

Conducting Translation Research in the Home Care Setting: Lessons from a Just-in-Time Reminder Study

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ABSTRACT

Background: Home care organizations are relatively isolated from academic health centers, university-based schools of nursing, and centers of health services research that have advanced the knowledge base for quality improvement. Thus limited information exists about how best to promote evidence-based practice in this setting.

Aims: This article examines research and translation issues posed by the decentralized home care setting and considers how these issues compare to issues in other settings.

Methods: A case study approach is used to frame a discussion of the contextual and practical factors that can influence the design and future acceptance of different translation strategies in the home care setting. Use of a recently concluded randomized trial that tested the effectiveness of two interventions designed to improve the adoption of evidence-based practices by home health nurses has been made to inform this discussion.

Discussion: Effective translation interventions in home health care need to address the unique nature of this setting including the dispersed, generalist workforce that serves a diverse patient population and lacks strong peer contact or on-site support and supervision. Proactive push translation strategies such as reminders that have been effective in other settings show promise in this service area but had a differential effect across conditions. Significantly, the cost-effectiveness analysis of this intervention showed that net patient care costs actually increased for one condition.

Implications: The study described in this article demonstrates that rigorous translation research can be conducted in highly decentralized practice settings. It also points to the value of assessing different levels of intensity of interventions in a single study, looking at process measures and patient outcomes, and conducting a cost-effectiveness analysis. To encourage broader adoption of translation strategies, additional incentives from purchasing or regulatory agencies may be needed.

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KEYWORDS translation research, provider behavior change, evidence-based practice, reminders, home health care, knowledge utilization, effectiveness, interventions, outcomes, randomized controlled trial

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BACKGROUND

This article focuses on a research translation study conducted in a highly decentralized field setting: home health care in the United States. As translation research seeks to identify effective strategies for implementing evidence-based practice (EBP) by practitioners in the real world, it is usually, though not always, conducted in field practice settings. However, practice settings vary considerably in their organizational culture and climate (Harrison 1999), physical environment, staff composition, and structure of social networks (Valente 1994). Moreover, little is known about which implementation strategies are

effective in which clinical contexts and for which clinical conditions (Farquhar, Stryer & Slutsky 2002). Home health care, where the practitioner's office is the patient's home, is a far more decentralized practice setting than hospitals, clinics, and nursing homes, where patients receive care in a common physical space. The purpose of this article is to examine research and translation issues posed by this decentralized setting and to consider how these compare to issues in other settings.

The vehicle for discussion is a recently concluded study titled "The Effectiveness and Cost-Effectiveness of Just-in-Time Evidence-Based E-Mail Reminders in Home Health Care." The study was conceived amid growing interest in EBP among U.S. home care organizations (Madigan 1998). However, home care organizations remain relatively isolated from academic health centers, university-based schools of nursing, and centers of health services research that have advanced the knowledge base for quality improvement; and there is a dearth of information about how best to implement EBP in this practice setting.

The article is divided into four parts. Part 1 describes the organizational context in which the e-mail reminder project was implemented, the content of the intervention, and the ways in which the context influenced its design. Part 2 describes methodological challenges posed by the research and strategies for overcoming them. Part 3 describes the results of the study and issues involved in sustaining the intervention, and Part 4 concludes by discussing the implications for practice, policy, and research.

THE ORGANIZATIONAL CONTEXT, INTERVENTION, AND FACTORS INFLUENCING INTERVENTION DESIGN

The Context

The home health care industry comprises more than 7,000 Medicare-certified home health agencies (HHAs) providing post-acute and long-term care services of largely unknown quality to a heterogeneous population (Institute of Medicine [IOM] 2001a). Home health patients, disproportionately female and elderly, are clinically diverse (Haupt 1998). Individuals with heart disease, including a significant proportion with heart failure, and those with cancer, constitute the two largest groups of discharged patients, approximately 13% and 9%, respectively (Haupt 1999). Home health patients are an especially vulnerable population by virtue of their advanced age, multiple comorbid conditions, and functional dependencies.

Skilled nursing services are the core service provided by home health agencies, and nurses provided approximately 110 million home health visits to Medicare beneficiaries in 1999 (McCall, Komisar, Petersons & Moore 2001). Generally, services are provided on a part-time basis in private

residences beyond the easy reach of on-site supervision. As a result, the difficulties of observing and improving care are formidable.

Despite concern about the impact of financial incentives on service provision and the implementation of a nationally mandated uniform patient assessment instrument in the United States (OASIS—Outcomes ASsessment and Information Set; Shaughnessy, Crisler & Schlenker 1997), relatively little is known about the quality of care provided (IOM 2001b). Seventy percent of respondents to a 1994 survey of Medicare-certified HHAs reported that they were engaged in some type of quality improvement program (Brannon & Dansky 2001). However, little is known about the implementation or effectiveness of these programs, hence the need for translation research to identify effective, affordable strategies for bringing evidence-based care to the home health setting.

The project described here was conducted at the Visiting Nurse Service of New York (VNSNY)—a large, urban, nonprofit home health care organization that employs over 6,000 staff members, including 1,900 RNs, who serve an average daily census of approximately 24,000 patients living in the New York City region. Although VNSNY is highly decentralized relative to institutional practice settings, it is larger, more resource-rich, and more technologically sophisticated than most HHAs. Relative to other HHAs, VNSNY is probably more reliant on formal procedures and standardized care protocols, which have been associated with greater use of quality improvement methods to promote EBP (Brannon & Dansky 2001). Its professional workforce, like that employed by most HHAs, is mainly generalist, is widely dispersed, and receives infrequent in-person or on-site clinical supervision.

The Intervention

A randomized controlled trial design was employed to test the relative effectiveness and cost-effectiveness of a basic and an augmented intervention designed to deliver key information to nurses about the treatment of a heart failure or cancer pain patient shortly after the patient's admission. Both basic and augmented interventions provided nurses with a one-time e-mail reminder highlighting six key, condition-specific evidence-based practices. The e-mail reminders consisted of an initial screen listing six practices in abbreviated form, as well as subsequent screens that the nurse could consult for more detailed information (Table 1). The augmented intervention expanded the information and resources available to the nurse by providing, in addition to the basic e-mail: (1) a laminated pocket card outlining more detailed care management information, (2) a prompter card to help the nurse improve communication with the patient's physician, (3) a self-care guide for patients, and (4) follow-up outreach by one of the agency's

TABLE 1
E-mail reminders

<p>HEART FAILURE BASIC E-MAIL REMINDER Your patient, Jane Doe, has a primary diagnosis of heart failure. Please ADHERE to these guidelines to improve patient outcomes.</p> <ul style="list-style-type: none"> A Assess meds are correct to treat HF and patient uses them D Document and monitor V/S and S/S q visit H Have patients record daily weight and act on increase E Educate about low sodium choices R Recognize and help patients learn response to HF symptoms E Encourage use of Heart Failure Self-Care Guide

(Document all your interventions) (SCROLL DOWN for more details)

A ASSESS HEART FAILURE MEDICATIONS

ACE inhibitors (e.g., vasotec/enalapril, capoten/captopril, prinivil/lisinopril)
 Diuretics (e.g., lasix/furosemide, zaroxolyn/metolazone)—consider PRN diuretic for competent patients
 Beta Blockers (e.g., coreg/carvedilol, metoprolol)
 Digoxin
 All HF patients, whether stable or unstable, do better on the right medications.

D DOCUMENT AND MONITOR PHYSICAL PARAMETERS

Monitor weight trends and S/S closely. Some S/S of worsening HF include: Weight gain of 3 lb or more in 1 day, or 5 lb or more in 7 or fewer days; increased breathlessness; and/or inability to perform usual ADLs. Contact MD/nurse practitioner immediately if S/S of fluid accrual or worsening HF occur.

H HAVE PATIENTS KEEP DAILY WEIGHT LOG

Instruct patients to weigh themselves first thing in the morning in the same amount of clothing or nude, after urination, and before eating. The patient should use the same scale every day. Use charitable (free) care dollars to buy scale if patient cannot afford one.

E EDUCATE ABOUT LOW SODIUM CHOICES

Instruct patient to remove salt from table. Teach patient that sodium is hidden in many foods such as canned foods, fast foods, tomato sauce, cold cuts, and cheese. Tell patient to avoid any food where the label shows sodium as one of the first three ingredients. Suggest other ways to improve taste of food. Obtain PRN diuretic whenever patient is competent, as a safeguard to “cheating.”

R RECOGNIZE AND TEACH SIGNS AND SYMPTOMS

Teach signs and symptoms of worsening HF and *when* and *how* to contact MD/nurse practitioner: fluid weight gain; swelling of ankles, feet, or legs; increased shortness of breath, orthopnea (need for more pillows to breath); increasing fatigue, cough, chest pressure, or pain. Make sure patient gets pneumovax, if patient never had it, and annual flu vaccine.

E ENCOURAGE USE OF SELF-CARE GUIDE

The Heart Failure Self-Care Guide should facilitate patient learning. Help patient to overcome adherence barriers such as lack of

(continued)

TABLE 1
(Continued)

information about what to do and/or obstacles to doing it, such as disbelief or despair that treatment makes any difference, insufficient funds to cover the high cost of treatment, difficulty in planning medication schedule, etc. Partnering with the patient in determining realistic and practical change is one of the best approaches to improve adherence.

<p>CANCER PAIN MANAGEMENT BASIC E-MAIL REMINDER Your patient, Jane Doe, has a primary diagnosis of cancer and is reporting pain. <i>To promote patient pain RELIEF, please adhere to these guidelines.</i></p> <ul style="list-style-type: none"> R Reassess and document pain (5th V/S) q visit (scale 0–10) E Eliminate barriers to treatment L Learn and implement analgesic guidelines I Intervene to limit side effects of analgesics E Encourage use of complementary therapies (e.g., heat/cold, massage) F Follow up with MD/nurse practitioner if pain is not relieved
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(Document all your interventions)

(SCROLL DOWN for more details)

R REASSESS PAIN

Assess description of the pain, its onset, location, and severity (on a 0–10 scale); aggravating and relieving factors; and the effect of pain on physical and psycho-social function. Patient self-report is the most reliable indicator of pain.

E ELIMINATE BARRIERS

Potential barriers include: fear of addiction, concern about becoming tolerant to pain medications, worries about unmanageable side effects, financial considerations.

L LEARN MORE ABOUT ANALGESICS

Medications for persistent cancer-related pain should be administered on an around-the-clock basis with additional as-needed doses, because regularly scheduled dosing maintains a constant level of drug in the body and helps to prevent a recurrence of pain. Suggest sustained-release, long-acting medication to MD/nurse practitioner as appropriate.

I INTERVENE TO LIMIT SIDE EFFECTS

Patients on opioids require a prophylactic bowel regimen with a softener and/or stimulant to minimize constipation. Monitor other common side effects such as sedation, confusion, nausea, dry mouth. If not relieved within a short period, contact MD/nurse practitioner.

E ENCOURAGE THE USE OF COMPLEMENTARY (NON-MEDICATION) THERAPIES

Examples: relaxation/imagery, heat/cold, massage, exercise, distraction, acupuncture.

F FOLLOW UP WITH MD/NURSE PRACTITIONER IF PAIN IS NOT RELIEVED

clinical nurse specialists who served as an “expert peer.” The aims of the research were to examine, relative to usual care, the effects of the basic and augmented interventions on nurse practices and on patient outcomes, as well as on the use and cost of home health, hospital, outpatient, and physician services.

Factors Influencing the Design of the Intervention

The research team designed a targeted intervention—a “magic bullet”—that would automatically deliver specific practice information to specific nurses caring for specific patients, which could be timed to arrive when needed and would minimize disruption in the agency’s standard operating procedures. The conditions selected for study were chosen for their prevalence and burden in the health care system in general, and home health care in particular, for the existing evidence base underpinning treatment recommendations in each area, and for the potential to import these recommendations, as appropriate, into the home care setting. Additionally, because each condition presents somewhat different practice challenges to home health nurses, it was anticipated that the choice of the two conditions would enhance our understanding of how specific clinical treatment issues might influence the impact of the interventions.

Translation Research

The basic and augmented intervention represented a marked departure from usual home health guideline dissemination, which tends to rely on standard didactic learning methods and occasional use of role-playing and other interactive techniques. At VNSNY when the study was conceived, nurses usually came into a regional or central office for training, and clinical information was presented to the group in either a lecture or question-and-answer format. However, the literature indicates that didactic, traditional education strategies, as well as passive dissemination of clinical guidelines and protocols, have by and large proved to be ineffective methods for changing clinical practice (Bero et al. 1998; Davis & Taylor-Vaisey 1999; Davis, Thomson, Oxman & Haynes 1995; Grimshaw et al. 2001). Audit and feedback interventions, especially delivered by peer or opinion leaders, have been found to be moderately effective, while the reminder systems (manual and computerized) and multifaceted interventions that served as a model for this home care study have demonstrated the strongest effects (Balas et al. 1996; Bero et al. 1998; Chueh & Barnett 1997; Davis & Taylor-Vaisey 1999).

In designing the e-mail reminder study, we sought to build on this research base in at least two ways. First, to test the effectiveness of a simple reminder system as compared to a multifaceted intervention with a reminder system at its core. Second, to learn whether a reminder system could be

a reliable method for influencing provider behavior beyond physicians in hospital-based or office settings, where most such systems have been tested.

Condition-Specific Research

HHAs that seek to promote EBP usually develop their own guidelines based on varying degrees of sophistication and/or interest in culling the research literature (Madigan 1998). In order to build this research on as strong an evidence base as possible, the study focused on two areas for which EBP guidelines had already been developed, albeit for other practice settings and other types of practitioners. Both heart failure and cancer pain met this criterion. Using a modified Delphi technique, the choice of practices to be highlighted in the reminders was based on the deliberations of two condition-specific expert panels informed by comprehensive reviews of the literature and existing guidelines on heart failure and pain.

Heart failure was selected as a study condition because it is among the most frequent and expensive conditions for which patients are admitted (and readmitted) to home care (Haupt 1999) and is a leading cause of disability and hospitalization in the United States (American Heart Association 2001; MedPAC 1998). Several recent studies have demonstrated that heart failure interventions can improve patient outcomes and reduce re-hospitalization rates (Harrison et al. 2002; Naylor et al. 1999; Rich et al. 1995). However, the interventions often require a great deal of coordination between hospital and home care agency, with the involvement of additional care managers or specialists. Thus, they tend to be costly and/or not easily reproducible.

Like heart failure, cancer is a frequently occurring diagnosis among home health patients (Haupt 1999). Cancer *pain*, which constitutes a heavy burden for those who experience it, is not a formal home care diagnosis, and there are no national figures available on its prevalence in the U.S. home health population. Among VNSNY patients discharged in 2002, OASIS data indicate that approximately 60% experienced pain interfering with activity upon admission to home care. Although a number of evidence-based guidelines have been promulgated for cancer pain management, the literature indicates a wide gap between guideline recommendations and pain management practice (Cleeland et al. 1994; Meier 2002; National Institutes of Health [NIH] 2002; Schmidt, Alpen & Rakel 1996). Among the impediments to effective cancer pain management is the knowledge deficit among health care professionals (IOM 2001c; McCaffery & Ferrell 1997; Spross, McGuire & Schmitt 1990; Von Roenn, Cleeland, Gonin, Hatfield & Pandya 1993). Part of the rationale for focusing on cancer pain, therefore, was to understand how transmitting better, more timely information to home health care nurses could improve the care of these patients.

Home Care-Specific Constraints and Opportunities

The design of the intervention also took into account three significant constraints specific to promoting EBP in home health care. First is HHAs' reliance on a generalist workforce. Most agencies rely on frontline nurses to care for patients with many different conditions and comorbidities, even though they may hire advanced practice nurses or clinical nurse specialists with cardiac, cancer, or other expertise to provide training in EBP to the frontline staff. The result is that transmission of condition- or problem-specific information is often far removed in time from the nurse's contact with an appropriate patient. Furthermore, it is rarely reinforced by frequent, regular contact with a group of patients to whom an evidence-based guideline would be applicable. Lapsed time and infrequent use, in turn, reinforce a cycle of unfamiliarity and discomfort with EBPs (Feldman et al. 2004). Thus "just-in-time" delivery was an important consideration in the design of the reminder intervention.

Communications difficulties in home care constitute a second constraint that influenced the design of the intervention. Communicating inexpensively and effectively with home health nurses is one of the most difficult challenges to influencing practices and processes of care in this setting. Because in-home supervision and consultation are costly and logistically difficult to arrange, they occur infrequently. Thus VNSNY's acquisition of hand-held, pen-based tablet computers with e-mail capacity for every frontline nurse provided a propitious opportunity to test the use of this medium to overcome communications barriers.

Nurses' visit burden is a third practice constraint that impedes EBP in the home care setting. Every home care admission, visit, and discharge requires multiple types of administrative and clinical documentation. As the home health nurse's office is the patient's home, the ancillary personnel available to alleviate data collection burdens in hospital and office-based settings cannot be easily deployed. Thus it is usually the frontline nurse who is responsible not only for clinical assessment; monitoring and documentation of signs, symptoms, and medications; hands-on care; and patient teaching; but also for collecting, updating, and transmitting the necessary administrative information to multiple parties. The resulting burden makes it difficult to focus nurses' attention on following or documenting adherence to detailed condition- and visit-specific pathways or guidelines (Feldman et al. 2004), especially if they are add-ons to standard operating procedures. A major consideration in designing the e-mail interventions was, therefore, to limit the number of evidence-based practices and to remind the nurses to document adherence in the standard patient record, rather than in separate documentation.

Differences Between Heart Failure and Cancer Pain in the VNSNY Practice Context

Differences in the organization's emphasis on, and prior training provided relative to, heart failure and cancer pain management were a final consideration in designing the intervention. As one of the most frequent and costly conditions for which patients are admitted to home care, heart failure has been the focus of guideline development, nurse training, and research at VNSNY for nearly a decade. In contrast, the treatment of pain has received relatively little attention and has not been the subject of formal training or prior research at the agency. Cancer patients are not admitted to home health care for palliative care or pain management per se but rather for treatment of other cancer-related post-acute-care problems. The agency's oncology clinical nurse specialist may address pain management issues in individual nurse consultations; however, pain management is rarely the main reason for referral. Thus even within the same organization, the heart failure and cancer pain reminders were introduced under different circumstances. Examining the reminder strategy in two different clinical contexts, we reasoned, could help us assess its generalizability and understand the organizational and individual factors affecting its impact across conditions.

METHODOLOGICAL CHALLENGES AND STRATEGIES

In designing this study, hypotheses were formulated in three broad areas: practitioner behavior, patient outcomes, and organizational/system costs. It was hypothesized that both the basic and augmented interventions would yield observable and significant improvement in nurses' adherence to selected evidence-based practices, captured in patient records and their accounts of nurses' care. It was also hypothesized that the interventions would significantly improve patients' self-reported, condition-specific clinical and functional outcomes, as well as health-related quality of life. The final hypothesis was that both interventions would be cost-effective, relative to usual care. Testing these hypotheses presented a variety of methodological challenges, most of them characteristic of translation research in general. The strategies used were drawn from the methods generally employed by health services researchers to conduct complex studies that examine intervention impacts at multiple levels.

The following discusses some key methodological issues, highlighting the research strategies used to address them in the home health setting. The issues include: (1) study design (achieving effective randomization); (2) data sources (collecting in an economical fashion, relevant, valid

information on key parameters); and (3) analysis (controlling for factors other than intervention versus control-group status, such as selection bias or differential attrition, that could account for differential outcomes).

Study Design

A major advantage of the e-mail reminders was that they could be targeted to individual practitioners in a way that allowed for an experimental design rather than a quasi-experimental approach. All nurses providing direct care to the target population were randomly assigned to either a control group (usual care) or one of two treatment groups (basic intervention or augmented intervention) upon identification of their first eligible patient with heart failure or cancer pain. Randomization occurred after the admitting nurse had completed the initial patient assessment and electronically transmitted the assessment data from his/her pen-based computer to the agency mainframe. At that point, a computerized algorithm developed by project staff identified nurses whose patients met the study criteria. A nurse's initial random assignment to a specific group determined the status for all new eligible patients with heart failure or cancer pain allocated to that particular nurse's care for the duration of the study. The nurse then received the condition-specific targeted intervention for each patient during the study period.

While nurses were randomly assigned to treatment or control groups, random assignment of patients to nurses was not feasible. Patients referred to the agency, however, are assigned to a specific nurse based primarily on where the patient lives and the nurse's overall caseload. Although not random, this assignment process is based on observable and exogenous factors that could be controlled for in subsequent analyses. Furthermore, agency managers responsible for assigning patients to nurses were blinded to the study. This approach, based on a random assignment of nurses and exogenous assignment of patients to nurses, was designed to ensure unbiased estimates while at the same time minimizing Hawthorne effects and unacceptable disruptions to service delivery. The resulting study population consisted of over 500 nurses and 1,301 newly admitted adult acute care (non-hospice) patients served by those nurses: 628 patients had a primary diagnosis of heart failure, and 673 had a primary diagnosis of cancer and reported pain at admission. Persons who were not cognitively able to give informed consent (as determined by the administration of the short portable mental status questionnaire; Pfeiffer 1975) as well as non-English, non-Spanish speaking subjects, were excluded from the study, and the appropriate Institutional Review Boards (IRB) approved the study.

Data Sources

Data were derived from five main sources: (1) routinely collected OASIS assessments conducted by nurses at patients' start of care; (2) patient clinical records; (3) a patient survey conducted 45–50 days post-assignment to the study; (4) administrative data routinely collected by the agency's billing and human resources departments; and (5) intervention cost data collected especially for the study.

Data on Nurse Practices

Clinical record review was the main source of information on clinician practices and processes of care. The study employed two structured chart abstraction instruments (one for heart failure and one for pain management), completed by trained and blinded nurse reviewers. This captured information on the documented patient assessment and instruction practices of study nurses at every visit provided to an eligible patient, from start of care to 45–50 days post-admission. The specific assessment and instruction practices captured were those identified in the e-mail reminders sent to nurses in the intervention groups and varied according to the arm of the study.

In-person patient interviews were conducted approximately 45 days after admission. In addition to serving as the source of information on patient outcomes (discussed below), they also provided an opportunity to triangulate nurse documentation of care practices with patient perceptions of that care. Items designed to capture patient-reported processes of care queried, for example, whether “the nurse told me I should weigh myself every day,” “the nurse suggested that I monitor my level of pain each day,” or “the nurse left me a patient information packet.” An early sub-analysis of these data suggests that agreement between nurses and patients was relatively low. Nurses may have focused their documentation on the provision of complex instructions, such as those related to medication management or signs and symptoms of disease. In contrast, patients were more likely to recall simple instructions (e.g., daily weighing) or concrete actions (e.g., distribution of educational materials), which the nurse documented less frequently in the patient record (McDonald, Murtaugh, Pezzin & Feldman 2001).

Data on Patient Characteristics and Patient Outcomes

A major advantage of conducting research in the U.S. home health care setting is the availability of routinely collected OASIS data. The OASIS instrument (Shaughnessy et al. 1997) focuses on patients' physiologic conditions and functional status and includes items on patient demographics, living arrangements, informal supports, comorbidities and symptom severity, risk factors, prognosis, therapies, medication/equipment management, pain, wounds,

neurologic/cognitive/behavioral status, activities of daily living (ADLs), and instrumental activities of daily living (IADLs). The just-in-time reminder study took full advantage of OASIS start-of-care data in developing risk adjustment models to adjust for any potential differences in patient severity between the study's intervention and control groups.

Two major limitations in OASIS data, however, required the administration of a patient survey to obtain all necessary information on patient outcomes. First, federal mandates require that OASIS data be collected at discharge or 60 days, whichever is sooner. Thus OASIS data are not routinely available for patients at a fixed point, post-admission to home care. Second, the OASIS instrument items are based on clinicians' professional judgment and do not embody validated condition-specific, patient-reported measures. To compensate for the limitations of OASIS in this study context, an in-person patient survey was conducted (in English and Spanish) approximately 45 days after the patient's admission. Interviewers were blinded to the study status of the patients, and the survey instrument relied on readily available, validated measures of condition-specific outcomes, health-related quality of life, and cost-effectiveness (i.e., Kansas City Cardiomyopathy Questionnaire [KCCQ], Green, Porter, Bresnahan & Spertus 2000; the European Organization for Research and Treatment of Cancer quality of life instrument [QLQ-C30], Aaronson et al. 1993; the SF-36, Ware & Sherbourne 1992; and the EuroQoL EQ-5D, Brooks 1996). Patients were asked for consent first when the interview was scheduled and then, in writing, at the start of the interview.

Analysis

Nurse Practices, Patient Outcomes, and Associated Costs

In order to control for chance differences and obtain unbiased estimates of the interventions' effects, multivariate models were used. These incorporated patient-specific, nurse-specific, and environmental variables that might confound the relationship between the interventions and outcomes of interest. Nurse-level analyses, for example, controlled for the nurses' sociodemographic characteristics (age, gender, race/ethnicity); home care employment status; and experience, educational level, and caseload. Patient-level analyses controlled for selected nurse characteristics, as well as sociodemographic characteristics of the patient, baseline measures of the patient's health and functional status, and baseline measures of patients' social support and living arrangements.

Sample Attrition

A standard concern in studies with longitudinal follow-up is the potential for sample attrition to introduce bias,

which can occur if the pattern of attrition differs by intervention and control groups and is correlated with the outcome measure being examined. Therefore, patients lost to interview follow-up (due to death, institutionalization, inability to contact, or refusal to respond) were compared with those for whom complete data were obtained, using baseline characteristics from the standard patient assessment on admission to home care (i.e., OASIS) and other administrative data available for all enrollees. The results of these attrition analyses were then incorporated into subsequent modeling of intervention impacts.

RESULTS AND SUSTAINABILITY

Translating research into practice is a notoriously complex process, dependent upon the content and characteristics of the EBP to be adopted, the channels through which information about the research is transmitted, and the organization and social system of implementation (Davis & Taylor-Vaisey 1999; Feldman & Kane 2003; Grimshaw et al. 2001; Grol 2001; Rogers 1995). Evidence suggests that translation is more likely to be successful when: (1) scientifically valid findings clearly demonstrate the effectiveness of the practice; (2) the components of the proposed changes are simple and well defined; (3) decision makers with the authority to adopt the changes receive the findings in a timely manner, understand them, and can appreciate their relevance to the problems of the organization; and (4) proposed changes are consonant with and reinforced by environmental, organizational, and personal resources and incentives (Davis & Taylor-Vaisey 1999; Feldman & Kane 2003; IOM 2001a).

An additional complexity of translation research, which focuses on identifying effective strategies for imparting and implementing EBP (Farquhar et al. 2002), is that two sets of EBP are in essence being transmitted: (1) the underlying clinical practice that is embodied in the translation mechanism, and (2) the translation mechanism itself. Usually, to demonstrate the success of the latter, it is necessary to show that the implementation strategy effected successful change in the former, that is, in clinical practice. First the impact of the reminder intervention itself is discussed and then the organization's response.

Effectiveness of the Intervention and Simplicity of the Findings

The first and most obvious task to be addressed in moving the just-in-time e-mail reminder intervention from research into practice has been to analyze, understand, and communicate the impact of the reminders on nursing practice and patient outcomes. Overall, the findings have been positive (see Feldman, Murtaugh, Pezzin, McDonald & Peng 2003; McDonald, Pezzin, Feldman, Murtaugh & Peng 2003; Murtaugh, Pezzin, McDonald, Feldman & Peng 2003). Thus

the main message to the organization's decision makers is that the system-driven, push approach shown to be effective in other practice settings (Chueh & Barnett 1997) and used to transmit the heart failure and cancer pain reminders to VNSNY nurses, at the right time and place, was effective in home care as well.

At a more practical level, the findings with regard to the comparative impacts of the basic versus augmented interventions in the two conditions studied are more complicated to distill into a clear message that organizational decision makers could use to guide them in deciding which approach to adopt. First, the interventions demonstrated a more consistently positive and significant set of impacts on heart failure compared to cancer pain. Second, the basic and augmented interventions behaved differently depending on the outcomes of interest (e.g., for heart failure, the augmented had a stronger impact on nurse practice, while the basic had a stronger impact on patient outcomes). Third, although the cost-effectiveness analyses for both conditions showed the basic intervention to be more cost-effective in improving selected patient outcomes than the augmented, net patient care costs associated with the interventions actually increased for heart failure, while they were not significantly impacted for the other.

A continuing challenge for the research team (and a subject for additional analysis) is to understand and then communicate how the different organizational and practice issues involved in heart failure care and cancer pain management may have influenced the somewhat different study findings and to help VNSNY decision makers craft a practical systems change that reflects the lessons learned from each condition.

Organizational Response

As might be expected, given the complexity of a large organization, its response has depended in part on the particular organizational circumstances of the specific target audience. The quality management staff, for example, which includes the clinical nurse specialists who were involved in the project from its inception, has focused principally on the quality implications of the findings and how the use of reminders might help to target and streamline quality management activities. Senior staff, in charge not only of quality management but also of organizational finances, systems, and operations, have focused not only on the quality implications of the study findings but also on financial and operational issues. In their consideration of whether or how to incorporate the e-mail reminders into standard operating procedures, they want first to understand how the reminders are likely to affect patient care costs and second how they can be made compatible with and integrated into new agency systems designed after the start of the reminder study.

VNSNY senior management hopes, if not expects, that quality-enhancing initiatives will also be cost-saving or at least cost-neutral (Leatherman et al. 2002). The finding that for one of the conditions (heart failure) both the basic and augmented interventions increased the cost of an episode of patient care is a matter of concern, given the agency's financial constraints under a per episode payment system, which provides a strong incentive to reduce direct costs. In the absence of federal or state payment incentives to offset the costs of quality initiatives, the business case in support of cost-increasing quality improvements might be strengthened by the demonstration of intangible benefits in the form of regulatory recognition of superior care. However, neither Medicare nor Medicaid explicitly rewards agency improvements in condition-specific patient outcomes. Few of the 11 HHA quality measures that the Centers for Medicare and Medicaid Services, U.S. Department of Health and Human Services (CMS), began disclosing on a public information Web site in 2003 (www.medicare.gov/?HHCompare) are condition-specific and, depending on an agency's case mix, few may be sensitive to improvement for any specific patient population. Thus, neither tangible nor intangible rewards are immediately available to offset the incremental costs of quality improvement.

A second issue is how to integrate the e-mail reminders with a new electronic problem-based record being implemented by the agency. To simultaneously address the issue of visit burden and documentation, the VNSNY has designed and is implementing an electronic problem-based patient record. This enables a nurse to enter a patient's clinical problems on the pen-based computer and document related assessment, instruction, monitoring, and hands-on care at every visit. On a daily basis, the data are electronically transmitted to the agency mainframe, which then creates and updates a permanent patient record accessible to a range of staff. This problem-based record is in itself a push-driven decision support system, whereby a patient's problems are triggered by the information entered by the nurse at the initial patient assessment. However, it does not send to the nurse a concise, bulleted set of evidence-based recommendations for a given patient. Thus the operational challenge is to ascertain where in the problem-triggering process and how in the underlying system architecture and software, the simple reminder concept and contents can be integrated into the new system.

IMPLICATIONS FOR RESEARCH, PRACTICE, AND POLICY

A series of important research, practice, and policy implications emerge from this case study of the just-in-time reminder project.

Research

First, the project demonstrates that rigorous scientific translation research, including assessment of organizational interventions tested through randomized trials, can be conducted in highly decentralized practice settings. Second, it shows that sophisticated quantitative methods—including severity/case mix adjustment and attrition analysis techniques developed in other areas of health services research—can and must be employed in such alternative settings to assure the integrity of the research findings. Third, it illustrates the potential for tapping a largely untapped resource in the United States (the OASIS uniform assessment instrument) to assist in economical data collection for future home health care research. Fourth, it points to the value in a single study of assessing different levels of intervention (e.g., basic and augmented) and of extending the research to encompass not just documented practitioner behavior but also patient outcomes. Fifth, it demonstrates the value of adding a cost-effectiveness component to compare translation strategies. Without the patient outcomes analysis and the cost-effectiveness component, the natural conclusion might well have been to adopt the more comprehensive, augmented approach. Lastly, in exposing the differences in intervention impacts for heart failure and cancer pain practices and outcomes, the study points to the importance of future research designed to elucidate how translational strategies are affected by, and in turn affect, practitioner behavior and patient outcomes for different clinical conditions.

Practice

The study's implications for the practice community are equally important. First, it provides support for the proposition that proactive, push translation strategies like reminder systems, with a robust research base indicating success in other practice settings, can be transferred successfully to other settings, characterized by different organizational features and operating constraints. Second, the study shows that practice setting does matter. The specific translation interventions successful in this decentralized setting were designed to address the specific features of that situation—a dispersed, generalist workforce serving a diverse patient population and lacking strong peer contact or on-site support and supervision. Third, the study shows that clinical context matters. The impact of the basic and augmented interventions evaluated differed by clinical condition, possibly because the organizational emphasis and prior preparation of practitioners were weaker for one condition than for the other. Finally, the study shows that incentives matter. Quality improvement costs to an organization tend to be immediate, direct, concentrated, and measurable, whereas the benefits generated may be dif-

fuse, indirect, and/or accrue to other parts of the health care system.

Policy

The above practice implication leads to the most important policy implication of the study, which is that government and other purchasers of home health care, like purchasers in other parts of the health care system, do not compensate the costs of quality improvement. Nor do the intangible rewards they may offer to high-quality home health agencies, for instance by posting comparative quality data on a public Web site, match the very powerful financial incentives they offer through prospective payment or managed care to cut costs and limit service use. An emerging body of empirical evidence suggests that giving provider organizations public recognition and better contracts for scoring well on quality measures may lead to heightened use of effective care management processes (American Hospital Association 2003; Casalino et al. 2003). However, such incentives have not by and large taken hold in the policy arena. Until they do, organizations seeking to institutionalize translation strategies that lead to improved patient outcomes, but not necessarily to short-term cost savings, will be fighting a battle without the full armamentarium necessary for success.

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