appropriate and timely care.
Claiborne et al. 2006 RCT	Inpatient physical rehabilitation program for stroke	Adult stroke inpatients	Social work care coordination services including initial assessment and ongoing monitoring	-QoL*, Short Form-36 (SF-36), self report -Depression*, Geriatric Depression Scale (GDS), self report	-Stress, psychosocial assessment, self report -Adherence*, adherence assessment, self report -Service needs, service needs assessment, self report	n/a	The intervention improved patient care.
Cohen et al. 2002 RCT	11 Veterans Affairs Medical Centers	Frail pts \geq 65	Intervention teams provided geriatric assessment and management according to VA standards and published guidelines	-Survival and health-related QoL*, Medical Outcomes Study 36-Item Short Form (SF-36) -Activities of daily living*, Katz Scale, all from pt interview -Physical performance*, on-site physical performance test	n/a	-Utilization of health services, pt interview -Costs, pt interview	The intervention had no significant effect on survival rates but significant reductions in functional decline with inpatient geriatric evaluation and management as well as mental health improvements w/o cost increases.
Cohen, et al. 2010 B-A	National sample of hospital inpatients	Hospitalized acute myocardial infarction pts	Get w/ the Guidelines-Coronary Artery Disease (GWTG-CAD) quality improvement program	-Hospital mortality	n/a	-LOS -Performance measures* (treatment and prescriptions received) -Door-to-balloon time \leq 90 min -Door-to-thrombolysis	Evidence-based care appeared to improve over time for pts irrespective of race/ethnicity, and differences in care by race/ethnicity care were reduced or

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						time \leq 30 min, all from Get-With-The-Guidelines-Coronary Artery Disease database, chart review	eliminated.
Cole, et al. 2006 B-A	Primary care practices affiliated w/ large health system	Medicare pts w/ depression and congestive heart failure	Telephone-based, nurse-led disease management program based on chronic care model	-Health, Patient Health Questionnaire (PHQ*), self-report	-Program acceptability and satisfaction*, self report	n/a	The intervention appears feasible and possibly effective.
Colon-Emeric, et al. 2006 CC	36 Nursing homes	Nursing home residents	Evidence-based fall reduction quality improvement collaborative; monthly environment assessments, screening and other interventions	-Fall rates, Minimum Data Set (MDS)	n/a	-Use of sedative hypnotics* -New admissions screened* -High-risk pts labeled -Risk-factor reduction attempts -Post-fall assessments -Vitamin D use, all from facility record (submitted monthly) and chart abstraction	Differences between self-reported practice and medical record require use of additional data sources to assess changes resulting from quality improvement programs.
Colon-Emeric, et al. 2008 RCT	Nursing homes w/ more than 10 residents	Nursing home residents w/ a recent hip fracture	Audit and feedback, educational modules, teleconferences, and academic detailing aimed at improving fracture prevention	-Facility fracture rates, chart review -Fall rates, chart review	n/a	-Quality indicators for osteoporosis and fracture prevention (incl. prescription of osteoporosis pharmacotherapy or hip protectors), chart review	Intervention was ineffective in improving fracture prevention although low participation may have affected outcomes.
Colon-Emeric, et al. 2009 B-A	2 Veterans Affairs nursing homes	Residents w/ fever, pneumonia, urinary tract infection, falls, and/or	Computerized order entry algorithms based on clinical practice guidelines	-Orthostatic blood pressure*, chart review	n/a	-Resource utilization, chart review -Reduced neuroleptics*, chart review -Reduced sedative-hypnotics*, chart review	Despite positive physician attitudes towards the intervention, use of it was infrequent, except for falls. Determining

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		osteoporosis				-Prescription of calcium*, chart review -Vitamin D*, chart review -External hip protectors*, chart review -Documentation of vital signs, chart review -Physical therapy referrals, chart review -Reductions of benzodiazepines or antidepressants, chart review	whether the intervention improves care requires further study.
Copeland, et al. 2010 RCT	Veterans Affairs Medical Center	Pts w/ congestive heart failure	Participant-specific self-management plan including telephone interactions w/ nurses and alerts for physicians	-Mortality -Hospitalization -30 day rehospitalization, all from pt chart and administrative data -QoL, Physical and Mental component Short Form (SF) Health Survey, pt structured interview	-Satisfaction (5 items), pt survey	-Prescription medication costs* -Outpatient visit costs* -Total costs attributable to congestive heart failure* -Total cost of care*, all from administrative data	The intervention resulted in potential behavioral improvements but did not improve survival.
Coultas, et al. 2005 RCT	Primary care clinics associated w/ urban academic health center	Pts \geq 45 w/ chronic obstructive pulmonary disease diagnosis, smoking history, and recent respiratory symptoms	Nurse training in Global Initiative for Chronic Obstructive Lung Disease guidelines and collaborative management	-QoL, St. George's respiratory questionnaire (SGRQ) -Illness intrusiveness*, Illness Intrusiveness Ratings Scale -QoL, Medical Outcomes Study Short Form (SF-36) -Hospital visit -ED visit, all from pt interview	n/a	-Health care utilization, pt interview	No clinically meaningful improvements in health status or health care utilization observed.

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Counsell, et al. 2007 RCT	Community-based health centers	Pts \geq 65 w/ annual income below 200% of federal poverty level	Home-based care management by a nurse practitioner and social worker collaborating w/ primary care physicians and geriatrics interdisciplinary team, guided by care protocols	-QoL*, Short Form 36 (SF-36) -Days in bed -Activities of daily living, Health Dynamics of the Oldest-Old (AHEAD, selected items), pt telephone interview -Hospitalization -ED visit*, all administrative data	-Satisfaction w/ care (1 item), pt telephone interview	-LOS -Quality of medical care*, ACOVE quality indicators, electronic medical record and pt telephone interviews	Improvement in quality of care and acute care utilization observed among study group. Health related QoL improvements were mixed and physical function outcomes were not different.
Counsell, et al. 2000 RCT	Community teaching hospital	Community-dwelling pts \geq 70	Acute Care for Elders (ACE), a multi-component intervention including an special environment, patient-centered care, planning for pt discharge, and prevention of iatrogenic illness	-Activities of daily living, Katz Index of Independence in Activities of Daily Living, self report	-Patient satisfaction*, self report	-Resource use, medical record -Implementation of orders to improve function, medical record -Provider satisfaction, provider report	The intervention improved the process of care and patient and provider satisfaction while hospital length of stay and costs remained unchanged.
Counsell, et al. 2009 RCT	Community-based primary care health centers	Low income elderly pts \geq 65	Home-based care management by a NP and social worker who collaborated w/ the primary care physician and a geriatrics interdisciplinary team and were guided by care protocols for common	n/a	n/a	-Chronic and preventive care costs, medical record -Acute care costs, medical record -Total costs, medical record	For pts at high risk of hospitalization, the intervention is cost neutral from the healthcare delivery system perspective.

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			geriatric conditions				
Crogan, et al. 2006 CC	Nonprofit nursing homes	Nursing home residents \geq 65 at risk for malnutrition	Individual Nutrition assessment process, involving individualized dietary plans implemented by dietician	-Body mass index, nurse -Serum albumin*, medical record -Functional status*, Katz Index of Independence in Activities of Daily Living Scale -Depression*, Geriatric Depression Scale (GDS) -QoL*, Quality of Life-AD, all from pt questionnaires	n/a	n/a	The intervention can help assess complex nutritional problems and influence outcomes target population.
Dahl, et al. 2008 B-A	Private long-term care facility	Dementia pts	Interdisciplinary quality intervention that included psychotropic agent monitoring and increased communication and collaboration w/ pt's family	-Medication-related side effects, pt chart	n/a	-Recommendations to adjust medication, pt chart -Pts taking psychotropic agents*, pt chart	The intervention significantly improved communication between the families, physicians, and the interdisciplinary team.

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Dedhia, et al. 2009 B-A	General medicine wards at an academic medical center, a community teaching hospital, and community-based nonteaching hospital	Pts \geq 65 admitted to the hospitalist service	Discharge planning intervention; admission form w/ geriatric cues, facsimile to the PCP, interdisciplinary worksheet to identify barriers to discharge, pharmacist-physician collaborative medication	-ED visit*, medical record -30 day rehospitalization and ED return rate*, medical record	-Satisfaction w/ discharge*, 3- and 15-item versions of Coleman's Care Transition Measures, pt survey	n/a	When hospitalized elderly pts are treated with consideration of their specific needs, healthcare outcomes can be improved.
Dettori, et al. 2005 B-A	Primary care clinics	Rural pts w/ diabetes	Health system interventions w/ coordinated diabetes education	-HbA1c*, medical record -Systolic blood pressure*, medical record -Diastolic blood pressure*, medical record -LDL cholesterol, medical record	n/a	-Delivery of 6 preventive services*, medical record	System changes in primary care and diabetes education can improve care and reduce barriers for target pts.
Duncan & Pozehl, et al. 2000 B-A	Orthopedic unit at acute care hospital	Hospital pts	Pain management performance feedback for individual nurses	-4-hr pain intensity rating -Highest pain intensity rating -Times pain ratings exceeded pt's acceptable level of pain* -Pain ratings on reassessment after analgesia administration, all from medical record	n/a	-Administered morphine equivalents*, medical record	Nurse feedback on past performance may contribute to decreased postoperative pt pain.
Duru, et al. 2009 RCT	Primary care clinics	Dementia pts	Coordinated care management for dementia		-Per-pt medical costs, caregiver survey and expenditure data	-Healthcare utilization -Fixed intervention costs, caregiver survey and expenditure data	The intervention did not show a significant cost offset but may still be worthwhile in improving care for dementia pts.
Eaton et al. 2005 B-A	State sample of home health care institutions	Medicare home health pts \geq 65 w/ decubitus ulcer	A change in Medicare reimbursement from fee-for-service to prospective	-Ulcer healing*, medical record -Discharge disposition*, medical record	n/a	-LOS*, medical record	The prospective payment system has affected nursing care effectiveness for stage III or later decubitus ulcer

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			payment				home health pts.
Edes, et al. 2007 B-A	Veterans Affairs Medical Center hospitals	Palliative care pts	Coordinated plan to increase access to hospice and palliative care services through staff development, collaboration w/ hospice care, outcomes measurement, policy changes, and proof of value efforts	n/a	n/a	-Pts receiving hospice home care, hospital records -Inpatients w/ palliative care consultation, hospital records -Palliative care consultations, hospital records	Due to the multifaceted, strategic plan and a mission of honoring end-of-life orders, the VA has made rapid progress in improved access to palliative care services for inpatients and outpatients.
Ell, et al. 2007 RCT	Home health care organizations	Community sample of pts ≥ 65	Antidepressant and/or psychotherapy w/ routine depression screening and staff training in depression care management for older adults	-Depression, PHQ-9 (subset of the Patient Health Questionnaire) -QoL, SF-20 pt questionnaire -Hospitalization -Emergency room visit -Home care readmissions, all pt interviews	-Barriers/facilitators to intervention implementation, pt and caregiver interviews	-Receipt of depression care*, medical record and study intervention reporting form -Number of home care visits, organizational records	The intervention is feasible in home health care organizations and results in improvements in depression outcomes, though these results are statistically insignificant.

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Elliott, et al. 2004 RCT	18 Rural communities	Cancer pts	Provider education to improve cancer care management; opinion leaders, bimonthly cancer conferences, quarterly project newsletters, rapid-cycle quality improvement system based on feedback, and clinical practice guidelines	-QoL, Functional Living Index-Cancer (FLIC), face-to-face and by mail pt survey	-Satisfaction, face-to-face pt survey -Mean miles traveled to healthcare provider*, face-to-face pt survey -Economic concerns, face-to-face pt survey	n/a	The intervention significantly reduced travel to care and results do not rule out the possibility of an impact on other pt outcome effects.
Fann, et al. 2009 RCT	18 Primary care clinics from 8 health care organizations	Pts \geq 60 w/ major depression or dysthymia and non-skin cancer	Improving Mood-Promoting Access to Collaborative Treatment (IMPACT): collaborative care, depression care manager, stepped care	-Depression*, Symptom Checklist (SCL-20), clinical assessment, pt survey -QoL (1 item)*, self report -Health-related functional impairment*, Sheehan Disability Scale, self report	n/a	n/a	The intervention appears to be feasible and effective for depression among older cancer patients in diverse primary care settings.
Feldman, et al. 2005 RCT	Urban home care agency	Home care pts diagnosed w/ heart failure	Basic intervention of an e-mail to nurse noting treatment recommendations, or an augmented intervention of basic email plus nurse reminder w/ additional	-Depression, Geriatric Depression Scale (GDS) -QoL*, EuroQoL EQ-5D -Self-management behavior -Heart-failure specific outcomes*, Kansas City Cardiomyopathy Questionnaire, all from pt interviews and administrative records	n/a	-Service use -Costs*, administrative records and pt interview	Nurse e-mails can positively impact pt self-care behaviors, knowledge, and clinical outcomes.

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			resources				
Feldman, et al. 2004 RCT	Urban home health care agency	Medicare pts w/ congestive heart failure	Implementation of evidence-based nursing protocol, pt self-care guide, and training to improve nurse teaching and support skills	-Mortality, administrative data -Survival at 90 days -Hospitalization -ED admission, all from claims record -QoL, Minnesota Living w/ Heart Failure Questionnaire (MLHFQ, 21 items), pt interview	-Satisfaction w/ home care services, Reeder-Chen Satisfaction w/ Home Health Care instrument (19 items used) -Nursing home admission, pt phone interview	-Outpatient physician use, claims record Nursing visit*, claims record	The intervention correlates w/ a marginally significant reduction in care use without a significant increase in physician or ED use or pt mortality.
Fenton, et al. 2006 CC	Primary care practices	Health plan enrolled pts ≥ 65 w/ notable outpatient service use	Geriatrician-led program emphasizing chronic disease self-management and physical activity	-Mortality -Hospitalization* both from automated administrative, clinical and pharmacy records	-Nursing home admission, automated administrative, clinical and pharmacy records	-Specialty visits -Outpatient visits -High-risk prescription, all from automated administrative, clinical and pharmacy records -Total health care costs*, clinical and cost data	Similar interventions may reduce hospitalization risk and total health care costs among the targeted vulnerable elderly population.
Ferguson, et al. 2003 RCT	359 Academic and non-academic hospitals	Pts ≥ 75 w/ coronary artery bypass graft surgery	Low-intensity CQI interventions (physician leader, educational products, and feedback) to speed the national adoption of 2 coronary artery	n/a	n/a	-Use of beta-blockade*, medical record, -Use of IMA grafting, medical record	A multifaceted, physician-led, low-intensity CQI effort can improve the adoption of care processes into national practice within the context of a medical specialty society infrastructure.

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			bypass graft surgery process-of-care measures				
Fonarow, et al. 2007 B-A	259 Hospitals	Pts hospitalized w/ heart failure	Organized Program to Initiate Lifesaving Treatment in Hospitalized pts w/ Heart Failure (OPTIMIZE-HF) web-based patient registry w/ performance feedback	-Hospital mortality, medical record -Mortality after 90 day discharge, medical record -Rehospitalization, medical record	n/a	-LOS* -Adherence to 10 process and quality of care indicators* (all improved except ACEI prescriptions at discharge), all from medical record	Participation in OPTIMIZE-HF correlated with an increase in utilization of evidence-based therapy, adherence to performance measures, and shorter lengths of stay.
Fonarow, et al. 2010 B-A	167 Outpatient cardiology practices	Heart failure pts	Registry to Improve the Use of Evidence-Based Heart Failure Therapies in the OP Setting (IMPROVE HF) including clinical support tools, structured improvement strategies, chart audits w/ feedback	n/a	n/a	-Beta-blocker use* -Aldosterone antagonist use* -Cardiac resynchronization therapy* -Implantable cardioverter defibrillator* -Education* -Angiotensin-converting enzyme inhibitor/receptor blocker use -Anticoagulation for AF, all from chart review	The IMPROVE HF, a defined and scalable practice-specific performance improvement intervention, was associated with substantial improvements in the use of guideline-recommended therapies.

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Ganz, et al. 2007 CC	2 Community medical groups	Pts \geq 75 w/ difficulty with falls, incontinence, or cognitive impairment	Assessing Care of Vulnerable Elders (ACOVE-2) intervention including case-finding, physician education, and a practice-change effort to guide care	n/a	n/a	-% of quality indicators satisfied, medical records, -Outpatient medical visits, administrative encounter data / medical records	The intervention that improved quality of care for targeted conditions did not affect measurable aspects of care on a broad set of masked quality measures. encompassing 9 other conditions.
Gonzales, et al. 2004 CC	Ambulatory office practices	Medicare pts w/ acute respiratory tract infections	Performance feedback (antibiotic prescription profiles) for primary care physicians, distribution of educational material for patients	-Office visit for acute respiratory tract infection, claims data	n/a	-Antibiotic prescriptions, administrative and pharmacy records	In the setting of an ongoing physician intervention, a patient education intervention had little effect; factors other than pt expectations and demands may play a stronger role in antibiotic treatment decisions.
Grant, et al. 2004 CC	4 Primary care clinics	Diabetes pts	Nurse practitioner identified pts w/ outlying values for visits and e-mailed care suggestions to PCPs and letters to pts	-HbA1c, medical record -LDL cholesterol, medical record - Blood pressure (mmHg), medical record	n/a	-HbA1c tested* -LDL cholesterol tested* -Blood pressure tested -Urine albumin tested* -ACE inhibitor / angiotensin receptor blocker prescribed -Aspirin prescribed -Statins prescribed, all from medical record	The intervention had a modest effect on management but was limited by the overall high quality of care at baseline and temporal improvements in all control clinics.
Gross, et al. 2002 B-A	University tertiary care hospital	Hospital pts w/ telemetry use	Advanced practice nurse was adopted to improve efficacy of telemetry use	-Adverse cardiac consequences of discontinuing telemetry use	n/a	-Mean time in hrs of telemetry utilization*, medical record	The intervention led to a quick reduction in the number of pts per month put on telemetry.

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Guadagnoli, et al. 2004 RCT	Primary care clinics	Pts w/ heart failure or myocardial infarction	Mailed practice guideline after discharge	n/a	n/a	-Care conformance w/ treatment recommendations, medical record	The intervention did not improve care quality in targeted pts.
Halm, et al. 2010 B-A	4 Academic health centers	Pts hospitalized for pneumonia	Design of evidence-based treatment guidelines and critical pathways, provider education sessions, reminder cards, promotion of standard orders, and development of pt education materials	-Inpatient mortality, chart review -ICU/coronary care unit stay, chart review -Days to clinical stability, chart review	-Knowledge (prescribed medicine, compliance, side effects, signals of worsening, course of disease), pt or caregiver phone interview	-LOS, medical record -Oral antibiotics when stable -Discharge when stable, -Days from stability to discharge -Antimicrobial therapy* -Adherence to 7 quality indicators (incl. first-line initial antibiotic therapy*), all from medical record	The intervention modestly improved some indicators, but did not affect resource use or pt knowledge.
Hammes, et al. 2010 B-A	Healthcare organizations	Deceased adults	Respecting Choices, a systematic advance care planning program	n/a	n/a	-Type and content of advance directive*, medical record -Type and content of Physician Orders for Life-Sustaining Treatment, medical record -Medical treatment provided at location of death, medical record	An advanced care planning system can be managed so that almost all adults have a plan that is specific and available at time of death, and so that treatment is consistent with this plan.
Hanson, et al. 2005 CC	Nursing homes	Nursing home residents	Selection and training of Palliative Care Leadership Teams w/ follow-up feedback and education	n/a	n/a	-% residents receiving hospice or palliative services, medical record* -Pain assessment*, medical record -Pain treatment among residents in pain*, medical record -Advanced care	Intervention effectively increased hospice enrollment, pain assessment, nonpharmacologic pain treatment, and advance care planning.

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						planning discussions*, medical record	
Hayes, et al. 2002 RCT	Hospitals in four states	Pts w/ congestive heart failure	Quality improvement feedback involving a physician liaison and quality improvement tools	n/a	n/a	-Documentation of measurement of left ventricular function, medical record Use of ACEIs in pts w/ LVSD, medical record -Use of target doses, medical record -Use of warfarin in pts w/ CHF and AF, medical record Dietary counseling, medical record	Evaluation of effects of external feedback on practice behavior requires sufficient time for organizational and individual clinician change to occur; physician liaisons may facilitate this.
Hayes, et al. 2001 RCT	29 Hospitals	Medicare beneficiaries w/ thromboembolic disease	Enhanced feedback intervention involving guidance from a physician, quality improvement tools, and a project liaison on improved care	n/a	n/a	-activated partial thromboplastin time (aPTT) prior to heparin -APTT w/in 3-8 hrs of heparin -APTT w/in 24 h of heparin -Prothrombin time (PT)/INR prior to discontinuation of heparin PT/INR after heparin discontinued prior to discharge for warfarin pts, all from medical record (electronic medical record abstraction instrument)	The intervention failed to add value to quality of care improvement feedback processes.

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Heiman, et al. 2004 RCT	General medicine clinics affiliated w/ an academic medical center	Pts \geq 70, or pts \geq 50 w/ chronic illness	Physician reminders and mailing of advance directives to pts along w/ educational materials	n/a	n/a	-Completed advance directives*, medical record -Documented discussion of an advance directive, medical record -Completion of a health care proxy, medical record -Completion of living will, medical record	Mailing forms and literature to patients before an appointment at which their physicians received a reminder about advance directives yielded a small but significant improvement in advance directive completion (physician reminders alone did not).
Herrin, et al. 2007 RCT	Primary care network	Medicare pts w/ diabetes	Nurse case management	-HbA1c, medical record -LDL, medical record -Blood pressure, medical record	n/a	-Cost of diabetes care, medical record -HbA1c measurement every 6 months, medical record -Performance of annual eye examination, medical record -Performance of annual lipid profile, medical record	Intervention did not improve costs from Medicare perspective.
Hoffman, et al. 2003 B-A	Nursing home care units	Nursing home residents	BedSAFE program to decrease use of bed rails	-Falls, medical record -Injuries related to falls from bed, medical record	n/a		Interdisciplinary program achieved safe reduction of bed rail use.
Holman, et al. 2004 B-A	Hospitals	Medicare pts w/ coronary artery bypass graft surgery	Identification of quality improvement team and implementation of various collaborative initiatives, including baseline	-Risk-adjusted hospital mortality, medical record -Reoperation for excessive bleeding*, medical record -ICU readmission, medical record -Rehospitalization, medical record	n/a	- LOS, medical record -Same-day surgery*, medical record -Quality indicators (all but Lipid management reported as improved), medical record	The interventions improved lipid management and use of beta-blockers.

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			measurement and provider education				
Holman, et al. 2001 CC	Hospitals providing coronary artery bypass graft surgery	Medicare pts using coronary artery bypass graft surgery	Confidential hospital-specific performance feedback and assistance w/ multimodal improvement interventions incl. option to share experience w/ peers	-Risk-adjusted hospital mortality, medical record -Rehospitalization, medical record -Readmission to ICU, medical record	n/a	-Adherence to quality indicators (incl. aspirin at discharge*, use of internal mammary artery for myocardial revascularization*), all from medical record	The interventions are associated with some improvement in quality of care for pts who underwent CABG surgery.
Horowitz, et al. 2002 B-A	Urban academic medical center	Pts \geq 18 w/ pneumonia	Physician and nurse educational interventions; lectures, feedback of performance data, one-on-one education by peers and pt interventions such as education by nurses and educational brochure	n/a	-Pt knowledge and experience* (12 items), pt survey	-LOS, medical record -Mean time on IV antibiotics*, medical record -Mean time from stability to discharge, medical record -Mean time from stability to switch*, medical record	The interventions improved pts' knowledge and experiences with care, while decreasing time on IV antibiotics.

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Hughes, et al. 2800 RCT	16 Veterans Affairs Medical Centers w/ home based primary care programs	Pts w/ \geq Activity of daily living impairments, a terminal illness, congestive heart failure, or chronic obstructive pulmonary disease	Home-based primary care, including a primary care manager, 24-hr contact for pts, advanced approval of hospital readmissions, and HBPC team participation in discharge planning	-Functional status, Barthel Index, pt -QoL, SF-36, pt -Rehospitalization	-Care satisfaction*, Ware Satisfaction w/ Care scales, pt -Care satisfaction*, Ware Satisfaction w/ Care scales, caregiver -Caregiver QoL*, SF-36 -Caregiver burden, Montgomery scale, obtained from pt and caregiver	-Cost over 12 months, financial data files and pt self-reports confirmed w/ provider	The intervention improved most QoL measures for terminally ill pts, satisfaction with care, caregiver burden, and hospital readmission rates.
Hutt, et al. 2004 B-A	6 Nursing homes contracted w/ a group-model, nonprofit HMO	Nursing home residents w/ nursing home-acquired pneumonia	Improved immunization facilitation and provision of appropriate emergency antibiotics w/ quarterly in-service education for nursing and aid staff	-Severity of symptoms (respiratory rate, pulse, dementia, delirium), Nursing Home-Acquired Pneumonia (NHAP) survey -Systolic blood pressure <90 -Pneumonia -Temperature \geq 100.5 F -Days from admission to symptom onset	n/a	-Average guideline adherence* (16 indicators incl. influenza vaccination*, antipneumococcal quinolone or equivalent*), Multi-state Nursing Home Case Mix and Quality Demonstration survey revision, chart review	The use of a multidisciplinary, multifaceted intervention resulted in improved quality of care for nursing home residents who become ill with pneumonia.
Hutt, et al. 2006 CC	12 Nursing homes	Nursing home residents	Nurse and physical education and internal team to improve pain management through vital sign, consultations, and rounds	-Pain*, 1 item from One-Minute Pain Assessment, Faces, Verbal Descriptor Scale and Numerical Rating Scale, or Checklist of Nonverbal Pain Indicators, both from pt, researcher observation, and medical records	n/a	n/a	The Pain Medication Appropriateness Scale is useful for pain medication prescribing assessment in nursing homes and elucidates why so many residents have poorly controlled pain.

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Hutt, et al. 2006 CC	2 State Veterans Homes	Nursing home residents at risk for lower respiratory tract infection	Multifaceted intervention including a formative phase to modify the intervention, institutional emphasis on immunization and availability of antibiotics, education sessions for nurses, and academic detailing	n/a	n/a	-Guideline compliance for influenza vaccination*, -Timely physical response to illness onset*, -X-ray for pts not hospitalized* -Appropriate and timely antibiotic use*, all from medical record -CNA attitudes about pneumonia, nurse interview	The intervention improved care processes.
Imperato, et al. 2002 B-A	Acute care hospitals	Male Medicare pts w/ radical prostatectomy	Baseline performance measurement and an educational feedback program to improve prostate pathology reports in radical prostatectomy	n/a	n/a	-Frozen section submission -Adenocarcinoma location* -Proportion of specimen involved by adenocarcinoma -Perineural involvement -Vascular involvement -Seminal vesicle state* -Periprostate fat state* -Nodes submitted -Node state*, medical record	The issues identified in the baseline with radical prostatectomy pathology reports were amenable to a cooperative educational intervention.
Imperato, et al. 2003 B-A	Community sample in one state	Medicare pts w/ breast cancer	Chart review and educational feedback for pathologists	n/a	n/a	-Quality indicators for pathology reports on mastectomy specimen (incl. documentation of present lymph nodes* -verification of tumor size*, all improved), all from medical record	Results indicate that the issues identified by breast cancer pathology reports are amenable to improvement.

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Jacobs, et al. 2005 B-A	Acute care hospitals	Medicare beneficiaries admitted for stroke care	Comprehensive stroke care quality improvement program including provision of benchmark data, self-assessment toolkit, and awareness and monitoring education	n/a	n/a	-Antithrombotic prescribed at discharge* -Sublingual nifedipine avoidance* - Symptom onset or interval documented -CT/MRI performed* -DVT prophylaxis*, - Time to CT/MRI Time to thrombolysis, all from medical record	The intervention improved some quality of care indicators for acute stroke care.
Jencks, et al. 2003 B-A	Hospitals affiliated w/ Quality Improvement Organizations	Medicare beneficiaries	Quality Improvement Organization-led changes to inpatient care services	n/a	n/a	-Adherence to 22 quality of care indicators*, medical record	Care improved substantially for the target population during study period but need for improvement remains.
Johnston, et al. 2010 RCT	12 Hospitals	Hospital pts w/ ischemic stroke	Implementation of standardized stroke discharge orders; statin, antihypertensive medications for pts w/ hypertension, and warfarin prescription for pts w/ arterial fibrillation	-Achievement of controlled blood pressure (systolic <140, diastolic <90), clinical measurements	n/a	-Documentation of a filled statin prescription, pharmacy records -Documentation of warfarin prescription or INR blood test, pharmacy records	Implementation of standardized discharge orders after stroke was associated with increased rates of optimal secondary prevention; this improvement was not significant in the primary analysis at the hospital level.
Johnston, et al. 2000 CC	Home health department at large health maintenance organization	New pts w/ congestive heart failure, chronic obstructive pulmonary disease, cerebral	Remote video system in home health care setting allowing nurse-pt interaction	-ED visit -Urgent care visits -Physical and mental health, Short Form Health Survey (SF, 2 items), all from pt interviews, surveys, medical record audits, computer database	-Satisfaction, pt survey -Medication compliance, medical chart, pt survey and medical record -Knowledge of disease, pt survey	-LOS -Service use (access to care), medical record -Direct and indirect costs of using technology, medical record	The intervention was effective, well regarded by pts, maintained care quality, had cost savings potential and is a potential substitute for some in-person visits.

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		vascular accident, cancer, diabetes, anxiety, or need for wound care			-Ability to move toward self-care, pt survey		
Jones, et al. 2004 CC	6 Nursing homes	Nursing home residents	Multifaceted educational and behavioral intervention	-Pts reporting pain -Pts w/ constant pain* -Pts w/ moderate / severe pain, Quick Pain Assessment survey pt-completed, provider assessment and chart review	n/a	-Proportion of residents w/ pain assessment*, medical record -Pts w/ pain reassessment*, medical record	Multiple factors deserve consideration when designing and implementing pain practice quality improvement and pain prevalence reduction efforts.
Jonos, et al. 2002 B-A	Community based home care agency	Diabetes inpatients	Teaching materials and standards of care teaching program developed to help home care staff nurses and their clients learn standards of care, facilitate tracking interventions and performance measures	-Health (1 item), pt questionnaire	-Satisfaction -Tobacco use -Understanding of care required to manage diabetes -Self-care skills, all items in pt questionnaire	-Adherence to performance indicators (incl eye exam*, foot care*, lipid tests*, diabetes self-management education*), all from pt questionnaires and medical record	Comparing clients' diabetes performance measures with national standards helped identify specific areas for quality improvement.
Kane, et al. 2007 CC	Nursing home	Nursing home residents	The Green House (GH) program alters the resident physical environment, staffing model for nursing assistants, and philosophy of	-QoL* (11 domains) -Health (1 item) -Functional status (11 items) -Emotional well-being*, DQoL, all from pt or proxy interview -Incidence and prevalence of indicators from Minimum Data Set, medical record / MDS	-Satisfaction* (3 items), pt interviews little or no activity*, incontinence*	-Adherence to quality of care indicators (incl. prevalence of bedfast pts*), MDS	The GH may improve QoL for nursing home residents which has implications for staff development and medical directors.

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			care				
Katon, et al. 2006 RCT	18 Primary care clinics from 8 health care organizations	Pts \geq 60 w/ major depression or dysthymia and diabetes	Improving Mood-Promoting Access to Collaborative Treatment (IMPACT): collaborative care, depression care manager, stepped care	-Depression*, Symptom Checklist (SCL-20), pt interview	n/a	-Total OP costs, administrative data -Total inpatient costs, administrative data	The intervention is a high-value investment for the target population, it is associated with high clinical benefits at no greater cost than usual care.
Kautz, et al. 2007 B-A	Tertiary hospital	Pts diagnosed w/ osteoporosis and admitted for total knee arthroplasty	Provider membership in integrated delivery system	n/a	-Coordination of care, Picker Post-Acute Care Survey, self report	n/a	The intervention did not produce consistent effects.
Keeney, et al. 2008 B-A	Long-term care facilities	Nursing home residents \geq 65	Collection of benchmark data, creation or modification of pain policies and protocols, implementation of pain management program, and presentation of educational programs	-Pain*, vital sign assessment, pt reported	n/a	-Pain management*, chart review	The intervention can cause improvement in pain management processes.

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Kiefe, et al. 2001 RCT	Physician practices	Medicare pts w/ diabetes	Ambulatory Care Quality Improvement Project, including chart review, physician feedback, and achievable benchmarks	n/a	n/a	-Influenza vaccines*, -Foot exam*, -Glucose control measurement* -Cholesterol measurement -Triglyceride measurement, adherence to achievable benchmarks, all from chart review	Using achievable benchmarks significantly enhances the effectiveness of physician feedback.
Kralj, et al. 2003 CC	2 Community oncology practices	Cancer pts w/ Hgb <12g/dL	A clinical reminder generated in real-time during a physician-pt encounter by an electronic medical record (EMR) system	n/a	n/a	-Frequency of erythropoietin prescription to pts w/ low Hgb levels*, medical record	The data support the effectiveness of clinical reminders as a way to influence physician prescribing behaviors and potentially improve the quality of pt care.
Kresowik, et al. 2000 B-A	14 Hospitals	Medicare pts undergoing carotid endarterectomy (CEA) procedures	Confidential reports to hospitals on outcomes of CEA and review of records by surgeons	-Stroke or mortality combined rate*, medical record	n/a	n/a	The intervention gives way to changes in care processes and improved outcomes of CEA procedures.
Krichbaum, et al. 2005 RCT	Long-term care facilities	Residents aged 65 and older w/ incontinence, pressure ulcers, depression, and aggression	Nurse-led direct care and implementation of care protocols, quality assurance committee action, and staff collaboration	-Cognitive status, Mini-Mental Status Exam -Depression*, Geriatric Depression Scale -Morale, Philadelphia Geriatric Center Morale Scale -Emotions, Apparent Emotion Rating Scale -PU*, Braden Scale of Pressure Sore Risk -Urinary Incontinence*, Incontinence Monitoring Schedule, all from clinical report	-Aggressive behavior, Ryden Aggression Scale, clinical report -Care needs and health status, MN case mix classification system, all from clinical report	n/a	The intervention improved quality of care across some measures.

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LaBresh, et al. 2004 B-A	24 Hospitals	Pts admitted w/ coronary artery disease	Collaborative quality improvement initiative including interactive training of hospital teams and use of Web-based pt Management Tool	-Blood pressure < 140/90 mmHg*, medical record / Patient Management Tool (PMT), web-based data entry	n/a	-Adherence to guidelines (smoking cessation counseling*, aspirin use, beta-blocker use, ACE inhibitor use, lipid therapy*, lipid measurement*, cardiac rehabilitation referral*), PMT	Implementation of a collaborative quality improvement initiative and the use of an interactive web-based patient management tool enhanced adherence to prevention guidelines in hospitalized patients with coronary artery disease.
LaBresh, et al. 2008 B-A	Volunteer community and teaching hospitals	Hospitalized pts admitted w/ ischemic stroke or transient ischemic attack	Get w/ The Guidelines-Stroke program	n/a	n/a	-13 performance measures (incl. timely thrombolytic medicine*, timely antithrombotic medicine*, anticoagulation agents for atrial fibrillation*, smoking cessation counseling*, lipid/diabetes treatment*, weight counseling*), all from hospital record	Hospitals participating in the Get With The Guidelines program showed statistically and clinically significant improvement in 11 of 13 quality improvement measures for the treatment of patients hospitalized for cerebrovascular disease.
Lapane, et al. 2007 B-A	1,141 Nursing homes	Nursing home residents	Potentially inappropriate medications included in surveyor guidelines	n/a	n/a	-Use of potentially inappropriate medications*, medical record	The intervention may not enhance medication-use quality improvement efforts.
Leone, et al. 2008 B-A	Long-term care facility	Pts in dementia care or skilled nursing care unit of nursing	Adoption of standard pain scale or assessment and evaluation of pain	-Presence of pain syndromes, medical record	n/a	-Use of pain evaluation tools, medical record -Pain medications used, medical record	Intervention-provided pain evaluation tools may help providers in challenging and complex situations and can have

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		home					positive outcomes for pts.
Levy, et al. 2009 RCT	Primary care practices	Female pts > 65	Chart reminder alone or chart reminder and mailed pt education to encourage bone mineral density testing	n/a	n/a	-Completed bone mineral density test*, medical record	Chart reminders and mailed pt education substantially increases bone density testing.
Lindner, et al. 2007 B-A	Veterans Affairs Medical Center nursing home	Nursing home inpatients	Modifications to electronic medical record to specify resuscitation status and alert clinicians to complete advanced directive discussion note	n/a	n/a	-Completion of advanced directive note*, medical record -Presence of do-not-resuscitate order*, medical record -Presence of other treatment-limiting orders*, medical record	Intervention increased completion of advanced directive discussion notes in seriously ill pts.
London, et al. 2005 B-A	Palliative care centers	Palliative care pts w/ cancer, cardiac illness, respiratory conditions, or dementia	Comprehensive, Adaptable, Life-Affirming, Longitudinal (CALL) intervention consistent w/ clinical practice guidelines for quality palliative care	-Physical, psychological and emotional health, Modified City of Hope Questionnaire, self report	-Health care experiences, Modified City of Hope Questionnaire -Spiritual status, Modified City of Hope Questionnaire, self report	-Service utilization, medical record	The intervention is an effective approach for people living with life-threatening illness.
Lyder, et al. 2004 B-A	Acute care hospitals in 1 state	Pts ≥65 treated for pneumonia, cerebrovascular disease, or congestive	Implementation of plan-do-study-act improvement cycles and results sharing	-Mortality, medical record -Pressure ulcer incidence, medical record	n/a	LOS, medical record -Identification of high-risk pts -Timely repositioning of bed-bound pts* -Use of nutritional consults*	The intervention was associated with increased performance on four quality of care indicators.

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		heart failure, w/ a LOS longer than 5 d				-Staging of acquired Stage II or greater pressure ulcers* -Daily skin assessments for high-risk pts, all from medical record	
Mahotiere, et al. 2006 B-A	Physician offices, hospital OP clinics, community health centers	African-American Medicare beneficiaries w/ diabetes	On-site visits, provider feedback, cultural competency training, along w/ community interventions	n/a	n/a	-Proportion of beneficiaries receiving biennial lipid profile, medical record	Although impossible to determine direct impact of individual interventions on reducing disparities, they appeared effective collectively.
Malone, et al. 2000 CC	Veterans Affairs Medical Centers	Pts at high-risk for drug-related problems	Clinical pharmacist-led optimization of medication therapy	-QoL, SF-36, pt questionnaire	n/a	n/a	The intervention had no significant impact on QoL for veterans with high risk for prescription-related problems.
Matcher, et al. 2002 RCT	6 large managed care organizations	Patients age 65 or older w/ non-valvular atrial fibrillation	High-quality anticoagulation service coordinated through managed care organizations	-Thromboembolic events, medical record -Major bleeding, medical record -Hospitalization, medical record	-Proportion of time that warfarin-treated patients were in target range for optimal prothrombin time-international normalized ratio (INR) range, medical record	n/a	The intervention did not improve care.
Maue, et al. 2002 B-A	Physician network health maintenance organization	Pts w/ hypertension	Physician-focused intervention strategy, disseminating guidelines, continuing medication education programs to achieve a greater	-Pts achieving blood pressure goals*, medical charts	n/a	-Changes in the antihypertensive medications prescriptions (ACE inhibitor, RAS-blocking agent, beta-blockers, calcium channel blockers, diuretics and others)*, pharmacy claims	A physician-focused intervention significantly improved blood pressure control in diabetic and nondiabetic hypertensive pts.

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			degree of blood pressure control in hypertensive pts				
McCauley, et al. 2006 RCT	Hospital	Pts hospitalized w/ heart failure	Advanced practice nurse care coordination service	-Rehospitalization*, medical record	n/a	n/a	Results of the intervention were positive. APNs successfully educated pts, suggested self-management strategies, improved pt-provider communication, and helped pts access community resources.
McCorkle, et al. 2000 RCT	Comprehensive Care Center	Surgically treated pts 60 to 92 w/ solid cancers	Standardized protocol delivered by advanced practice nurses; assessment and management guidelines, doses of instructional content, and schedules of contacts, home visits and telephone contacts	-Length of survival*, letters sent to patients, telephone contacts, death certificate -Depression, Center for Epidemiological Studies Depression Scale (CES-D) -Symptom distress, Symptom Distress Scale (SDS) -Functional status, Enforced Social Dependency Scale (ESDS), all pt reported	n/a	n/a	Intervention is linked to improved survival, but since this is the first empirical study of its type, additional research is needed.

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McMahon, et al. 2010 CC	Community teaching hospital	Hospital pts	Inpatient medicine service w/ reduced resident workload; experimental teams consist of two attending physicians, two residents and three interns	-Hospital mortality, administrative data -Rehospitalization, administrative data	-Satisfaction, pt survey -Discharge location, administrative data	-Cause of death, pt chart - LOS, administrative data -Adherence to national hospital inpatient quality measures (incl. pneumonia, acute myocardial infarction, and heart failure measures), administrative data and medical record	Reduced trainee workload and increased participation of attending physicians was associated with higher trainee satisfaction and increased time for educational activities.
Meehan, et al. 2004 B-A	Primary care practices	Medicare pts w/ hypertension	Feedback of baseline performance data, provision of practice enhancing materials	-Hypertension pts w/ < 140/90 mmHG, provider assessment / medical record -Hypertension / chronic renal disease / diabetes mellitus / heart failure pts < 130/85 Hg, provider assessment / medical record	n/a	-ACE inhibitors prescribed Beta-blockers prescribed -Diuretics / ACE inhibitors prescribed -Diuretics / beta-blockers prescribed, all for indicated pts, all from medical records	Multifaceted intervention did not improve care for target population.
Meehan, et al. 2001 B-A	Acute care hospitals	Hospitalized pneumonia pts	Feedback of performance data, evidence-based pneumonia critical pathway distributed, sharing of pathway implementation experiences	-30 day mortality, medical record 30 day rehospitalization, medical record	n/a	-LOS*, medical record -Early antibiotic administration*, medical record -Blood culture collection, medical record -Oxygenation assessment*, medical record	Statewide improvements were demonstrated in the care of hospitalized pneumonia pts concurrent with a multifaceted quality improvement intervention.

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Mehta, et al. 2002 CC	Acute-care hospitals	Medicare and non Medicare pts w/ acute myocardial infarction	Guidelines Applied in Practice (GAP) intervention included a kickoff presentation, creation of guideline-oriented tools designed to facilitate adherence to key quality indicators, assignment of physician and nurse opinion leaders and site visits	n/a	n/a	-Aspirin Use* -Beta-blocker use*, and angiotensin-converting enzyme inhibitors use at discharge -Time to reperfusion -Smoking cessation and diet counseling* -Cholesterol assessment and treatment, all from medical record	Implementation of guideline-based tools for acute myocardial infarction may facilitate quality improvement among a variety of pts, caregivers, and institutions.
Miles 2008 B-A	Nursing homes	Nursing home residents at risk for hip fracture	Practice redesign aimed at hip fracture prevention	n/a	-Hip fracture rates*, medical record -Treatment of osteoporosis*, medical record	n/a	A rigorous individualized approach can reduce hip fracture rates in nursing homes.
Miura, et al. 2009 CC	Academic-affiliated community hospital	Hospital pts admitted to the hip fracture service	Interdisciplinary, geriatrician-led program including set protocols, preprinted orders, and standardized assessments	n/a	n/a	-LOS*, administrative data -Time to surgery*, administrative data -Total cost*, administrative data	The findings suggest that care with set protocols overseen by a trained lead physician may improve the quality and cost effectiveness of managing elderly pts with hip fracture.
Moreno, et al 2009 RCT	Community sample	Medicare beneficiaries	Intensive nurse case management via tele-visits	n/a	n/a	-Medicare service use, claims data -Costs covering 6-yr follow-up, claims data	Although the intervention had modest clinical outcome effects, it did not reduce Medicare use or

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							costs for health services.
Morey, et al. 2009 RCT	Veterans Affairs Medical Center	Male primary care pts \geq 70	Physical activity counseling in primary care, intervention included telephone counseling and provider messaging	-Gait speed, speed trap wireless timing device -Physical performance, Short Physical Performance Battery -Health, Function and Disability, SF-36 (selected items) -Late Life Function, Late Life Disability, all self-reported	-Physical activity*, Community Healthy Activities Model Program for Seniors, all provider assessment -Physical activity self-efficacy and motivation*, self report	n/a	The intervention did not improve usual gait speed but significantly improved rapid gait and physical activity.
Morgenstern, et al. 2002 CC	Community hospital and physicians	Pts w/ cerebrovascular events	Educational intervention on hospitals and community physicians while changing the stroke identification skills, outcome expectations, and social norms of community residents was developed to increase the proportion of stroke pts treated appropriately	n/a	n/a	-Proportion of pts treated w/ IV rTPA* -Proportion of treated pts who met eligibility criteria for IV rTPA for acute ischemic stroke -Delay time from symptom onset to hospital arrival in the intervention community, all from medical record	An aggressive, multilevel stroke educational intervention program can increase delivery of acute stroke therapy.

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Munir et al. 2006 B-A	Academic long-term care facility specializing in dementia	Long-term care residents	Educational letter on calcium and vitamin D assessment and supplementation signed by medical director sent to primary care physicians; pharmacist reviewed orders and faxed requests to physicians for additional tests and supplements	n/a	n/a	-Calcium supplementation*, pt chart -Vitamin D supplementation,* pt chart -Ongoing calcium supplementation*, pt chart -Vitamin D assessment*, pt chart	The intervention increased the number of residents with calcium supplementation, vitamin D assessments, identified vitamin D deficiencies and vitamin D supplementation.
Naughton, et al. 2001 RCT	Skilled nursing facilities	Pts w/ a episode of pneumonia acquired more than 3 days after admission to skilled nursing facilities	Multifaceted education intervention, including small group consensus process developed to improve nursing home acquired pneumonia	-30 day mortality, medical record from nursing home and hospital -Severity of pneumonia, medical record from nursing home and hospital -Hospitalization, medical record from nursing home and hospital	n/a	-Antibiotic use at diagnosis, medical record from nursing home and hospital -Antibiotic use consistent w/ the guidelines*, medical record from nursing home and hospital	Care within skilled nursing facilities can be significantly changed using standard quality improvement techniques.
Naylor, et al. 2004 RCT	Academic and community hospitals	Pts \geq 65 hospitalized w/ heart failure	Nurse-directed discharge planning and home follow-up	-Time to rehospitalization or death* -Rehospitalization* -Acute care visit, medical record / bills -QoL*, Minnesota Living w/ Heart Failure Questionnaire (MLHFQ) -Functional status, Enforced Social Dependency Scale (ESDS), pt phone interview	-Satisfaction w/ care*, researcher developed instrument, pt phone survey	- Provider home visits, patient records and bills -Costs*, medical and administrative records	Intervention increased length of time between hospital discharge and readmission or death, reduced total rehospitalizations, and decreased healthcare costs.

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Nowalk, et al. 2003 B-A	Suburban community teaching hospital	Unvaccinated pts ≥ 65 and pts w/ chronic medical conditions predisposed to invasive pneumococcal infection	Admission vaccination screening and computer based record keeping to identify unvaccinated eligible pts and track vaccination status	n/a	n/a	-Rate of in-hospital vaccination*, medical record -Assessment of previous vaccination status*, medical record	Interventions improved the assessment and documentation of inpatient vaccination status.
O'Connor, et al. 2009 RCT	Multispecialty health group	Diabetes pts	Simulated case-based physician learning intervention or the same simulated case-based learning intervention w/ physician leader feedback	-HbA1c*, electronic clinical database -Cholesterol, LDL*, electronic clinical database	n/a	-Pharmacotherapy intensification rate, clinical record and pharmacy claims data -Risky prescribing events*, use of metformin in pts w/ serum creatinine ≥ 1.5 mg/dl, clinic record and pharmacy claims data	The simulated, case-based learning intervention significantly reduced risky prescribing events and marginally improved glycemic control in pts but the addition of opinion leader feedback did not improve the intervention.
Ouslander, et al. 2009 B-A	3 nursing homes	Nursing home pts	Communication and clinical practice tools and strategies provided to assist in reducing potentially avoidable hospitalizations plus support from an advance practice nurse	-Hospitalization*, Minimum Data Set (MDS)	n/a	n/a	The intervention demonstrate potential to reduce avoidable hospitalizations.

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Pai, et al. 2002 B-A	31 Acute care hospitals	Hospital pts w/ heart failure	Public profiling of hospital performance, development of quality improvement activities to improve management of heart failure	n/a	n/a	-Prescription of ACEIs, medical record -Ejection fraction documentation*, , medical record	The intervention had a differential impact across indicators and hospitals.
Palmas, et al. 2010 RCT	Primary care practices	Pts ≥ 55 residing in designated medically underserved areas	Diabetes case management telemedicine intervention	n/a	n/a	-Mean annual Medicare payments, claims -Cost of telemedicine intervention, expenditure records	The high-cost intervention was not associated with decreased Medicare claims in this underserved medical population.
Peikes, et al. 2009 RCT	15 Care coordination programs	Medicare pt w/congestive heart failure, coronary heart disease, and / or diabetes	Nurse-provided pt education and monitoring to facilitate better adherence and ability to communicate w/ physicians	-Hospitalization, claims data	-Quality of care, pt survey	-Monthly Medicare expenditures, claims data -Process of care quality indicators (incl. health education, service arrangement / assistance, preventive services), pt survey, medical claims data	Viable care coordination programs without a strong transitional care component are unlikely to yield net Medicare savings; programs with substantial in-person contact that target moderate to severe pts can be cost-neutral and improve some care.
Pennell, et al. 2005 B-A	Urban medical center w/ a specialization in cardiovascular surgery, infectious diseases, and	Coronary bypass surgery pts	Comprehensive diabetes management program w/ professional education, OP programs for diabetes management, and inpatient	-Mortality, chart review -Blood glucose values*, chart review	n/a	-Perioperative use of intravenous insulin infusion therapy*, chart review -Use of sliding scale insulin, chart review -Basal medication on IV insulin infusion, chart review -Basal medication on	The intervention had a positive impact on practice patterns.

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	gastrointestinal diseases		program to optimize diabetic pt outcomes and reduce LOS			sliding scale insulin, chart review -Frequency of blood glucose tests for nondiabetic pts, chart review -LOS, chart review -Postoperative infections, chart review	
Philbin, et al. 2000 RCT	Large tertiary care hospital	10 acute care community hospitals	Regional, multihospital collaborative quality improvement intervention on care and outcomes in heart failure in community hospitals	-Hospital and 6-month mortality -Rehospitalization -QoL, Ladder of Life question, pt contacted by nurse	n/a	-LOS, chart review -Hospital charges, chart review -Adherence to 5 quality of care indicators, chart review	The intervention was associated with a small but statistically insignificant LOS.
Piatt, et al. 2010 RCT	11 Family and internal medicine primary care practices	Diabetes pts	Chronic care model intervention (CCM) or provider education only	-HbA1c* -Total cholesterol, HDLc and Triglycerides, Cholestech LDX System -Non-HDLc* -Blood pressure*, all clinical measurements -Well-being / mental health, World Health Organization (Ten) Quality of Well-Being Index (QWB 10), pt questionnaire	-Proportion of pts self-monitoring blood glucose*, pt questionnaire	-Health care utilization, Modified Diabetes Care Profile (MDCP, selected sections), pt questionnaire	Improvements in outcomes can be sustained over time after a multifaceted diabetes care intervention; more research is necessary to understand if improvements in outcomes can be sustained after diabetes self-management education.

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Pierre, et al. 2006 B-A	Community teaching hospital	Hospitalized pts ≥ 65	Interdisciplinary continuous process improvement team-developed educational intervention for providers focusing on the role of medications in the etiology of delirium among group of interest	n/a	n/a	-Reduction of targeted Rx drugs*, pt charges from pharmacy and quality management departments -Number of referrals to evaluate pt mental status given by physicians and nurses to psychologists*, chart review	The intervention resulted in the decreased use of targeted medications.
Preston, et al. 2000 CC	Community-based primary care practices	Female Medicare beneficiaries ≥ 65 w/ at least one primary care visit	Pt education, physician reminders, and physician feedback to encourage mammography use	n/a	n/a	-Biennial mammography rate*, medical record -Adherence to mammography referral*, medical record	The intervention demonstrated the effectiveness of a multifaceted intervention in a community physician practice setting.
Quinley, et al. 2123 RCT	Primary care physician practices	Medicare pts ≥ 65	The addition of a telephone follow-up to existing mailed physician performance feedback	n/a	n/a	-Cumulative pneumococcal vaccination rate*, Medicare claims data	Telephone follow-up is an effective and straightforward method to enhance the impact of practice-specific feedback to promote improvements in Medicare polyvalent pneumococcal vaccine immunizations.

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Rabow, et al. 2004 CC	General medicine OP clinic	Pts w/ advanced congestive heart failure, chronic obstructive pulmonary disease, or cancer w/ a life expectancy of 1 to 5 yrs	Palliative care team consultations for referring primary care physicians and advance care planning, psychosocial support, and family caregiver training for pts	-Function, Rapid Disability Rating Scale -Dyspnea*, UCSD Shortness of Breath Questionnaire -Pain*, Brief Pain Inventory -Depression, CES-D -Sleep* -QoL, Multidimensional QoL Scale-Cancer, all pt questionnaires -ED visit -Hospitalization, medical record	-Anxiety, Profile of Mood State* -Spiritual well-being*, Spiritual Well-Being Scale -Healthcare satisfaction, 25 items Group Health Association of America Consumer Satisfaction Survey -Power of attorney -Funeral arrangement* -Plans for disposition of possessions, all pt questionnaires but provider was present	-Health care utilization, medical record -Location and setting of death, primary care physician -Costs, computer billing system	Palliative care for seriously ill outpatients can be effective; nevertheless, implementation barriers must be explored.
Rabow, et al. 2003 CC	General medicine practice in an academic medical center	Outpatients w/ cancer, advanced congestive heart failure, or advanced chronic obstructive pulmonary disease	Palliative care consultation w/ primary care physicians (PCPs) and educational and supportive services to pts and their families	n/a	-Satisfaction (w/ family, physician, medical center)* -Program assessment (timing, introduction advance care planning), all from pt interview	-Physician referrals*, medical record	The intervention appears acceptable and helpful to pts but barriers to implementation need to be explored.
Rantz, et al. 2003 B-A	Nursing homes	Nursing home residents	Strategy to improve outcomes including partnership between state nursing home survey administrators and nursing	-Resident outcomes (incl. PU*, range of motion*, activities of daily living, dehydration*, fecal impaction*, incontinence*, physical function*, skin care, cognitive functioning*, depression*), MDS, Show-Me Quality Indicator Report, medical record	n/a	-Process measures (incl. hypnotic drug use*), MDS, Show-Me Quality Indicator Report, medical record	Other states should consider emulating intervention.

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			school as well as on-site clinical experts to support facilities				
Rantz, et al. 2001 RCT	Nursing facilities	Nursing home residents	Nursing facilities provided w/ comparative quality performance information, quality improvement education, and/or expert clinical consultation to improve clinical practices and subsequently improve resident outcomes	-Selected Minimum Data Set patient outcomes (incl. prevalence of little or no activity*), Minimum Data Set (MDS)	n/a	-Use of 9 or more different medications Prevalence of occasional or frequent bladder or bowel incontinence w/out a toileting plan, - Prevalence of daily physical restraints, all from Minimum Data Set (MDS)	Those nursing homes that sought the additional expert clinical consultation were able to effect enough change in clinical practice to improve resident outcomes significantly.
Rask, et al. 2007 CC	19 Nursing homes owned by non-profit organizations	All residents of participating nursing homes	Falls management program; organizational leadership buy-in support, designated facility-based falls coordinator and interdisciplinary team, education and training,	-Fall rates, MyInnerView quality improvement software -Serious injuries, MyInnerView quality improvement software	n/a	-Restraint use*, MyInnerView quality improvement software -Adherence to 21 care process indicators, chart review	The intervention was associated with improved care process documentation and a steady fall rate despite substantial reductions in the use of physical restraints.

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			ongoing consultation and oversight by advanced practice nurses				
Resnick, et al. 2006 B-A	1 Nursing home	Nursing home residents	Two-tiered motivational intervention (Res-Care) that involves teaching and motivating nursing assistants to engage in restorative care activities w/ residents	-QoL, Dementia Quality of Life Instrument -Self-efficacy for Functional Activities -Functional performance, Barthel Index -Pain, all interview or questionnaire -Muscular contractures and strength, physical examination	-Outcome Expectations for Functional Status, pt questionnaire	n/a	The results have been used to revise the intervention to include additional education needs, revisions in the motivational intervention, clarification of the documentation and motivational techniques, and implementation of a more comprehensive treatment fidelity plan.

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Reuben, et al. 2010 B-A	Primary care practices	Dementia pts ≥ 75	Practice redesign, adaptation of the Assessing Care of Vulnerable Elders (ACOVE)-2 including screening, efficient collection of clinical data, medical record prompts, pt education and empowerment materials, physician decision support and education	n/a	n/a	-Adherence to quality indicators (including referral to Alzheimer's Association*, Assessment of functional status*, - Antipsychotic risk and benefit discussion*, Caregiver counseling*), all from medical record	The intervention can increase referral to Alzheimer's Association chapters and improve quality of dementia care.
Rihal, et al. 2006 B-A	Academic medical center	Pts that underwent percutaneous coronary intervention (PCI)	Evaluation of current practice targeting process improvement, reduction of practice variation, and optimization of resource consumption for PCI procedures	-Hospital mortality*, medical record -Myocardial infarction* -Target vessel revascularization, medical record	n/a	-LOS*, administrative records -Procedural success, medical record -Total procedural cost*, administrative records -Total post-procedural cost*, administrative records	The intervention successfully reduced costs while maintaining or improving care quality.
Robinson, et al. 2006 B-A	1 Nursing home	Nursing home residents	Eden Alternative including bottom-up decision making, a focus on the individual, self-directed staff	-Depression, Geriatric Depression Scale (cognitively intact pts) or Cornell Depression Scale (cognitively impaired pts), pt questionnaire	-Family satisfaction, Family Questionnaire, pt family questionnaire	n/a	The intervention demonstrated the importance of valuing decisions made by those closest to residents.

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			teams, and companion animals				
Roman, et al. 2001 B-A	Academic medical center	Diabetes pts	Redesign of the hospital's capillary blood glucose monitoring form into a color-coded process control chart and a clinical path for type 2 diabetes as a secondary diagnosis	-Glucose level -HbA1c -Severe hyperglycemia*, medical record -Prolonged hyperglycemia* -Nosocomial infections*, medical record	-Knowledge of target blood glucose -Confidence in managing diabetes, pt phone interview	-LOS -Standing diabetes regimen*, medical record -Receipt of dietary information, blood glucose monitoring instructions, insulin injection instructions, signs of a potential AE, and other relevant home-care instructions, all pt phone interview	Interventions were associated with a reduction in prolonged and severe hyperglycemia as well as the frequency of nosocomial infections; the study also identified opportunities to improve diabetes knowledge and self-care instructions.
Rosen, et al. 2006 B-A	1 Not-for-profit nursing home	All residents and all staff at the nursing home	Quality improvement process to reduce pressure ulcers; ability enhancement, incentivization, management feedback; computer-based education program on PU prevention, penlights to promote early detection, real-time feedback	-Incidence of new pressure ulcers*, medical records -Stage 2 or worse pressure ulcers*, medical records	n/a	n/a	The intervention resulted in a significant decrease in pressure ulcers but these effects did not persist when the three components of the intervention were stopped.

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Rosher, et al. 2005 B-A	1 nursing home	Pt family members	Eden Alternative including educational programs geared towards cultural change and the implementation of daily pleasures such as gardens and outside time	n/a	-Family satisfaction, Family Questionnaire, pt family questionnaire	n/a	The intervention provided many opportunities for family involvement and improved satisfaction scores, reflecting greater communication and interaction among families, staff, and residents.
Rubin, et al. 2006 B-A	Community teaching hospital	Hospitalized pts ≥ 70	Hospital Elder Life Program (HELP) providing standardized protocols for delirium risk factors	-Delirium rate*, medical record	-Satisfaction*, nurse and family survey	-LOS, medical record -Costs of care*, medical record	The program yields clinical and financial benefits.
Rubin, et al. 2010 B-A	OP respiratory department in a specialized hospital	Pts w/ severe chronic obstructive pulmonary disease	Multidisciplinary team coordinated by a liaison nurse/case manager to provide pulmonary rehabilitation program consisting of education, exercise training, physiotherapy and occupational therapy	-COPD exacerbations* -Hospitalization*, all from hospital record -QoL*, CRQ -BODE index (BMI, airflow obstruction, dyspnea, exercise capacity)* -Dyspnea* (Borg index, mMRC, CRQ) -Exercise capacity, 6MWT, all from tests and pt questionnaire	n/a	-LOS, hospital record	The rehabilitation program substantially reduces health resources use in pts with severe and very severe chronic obstructive pulmonary disease.

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Sauaia, et al. 2000 RCT	Hospitals in Cooperative Cardiovascular Project	Medicare pts w/ acute myocardial infarction (AMI)	Cardiologist and quality improvement specialist-led presentations to providers on baseline performance data	n/a	n/a	-Adherence to quality indicators (incl. reperfusion, aspirin, beta-blockers, angiotensin-converting enzyme inhibitors), all from medical record	The intervention was not associated with larger improvement in acute myocardial infarction care compared to the mailed feedback; other interventions, such as opinion leaders, may be necessary to improve care.
Schuster, et al. 2006 B-A	2 large hospital-owned health systems	Pts at risk for cardiovascular diseases	Cardiovascular disease management; mailing a physician signed letter stating goal LDL levels and urging pts to take action towards this goal	-LDL cholesterol*, pt chart -Systolic blood pressure*, pt chart -Diastolic blood pressure, pt chart -Total cholesterol*, pt chart	n/a	n/a	The intervention produced significant improvements in clinical outcomes.
Sennour, et al. 2009 CC	Community teaching hospital	Acutely ill hospitalized older pts	Collaborative geriatrics consultation model w/ team led by geriatrician and geriatrics NP, team assisted w/ identifying cases, provided consultation early in the hospital stay, and evaluated functional and psychological issues	n/a	n/a	-LOS*, administrative data -Hospital cost*, administrative data -Referrals*, administrative data	The Proactive Geriatrics Consultation Service is a promising model of collaboration between hospitalists and geriatricians for improving care of hospitalized older adults.

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Shapiro & Taylor 2002 RCT	Community sample	Moderate risk elderly (based on state risk score)	Earlier-than-usual case management service delivery	-Mortality*, medical record, -Permanent institutionalization*, medical record -Depression*, Center for Epidemiological Studies Depression Scale (CES-D, 12 items), pt survey	-Satisfaction w/ social relationships* (4 items) -Environmental mastery*, Ryff index (3 items) -Life satisfaction (1 item), all pt survey	n/a	Significant improvement in well-being and reduced likelihood of institutionalization and death demonstrate the intervention's importance.
Shaughnessy, et al. 2002 CC	Home health agencies	Older adults admitted to home health care	Provision of risk-adjusted outcome reports for comparison to other sites via Outcome-Based Quality Improvement methodology	-Hospitalization*, medical record -Health Status Outcome Measure improvements and stabilizations (functional, physiological, emotional / behavioral, cognitive health outcomes)^^^, OASIS data	n/a	n/a	The Intervention improved outcomes for target pts.
Sheikh, et al. 2004 CC	National sample	Medicare beneficiaries who had a carotid endarterectomy	Peer Review Organization interventions to decrease adverse outcomes related to carotid endarterectomy procedures	-Mortality, medical record -Stroke, medical record	n/a	n/a	The interventions did not decrease mortality or stroke rates.
Shihet, et al. 2007 B-A	Community sample	Nursing home residents	Medicare Program operated quality improvement organization program	-QALY gains*, Health Utility Index Mark 2 (HUI2) -Short-stay residents w/ moderate or severe pain* -Pts w/ loss of function -Long-stay residents w/ moderate or severe pain* -Pts w/ pressure sores, all resident-level minimum data set (MDS)	n/a	-Pts w/ physical restraints* -Cost per QALY gained, Quality Improvement Organization cumulative expenditures	The intervention suggest that CMS' investment in the quality improvement program resulted in cost-effective improvements in QALYs.

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Sidorov, et al. 2003 B-A	Health maintenance organization	All pts (Medicare+choice enrollee) entering congestive heart failure program	Congestive heart failure disease state management intervention, case manager for ongoing follow-up to assure compliance w/ physician follow-up and medications, guideline based care	-QoL,* SF-36, pt survey	n/a	-Completion of cardiac imaging*, medical record -ACE inhibitor prescription*, medical record -Beta-blocker prescription*, medical record	Intervention findings and success with the use of this tool indicate the SF-36 can be an important part of the ongoing assessment of pts in a disease management program for CHF.
Siminerio, et al. 2010 B-A	Rural primary care practice	Diabetes pts	Decision support, self-management, and delivery system redesign	-HbA1c*, medical record -Systolic and diastolic blood pressure (mm Hg)*, medical record -Serum cholesterol*, medical record	-Empowerment*, Diabetes Empowerment Scale (DES), pt survey -Pt knowledge*, Diabetes Self-management Program of UPMC Health System Initial Assessment	-HbA1c measures present* -Lipid profile present* -Urine analysis present* Dilated eye exam undertaken* Foot exam undertaken* Monofilament undertaken*, all from medical record	The intervention had a positive influence on practice and pt outcomes.
Smith, et al. 2006 B-A	Large health maintenance organization	Adult enrollees	Use of computerized provider order entry w/ clinical decision support	n/a	n/a	-Prescription per 10,000 members per mo*, pharmacy data	Alerts in an outpatient electronic medical record may be effective in reducing prescribing of contraindicated medications; the effect on pt outcomes is less certain and deserves further investigation.
Smith, et al. 2005 RCT	University-affiliated health system	Heart failure pts	Registered nurse provided telephone-based pt education and	-QoL*, Medical Outcomes Study Short Form (SF-36), pt completed by phone or at home	n/a	n/a	It is unclear whether the intervention can provide long-term QoL improvement.

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			medication management				
Snyder & Anderson 2005 CC	Hospitals	Medicare beneficiaries	Voluntary participation w/ quality improvement organization	n/a	n/a	-15 Quality indicators of the quality improvement organizations to improve care for Medicare pts (incl. pneumonia immunization indicator*), all from medical record	Hospitals that participated in the quality improvement program are not more likely to show improvement than hospitals that do not.
Song, et al. 2005 RCT	Cardiothoracic surgery clinic	Pts undergoing cardiac surgery	Patient-Centered Advance Care Planning Interview consisting of a representational assessment, exploration of concerns, creation of conditions for conceptual change, introduction of replacement information and a summary	n/a	-Decisional conflict*, Decisional Conflict Scale -Congruence w/ surrogate on end-of-life scenarios*, Statement of Treatment Preferences -Knowledge of advance care planning -Anxiety, Spielberger's State Anxiety Inventory, surrogate and pt questionnaire	n/a	The intervention can be an effective approach to advance care planning, leading to increased pt-surrogate congruence without negative impacts on decisional conflict and anxiety.
Stevenson, et al. 2000 B-A	133 Long-term care facilities	Long-term care facilities residents	Collaborative efforts to improve pneumococcal vaccination rates	n/a	n/a	-Vaccination rates*, medical record	Simple vaccination strategies implemented over a short time period can significantly impact vaccination rates.

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Stock, et al. 2008 CC	Community sample	Primary care pts \geq 66	Chronic care model or primary care physician supported by care manager	-Physical function, Physical Function Survey, pt survey -Health related QoL* (24-items from SF-36), pt survey	n/a	n/a	A chronic care model approach appears to improve health related QoL in the target population.
Subramanian, et al. 2004 RCT	Veterans Affairs Medical Centers	Primary care pts	Physician care suggestions generated by electronic medical record and data from Pt questionnaires	-QoL, Physical and Mental Component (SF-36) -Functional status / QoL, McMaster Chronic Heart Failure Questionnaire -Hospitalization -ED visit, medical record -Improvement in New York Heart Association class, survey	-Satisfaction w/ primary care physician*, American Board of Internal Medicine instrument, pt survey	-Outpatient visits, medical record -Physician adherence to heart failure guidelines, medical record	The intervention did not change physician treatment decisions nor improve pt outcomes.
Taylor, et al. 2003 RCT	Clinics in a medically underserved area	Pts at high risk for medication-related adverse events	Pharmaceutical care, including medical record review, medication history review, pharmacotherapeutic evaluation, and pt medication education and monitoring	-QoL, SF-36 -Hypertension* -Diabetes* at goal, HbA1c -Dyslipidemia* at goal, LDL cholesterol -Anticoagulation* at goal, INR -Hospitalization* -ED visit*, all from medical record	-Medication knowledge*, pt self-report -Compliance*, pt self-report -Pharmacy related satisfaction*, pt self-report	-Medication misadventures -Inappropriate prescribing*, -Number of prescribed medications Medication Appropriateness Index (MAI), all from medical record and pt self-report	Pharmaceutical care in a rural, community based setting appeared to reduce inappropriate prescribing, enhance disease management, and improve medication compliance and knowledge without adversely affecting health-related QoL.
Titler, et al. 2008 RCT	12 Acute care hospitals	Hospital pts \geq 65 w/ a hip fracture	Promotion of evidence-based acute pain management practices in hospitalized older adults	-Mean pain intensity*, (1 item) medical record abstract form (medical record and provider assessment)	n/a	-Adoption of pain management practices, medical record abstract form (18 indicators, medical record and provider assessment)	The intervention improved quality of acute pain management of older adults hospitalized with hip fracture.
Tosi, et al. 2008 B-A	13 hospital-based facilities and 1 ambulatory-care facility	Adult pts w/ low-energy fracture	Quality improvement program designed to improve the application of evidence-based	n/a	n/a	-Adherence to 9 quality of care indicators, chart review	The intervention produced significant effects on many of the quality of care indicators with the most significant impacts in pt

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			strategies for the prevention of secondary fractures				communication and education.
Unützer, et al. 2002 RCT	18 Primary care clinics from 8 health care organizations	Pts \geq 60 w/ major depression or dysthymia	Improving Mood-Promoting Access to Collaborative Treatment (IMPACT): collaborative care, depression care manager, stepped care	-Depression*, Symptom Checklist (SCL-20) -Health-related functional impairment*, Sheehan disability scale -QoL* (1 item), all from pt phone interview	-Satisfaction* w/ depression care (1 item), pt phone interview	-Service use, Cornell Services Index (plus additional items)*, pt phone interview	The care model appears to be feasible and significantly more effective than usual care for depression in a wide range of primary care practices.
Unützer, et al. 2001 RCT	18 Primary care clinics from 8 health care organizations	Pts \geq 60 w/ major depression or dysthymia	Improving Mood-Promoting Access to Collaborative Treatment (IMPACT): collaborative care, depression care manager, stepped care	n/a	n/a	-Service use and medication, in parts from Cornell Services Index, pt phone survey	The study blends methods from health services and clinical research in an effort to protect internal validity while maximizing the generalizability of results to diverse health care systems.
Vandenber g, et al. 2005 B-A	State veterans' homes	Deceased state veterans' home pts	Interdisciplinary quality improvements to end-of-life care	-Pain* -Dyspnea* -Uncomfortable symptoms* -Depression -Agitation and anxiety, all from family member survey of deceased	-Overall quality of care* -Clarity of information Recommendation of service -Emotional needs, - Spiritual needs* -Loneliness -Preparedness for death*, all from family member	-Support disciplines -Discussion about advance directives, all from family member survey of deceased	Multidisciplinary quality improvement processes developed in part based on caregiver surveys is one process that effectively improves end-of-life care.

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					survey of deceased		
Vickrey, et al. 2006 RCT	3 Healthcare organizations collaborating w/ 3 community agencies	Dementia pts, ≥ 65, receiving Medicare and informal caregiver	Disease management program led by care managers and administered to pt-caregiver pairs at intervention clinics	-QoL*, Health Utilities Index Mark 3 (HUI3), caregiver survey	-Caregiver dementia knowledge, (5 items) -Health care quality*, CAHPS 1.0 -Caregiver confidence -OMHEOHCI -Social support, MOS -Caregiver QoL, EuroQol-5D -Negative caregiving consequences, all from caregiver survey	-Adherence to dementia guidelines* (all improved except monitoring for outcome and side effects, caregiver understanding of behavior or depression medication effects), 14 from medical record review and 9 from caregiver survey	A dementia guideline-based disease management program led to significant improvements in quality of care for pts with dementia.
Wang, et al. 2009 B-A	National sample of hospital inpatients	Pts w/ acute MI undergoing primary percutaneous coronary intervention	Get w/ the Guidelines (GWTG) program	-Mortality*, web-based patient management tool	n/a	- Mean door to balloon time* -Adherence to CMS and Joint Commission on Accreditation of healthcare Organizations core measures and recommendation* (most reported as improved), all from web-based patient management tool	Within the program, door-to-balloon times decreased significantly over time; there was minimal correlation with changes in other quality measures or mortality.

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Wang, et al. 2002 B-A	Coronary care unit in a teaching hospital	Hospital pts	Practice guidelines for routine laboratory and chest radiographic testing developed by multidisciplinary team, guidelines incorporated into computer admission orders and education	-Mortality, medical record -ICU readmission, medical record -Rehospitalization, medical record -Days of ventilator support, medical record	n/a	-LOS, medical record -Utilization of diagnostic tests*, medical record	The utilization management intervention was associated w/ significant reductions in test ordering without a measurable change in clinical outcomes.
Want, et al. 2008 B-A	Independent practice association	Frail elderly	Frail and Elderly Program including care coordinated by care managers and physicians	-Functional status, Activities of daily living*, clinical report -Functional status, Instrumental activities of daily living*, clinical report -Blood pressure*, clinical report -QoL*, SF-12, clinical report	-Medication compliance*, medical report	n/a	The model can help result in program success with potential benefits for individuals, practices, communities, and all whose lives are touched by chronic disease.
Waterman, et al. 2001 CC	8 Outpatient health centers	Pts taking warfarin	A multidisciplinary telephone based anticoagulation service (ACS) was provided to help pts use warfarin	n/a	-Pt knowledge*, pt survey -Pt satisfaction*, pt survey	-Timeliness of INR monitoring*, pt survey -Time saved by referring*, physician survey	A telephone based anticoagulation service can improve pts satisfaction with and knowledge about their antithrombotic therapy.

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Wenger, et al. 2009 CC	2 Community medical groups	Pts \geq 75 w/ difficulty with falls, incontinence, or cognitive impairment	Assessing Care of Vulnerable Elders (ACOVE-2) intervention including case-finding, physician education, and a practice-change effort to guide care	n/a	n/a	-% of quality indicators satisfied (processes of care for falls*, incontinence*, and dementia), medical record	A practice-based intervention integrated into usual clinical care can improve primary care for falls and urinary incontinence, however even with the intervention, less than half of the recommended care for these conditions was provided.
Wheeler & Waterhouse 2002 CC	Community sample	Pts w heart failure	Telephone outreach by nursing students	-Rehospitalization*, medical record -Heart failure symptoms*, MN Living With Heart Failure Questionnaire, self report	n/a	n/a	The intervention apparently achieved positive outcomes in target pts.
Wild, et al. 2004 RCT	Telemetry unit of a community hospital	Hospital pts	Implementation of interdisciplinary rounds	n/a	n/a	-LOS, medical record -Provider visits, medical record	Interdisciplinary rounds were not associated with a decreased LOS in a telemetry ward.
Zillich, et al. 2008 B-A	Veterans Affairs regional network w/ 8 hospitals and 21 community-based OP clinics	OP veterans \geq 65 who received one or more high-risk medications and the prescribing clinicians	Real-time warning message to prescribers when high-risk drug was ordered, personally addressed letter from the Chief Medical Officer to consider discontinuing, information, and a list of alternatives;	n/a	n/a	-Absence of high-risk medication prescription*, electronic chart	The multi-method intervention significantly decreased prescribing of high-risk medications to older pts.

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			distribution of list of older pts receiving medication				

Note: * reported as improved by the authors; ^: Indicators from Minimum Data Set: new fractures, falls, behavioral symptoms, depression, cognitive impairment, incontinence, urinary tract infection, weight loss, dehydration, decline of late loss of activities of daily living, decline of range of motion, little or no activity, pressure ulcer; ^^: OASIS outcome measures, improvement or stabilization in functional (activities of daily living: ambulation / locomotion, dressing upper body, dressing lower body, grooming, bathing, toileting, transferring, eating), functional (instrumental activities of daily living: management of oral medications, light meal preparation, laundry, housekeeping, shopping, telephone use), physiological (pain interfering with activity, number of surgical wounds, status of surgical wounds, dyspnea, urinary tract infection, urinary incontinence, bowel incontinence, speech or language), emotional / behavioral (anxiety level, behavioral problem frequency)cognitive (confusion frequency, cognitive functioning), utilization outcome measures (acute care hospitalization, discharge to community, emergent care); ^^: 13 selected MDS indicators: incidence of new fractures, prevalence of falls, prevalence of behavioral symptoms affecting others, use of 9 or more different medications, prevalence of occasional or frequent bladder or bowel incontinence without a toileting plan, prevalence of indwelling catheters, prevalence of fecal impaction, prevalence of weight loss, prevalence of bedfast residents, prevalence of daily physical restraints, prevalence of little or no activity, prevalence of stage 1 to 4 pressure ulcers, prevalence of stage 1 to 4 pressure ulcers (low risk); B-A: uncontrolled before-after study; Beh: Behavioral; CAHPS: Consumer Assessment of Healthcare Providers and Systems; CC: concurrent controls; Cogn: cognitive; CSDD: Cornell Scale for Depression in Dementia; CT: computer tomography; DQoL: Dementia Quality of Life Instrument; DVT: deep vein thrombosis; INPT: inpatient; ED: Emergency department; INR: International Normalized Ratio; LDL: Low-density lipoprotein; LOS: length of hospital stay; pts: participants, n/a: not available; MDS: Minimum Data Set; MRI: magnetic resonance imaging; OMHEOHCI: Outcome Measures for Health Education and Other Health Care Interventions; PU: pressure ulcer; RCT: randomized controlled trial; QoL: Quality of Life; w/: with