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# Lessons Learned from Testing the Quality Cost Model of Advanced Practice Nursing (APN) Transitional Care

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## Abstract

**Purpose—**To describe the development, testing, modification, and results of the Quality Cost Model of Advanced Practice Nurses (APNs) Transitional Care on patient outcomes and health care costs in the United States over 22 years, and to delineate what has been learned for nursing education, practice, and further research.

**Organizing Construct—**The Quality Cost Model of APN Transitional Care.

**Methods—**Review of published results of seven randomized clinical trials with very low birth-weight (VLBW) infants; women with unplanned cesarean births, high risk pregnancies, and hysterectomy surgery; elders with cardiac medical and surgical diagnoses and common diagnostic related groups (DRGs); and women with high risk pregnancies in which half of physician prenatal care was substituted with APN care. Ongoing work with the model is linking the process of APN care with the outcomes and costs of care.



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**Findings—**APN intervention has consistently resulted in improved patient outcomes and reduced health care costs across groups. Groups with APN providers were rehospitalized for less time at less cost, reflecting early detection and intervention. Optimal number and timing of postdischarge home visits and telephone contacts by the APNs and patterns of rehospitalizations and acute care visits varied by group.

**Conclusions—**To keep people well over time, APNs must have depth of knowledge and excellent clinical and interpersonal skills that are the hallmark of specialist practice, an in-depth understanding of systems and how to work within them, and sufficient patient contact to effect positive outcomes at low cost.

### Keywords

advanced practice nurses; Quality Cost Model; transitional care; costs; outcomes

Dramatic changes in health care have occurred over the past 2 decades resulting in merged health systems, shortened hospital stays, rapid growth of outpatient and home care services and changed systems of reimbursement (Lesser & Ginsburg, 2001). The goal is to provide the most effective health care services at the lowest cost. Examining the effectiveness of health care providers has accompanied these changes. Today's data-driven health care systems require that provider practices are based on evidence and that provider time and number of patient contacts be justified (Delaney, Reed, & Clarke, 2000).

In 1980, responding to changes occurring in health care, a team of researchers at the University of Pennsylvania developed a model of transitional care delivered by advanced practice nurses (APNs) that could serve as a safety net for vulnerable patient groups being discharged early from hospitals; this approach might maintain quality care and reduce health care costs (Brooten, Brown et al., 1988). Since 1980 research with this model of care has been conducted in two phases. The first phase, which remains ongoing, focused on testing, refining, and modifying the model for use with different patient groups. Consistent success in improving patient outcomes and reducing health care costs in patient groups in which the model has been tested led to the second phase of research. This second phase is focused on delineating the reasons for the model's success by linking patient outcomes and costs of care with the process of care. This ongoing research includes examination of patient problems that require more APN rime and contacts, profiles of individual patients who require more APN time and contacts, and APN interventions used in providing transitional care (Brooten, Youngblut, Deatrick, Naylor, & York, 1997–2001). The purpose of this article is to describe the development, testing, modification, and results of this model of APN transitional care on patient outcomes and health care costs, and to delineate what has been learned for nursing education, practice, and further research.

## The Quality Cost Model of APN Transitional Care

The Quality Cost Model of APN Transitional Care was designed initially to promote early discharge of high-risk, high-cost, high-volume groups of patients by substituting a portion of hospitalization with a comprehensive program of transitional care delivered by APNs whose clinical specialty preparation matched the patient groups they followed (Brooten, Brown, et al., 1988). Transitional care was defined as comprehensive discharge planning designed for each patient group plus APN home follow-up through the period of normally expected recovery or stabilization. The intervention included a series of home visits, daily telephone availability of the APN specialists, and physician backup. In this model, quality of patient outcomes and health care costs are compared; research data include patient problems, APN interventions, type and number of patient contacts, and total time for each contact.

Development of the model was guided by the three-variable framework of quality of care including outcome, patient satisfaction, and cost (Doessel & Marshall, 1985). Cost and outcomes are the main variables, and satisfaction is viewed as an outcome of the health service. Master's-prepared APNs (clinical nurse specialists or nurse practitioners) were used for both quality and cost. Use of a master's-prepared APN specialist was based on the assumption that nurses with advanced knowledge and skill in the care of the specific patient groups they follow avoids the variability in preparation (Diploma, ADN, BSN) of nurse generalists. Master's-prepared APN specialists with advanced knowledge and skills can individualize care and function under general protocols needing less detailed procedures, protocols, and direct supervision than can personnel with less preparation. Whether APN specialists are needed for all patient populations has yet to be determined.

## Components of the Intervention

The model was tested in a series of randomized clinical trials. Control groups received care that was standard for the group at the study site. In the original development of the model, patients in intervention groups were discharged early provided they met a standard set of discharge criteria agreed upon by the physicians and APN specialists (Brooten, Brown, et al., 1988), including physical, emotional, and informational readiness for discharge and an environment supportive of convalescence at home. Specifically, discharge criteria included: (a) general physiologic stability and absence or control of complications; (b) ability to assume self-care or having a support person in the home able and willing to assist in care; (c) no overt major emotional problems; (d) demonstrated knowledge of reportable signs and symptoms, medication administration, diet, activity limitations, and other group specific therapies and skills; and (e) a home environment supportive of convalescence with basic services such as heat and telephone (or ready access to one), the opportunity for rest, and available food and transportation.

The APNs prepared patients for discharge and coordinated discharge planning with patients, physicians, caregivers, hospital nursing staff, social service staff, community resource groups, equipment vendors, and others. The APNs also coordinated or provided patient and caregiver teaching, helped establish the day of discharge, coordinated plans for medical follow-up, and made referrals to community agencies. When problems were encountered, the APNs consulted with physicians and other health care providers.

Following discharge, the APN specialists conducted a series of home visits and were in contact with patients and their families by telephone. The number and timing of home visits varied with the patient group. Operating within broad protocols, the APNs used their clinical judgment regarding the number and length of contacts (telephone or home visits). The APNs were available to patients and families by telephone from 8 am to 10 pm Monday through Friday and from 8 am to noon on Saturday and Sunday. After 10 pm on weekdays and noon on weekends, patients were asked to call their private physicians or hospital emergency room if immediate care was needed.

The APNs assessed and monitored the physical, emotional, and functional status of patients, provided direct care where needed, assisted in obtaining services or other resources available in the community, and provided group-specific as well as individual teaching, counseling, and support during convalescence. If complications arose, APN specialists consulted with the backup physicians to determine the most effective immediate treatment.

## Testing the Model

Testing provided data on the quality of care as reflected in patient outcomes and cost of care with thorough documentation of APN interventions. Patient physical and psychosocial

outcomes included mortality, morbidity (e.g., rehospitalizations, acute care visits), functional status, affect, patient satisfaction with care, and outcomes important to specific patient groups. Cost of care included charges for initial hospitalization, rehospitalizations, and physician and other postdischarge health services, and in the APN intervention groups, cost of the services of the APN specialists. In the early testing of the model, costs also included time lost from employment by family members caring for patients. When shortened hospital stays became the norm for all patients, the focus on early discharge and the need to include this cost were eliminated. Each intervention group patient also had an interaction log created and maintained by the APNs. These logs documented each interaction between the patient and APN almost verbatim and included patient problems, APN interventions, type and time of patient contact (Brooten, Brown, et al., 1988).

## Findings for Patient Outcomes and Health Care Costs

The model was initially developed and tested with very low birthweight (VLBW) infants (Brooten et al., 1986) through grants from the Division of Nursing at the Department of Health and Human Services and the Robert Wood Johnson Foundation. The model was subsequently refined, modified, and tested with women with unplanned cesarean deliveries (Brooten et al., 1994), women with high-risk pregnancies (York et al., 1997), and women after abdominal hysterectomy (Hollingsworth & Cohen, 2000), supported by a research program grant from the National Institute of Nursing Research (NINR; Brooten et al., 1989). With two NINR-funded grants, Naylor and colleagues tested the model with elders with cardiac medical and surgical DRGs (Naylor et al., 1994) and with elders with common DRGs at risk for poor outcomes following hospital discharge (Naylor et al., 1999). In a subsequent NINR-funded study using the model with women with high-risk pregnancies (preterm labor, diabetes, and hypertension), Brooten and colleagues modified the antenatal portion. Antenatal APN home visits and telephone follow-up were substituted for half of the routine antenatal care provided by physicians in the clinic or physicians' office (Brooten et al., 2001). Findings from these studies are summarized in Table 1.

Widespread dissemination of the research in nursing and interdisciplinary journals led to public attention and effects on practice. Study findings have been presented in testimony to Congress and state legislatures and have been cited in the Congressional record. Protocols from several of the studies have been used by nurses in public health agencies. Physicians have adopted study discharge criteria. Clinicians in a major U.S. West Coast health care system used the findings on infant birthweight to change infant feeding practices. A neonatologist in Texas used the study's findings to establish a similar infant follow-up program. Nurses on the West Coast used the findings to establish a business to follow-up high-risk infants and children. To date, the body of work has resulted in 14 doctoral dissertations, 3 Doctor of Nursing (ND) theses, and well over 50 undergraduate, masters', and doctoral students publishing with the various research teams. In addition, other researchers have used the model as a framework for their research.

Work with the model is continuing. With a grant from the NINR, Naylor and colleagues are using it with elders with congestive heart failure (Naylor et al., in review). Also funded by the NINR, Brown and colleagues (1995–2001), using a modification of the model, are comparing maternal and infant outcomes and costs of care between two groups of women who breastfed their low birthweight infants: a control group that received routine care for breastfeeding and an intervention group that received a structured program of breastfeeding support services provided by perinatal APNs. Pilot studies have been conducted using the model with HIV positive infants and their families (Thurber & DiGiamarino, 1992).

Each test of the model was built on knowledge gained from previous trials, changes in health care, and specific needs of the study population. Length of APN follow-up changed

based on recovery times from previous study groups and the clinical realities resulting from managed care penetration. Some measures, such as self-esteem, were dropped in subsequent trials because of little variability in scores, and others, such as functional status, were tailored to the study population. When testing with one study group was successful, data were analyzed to identify (a) those patients for whom the intervention did not yet show a difference, and (b) what modifications were needed to achieve greater improvements in patient outcomes and health care cost savings. For example, although we had achieved considerable improvements in outcomes and costs with the additive model in high-risk pregnancy, we realized the stressors of attending prenatal care remained and that we could reduce them by substituting APN care delivered in homes for half of traditional physician antenatal care delivered in clinics or physicians' offices. The reality of making health care improvements for elders with many co-morbidities necessitated a much broader team of health care specialists. Thus the intervention was continuously refined and more specifically targeted for subsequent testing.

## What Has Been Learned

Developing and testing the model across the life span with various groups of high-risk, high-cost, high-volume patients has made many important points clear, including the use of APN specialists, very different patterns of morbidity by patient group, a "dose effect" of APN care as well as points specific to patient groups.

The use of APN specialists, where the advanced knowledge and skills of the APNs are matched to the patient groups followed, was a key factor in improved patient outcomes and reduced health care costs. The APNs' content expertise provided credibility, legitimacy, and a level of trust when working with physicians, nursing staff, pharmacists, vendors, and other health care providers. The APNs' interpersonal skills and knowledge of systems and community resources were important to their success. Enacting the role successfully required constant interacting and negotiating with patients, families, physicians, nursing staff, research team members, various health care service providers, vendors, and others. Knowledge of systems and the ability to work within them to negotiate changes or to obtain needed resources for patients or families was equally important. This skill was apparent in the trials with women with high-risk pregnancies when, for example, the WIC worker did not work on the days when these women were seen in clinic. This situation required that the women return to the clinic on additional days to register for the program and the food important to their own and their fetus' health. Many similar situations occurred in working with the elder groups. Negotiating to alter staff's schedules or patients' schedules to decrease stress on the patients or to obtain needed resources occurred in several studies.

Testing the model among many patients' groups showed differing patterns of morbidity by group (Brooten, Naylor, et al., 1996). For the women with surgical procedures (cesarean and hysterectomy), almost all rehospitalizations occurred within the first 3 weeks after discharge (Donahue et al., 1994). In the VLBW infant group, more than 75% of the rehospitalizations occurred in the first 6 months after discharge (Termini, Brooten, Brown, Gennaro, & York, 1990). For elders with cardiac surgical conditions, rehospitalizations were most frequent in the 1st month after discharge, and patients with cardiac medical conditions had about equal numbers of rehospitalizations in the 1st and 2nd months after discharge (Naylor & McCauley, 1999). Although acute care visits were most numerous in the 1st month after discharge, a substantial number of acute care visits occurred throughout the follow-up period, unlike the pattern of rehospitalizations.

The reasons for rehospitalizations and acute care visits reflect the problems of each group. The VLBW infant group, with immature organ systems, was rehospitalized most frequently

for respiratory difficulties, particularly pneumonia, and for surgery and general infections (Termini et al., 1990). Women in the cesarean and hysterectomy groups were rehospitalized most frequently for infections or complications associated with surgery including ileus and thromboembolism (Brooten, Naylor et al., 1996). Glucose control and preterm labor were major reasons for antenatal rehospitalizations for women with diabetes in pregnancy (Brooten et al., 1998; York, Brown, &; Miovech, 1995). In the substitution high-risk pregnancy study, half of the rehospitalizations in the first 8 weeks postpartum were directly related to complications from the pregnancy (Hamilton, Brooten, & Youngblut, in press).

Problems of arrhythmias, unstable angina, myocardial infarction, and heart failure were the primary reasons for rehospitalizations in the elderly with medical and surgical cardiac DRGs (Happ, Naylor, & Roe-Prior, 1997). Profiles of rehospitalizations and acute care visits are important information for discharge planning and contacts after discharge. They also are important for researchers examining postdischarge patient outcomes. Most importantly, using the model reduced rehospitalizations across APN-followed groups. Where the reduction in rehospitalizations did not reach a level of statistical significance compared to controls, the trend was noted. Patient problems were detected earlier in the APN-followed groups resulting in shortened hospitalizations at less cost.

A “dose effect” of APN care became clear in testing the model across groups. When Naylor and colleagues (1994) used only the discharge planning portion of the model with APNs visiting patients in the hospital and contracting them by telephone for 2 weeks after discharge without home visits, reductions in rehospitalizations occurred only in the cardiac medical group and only for 6 weeks after discharge. When Naylor and colleagues (1999) strengthened the APN dose by adding home visits, the APN-followed group had significantly fewer readmissions and total hospital days than did patients in the control group 24 weeks after the initial hospitalization.

To achieve improved outcomes, APNs spent more time with subgroups of patients. Preliminary analysis demonstrated the cesarean birth group required a mean of 20 minutes more APN time during hospitalization and a mean of 40 minutes more in home visits with women who had morbidity (infections) compared to women without morbidity (Brooten, Knapp, et al., 1996). We also have noted large amounts of APNs’ time spent with nonmorbid women who had problems with spousal abuse and parenting. While APN intervention into these issues might be regarded as beyond the concern of an insurer in a system of managed care, the potential social costs and benefits must be considered. What is the cost of APN time spent intervening compared to the financial and human costs of potential physical abuse of a woman or infant, intervention by the police, court costs, and possible foster placement of a child?

Optimal number and timing of postdischarge home visits and telephone contacts varied by patient group. In the elder and VLBW infant groups, APNs found that the effects of the first home visit were maximized when done 24 to 48 hours after discharge. This allowed time in the VLBW group, for example, for infant adjustment to the new environment and for the family to gather their questions. A telephone contact within the first 24 hours of discharge was important, however, to answer questions and concerns. Results of the intervention in the cesarean and hysterectomy group indicated that one home visit in the 1st week plus a telephone call in each of the first 2 weeks was sufficient for most women as long as the APNs were available by telephone for consultation. For women with diabetes during pregnancy, three antenatal home visits would have sufficed for most women if APN telephone consultation was available (Brooten et al., 1995).

Much was learned regarding discharge planning, including identification of periods of high anxiety in order to provide the most effective teaching. For all patient groups, the model protocols included patient teaching for postdischarge care plus return demonstration of basic knowledge and skills and printed take-home materials needed to promote recovery and maintain health after discharge. Teaching and return demonstration was begun as soon as possible during hospitalization and was repealed often to ensure patient learning.

Despite this comprehensive approach, many mothers of VLBW infants who had successfully demonstrated basic infant caretaking skills before discharge telephoned the APNs shortly after discharge to have the APNs review caretaking skills such as temperature taking (Brooten, Gennaro, Knapp, Brown, & York, 1989; Butts et al., 1988). The mothers apparently had not retained sufficient knowledge to act upon it or they were too anxious to try. Analysis of the data on maternal anxiety (Brooten, Gennaro et al., 1988) showed that maternal anxiety was highest the week the infant was born and the week of infant discharge when much of the discharge teaching and return demonstration had occurred. The effect of high anxiety on retention of information helped to explain the problem these mothers were experiencing. This same phenomenon was found in the first test of the model with elders (discharge planning only, no APN home visits; Naylor et al., 1994). These findings showed the importance of identifying points of highest anxiety in each patient group and avoiding these times whenever possible in conducting discharge teaching and return demonstrations.

Across groups we found that the most reliable and valid information on environmental supports was gained during home visits (Armstrong, Brown, York, & Robbins, 1991; Robbins, Armstrong, York, Brown, &, Swank, 1991) and that patients tended to underreport or minimize environmental difficulties during hospital interviews. Coordination of the discharge plan and participants must begin as early after admission as possible if postdischarge services are to be in place at the time of discharge. This need was clearly demonstrated with the elder and VLBW groups. Both groups required multiple health and social services after discharge that needed to be obtained from several sources (Brooten, Youngblut, Deatrick, Naylor & York, in press).

We have learned much about measuring health care costs such as hospital, emergency room, and physician charges. Obtaining health care charges has become very difficult over the past 20 years, particularly following the advent of managed care. Fees are now required for obtaining such data from most health care systems, after patient permission, and often a delay of 6 months or more to receive the data. Obtaining health care costs from patients is also resource intensive. The costs of APN services were calculated as actual costs in our randomized sample trials and were converted to a charge that equaled the cost. Other methods that can be used include cost-adjusted charges, use of resource units (e.g., number of emergency room visits, postdischarge services), and microcosting. The costs of microcosting analysis were prohibitive and were beyond the scope of our studies. However, our goal was not to determine the true costs for any patient, but rather, to determine whether patients in the APN intervention groups had lower costs than did patients in the control groups, and, if so, relatively how much lower. Charge data are adequate for making such proportional estimates. Similar proportional estimates would be needed if resource units or cost-adjusted charges were used (Brooten, 1997).

Based on our 20 years of working with this model of care delivery with high-risk populations and recent changes in the health care market, several implications for the education of APNs are clear. To keep people well over an extended period (e.g., 1 year), APNs must have in-depth understanding of how-care is delivered across settings and die opportunity to provide care across settings. APNs must possess depth of knowledge and excellent clinical skills that are the hallmark of specialist practice. Knowledge and skills are

necessary to individualize care and to anticipate and prevent problems to keep people well over the contract period and beyond. APNs must be able to: negotiate health and social systems to provide people with the supports necessary to stay healthy or minimize the effects of illness; collaborate effectively with physicians, families, and other providers; coordinate complex therapeutic regimens; develop strong patient advocacy skills and skills in teaching and counseling.

## Questions Remaining to be Answered

Ongoing work (Phase 2) includes analyzing data from 675 subjects, half of who have had the APN intervention, from 5 of the randomized trials using the Omaha system (Brooten et al., 1997–2001). The data set contains information about costs, patients' sociodemographic data and data on patients' problems and outcomes, APN interventions, and time per contact and per patient. Common instruments and costing methods have been used across studies. In each trial, the number of APN visits and telephone contacts was determined by protocol and provider judgment rather than by health care reimbursement plans. Results of this work will yield profiles of patients' problems and APN interventions by patient group and individual patient; patients who require more APN time or contacts; patients with higher health care costs and those with poorer outcomes. This work is beginning to link patient problems, APN interventions, costs, outcomes and APN resources consumed. Such data are essential to develop targeted, effective nursing interventions to improve the health of vulnerable, high-volume, high-cost patient groups while maintaining reasonable health care costs—data important in evolving nursing practices and in systems of managed care.

Further work is needed in testing the model with APNs in supervisory or consultative versus direct care roles, the use of APN specialists versus registered nurse generalists, and testing with other vulnerable patient groups with frequent hospitalizations, rehospitalizations, or very high costs. The samples of the randomized trials to date have consisted of predominantly African American and White participants, reflecting national statistics for the relevant diagnoses and the demographic make-up of the recruitment sites. Applications of the model with other cultural groups are necessary. Continuing work in profiling patients' problems and APN interventions by group and individual patient, profiling high and low users of APN time and contacts, and linking them with outcomes and cost will allow more effective and efficient targeting of APN time and health care dollars toward optimal patient outcomes.

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## Table 1

Randomized Clinical Trials of APN Transitional Care Model

| Study group | APN intervention | Measures | Patient outcomes: APN intervention group | Health care costs: APN intervention group |
|---|---|---|---|---|
| VLBW infants (<1500gms) (*N*=79; 39 intervention, 40 control) | • Comprehensive discharge teaching<br>• Home visits and telephone follow-up through 18 months after discharge | • Hospital length of stay<br>• No. rehospitalizations<br>• No. acute care visits<br>• Hospital and outpatient charges<br>• Infant growth & development<br>• Infant immunization<br>• Intant morbidity<br>• Maternal affect | • Discharged mean of 11 days earlier, 200 gms less in weight, 2 weeks younger in age<br>• No differences in rehospitalizations and acute care visits, physical or mental growth of infants<br>• No differences in maternal affect | • Mean 27% reduction In hospital charges<br>• Mean reduction of 22% in physician charges<br>• Mean cost savings of $18,000 per infant |
| Unplanned cesarean birth (*N*=122; 61 intervention, 61 control) | • Enrolled at delivery<br>• Comprehensive discharge planning<br>• Home visits and telephone follow-up for 8 weeks postpartum | • Hospital length of stay<br>• No. rehospitalizations<br>• No. acute care visits<br>• Hospital and outpatient charges<br>• Complications<br>• Patient satisfaction<br>• Maternal affect<br>• Maternal self-esteem<br>• Maternal functional status<br>• Infant immunization | • Discharged mean of 30.3 hours earlier postpartum<br>• Significantly greater patient satisfaction<br>• Significantly greater number of infants immunized<br>• No maternal rehospitalization vs. 3 in control group<br>• No differences In maternal affect, self esteem, functional status | Mean 29% reduction in health care charges |
| High-risk pregnancy: Additive (*N*=97; 44 intervention, 52 control) | • Antenatal home visits & telephone follow-up in addition to routine prenatal care<br>• Comprehensive discharge planning<br>• Home visits & telephone follow-up through 8 weeks postpartum | • No. antenatal rehospitalizations<br>• Hgb A1c (women with diabetes)<br>• Fetal & neonatal deaths<br>• Infant birth weight<br>• Infant gestational age<br>• No. postpartum rehospitalizations | • Significantly fewer antenatal rehospitalizations (women with diabetes)<br>• LBW three times more prevalent in control women with diabetes<br>• No differences in affect, self-esteem, return to function, satisfaction with care, infant immunizations | Mean 44% reduction in total hospital charges |

| Study group | APN intervention | Measures | Patient outcomes: APN intervention group | Health care costs: APN intervention group |
|---|---|---|---|---|
| | | • No. postpartum acute care visits<br>• Hospital and outpatient charges<br>• Complications<br>• Maternal affect<br>• Maternal self-esteem<br>• Maternal functional status<br>• Patient satisfaction<br>• Infant immunization | | |
| Hysterectomy (*N*=109; 53 intervention, 56 control) | • Comprehensive discharge planning<br>• Home visits and telephone follow-up for 8 weeks after discharge | • Hospital length of stay<br>• No. rehospitalizations<br>• No. acute care visits<br>• Hospital and outpatient charges<br>• Complications<br>• Patient satisfaction<br>• Affect<br>• Self-esteem<br>• Sexual function | • Significantly greater satisfaction with care<br>• Mean rehospitalization costs $1500 less than controls<br>• No differences in affect, self esteem, sexual function | Mean 6% reduction in total hospital charges |
| High-risk pregnancy: Substitution (*N*=173; 85 intervention, 88 control) | • Antenatal APN home visits & telephone follow-up substituted for half of physician antenatal care in clinic<br>• Comprehensive discharge planning<br>• Home visits & telephone follow-up through 8 weeks postpartum | • No. antenatal rehospitalizations<br>• Fetal & neonatal deaths<br>• Infant birth weight<br>• Infant gestational age<br>• No. postpartum rehospitalizations<br>• No. postpartum acute care visits<br>• Hospital and outpatient charges<br>• Complications<br>• Maternal affect<br>• Patient satisfaction | • Lower fetal and infant mortality (2 vs. 9)<br>• 11 fewer preterm infants<br>• More multiple pregnancies carried to term (77% vs. 33%)<br>• Fewer prenatal hospitalizations (41 vs. 49)<br>• Fewer infant rehospitalizations (18 vs. 24)<br>• Savings of 750 hospital days | • 39% reduction in prenatal hospital charges<br>• Total savings of $2,496,145 in health care costs for mothers and infants |

| Study group | APN intervention | Measures | Patient outcomes: APN intervention group | Health care costs: APN intervention group |
|---|---|---|---|---|
| Elderly: Cardiac medical & surgical DRGs (*N*=276; 139 intervention, 137 control) | • Hospital visits<br>• Comprehensive discharge planning<br>• 2-week telephone follow-up | • No. rehospitalizations<br>• No. hospital days<br>• No. acute care visits<br>• Charges<br>• Functional status<br>• Mental status<br>• Patient satisfaction<br>• Perception of health<br>• Self-esteem<br>• Affect | • Fewer rehospitalizations, fewer total rehospitalized days in medical cardiac group from initial hospitalization to 6 weeks after DC only<br>• No differences in surgical cardiac group<br>• No differences in satisfaction and other patient and family outcomes | • Medical intervention group charges $170,248 lower at 2 weeks after DC and $137,508 lower from 2–6 weeks after DC<br>• Charges similar for medical intervention and control groups from 6–12 weeks<br>• Charges similar for surgical intervention and control groups |
| Elderly: Common medical & surgical DRGs (*N*=363; 177 Intervention, 186 control) | • Comprehensive discharge planning<br>• Home visits and Telephone follow-up for 4 weeks after discharge | • No rehospitalizations<br>• No. hospital days<br>• No. acute care visits<br>• Medicare reimbursement<br>• Functional status<br>• Depression<br>• Patient satisfaction | From initial hospitalization through 24 weeks:<br>• Fewer rehospitalizations<br>• Fewer patients with multiple rehospitalizations<br>• Fewer hospital days per patient<br>• No significant differences in acute care visits, functional status, depression, or patient satisfaction | • Medicare reimbursements for control group double that for intervention group ($1.2 million vs. $0.6 million) |