

Chapter 13. Patient Safety and Quality in Home Health Care

Carol Hall Ellenbecker, Linda Samia, Margaret J. Cushman, Kristine Alster

Background

Home health care is a system of care provided by skilled practitioners to patients in their homes under the direction of a physician. Home health care services include nursing care; physical, occupational, and speech-language therapy; and medical social services.¹ The goals of home health care services are to help individuals to improve function and live with greater independence; to promote the client's optimal level of well-being; and to assist the patient to remain at home, avoiding hospitalization or admission to long-term care institutions.²⁻⁴ Physicians may refer patients for home health care services, or the services may be requested by family members or patients.

The Centers for Medicare and Medicaid Services (CMS) estimates that 8,090 home health care agencies in the United States provide care for more than 2.4 million elderly and disabled people annually.⁵ To be eligible for Medicare reimbursement, home health care services must be deemed medically necessary by a physician and provided to a home-bound patient. In addition, the care must be provided on an intermittent and noncontinuous basis.⁵ Medicare beneficiaries who are in poor health, have low incomes, and are 85 years of age or older have relatively high rates of home health care use.⁶ Common diagnoses among home health care patients include circulatory disease (31 percent of patients), heart disease (16 percent), injury and poisoning (15.9 percent), musculoskeletal and connective tissue disease (14.1 percent), and respiratory disease (11.6 percent).⁷

Delivering Health Care in the Home

The home health care environment differs from hospitals and other institutional environments where nurses work. For example, home health care nurses work alone in the field with support resources available from a central office. The nurse-physician work relationship involves less direct physician contact, and the physician relies to a greater degree on the nurse to make assessments and communicate findings. Home health care nurses spend more time on paperwork than hospital nurses and more time dealing with reimbursement issues.^{8,9} Certain distinctive characteristics of the home health care environment influence patient safety and quality of outcomes: the high degree of patient autonomy in the home setting, limited oversight of informal caregivers by professional clinicians, and situational variables unique to each home.

Respect for patient autonomy is valued in hospital-based care. Nonetheless, many decisions are made by clinicians on behalf of hospitalized patients. In home health care, clinicians recognize that the care setting—the home—is the inviolable domain of the patient. Therefore, compared to the hospitalized patient, the home health care patient often has a greater role in determining how and even if certain interventions will be implemented. For example, in a hospital, nurses, physicians, and pharmacists may all play a role in ensuring that the patient receives antibiotics at therapeutically appropriate intervals. At home, however, the patient may

choose to take the medication at irregular times, despite advice about the importance of a regular medication schedule. Thus, interventions to promote patient safety and quality care must account for the fact that patients will sometimes choose to act in ways that are inconsistent with the relevant evidence, and the clinician's best efforts may not result in desired outcomes.

In addition to deliberate choices made by informed and capable patients regarding their care, individual patient variables may also influence home-based outcomes in ways that are different from those patients who are hospitalized. Ellenbecker and colleagues^{10, 11} reported that reading skill, cognitive ability, and financial resources all affect the ability of home health care patients to safely manage their medication regimens. Yet, none of these variables may play a meaningful role in the safe administration of medications to hospitalized patients.

In addition to self-care, some home-bound patients receive assistance from family members or other informal caregivers. Professional clinicians have no authority over these caregivers. Further, the home environment and the intermittent nature of professional home health care services may limit the clinician's ability to observe the quality of care that informal caregivers deliver—unlike in the hospital, where care given by support staff may more easily be observed and evaluated. For example, because of limited access to transportation, a husband may decide not to purchase diabetic supplies for his dependent wife. This behavior may not come to the clinician's attention until an adverse event has occurred. Evidence-based interventions are predicated on careful assessment. However, limited opportunity to directly observe the patient and informal caregivers may hinder efforts to quickly determine the etiology of an adverse event. If a home health care patient is found with bruises that the patient can't explain, is the cause a fall, physical abuse, or a blood dyscrasia? In both self-care by patients and care by informal caregivers, safety and quality standards may not be understood or achieved.

Another distinctive characteristic of home health care is that clinicians provide care to each patient in a unique setting. There may be situational variables that present risks to patients that may be difficult or impossible for the clinician to eliminate. Hospitals may have environmental safety departments to monitor air quality and designers/engineers to ensure that the height of stair risers is safe. Home health care clinicians are not likely to have the training or resources to assess and ameliorate such risks to patient safety in the patient's home.

Finally, given the large number of elderly persons who receive care from Medicare-certified home health care agencies, it is reasonable to anticipate that some patients will be in a trajectory of decline. Due to both normal aging and pathological processes that occur more frequently with advancing age, some elderly persons will experience decreasing ability to carry out activities of daily living (ADLs), even when high-quality home health care is provided. Thus, an implicit goal of home health care is to facilitate a supported decline. That is, patients who do not show clinical signs of improvement may nonetheless receive quality care that results in a decelerated decline or increased quality of life. This is consistent with the American Nurses Association's assertion that promoting the patient's optimal level of well-being is a legitimate goal of home health care.³

Assessing Quality of Care in the Home

The goals and multidisciplinary nature of home health care services present challenges to quality measurement that differ from those found in a more traditional hospital setting. The CMS mandates reporting of home health care outcome measures. The Outcome-Based Quality Monitoring (OBQM) program monitors, reports, and benchmarks adverse events such as emergent care for injury caused by fall or accident, increased number of pressure ulcers, and substantial decline in three or more ADLs.⁵

Pay for performance, a mechanism that ties a portion of an agency's reimbursement to the delivery of care, is another CMS quality initiative anticipated in the near future.¹² In preparation, quality-improvement organizations and providers are working to identify and develop a set of performance measures proven effective in home care. A 2006 Medicare Payment Advisory Commission report to Congress identified patient safety as an important component of quality and the need to expand quality measures to include process and structural measures. An expanded approach to quality measurement should accomplish the following goals: broaden the patient population being evaluated, expand the types of quality measures, capture aspects of care directly under providers' control, reduce variations in practice, and improve information technology.¹³

In January 2007, the home health community, health care leaders, and quality-improvement organizations launched the Home Health Quality Improvement National Campaign 2007. The campaign focuses on improving the quality of patient care in the home health care setting by providing agencies with monthly best practice intervention tools. The goal is to prevent avoidable hospitalizations for home health care patients. The Home Health Quality Improvement National Campaign uses a multidisciplinary approach to quality improvement that includes key home health, hospital, and physician stakeholders.¹⁴

Research Evidence

In many respects, home health care clinicians and clinicians working in other settings have similar concerns about patient safety and care quality. For example, patient falls occur both in homes and in hospitals, and some measures aimed at preventing falls are equally applicable to both settings. However, the significant differences between home health care and other types of health care often require interventions tailored to the home health care setting.

This chapter includes an analysis of the evidence on promoting patient safety and health care quality in relation to problems frequently seen in home health care. The following six areas were selected for review:

- Medication management
- Fall prevention
- Unplanned hospital admissions
- Nurse work environment
- Functional outcomes and quality of life
- Wound and pressure ulcer management

Adverse events in these areas could jeopardize achievement of one or more home health care goals.

Medication Management

Nearly one-third of older home health care patients have a potential medication problem or are taking a drug considered inappropriate for older people.¹⁵ Elderly home health care patients are especially vulnerable to adverse events from medication errors; they often take multiple medications for a variety of comorbidities that have been prescribed by more than one provider. The majority of older home health care patients routinely take more than five prescription drugs, and many patients deviate from their prescribed medication regime.¹¹ The potential of medication errors among the home health care population is greater than in other health care

settings because of the unstructured environment and unique communication challenges in the home health care system.¹¹

A search of the literature identified only three studies testing interventions to improve medication management and adherence in home health care patients.^{16–18} The studies are summarized in Table 1. All three studies used a controlled experimental design, with random assignment of patients to one or two treatment groups and a control group of usual care. The populations studied were elderly Medicare patients receiving home health care, ranging from 41 to 259 patients.

The interventions tested were patient education delivered by telephone or videophone with nurse followup, education tailored to individual patients, and medication review and collaboration among providers (e.g., nurse, pharmacist, physician) and patient. Specific outcomes included identifying unnecessary and duplicate medication, improving the use of specific categories of medication such as cardiovascular or psychotropic drugs, and identifying the extent of use of nonsteroidal anti-inflammatory drugs (NSAIDs). The effectiveness of the interventions was measured by improved medication management and adherence to drug protocols. Adherence was estimated objectively from medication refill history and medication event monitoring, and subjectively from patient self-report scores on pre- and postintervention questionnaires testing knowledge, understanding of disease, and adherence.

Evidence from these studies suggests that all of the interventions tested were at least somewhat effective. Medication use improved for patients receiving the intervention, while control groups had a significant decline in adherence to drug protocols. The educational interventions were most successful when individually tailored to patients' learning abilities. The interventions were most effective in preventing therapeutic duplication and improving the use of cardiovascular medications, less effective for patients taking psychotropic medication or NSAIDs. Generally, as knowledge scores improved, adherence improved. When more than one intervention was tested, there was generally no difference between the two intervention groups.

Evidence-Based Practice Implications

Nurses must be vigilant for the possibility of medication errors in the home health care setting, recognizing the associated risk factors. Technology provides many opportunities to improve communication with patients, to provide patients with accurate information, to educate them about their medications, and to monitor medication regimens. Paying close attention to at-risk patients is most effective; therefore, accurate documentation and review of medications during each patient encounter is important. The evidence suggests that frequent medication reviews and collaboration with other members of the health care team, especially pharmacists, will help to prevent adverse events associated with poor medication management.

Research Implications

More effective methods are needed to improve medication use in the home health care population. Research should continue to expand the knowledge of factors that contribute to medication errors in home health care and determine what interventions are the most effective in improving medication management in the home.

Table 1. Summary of Evidence Related to Medication Management

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Fulmer 1999 ¹⁸	Medication compliance	Randomized controlled trial	Randomized controlled trial. Outcomes: prescribed cardiac medications taken	n = 50 patients, 65 years or older with congestive heart failure, receiving home care or clinic services	1. Daily videophone 2. Regular telephone reminders 3. Control: usual treatment	Control group medication compliance dropped significantly ($P = .04$) over time compared to intervention groups (telephone or videophone). No significant difference between the two intervention groups.
Gates 2005 ¹⁷	Medication improvement	Randomized controlled trial	Randomized controlled trial. Outcomes: medication knowledge and adoption of medication list	n = 41 patients from 2 homecare agencies, 2 educational groups	1. Video 2. Tailored to individual	Knowledge improved with education tailored to individual (group 2), Group 2 members were more likely to speak with a provider before purchase of an over-the-counter drug ($P = .043$) and were significantly more likely to keep an updated medication list ($P = .003$).
Meredith 2002 ¹⁶	Medication improvement	Randomized controlled trial	Randomized controlled trial: Outcomes: unnecessary therapeutic duplication and inappropriate cardiovascular, psychotropic, and NSAIDs use.	Medicare home health care patients, more than 65 years of age with at least one medication problem, from 2 large urban home care agencies; n = 130 intervention, n = 129 control	1. Medication program to identify potential med problems and collaboration with clinical pharmacist and nurse 2. Control: usual care	Medication use improved for 50% of intervention patients and 38% of control patients ($P = .051$). Intervention effect greatest for therapeutic duplication ($P = .003$), and intervention group improved in use of cardiovascular meds ($P = .017$). There were no differences in the groups for psychotropic medication or NSAID problems.

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Fall Prevention

Emergent care for injury caused by falls or accidents at home is one of the most frequently occurring adverse events reported for patients receiving skilled home health care services.¹⁹ Thirty percent of people age 65 and older living in the community fall each year. One in five of these fall incidents requires medical attention.²⁰ Falls are the leading cause of injury-related death for this population.²¹ Among the elderly, Stevens²² reported direct medical costs in 2000 totaled \$179 million for fatal fall-related injuries and \$19 billion for nonfatal injuries due to falls.

Although there is strong evidence of effective fall-prevention interventions for the general over-65 population,^{20, 23, 24} knowledge of fall prevention in home health care is limited. For the general older population living in the community, evidence suggests that individualized home programs of muscle strengthening and balance retraining; complex multidisciplinary, multifactorial, health/environmental risk factor screening and intervention; home hazard assessment and modification; and medication review and adjustment can all reduce the incidence of falls.²⁰ However, patients in home health care are often older, sicker, and frailer than the average community-residing older adult, and it is not known if knowledge from other settings is transferable to home health care.

Research studies specific to home health care are predominantly retrospective, descriptive, correlational designs in single agencies, using matched control or randomized control groups to explore patient characteristics and other factors contributing to patient falls.²⁵⁻²⁷ Findings suggest that factors related to falls for home health care patients are previous falls, primary diagnosis of depression or anhedonia, use of antipsychotic phenothiazines and tricyclic antidepressants, secondary diagnoses of neurological or cardiovascular disorders, balance problems, frailty, and absence of handrails.²⁵⁻²⁷

A literature review located only three studies testing interventions to prevent falls.²⁸⁻³⁰ The studies are summarized in Table 2. All three interventions were quality-improvement programs in single agencies. The findings suggest that risk factor screening and intervention using a valid and reliable instrument and physical therapy aimed at improvement in gait and balance may reduce injury and emergent care for falls. Unfortunately, there is no evidence that the number of falls incurred by the home health care population can be reduced. It may be that improved provider assessments increased the number of falls reported and documented.

Evidence-Based Practice Implications

Home health care providers need to know the risk factors for falls and demonstrate effective assessment and interventions for fall and injury prevention. Falls are generally the result of a complex set of intrinsic patient and extrinsic environmental factors. Use of a fall-prevention program, standardized tools, and an interdisciplinary approach may be effective for reducing fall-related injuries.

Research Implications

There are several limitations in the current evidence on falls in home health care. Most of the research is descriptive, and there are no randomized controlled studies. Findings from small, single-agency quality-improvement projects cannot be generalized. It is not known if predictors for falls in home health care patients are the same as those for other community dwellers over

age 65. Research is needed to expand the knowledge of factors that contribute to falls in this population and to develop effective interventions. Research is also needed to explore factors to prevent injury from falls, as it is likely that the incidence of falls in this population cannot be completely eliminated.

Table 2. Summary of Evidence Related to Fall Prevention

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Bright 2005 ²⁸	Fall prevention/risk reduction	Quality improvement project/research	Observational study without controls. Outcomes: improvement in balance and gait, number of falls, and emergent care for falls or accidents.	Year 1 n = 153 patients and year 2 n = 183 patients age 62 and over and at risk for falls from 1 Midwest home care agency.	Fall prevention/risk reduction program: screening with Tinetti assessment, education, physical therapy intervention, and followup.	Emergent care for injury caused by fall or accident at home decreased from 2.58% to 1.72% within 7 months. Improvement in gait and balance scores from 15.59 to 18.43. There was no change in number of falls in home.
Sperling 2005 ³⁰	Fall prevention (see also medication management)	Quality improvement project/research	Observational study without controls. Outcomes: patient falls.	n = 228 patients 65 years of age or older from a medical-centered home care agency.	Medication management model: medication review and oversight for patients at risk.	The number of reported falls increased, possibly related to increased staff awareness and better reporting.
Yuan and Kelly 2006 ²⁹	Fall prevention/risk and injury reduction	Quality improvement project/research	Observational study without controls. Outcome: rate of falls, injury from falls.	Unknown number of at-risk patients for falls from 1 hospital-based home care agency.	Fall prevention program, multidisciplinary risk assessment with Morse scale, evidence-based guidelines.	Number of patient falls remained relatively stable, but fewer patients were injured in falls.

Unplanned Hospital Admissions

A primary goal of home health care is to discharge the patient to self or family care and avoid subsequent hospitalizations. Unplanned admission to the hospital is an undesirable outcome of home health care that causes problems for patients, caregivers, providers, and payers. Unplanned hospital admissions are associated with complications, morbidity, patient and family stress, and increased costs.³¹ An estimated 1,034,034 home health care patients were hospitalized in 2004. The national rate of unplanned hospital admissions for home health care patients has gradually increased from 27 percent in 2000 to 28 percent in 2006,³² and it is the only publicly reported home health care patient outcome that has never improved at the national level.³³

Several researchers have explored the characteristics of home health care patients and other factors associated with hospitalization.^{31, 34-39} The studies have been predominantly retrospective, descriptive, and correlation designs examining home care populations from single or multiple agencies.^{31, 35-38} One study is a prospective study of a random sample of agencies.³⁹ Evidence suggests that unplanned hospital admissions are due mostly to an acute exacerbation of chronic disease—exacerbations that could be prevented through knowledge of risk factors, provider communication, and careful monitoring.³⁹ Risk factors associated with unplanned hospital admissions are polypharmacy,^{31, 35} length of home health care episode,^{34, 36} development of a new problem or worsening primary or secondary diagnosis,³⁶ wound deterioration and falling accidents,³¹ and age.^{31, 37} Based on this evidence most experts^{31, 37} conclude that 20 to 25 percent of unplanned hospital admissions are preventable. For example, Shaughnessey and colleagues² found that agencies actively involved in Outcomes-Based Quality Improvement (OBQI) monitoring reduced their rate of patient hospitalizations when compared to non-OBQI agencies.

The Briggs National Quality Improvement and Hospitalization Reduction Study³³ convened a panel of experts to identify best practice strategies that agencies should implement to prevent unplanned hospitalizations. Recommended best practices included implementing a fall prevention program, front loading visits, management support, 24-hour on-call nursing coverage, medication management, case management, patient/caregiver education, special support services, disease management, positive physician and hospital relationships, data-driven services, safety and risk assessment, and telehealth. These recommendations were not empirically tested, however.

Only eight studies have tested the effectiveness of interventions to prevent unplanned hospital admissions for home health care patients. Five of these studies employed a randomized controlled trial design, and three used a nonrandomized control or comparison group design. The tested interventions consisted primarily of increasing the intensity of care provided through a disease management program, a team management home-based primary care program, a multidisciplinary specialty team intervention, advanced practice nurse (APN) transitional care, telehealth services, and intensive rehabilitative care prior to hospital discharge.⁴⁰⁻⁴³ Most of these interventions were effective or somewhat effective in preventing or delaying hospitalization. Additionally, four of the studies reported lower mean costs or charges for the intervention groups related to lower hospital costs,^{40, 42-44} and one study⁴⁵ reported higher costs for the intervention group based on the costs of the team-managed primary care intervention.

In these studies, patients with congestive heart failure (CHF) had fewer unplanned hospital admissions and longer survival times prior to first admission³⁹⁻⁴² if they received APN

transitional care, team-managed home-based primary care, or a multidisciplinary specialty team intervention.⁴⁰⁻⁴³ Patients with CHF who received telecare and telephone interventions also had significantly fewer emergency room visits, but no change in hospital admissions.⁴² Team-managed home-based primary care has been found to be most effective for people who are severely disabled.⁴⁵ Daly and colleagues⁴⁴ reported that long-term mechanically ventilated patients who received a disease management program intervention involving APN services and interdisciplinary coordination had significantly fewer mean days of hospitalization.

Results from one nonrandomized controlled study suggest that patients with chronic obstructive pulmonary disease (COPD) who received APN transitional care also experienced fewer unplanned hospital admissions.⁴⁶ Intrator and Berg⁴⁷ reported that patients hospitalized with hip fractures had fewer unplanned hospital admissions when they received home health care services following inpatient rehabilitation compared with those patients who received inpatient services only. Findings are summarized in Table 3.

Evidence-Based Practice Implications

Evidence suggests that specialized, coordinated, interdisciplinary care has a positive impact on unplanned hospital admissions in select home health care populations. Agencies can identify patient characteristics associated with hospitalization unique to their patient population. High-risk patients may require specialized interventions beyond the traditional scope of home health care services. Targeted interventions using process-of-care analysis and data available from the Outcome and Assessment Information Set (OASIS), within the framework of OBQI, may result in fewer unplanned hospital admissions for home health care patients.

Research Implications

The available evidence suggests that in addition to the use of APNs for care of complex cases, traditional home health care professionals, individually or through interdisciplinary practice, may be effective in preventing unplanned hospital admissions with targeted interventions. Although numerous strategies have been recommended by researchers and other home care experts, most interventions have not been empirically tested. Costs and benefits of the various interventions also need further exploration. The measurement of intervention costs and cost savings from prevented hospitalizations are not well understood. Some patient populations, due to the nature and complexity of advanced disease process, may require more intense and specialized home health care services that will not result in cost savings. On the other hand, use of seemingly more expensive transitional resources, such as APNs, have been proven cost effective, although adoption of such research-based best practices may be impeded by lack of reimbursement and incentives.⁴⁸ Research is needed to understand the impact of shifting care and cost to home health care on patient outcomes and home health care industry fiscal status.

Table 3. Summary of Evidence Related to Unplanned Hospital Admission

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Briggs 2006 ³³	Hospitalization reduction	Quality improvement project/ consensus report, and retrospective cohort study	Nonexperimental descriptive Outcomes: 15 best practice strategies to prevent hospitalization. Type and percent of agencies implementing best practices.	Convenience sample of 400 agencies with lower-than-average hospitalization rates	Panel consensus on 15 best practice survey of agencies	Best practice strategies: Fall prevention Front loading visits Management support 24-hour on-call nursing coverage Medication management Case management Patient/caregiver education Special support services Disease management Physician relationships Data-driven services Safety and risk assessment Hospital relationships: Discharge staff and EM staff Telehealth. Successful agencies intentionally used one or more of these strategies. Most strategies did not involve extra expense.
Daly 2005 ⁴⁴	Hospital admission	Randomized controlled trial	Randomized controlled trial. Outcomes: hospitalization rate, duration, and cost effectiveness	Chronically ill, long-term mechanically ventilated patients discharged from academic medical center: n = 231 intervention, n = 103 control	1. Disease management program, care coordination, family support, teaching, from a team of APNs, a geriatrician, and a pulmonologist 2. Usual care	Intervention group had significantly fewer mean days of hospitalization vs. control ($P = .03$). The average savings per patient in the intervention group was \$21,549.

Table 3. Summary of Evidence Related to Unplanned Hospital Admission (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Hughes 2000 ⁴⁵	Hospital readmissions (See also Table 5)	Randomized controlled trial	Randomized controlled trial. Outcomes: hospital readmissions and costs over 12 months	Patients with a mean age of 70 years who had 2 or more ADL impairments or a terminal illness, CHF, or COPD. n = 981 intervention, n = 985 control	1. Team-managed home-based primary care (HBPC): primary care manager, 24-hour contact for patients, prior approval of hospital admissions 2. Customary Department of Veterans Affairs and private sector care	Team-managed HBPC patients with severe disability experienced a 22% relative decrease in hospital readmissions ($P = .03$) vs. control group at 6 months, but it was not sustained at 12 months. Total mean per-person costs were 6.8% higher in the TM/HBPC group at 6 months (\$19,190 vs. \$17,971) and 12.1% higher at 12 months (\$31,401 vs. \$28,008 ($P = .005$)).
Intrator and Berg 1998 ⁴⁷	Hospitalization or non skilled nursing facility admission	Retrospective cohort study	Observational study with controls. Outcomes: hospitalization and any non skilled nursing facility admission.	324 patients age 70 or older who had acute hospitalization for hip fracture and were discharged to home after inpatient rehabilitation	1. Inpatient rehabilitation discharge with additional home care services 2. Inpatient rehabilitation with no additional home care	Patients who received additional home health care services (27.2%) were less likely to be hospitalized than those who received rehabilitation only (31.1%); they were also less likely to have a non skilled nursing facility admission (11.3% vs. 23.3%), and more likely to survive the year with no subsequent Medicare claims (65.6% vs. 55%).

Table 3. Summary of Evidence Related to Unplanned Hospital Admission (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Jerant 2001 ⁴²	Hospitalization for CHF and cost	Randomized controlled trial	Randomized controlled trial. Outcomes: CHF-related readmission charges and all-cause readmissions, emergency department (ED) visits, and associated charges	CHF patients discharged from 1 large medical center: n = 13 intervention (group 1), n = 12 intervention (group 2), and n = 12 control (group 3)	1. Home telecare 2. Telephone care 3. Usual care	Mean CHF-related readmission charges were 86% lower in the telecare intervention group and 84% lower in the telephone group than in the usual care group. The between-group difference was not statistically significant. Both intervention groups had significantly fewer CHF-related ED visits ($P = 0.0342$) and charges ($P = 0.0487$) than the usual care group. There was no statistically significant difference in all-cause readmissions between groups.
Naylor 2004 ⁴⁰	Hospitalization (See also Table 5)	Randomized controlled trial	Randomized controlled trial. Outcomes: time to first hospitalization, number of hospitalizations, and costs	Patients age 65 and older from 6 academic and community hospitals, n = 118 intervention and n = 121 control	1. APN transitional care from hospital to home care 2. Routine care (58% received skilled home care services)	First time to readmission was longer for intervention ($P = .026$); intervention group had fewer readmissions at 52 weeks (104 vs. 162, $P = .047$) and lower mean cost (\$7,636 vs. \$12,481, $P = .002$).
Neff 2003 ⁴⁶	Hospitalization, acute care, and emergency room visits (See also Table 5)	Nonrandomized controlled trial	Nonrandomized controlled trial. Outcomes: length of stay, hospitalization, emergent care.	Medicare patients age 62 or older, from a large home care agency, with a primary or secondary diagnosis of COPD, n = 39 control and n = 41 intervention	1. Transitional care APN model with pulmonary disease management team 2. Routine home care	Intervention group patients had a shorter length of stay ($P < .05$). Fewer rehospitalizations and acute care visits ($P < .05$) and more remained at home ($P < .05$).

Table 3. Summary of Evidence Related to Unplanned Hospital Admission (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Rich 1995 ⁴³	Hospitalization (See also Table 5)	Randomized controlled trial	Randomized controlled trial. Outcomes: hospital readmissions and cost.	Patients age 70 and older hospitalized with CHF in a large urban hospital, n = 142 intervention and n = 140 control	1. Intensive multidisciplinary inpatient intervention by specialized geriatric team, discharged with home care and telephone followup by research team member 2. Usual care	Intervention group had greater 90-day survival without readmission (66.9% vs. 54.3% for control; (<i>P</i> = .040) and had fewer readmissions for CHF (<i>P</i> = .04). Cost of hospital readmissions were higher in control group by an average of \$1,058 per patient (\$3,236 vs. \$2,178, <i>P</i> = .03).
Shaughnessy 2002 ²	Hospitalizations (See also Table 5)	Pretest and post-test study	Observational study with control. Outcomes: measures of hospitalizations	2 groups of home care agencies 73 OBQI agencies (263,465 patients) intervention Non-OBQI agencies (248,621 patients) control	1. Clinical and administrative OBQI intervention at demonstration agencies, patient outcome reports for comparison with a reference population 2. Control: usual care	The intervention group had a decline in hospitalizations over a 3 and 4 year period (<i>P</i> < .001) with OBQI.

Nurse Work Environment

Evidence from the acute care setting suggests a relationship between nurses' work environment, patient safety, and quality of patient care.⁴⁹⁻⁵¹ A positive work environment is one that supports nurse autonomy and control over the work environment, including shared governance or decisionmaking.⁵²⁻⁵⁵ It is an environment with strong and visible nursing leadership, organizational support, peer support, and positive physician collaboration.⁵³⁻⁵⁵

Research exploring the relationship of the work environment, patient safety, and quality in home health care is in early stages of development. There have been no randomized controlled studies to date. Feldman and colleagues⁵⁶ examined the relationship of patient adverse events with characteristics of the nurses' work environment at one very large urban home health care agency. Characteristics of 86 home health care teams within the agency were examined. Researchers reported that adverse events were lower for teams with higher patient volume and visits, fewer weekend admissions, more equitably distributed incentives, and more teamwork. Rates were higher when teams perceived supervisor support for adverse event reporting. This is the first rigorous study to identify organizational factors associated with potential adverse events, and there were limitations. It was a descriptive, correlational study, and the agency involved in the study is not typical of most agencies in the United States as it serves a disproportionately diverse urban population. Several of the findings approached significance only at a probability level (alpha) of 0.10.

Kroposki and Alexander⁵⁷ explored the relationships among patient satisfaction, nurse perception of patient outcomes, and organizational structure in a descriptive study. They reported that higher patient satisfaction scores were more likely in home health care agencies where nurses and supervisors had good working relationships, opportunity for shared decisionmaking was present, and formalization of organizational and professional guidelines existed. Limitations of this study included its descriptive, nonrandomized design of multiple agencies from one State and the lack of a reliable and validated tool to measure nurse perception of patient outcomes. Findings are summarized in Table 4.

Evidence-Based Practice Implications

Agencies should consider how characteristics of the work environment may be influencing patient safety and quality outcomes. It is necessary to explore the context of the environment when examining clinicians' practices in an effort to identify necessary system changes.

Research Implications

It is not known what characteristics of the home health care nursing work environment are related to patient safety and quality. Home health care research is needed to investigate the relationship of work environment characteristics, nurse satisfaction, and patient outcomes.

Table 4. Summary of Evidence Related to Nurse Work Environment

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Feldman 2001–2005 ⁵⁶	Adverse events	Prospective cohort study	Observational study with controls. Outcomes: team-attributable patient adverse events.	51,560 patient care episodes from the largest U.S. home care agency with average age of patient 71 years	86 home care teams Staff perception of work environment, especially aspects of organizational and team culture climate	7% of the 51,560 episodes had an adverse event. Adverse events were lower for teams with higher volume of patient care episodes ($P \leq .05$), higher concentration of visits among staff ($P \leq .10$), fewer weekend admissions ($P \leq .01$), more weekend visits ($P \leq .01$), in noncongregate care setting ($P \leq .10$), and more care provided by nurses without bachelor's or higher education ($P \leq .10$). Adverse events were lower for teams with greater equity in distribution of incentives ($P \leq .10$), more teamwork ($P \leq .10$).
Kroposki and Alexander 2006 ⁵⁷	Relationship of patient satisfaction, nurse perception of outcomes, and organizational characteristics	Cross-sectional study	Observational study with controls. Outcomes: relationship of nurse perception of outcomes and organizational structure to patient satisfaction.	Convenience sample of 325 patients and 205 nurses from 38 home care agencies in a southeastern State	Evaluation of patient satisfaction, nurse perception of patient outcomes, and organizational structure	Significant correlation between nurses' ability to meet client's psychosocial needs and patient satisfaction ($P < .05$). No other relationships existed between client satisfaction and outcome inventory components. There was a significant positive relationship between organizational attributes and patient satisfaction in agencies with shared decisionmaking and open communication ($P < .05$) and formal rules and procedures ($P < .05$).

Functional Outcomes and Quality of Life

The goal of care provided in the home is to restore or maintain patient physical and mental functioning and quality of life, or to slow the rate of decline to allow the patient to remain at home and avoid institutionalization. Most patients and family members prefer the home environment, when it is feasible. A patient's and family's ability to function independently and safely in the home increases the possibility of the patient remaining there.

Improving patient safety and quality of care by educating and assisting caregivers (families and providers) is an approach tested in several randomized controlled trials. The findings are summarized in Table 5. Archbold and colleagues⁵⁸ pilot tested preparedness, enrichment, and predictability (PREP), a formal nursing intervention designed to prepare family caregivers to provide care. While the study had many limitations, preliminary evidence on the effectiveness of the intervention suggests that families benefit from being informed and prepared.

Other researchers have tested interventions to improve nurse providers' knowledge and awareness.⁵⁹⁻⁶¹ Intervention studies to educate and inform nurse providers have been conducted in small and large urban and rural home health care settings, with nurses randomly assigned to an intervention group or a control group. The interventions generally provided nurses with additional education, extra resources for patients, and specialized patient information. In one frequently reported study, evidence-based care with specific disease-related information was sent to nurses by "just-in-time" e-mail reminders.^{59, 60}

In all cases the interventions improved nurses' performance, which resulted in better patient outcomes. Patients of nurses in these studies showed significant improvement in pain management, quality of life, satisfaction with care, and other variables associated with improved quality of care, including better communication with providers, better medication management, and improved disease symptoms. Nurses' improved performance included increased documentation of critical patient assessments. In the case of "just-in-time" e-mail reminders, the intervention group that had additional clinical and patient resources had better patient outcomes, suggesting that the multifaceted approach or stronger dose of the intervention was more effective.

A number of randomized controlled trials have tested the effectiveness of specific interventions to improve patient safety and quality in disease management,^{62, 63} urinary incontinence,^{64, 65} level of ADL functioning,^{44, 46, 66-68} quality of life, general health outcomes, and patient satisfaction.^{44, 46, 59, 62, 66-70} Corbett⁶³ demonstrated that individualized patient education in foot care for diabetics was effective in improving patients' self-care. Scott and colleagues⁶² demonstrated an improvement in quality of life in patients with CHF through a program of patient education and mutual goal setting. Dougherty and colleagues⁶⁴ and McDowell and colleagues⁶⁵ tested behavioral management interventions to treat urinary incontinence in the elderly and reported positive results based on behavior management interventions of self-monitoring and bladder training. Mann and colleagues⁶⁷ tested the introduction of assistive technology (canes, walkers, and bath benches) and changes made to the home environment (adding ramps, lowering cabinets, and removing throw rugs) with populations of frail elderly. These interventions were successful in slowing functional decline in the study patients.

Some of the research evidence suggests more efficient mechanisms for providing care. In exploring the amount of care that is effective, Weaver and colleagues⁷¹ decreased (compared

with usual care) the number of post-hospitalization visits by patients with knee and hip replacements and added one preoperative home visit. No differences in functional ability, quality of life, or level of satisfaction between those patients receiving usual care (more visits) and those receiving the intervention (fewer postoperative visits and one preoperative visit) were found. Several studies have examined the use of technology in patient functioning and independence. Johnston and colleagues⁶⁹ tested real-time video nursing visits and found no difference in patient outcomes or level of satisfaction with usual care or care enhanced by video technology.

A number of randomized controlled trials have tested the outcomes of interventions based on the specialty of the provider combined with different models of care management, or interventions based solely on different models of care management.^{44, 46, 65, 70, 71} Research examining the effect of APN providers on the quality of patient care suggests they have a positive effect. In two studies testing the transitional care model, APN-directed teams delivered care to patients with COPD⁴⁶ and CHF⁷⁰ and found improvements in the group in the transitional care model. Patients experienced fewer depressive symptoms and an increase in functional abilities when compared with patients receiving usual care.^{46, 70} Patients in these studies also needed fewer nursing visits, had fewer unplanned hospital admissions, and had fewer acute care visits. A nurse practitioner's urinary incontinence behavioral therapy was effective in decreasing the number of patients' urinary incontinence accidents.⁶⁵ The Veterans Affairs Team-Managed Home-Based Primary Care was an add-on to care routinely provided in the Veterans Affairs Home-Based Primary Care program.⁴⁴ The added component emphasized continuity of care and team management with a primary care manager, 24-hour on-call nursing availability for patients, prior approval of hospital admissions, and team participation in discharge planning. The investigators found significant improvements in quality of life, functioning, pain management, and general health outcomes for terminally ill patients in this study, and an increase in satisfaction for nonterminally ill patients and family caregivers.

However, mixed results have been obtained from the research to date on the effectiveness of models of care management.^{66, 68} Some intervention models have been less effective than others. The interventions are usually an add-on to routine care, and their effectiveness has been determined by a comparison to a control group of usual or routine home health care. An intervention model that does not appear to be effective is the Health Outcomes Management and Evaluation model tested by Feldman and colleagues⁶⁶ This model adds a consumer-oriented patient self-care guide and training to improve nurses' teaching and support skills. Study results showed no difference in patient quality of life or satisfaction. Tinetti and colleagues⁶⁸ compared the outcomes of a systematic, multicomponent rehabilitation program, including therapies for physical and functional impairments, to the outcomes from usual home-based rehabilitation care. No differences were found between the two groups.

Evidence-Based Practice Implications

The preceding discussion suggests that working closely with and supporting family caregivers is, and will continue to be, an important aspect of helping patients to remain in their homes. It also suggests that nurses' effectiveness in working with patients can be enhanced if nurses are supported in their work. Support can be provided by electronic communication, reminders of protocols, disease-specific educational materials for patients, and working with APN colleagues to serve as clinical experts for staff. Home health care nurses are relatively isolated in the field, and any mechanism to improve communication with supervisors in the office and with other providers will assist nurses in their practice. Incorporating the use of

remote technology to substitute for some in-person visits can improve access to home health care staff for patients and caregivers.⁶⁹

Specific patient interventions can be helpful in improving patient health and quality of life. Interventions of individualized education and disease-specific programs, such as a behavioral management program for urinary incontinence or educational programs for foot care, should be incorporated into practice. The rate of a patient's functional decline can be slowed and costs reduced through a systematic approach to providing assistive technology and environmental interventions to frail elderly patients in their homes. A patient's need for these interventions can be determined with a comprehensive assessment and continued monitoring.

Research Implications

Evidence of the outcomes of health care provided in the home is limited; there are very few controlled experiments on which providers can base their practice. Research is limited in the areas of composition, duration, and amount of home health care services needed to ensure patient safety and quality. Research is needed to determine effective interventions to improve, maintain, or slow the decline of functioning in the home health care population.

More research is also needed to determine mechanisms to keep nurses informed and supported. Providing communication and support is a challenge when providers are geographically dispersed and spend most of their time in the field. Remote technology has the potential to reduce costs: it can substitute for some in-person visits, and it can improve access to home health care staff for patients and caregivers.

Table 5. Summary of Evidence Related to Functional Outcomes and Quality of Life

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Archbold 1995 ⁵⁸	Family preparedness	Quasi-experimental retrospective without a control group	Nonrandom trial. Outcomes: care effectiveness scale, indicating greater preparedness, enrichment, and predictability.	Caregiver families referred to home care agency: n = 11 intervention and n = 11 standard home care	1. Nursing interventions, designed to increase preparedness (PR), enrichment (E), and predictability (P) in families providing care to older people. 2. Comparison	Intervention (PREP) group one standard deviation higher than the control group ($P < .05$), rated their assistance from PREP nurses significantly higher ($P < .01$); had lower mean hospital costs (\$2,775) versus comparison group (\$6,929).
Corbett 2003 ⁶³	Diabetic foot care	Randomized controlled trial, pre/post-test	Randomized controlled trial pre/post test. Outcomes: patient self-report knowledge.	40 home care patients with diabetes from 1 home care agency, 2 groups	1. Intervention: individualized education about proper foot care 2. Control	The educational intervention improved patient's knowledge, confidence, and reported foot care behaviors.
Dougherty 2002 ⁶⁴	Urinary incontinence	Randomized controlled trial	Randomized controlled trial Outcomes: severity and episodes of urine loss—frequency, interval, and quality of life.	218 older women from 7 rural counties in north Florida	1. Behavior management program—self-monitoring and bladder training 2. Control	Intervention group incontinence severity decreased by 61%. Control group incontinence severity increased by 184%.

Table 5. Summary of Evidence Related to Functional Outcomes and Quality of Life (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Feldman 2004 ⁶⁶	Quality of life and patient satisfaction with care	Randomized controlled trial	Random assignment of nurses. Outcomes: service use and quality of life, satisfaction with care.	371 patients with CHF and 205 nurses from a large, urban, nonprofit home care agency	1. Formal nurse protocol of "Health Outcomes Management & Evaluation," patient self-care guide, and nurse training in teaching and support skills 2. Usual care	No difference in physician visit, patient mortality, quality of life, or patient satisfaction.
Feldman 2005 ⁶⁰	Functional status, quality of life, and service use (see also Table 3)	Randomized controlled trial	Randomized controlled trial Outcome: clinical, functional, and quality of life status.	1,242 patients from a large, urban, nonprofit home care agency: 390 basic 404 augmented 448 control	1. Nurse e-mails highlighting clinical recommendations 2 Augmented: e-mails and additional clinician and patient resources 3. Usual care	Both intervention groups demonstrated improved patient clinical and functional outcomes (symptoms, physical limitations, quality of life, and social limitations) ($P \leq .05$). Both intervention groups demonstrated better management of medications ($P \leq .05$) Intervention group 1 scored higher on quality of life relative to control ($P \leq .05$).

Table 5. Summary of Evidence Related to Functional Outcomes and Quality of Life (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Hughes 2000 ⁴⁵	Functional ability, quality of life, patient satisfaction, and cost (see also Table 3)	Randomized controlled trial	Randomized controlled trial. Patient functional status, patient and caregiver HR-QoL and satisfaction, caregiver burden, hospital readmissions, and costs over 12 months.	1,966 patients average age of 70 with 2 or more ADL impairments or terminally ill, CHF or COPD 981 intervention 985 control	1. Home-Based Primary Care: with team manager, 24-hour contact, prior approval readmissions, and team discharge planning 2. Home-Based Primary Care VA and private sector care	Significant improvements were seen in terminal intervention group (TM/HBPC) patients in HR-QoL scales of emotional role function, social function, bodily pain, mental health, vitality, and general health. TM/HBPC nonterminal patients had significant increases of 5 to 10 points in 5 of 6 satisfaction-with-care scales. The caregivers of terminal patients in the TM/HBPC group improved significantly in HR-QoL measures. Caregivers of nonterminal patients improved significantly in QoL measures and reported reduced caregiver burden ($P = .008$).
Johnston 2000 ⁶⁹	Quality of patient care and cost	Quasi-experimental study with random assignment	Randomized controlled trial. Outcomes: medication compliance, knowledge of disease, self-care ability, service use, patient satisfaction, and costs.	212 patients with CHF, COPD, cerebral vascular accident, cancer, diabetes, anxiety, or need for wound care	1. Routine care and video visits, nurses and patients interact in real time, included equipment for assessing cardiopulmonary status 2. Routine care	No differences in the intervention or control groups in quality indicators, patient satisfaction, or use. No health care cost savings realized.

Table 5. Summary of Evidence Related to Functional Outcomes and Quality of Life (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Mann 1999 ⁶⁷	Functional ability (independence), quality of life (pain reduction), and costs	Randomized controlled trial	Randomized controlled trial. Functioning and pain, measured with valid and reliable instruments; health care costs.	Frail elderly persons referred from community agencies, hospitals, and home care agencies in New York State: n = 52 intervention, n = 52 control	1. Usual care, assistive technology, (canes, walkers, etc.), and environmental interventions (ramps, removal of rugs, etc.) 2. Usual care control	Both groups showed significant decline in functional motor score, with a significantly greater decline for the control group. Pain scores were significantly higher for the control group. Treatment group expended more costs than the control group. Control group had significantly more expenditures for institutional care and significantly greater expenditures for nurse visits and case manager visits.
McDonald 2005 ⁵⁹	Quality of life (pain management) through provider behavior change	Randomized controlled trial	Randomized controlled trial. Outcome measure: Estimate of treatment effect on nurse-documented care practices and patient's pain management.	Nurses, from a large, urban, nonprofit home care agency: n = 121 basic, n = 97 augmented, and n = 118 control	1. Basic group – nurse e-mails highlighting clinical recommendations 2 Augmented group – additional clinician and patient resources 3. Usual care	Patients in augmented intervention improved significantly over the control in ratings of pain intensity at its worse ($P = 0.05$). Patients in basic intervention had better ratings of pain intensity on average ($P < 0.05$). In both intervention groups, evidence of nurse assessment increased.

Table 5. Summary of Evidence Related to Functional Outcomes and Quality of Life (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
McDowell 1999 ⁶⁵	Functional ability (urinary continence)	Prospective, randomized controlled clinical trial with cross-over design	Randomized controlled trial, observational study with controls. Outcomes: bladder diaries, urinary accidents	Home health care patients ages 60 and older with urinary incontinence: n = 53 intervention, n = 52 control	1. Nurse practitioner delivered behavioral therapy of biofeedback-assisted pelvic floor muscle training, urge and stress strategies, and bladder retraining 2. Control	Intervention group had a significantly greater reeducation in urinary accidents per day ($P < .001$). Average number of accidents decreased from 4.0 to 1.7 after treatment ($P < .001$).
Naylor 2004 ⁴⁰	Mortality, quality of life, and satisfaction	Randomized controlled trial	Randomized controlled clinical trial. Outcomes: patient report, physical and emotional quality of life, functional status, and satisfaction.	Patients 65 years of age or older with CHF discharged from Philadelphia academic and community hospitals: n = 118 intervention, n = 121 control	1. Transitional care intervention – 3-month APN-directed discharge plan and home care followup 2. routine care (1/2 home care)	Intervention had improvement in quality of life ($P < .05$), in functioning ($P < .05$), and in satisfaction ($P < .001$) vs. control group.
Neff 2003 ⁴⁶	Quality of patient outcomes	Non-randomized trial controlled	Nonrandomized controlled trial. Outcomes: ADLs, IADLs, dyspnea, anxiety, and depression	Medicare patients from a large home care agency: n = 41 urban control group n = 39 rural	1. Transitional Care Model: APN pulmonary disease management team 2. Routine home care	Intervention group experienced fewer depressive feelings ($P < .05$) and better ADL status ($P < .05$). There were no differences in IADLs or dyspnea in the groups.
Scott 2004 ⁶²	Quality of life and mental health	Randomized controlled trial	Randomized controlled trial. Outcomes: Mental Health Inventory and Quality of Life Index.	88 patients with heart failure from 2 nonprofit home care agencies in the Midwest	All got routine care and 1. Mutual goal setting, 2. Supportive educative 3. Placebo	Mutual goal setting group had significantly higher mental health scores ($P = .003$) at 6 months. Mutual goal setting and supportive education groups had significantly higher quality of life ($P = .01$) at 6 months.

Table 5. Summary of Evidence Related to Functional Outcomes and Quality of Life (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Tinetti 1999 ⁶⁸	Functional status – self-care ADLs	Randomized controlled trial	Randomized controlled trial. Outcomes: a battery of self-report and performance-based measures of physical and social function.	304 persons age 65 who had undergone surgical repair of a hip fracture at two hospitals in New Haven, CT, from 27 home care agencies	1. Systematic multicomponent rehabilitation strategy addressing both modifiable physical impairments (physical therapy) and ADL disabilities (functional therapy) 2. Usual care	There was no significant difference in the proportion of participants in the two groups who recovered to prefracture levels in self-care ADL at 6 months (71% vs. 75%) or 12 months (74% in both groups), or in home management ADL at 6 months (35% vs. 44%) or 12 months (44% vs. 48%). There also was no difference between the two groups in social activity levels, two timed mobility tasks, balance, or lower extremity strength at either 6 or 12 months. Compared with participants who received usual care, those in the multicomponent rehabilitation program showed slightly greater upper extremity strength at 6 months ($P = .04$) and a marginally better gait performance ($P = .08$).
Vallerand 2004 ⁶¹	Quality of life (pain management)	Longitudinal, multilevel, randomized controlled trial	Randomized controlled trial. Outcomes: nurse knowledge and attitudes of pain management, patient's self-reported pain level.	Home care nurses: n = 100 intervention, n = 102 control, from 11 home care agencies in Midwest United States 5 intervention 6 control	1. Nurse education program – Power over Pain (POP) 2. Control	Patients of nurses' intervention group self-report worst pain scores decreased significantly ($P < 0.04$). Nurses' intervention group had significantly improved knowledge, attitudes, and perception of control over pain ($P < 0.05$).

Table 5. Summary of Evidence Related to Functional Outcomes and Quality of Life (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Weaver 2003 ⁷¹	Functional status and quality of life	Randomized controlled trial	Randomized controlled trial. Outcomes: functional status, lower extremity functioning, health-related quality of life, satisfaction, use, and cost.	136 patients with surgical hip or knee replacements from a hospital home care agency.	1. Pre-op visit by nurse and physical therapist, 9 to 12 post-op home visits 2. Usual protocol with more visits (11 to 47)	There was no difference in functioning, quality of life, or satisfaction. Intervention group costs were 55% lower than control (due to fewer visits).

Wound and Pressure Ulcer Management

Adverse wound events are monitored under the OBQM program. Emergent care for wound infections, deteriorating wound status, and increase in the number of pressure ulcers are monitored and reported as adverse events.⁷⁰ The data are used to reflect a change in a patient's health status at two or more times, usually between home health care admission and transfer to a hospital or other health care setting. Data for these outcomes are collected using OASIS-designated intervals. Patient outcome measures related to surgical wounds that are monitored under the OBQI include improvement in the number of surgical wounds and improvement in the status of surgical wounds.¹⁸

Wound Management

Over a third of home health care patients require treatment for wounds, and nearly 42 percent of those with wounds have multiple wounds. Over 60 percent of wounds seen in home health care are surgical, while just under one-quarter are vascular leg ulcers and another one-quarter are pressure ulcers.⁷¹ Most home health care nurses can accurately identify wound bed and periwound characteristics; the majority (88 percent) of wound treatments have been found to be appropriate.⁷² The appropriateness of wound treatments in home health care is significantly related to wound healing. Patients with healing wounds had shorter home health care visits and shorter home health care lengths of stay.⁷¹

A literature review identified seven studies that tested interventions to improve wound care management in home health care.⁷³⁻⁷⁹ Findings are summarized in Table 6. Three compared effectiveness of various wound treatments. Capasso and Munro⁷⁴ found no significant difference in wound closure between amorphous hydrogel dressings and wet-to-dry saline dressings, but costs were found to be significantly higher for the saline dressings due to the need for more nursing visits. Kerstein and Gahtan⁷⁶ found the percentage of venous leg ulcers healed using hydrocolloidal dressings was six times higher than with saline gauze dressings and nearly four times greater using an Unna boot; the hydrocolloidal dressings were most cost-effective. Use of negative pressure wound therapy resulted in successful closure of 43 percent of wounds that failed to respond to previous treatment.⁷⁸

Four studies reported positive outcomes from interventions to improve and support home health care nurse practice.^{73, 75, 77, 79} Use of telemedicine to provide consultation with wound management experts resulted in improved healing rates, decreased healing time, and decreased home visits and hospitalizations related to wounds.^{73, 77} Fellows and Crestodina⁷⁵ studied the rate of bacterial contamination of normal saline solutions prepared from distilled water and table salt, a practice common for wound care in the home, and found refrigerated solutions essentially growth-free at 4 weeks. A quality improvement project reported a reduction in adverse events through structured nurse education, introduction of protocols, and competency review.⁷⁹

Pressure Ulcer Management

Rodrigues and Megie⁸⁰ found that 37 percent of wounds in home health care patients were pressure ulcers, with a mean wound duration of nearly 27 months. Nearly 1 in 10 patients admitted to home health care had pressure ulcers and approximately one-third were at risk of developing new ulcers; yet according to one study, only 27 percent of patients with existing

ulcers and 14 percent of those at risk were receiving appropriate pressure-reducing treatment.⁸¹ Incontinence, limitations in ADLs, mobility impairment, skin drainage, recent fractures, anemia, use of oxygen, and recent institutional discharge were associated with pressure ulcer development.^{81, 82} Guidelines from the Wound, Ostomy and Continence Nurses Society⁸³ call for an initial risk assessment for pressure ulcers of all patients on admission to home health care, and reassessment every visit thereafter, using a validated risk assessment tool. However, one study found that only 21 percent of agencies used a validated tool such as the Braden Scale⁸⁴ to identify patients at risk, nearly 8 percent performed no assessments on admission, and only 33 percent used risk prediction or pressure ulcer prevention protocols.⁸⁵ Just over half of agencies reported routine skin inspections by nurses of at-risk patients.

A literature review resulted in identification of five studies relating to pressure ulcer management in home health care. The findings are summarized in Table 7. Three studies were randomized controlled trials testing interventions to improve pressure ulcer healing.⁸⁶⁻⁸⁸ One intervention tested the use of air-fluidized bed therapy with services of a nurse specialist;⁸⁷ a second intervention used noncontact normothermic wound therapy.⁸⁸ Both resulted in significant improvement in wound healing compared to conventional moist dressings. Overall healing rates were similar for polymer hydrogel and hydrocolloidal dressings, although debridement performance of the hydrogel dressing resulted in more favorable clinical evaluation.⁸⁶

The remaining two studies evaluated the use of the Braden Scale for prediction of pressure ulcer risk in home health care patients, with mixed results. Ramundo⁸⁹ reported that the Braden Scale had validity in identifying at-risk patients, but limited predictive ability, while Bergquist⁸² found that the summative score of the scale was significantly associated with pressure ulcer development. All subscale scores except nutrition were significantly and negatively associated with pressure ulcer development.

Evidence-Based Practice Implications

When compared with wet-to-dry or moist saline dressings, most wound treatments tested showed greater effectiveness or lower cost. Home health care nurses should be knowledgeable in the use of the full range of existing and emerging wound products, practices, and treatments and demonstrate skill in accurate wound assessment and staging. Provision of structured resources, expert consultation, and competency testing for home health care nurses can improve home health care wound management. Nurses must be knowledgeable in risk factors for pressure ulcer development and relevant preventive measures; they must assess every patient using a valid and reliable instrument, such as the Braden Scale, on admission to home health care and regularly thereafter.

Research Implications

Relatively little is known about the most effective practices for wound care in the home health care setting. Although studies have compared different treatments for wounds, the most efficacious treatments for different wounds are unknown in the presence of various risk factors found in the home health care setting. Randomized controlled clinical trials exist comparing different pressure ulcer treatments in the home, with the exception of care of other types of wounds. Promising findings from studies with small sample sizes should be replicated with larger samples and diverse populations.

Table 6. Summary of Evidence Related to Wound Management

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Capasso and Munro 2003 ⁷⁴	Wound management, treatment, and cost	Retrospective cohort study	Observational study with control (Level 4) Outcomes: wound size, predominant tissue type, type of exudates; cost of treatment.	Patients 25 years of age or more with superficial wounds without undermined areas: 1. Arterial surgical wound dehiscence or 2. Nonhealing arterial or diabetic ulcerations In 3 home care agencies, n = 25 intervention, n = 25 control	1. Amorphous hydrogel dressings 2. Control wet-to-dry normal saline gauze dressings	No significant difference found in the rate of wound closure between the two types of dressings ($P = .66$). Costs were significantly higher ($P = .006$) for control (\$3,774) than for the intervention dressings (\$2,634) due to significantly higher numbers of required nursing visits ($P = .003$). There was no significant difference in the cost of wound care supplies.
Fellows and Crestodina 2006 ⁷⁵	Wound management, treatment, and cost	Nonrandomized trial	Nonrandomized trial. Outcomes: bacterial growth on agar-agar plate (Level 2)	7 1-gallon jugs of normal saline prepared from distilled water with 8 tsp of table salt added	Saline solutions were tested for bacterial growth at 1-week intervals for 4 weeks or until growth appeared. 1. Researcher prepared, nonrefrigerated (2) 2. Researcher prepared, refrigerated (2) 3. Patient prepared, refrigerated (3)	Researcher-prepared, nonrefrigerated saline preparations showed bacterial growth in 2 weeks compared to refrigerated solutions, which remained bacteria-free at 4 weeks. Two patient-prepared, refrigerated solutions remained bacteria-free at 4 weeks, while the third showed trace growth.

Table 6. Summary of Evidence Related to Wound Management (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Kerstein and Gahtan 2000 ⁷⁶	Wound management, treatment, and cost	Nonrandomized controlled trial	Nonrandomized trial. Outcomes: complete wound healing, recurrence, and cost of treatment.	81 patients with venous ulcers, 47 in a home care agency and 34 seen in a physician's office n = 32 intervention (group 1) n = 33 intervention (group 2) n = 16 intervention (group 3)	1. Hydrocolloidal dressing and compression hosiery 2. Unna's boot 3. Saline gauze dressing and compression hosiery	13% of ulcers in the first intervention group did not heal or recur, compared to 21% of ulcers in the second intervention group and 88% percent in the third group. Hydrocolloid dressings were more cost effective than Unna's boot or saline-gauze dressings. No difference was found between home care or physician's office outcomes. Patients preferred home care, but costs were higher.
Kobza and Scheurich 2000 ⁷⁷	Wound management, provider support	Nonrandomized controlled trial	Nonrandomized controlled trial. Outcomes: healing rates, average weeks to healing, average visits per wound patient, condition on discharge from home health.	76 patients ages 28 to 94 with Stage III or IV pressure ulcer, diabetic foot ulcer, venous stasis ulcer, or with orders for twice-daily dressing change (191 wounds), urban and suburban hospital-based home care agencies	Two-way in-home video visit via telemedicine for wound specialist with home health nurse present to evaluate wound and recommend treatment Baseline retrospective patient sample per agency	Intervention resulted in improved healing rates for all wounds except Stage III pressure ulcers; decreased average healing time for all wound categories; 58% discharges with wounds healed/ healing compared to baseline control of 37%; decreased average number of home health visits to 33 from 60 per patient; and a decreased number of hospitalizations related to wound complications of 6% with intervention from 18% at baseline.

Table 6. Summary of Evidence Related to Wound Management (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Philbeck 1999 ⁷⁸	Wound management, treatment	Nonrandomized controlled trial	Nonrandomized controlled trial. Outcomes: reduction in wound area over time, wound volume, and healing rate; cost of treatment	1,032 Medicare home care patients with 1,170 wounds failing to respond to previous intervention; 989 wounds over 30 days old, 566 were Stage III or IV pressure ulcers	Negative pressure wound therapy	498 (43%) of wounds resulted in successful closure with intervention; 145 (12%) showed no improvement. Intervention averaged 57 days and resulted in average reduction of wound area and volume.
Sturkey 2005 ⁷⁹	Wound management, provider support	Quality improvement project	Observational study comparing pre- and postintervention. Outcomes: OASIS Adverse Event Outcome Reports “Emergent Care for Wound Infection/ Deteriorating Wound Status”; number of visits required for wound care; State survey and JCAHO/Medicare survey observed breaches in infection-control practices.	One home care agency, Georgia	Educational program including best practice video and skills laboratory; education on wound care staging, healing and appropriate protocols; observation of actual practice in home using competency skills checklist; certification in negative wound pressure therapy	Adverse Event Outcome Reports, Emergent Care for Wound Infection/ Deteriorating Wound Status improved from 1.83% to 1.09%, compared to a national average of 1.27%; decreased average visits for wound patients by 30%; achieved no breaches observed during State or JCAHO survey visits.

Table 7. Summary of Evidence Related to Pressure Ulcer Management

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Berquist 2001 ⁸²	Pressure ulcer management, prediction	Retrospective cohort study.	Retrospective cohort study without controls. Outcome measure: development of Stage I to IV pressure ulcers or no ulcer development.	1,684 patients age 60 years or older without pressure ulcers on admission, with documented Braden Scale scores, one large Midwestern urban home care agency	None	Braden Scale summative scores were significantly lower for subjects who developed pressure ulcers than subjects remaining free of pressure ulcers ($P < .01$). All subscale scores except nutrition were significantly and negatively associated with pressure ulcer development ($P < .01$), but only the summative score remained significantly associated on completion of a backward stepwise procedure ($P < .001$).
Motta 1999 ⁸⁶	Pressure ulcer management, treatment	Randomized controlled trial	Randomized controlled trial. Outcomes: healing rate, debridement using Bates-Jensen Pressure Sore Status Tool	Home care patients with Stage II or III pressure ulcer, in home care setting: n = 5 intervention (group 1), n = 5 intervention (group 2)	1. Polymer hydrogel dressing 2. Hydrocolloidal dressing	The overall healing rate for the two groups was similar. Intervention 1 had more favorable overall clinical evaluation based largely on its autolytic debridement effect.
Ramundo 1995 ⁸⁹	Pressure ulcer management, prediction	Prospective cohort study	Observational study with control. Outcomes: Braden Scale scores, development of pressure ulcers	48 newly admitted patients free of skin breakdown who were unable to leave bed or chair, one suburban, community-based home health care agency	None	7 patients (17%) developed pressure ulcers; Braden Scale scores ranged from 11 to 22. At a score of 18, sensitivity of the tool was 100%; however, specificity was only 34%, indicating that the scale has validity in identifying patients at risk, but has limited predictive ability in home health care.

Table 7. Summary of Evidence Related to Pressure Ulcer Management (continued)

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Strauss 1991 ⁸⁷	Pressure ulcer management, treatment	Randomized controlled trial	Randomized controlled trial. Outcomes: wound status, inpatient hospital days, inpatient hospital charges, Medicare DRG, and physician payments.	Patients with Stage III or IV pressure ulcers and severely limited mobility, in home care setting: n = 47 intervention, n = 50 control	36 weeks of treatment, either 1. Air-fluidized bed therapy with services of a visiting nurse specialist, or 2. Control – conventional therapies	A higher proportion of intervention patients were classified as improved without statistical significance. Intervention patients spent significantly fewer days in the hospital (11.4 vs. 25.5 days, $P < .01$) and used significantly fewer total inpatient resources ($P < .05$). Total inpatient and outpatient resource utilization was lower, but not significant.
Whitney 2001 ⁸⁸	Pressure ulcer management, treatment	Randomized controlled trial	Randomized controlled trial. Outcomes: wound healing and periwound temperature changes, measured using valid, reliable instruments.	Patients, age 18 or older with Stage III or IV pressure ulcers in primary care, home care, acute care, or long-term care facilities: n = 15 intervention, n = 14 control	1. Noncontact normothermic wound therapy 2. Control – moist dressings	The intervention group healed significantly faster ($P = .01$), and average periwound temperature increased significantly ($P = .001$).

Conclusion

Home health care clinicians seek to provide high quality, safe care in ways that honor patient autonomy and accommodate the individual characteristics of each patient's home and family. Falls, declining functional abilities, pressure ulcers and nonhealing wounds, and adverse events related to medication administration all have the potential to result in unplanned hospital admissions. Such hospitalizations undermine the achievement of important home health care goals: keeping patients at home and promoting optimal well-being. Nevertheless, the unique characteristics of home health care may make it difficult to use—or necessary to alter—interventions that have been shown to be effective in other settings. Therefore, research on effective practices, conducted in home health care settings, is necessary to support excellent and evidence-based care.

In reviewing the extant studies, the authors of this chapter found useful evidence in all selected areas. However, the number of studies was few and many questions remain. Replications of investigations originally conducted in health care settings other than the home, and studies considering home health care-specific issues are needed to support evidence-based clinical decisions. The available evidence suggests that the work environment in which home health care nurses practice may indirectly influence patient outcomes in many areas, and that technology can be used to support positive patient outcomes. Thus, studies that link nurse-related variables to improved care safety and quality are needed, as well as studies that focus directly on patients. The demographics of an aging society will sustain the trend toward home-based care. Home health care practices grounded in careful research will sustain the patients and the clinicians who serve them. Given the focused review of evidence-based studies comprising this chapter, many informative sources of use to the practicing home health care nurse are omitted. Table 8 lists additional key resources.

Table 8. Additional Resources

Source	Area(s) Addressed	Web Access
AHRQ Electronic Catalog	Pressure ulcer treatment	http://www.ahrq.gov/gils/00000108.htm http://www.ahrq.gov/gils/00000109.htm http://www.ahrq.gov/gils/00000110.htm
AHRQ Evidence-Based Practice Reports	Nurse work environment: Staffing and quality of patient care Wound healing technologies	http://www.ahrq.gov/clinic/tp/nursesttp.htm http://www.ahrq.gov/clinic/tp/woundtp.htm
AHRQ National Guideline Clearinghouse	Medication management Fall assessment and management Functional outcomes and quality of life: Contingence promotion Diabetic foot complication prevention, ulcer management Pain assessment and management Wound management, lower extremity: arterial disease, neuropathic disease, venous disease Pressure ulcers: prediction, prevention, and treatment	http://www.guideline.gov/browse/guideline_index.aspx
Home Health Quality Improvement National Campaign (HHQI) (development in process)	Medication management Fall prevention Unplanned hospital admissions	http://www.homehealthquality.org/hh/
Journal of Wound Care (UK)	Wounds and pressure ulcers	http://www.journalofwoundcare.com
Journal of Wound, Ostomy and Contingence Nursing	Functional outcomes Contingence Wounds and pressure ulcers	http://www.jwocnonline.com
MedPac Report to Congress, Chapter 5: Adding quality measures in home health	Fall prevention Wound care of pressure ulcers	www.medpac.gov/publications%5Ccongressional_reports%5CJun06_Ch05.pdf
National Pressure Ulcer Advisory Panel	Pressure ulcers	www.npuap.org
Ostomy Wound Management	Wound management	http://www.o-wm.com

Search Strategy

The literature review for this chapter focused on identifying evidence-based practices that supported the goals of home health care: to promote independent functioning; to remain at home, avoiding hospital or nursing home admission; and to achieve optimal well-being. The search was conducted using multiple variations of key terms informed by the characteristics of home health care described at the beginning of this chapter, adverse events used in the OBQM,⁵ goals of the Home Health Quality Improvement National Campaign 2007,¹⁴ and the nurse-sensitive quality indicators developed by the American Nurses Association.¹⁵ The Cumulative Index to Nursing & Allied Health, Cochrane Library, Medline, and ProQuest Nursing & Allied Health databases were searched, as well as the grey literature and government Web sites, including the CMS and Agency for Healthcare Research and Quality. Hand searches were conducted of the reference lists of retrieved articles. Search limitations were English language, United States or Canada, peer-reviewed journals or scholarly literature, published between 1990 and the first quarter of 2007. Studies cited in the evidence table were accepted for review using the following inclusion criteria:

- The study was published between 1990 and the first quarter of 2007, inclusive.
- The research was conducted in the United States or Canada.
- The study included an intervention that directly or indirectly influenced a patient outcome.
- The intervention took place under the auspices of a home health care agency.
- Subjects in the study had to be home health care patients (not community-residing or outpatient ambulatory) and 18 years of age or greater.

Author Affiliations

Carol Hall Ellenbecker, Ph.D., R.N., professor, University of Massachusetts, Boston. E-mail: carol.ellenbecker@umb.edu.

Linda Samia, Ph.D., R.N., program manager, Healthy Choices for ME, MaineHealth's Partnership for Healthy Aging. E-mail: samial@mmc.org.

Margaret J. Cushman, Ph.D.(c), R.N., F.H.H.C., F.A.A.N., research associate, University of Massachusetts, Boston. E-mail: margaret.cushman@umb.edu.

Kristine Alster, Ed.D., R.N., associate provost, University of Massachusetts, Boston. E-mail: kristine.alster@umb.edu.

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