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Impact of Discharge Planning Decision Support on Time to Readmission Among Older Adult Medical Patients

Kathryn H. Bowles, PhD, RN, FAAN, FACJMI, Alexandra Hanlon, PhD, Diane Holland, PhD, RN, Sheryl L. Potashnik, PhD, and Maxim Topaz, MA

Abstract

Purpose of the Study—Hospital clinicians are overwhelmed with the volume of patients churning through the health care systems. The study purpose was to determine whether alerting case managers about high-risk patients by supplying decision support results in better discharge plans as evidenced by time to first hospital readmission.

Primary Practice Setting—Four medical units at one urban, university medical center.

Methodology and Sample—A quasi-experimental study including a usual care and experimental phase with hospitalized English-speaking patients aged 55 years and older. The intervention included using an evidence-based screening tool, the Discharge Decision Support System (D2S2), that supports Clinicians' discharge referral decision making by identifying high-risk patients upon admission who need a referral for post-acute care. The *usual care phase* included collection of the D2S2 information, but not sharing the Information with case managers. The *experimental phase* Included data collection and then sharing the results with the case managers. The study compared time to readmission between index discharge date and 30 and 60 days in patients in both groups (usual care vs. experimental).

Results—After sharing the D2S2 results, the percentage of referral or high-risk patients readmitted by 30 and 60 days decreased by 6% and 9%, respectively, representing a 26% relative reduction in readmissions for both periods.

Implications for Case Management Practice—Supplying decision support to identify high-risk patients recommended for postacute referral is associated with better discharge plans as evidenced by an increase in time to first hospital readmission. The tool supplies standardized information upon admission allowing more . time to work with high-risk admissions.

Keywords

case management; clinical decision support systems; discharge planning; efecironic health record; patient discharge; readmission

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Address correspondence to Kathryn H. Bowles, PhD, RN, FAAN, FACMI, Center for Integrative Science in Aging, University of Pennsylvania School of Nursing, 418 Curie Boulevard, Philadelphia, PA 19104 (bowles@nursing.upenn.edu)..

Conflicts of interest: The lead author, Kathryn H. Bowles, . owns equity in RightCare Solutions that might, in the future, commercialize some aspects of this work. The study was conducted and completed before the equity was obtained. The university conflict of interest committee reviewed the study and assigned a management plan that required an independent statistician (ALH) complete the study analysis and lead the interpretation of study results. The plan was followed exactly. For the remaining authors, no conflicts are declared.

Decreasing readmissions through better discharge planning (DP) and transitional care is an international priority and many teams are working on solutions to improve this measure of quality (Bauer, Fitzgerald, Haesler, & Manfrin, 2009; Boling, 2009; BOOSTing Care Transitions Resource Room Project Team, 2008; Boutwell, Griffin, Hwu, & Shannon, 2009 March; Bowles et al., 2009; Coleman, Parry, Chahners, & Min, 2006; Graumlich et al., 2009; Jack et al., 2009; Naylor et al., 1999, 2004; Preyde, Macaulay, & Dingwall, 2009; Shepperd et al., 2010). A critical step of the process occurs when the clinical team decides whether or not to refer the patient for post-acute care (PAC) services such as skilled home care, inpatient rehabilitation, or skilled nursing facility care. Although the volume of these decisions is high, there are no nationally recognized, empirically derived decision support tools in use to assist clinicians in making these important decisions. The quality of hospital DP decisions determines whether older adults receive the health and social services they need or are sent home with unidentified and unmet needs, leading to increased risk of developing costly, poor outcomes (Bowles et al., 2008; Sherman, 2009a, 2009b).

This study tested the effect of an evidence-based screening tool, the Discharge Decision Support System (D2S2), that supports clinicians' discharge referral decision making by identifying high-risk patients who need a referral for PAC (Bowles et al., 2008, 2009). The study examined whether alerting hospital case managers about high-risk patients would result in better discharge plans as evidenced by time to first hospital readmission.

Methods

Design

A quasi-experimental, two-phase study was conducted on medical units at one urban, university medical center in March 2010–October 2011. The usual care phase was studied for 8 months. Usual care included assessment for DP needs by unit-based case managers who also do utilization review and DP. They assess all newly admitted patients using a self-developed assessment form, they attend daily discharge rounds with physicians and staff nurses to formulate the plan of care, and they make decisions to recommend referrals for PAC.

In the usual care phase, the research team collected the D2S2 to note how the patients scored on the D2S2, but the results were not shared with clinicians. This phase was followed by staff education about the tool and implementation of a 1-year experimental phase when the advice from the D2S2 tool was shared with the case managers to alert them of risk status (high *risk--refer* and low *risk--do not refer*) and to study impact on time to readmission. A prospective, patient-level randomized, clinical trial was not possible because case managers are assigned to units and care for multiple patients on the same unit. The usual care condition would be contaminated.

Sample

Trained nursing student or registered nurse research assistants (RAs) daily received a list of admitted patients aged 55 years and older. The RAs removed patients who did not speak English, were on dialysis, hospice, or were admitted from an institution (their PAC was

predetermined). Eligible cognitively intact patients gave their consent to participate. Those with cognitive impairment were assented and their responsible caregiver provided consent and study information. The university institutional review board approved the study. Once consented, the RAs administered the D2S2 to all study patients or their caregivers as appropriate.

In the usual care phase, 319 patients were enrolled. However, 38 were excluded in the final analysis for the following reasons: 17 had final diagnoses that were brief stays with uncomplicated discharge plans not in need of decision support the team added these to the exclusion criteria for phase 2 (percutaneous procedure without stent, cardiac defibrillator implant without catheterization); 17 patients were missing the All Patient Refined Diagnostic Related Group (APR-DRG) score needed for severity adjustment, and four died before discharge. The final sample for analysis was 281.

In the experimental phase, 282 patients were enrolled. Thirty were excluded in the final analysis: 10 received the excluded diagnoses as a final diagnosis, five died before discharge, four had missing APR-DRG scores, and 11 did not have their scores properly shared (i.e., missing or shared too late-after discharge). The final sample for analysis was 252.

Discharge Dedsion Support System

The intervention was conducted using the D2S2. In the usual care phase, the tool results were not shared with the case managers but were used for comparison to the patients in the experimental phase where the tool results were shared with case managers as described later. The D2S2 tool was developed through a National Institutes of Health-funded study (R01-NR07674) where multidisciplinary DP experts identified the characteristics of patients needing a referral for PAC. Subsequent regression modeling of those characteristics resulted in a predictive model of six factors associated with the expert PAC referral decision: age, walking ability, length of stay, the number of comorbid conditions, depression, and self-rated health assessment (Bowles et al., 2008, 2009). Validation was completed with a hold-out sample. There is a version for patients who self-report (cognitively intact) and another for those who cannot, which is collected from a caregiver. Table 1 shows the concepts assessed by the tool. Admitting nurses or case managers ask the questions of the patient or caregiver and, depending on how a patient/caregiver answers the questions, points accumulate to reach an optimal cutoff score that was derived on the basis of the best sensitivity and specificity (area under the curve was 0.86). A reliable tool has an area under the curve of at least 0.80 (Hanley & McNeil, 1982). The cutoff score divides patients into two groups: those recommended *refer* for PAC and the others are *do not refer*. The tool is collected at admission and is repeated every 8 days to capture change in condition.

APR-DRG

Severity of illness was measured using the four APRDRG subclasses (minor, moderate, major, extreme). The score is generated from diagnoses and procedure codes, age, gender, discharge date, status of discharge, and days on mechanical ventilator (<http://www.ahrq.gov/legacy/quaVmortality/Hughessumm.pdf>, 2012). The APR-DRG severity class served as a control variable for risk adjustment.

Data Collection

Research assistants collected study data within 24–48 hours of hospital admission. In the usual care phase, sociodemographic, clinical information, and the D2S2 were collected but were not shared with the case managers. The same information was collected in the experimental phase and the D2S2 advice was shared with the case managers. Case manager documentation and final referral status were collected to determine who was offered a referral and who was actually referred for PAC. Subsequent hospital readmissions to the health system (three hospitals) were collected up to 60 days after the index discharge.

To compensate for the limitation imposed by a pre- to post-quasi-experimental design, the team also collected the readmissions for the study units 6 months before the study, during the study, and 6 months after to serve as an historical comparison to assess the average readmission rate over time. This would add information about whether other interventions or temporal effects influenced the findings.

Experimental Phase Procedures

Prior to the experimental phase of the study, the case managers and staff nurses were educated about the D2S2 by the lead investigator. In-person sessions were held on the units and included information about how the tool was developed, what the scores meant, and the case managers were instructed to discuss the information in DP rounds. Staff nurses on the units were also educated in person by the investigators about the tool and its purpose. The decision support advice (D2S2 scores and refer yes or no) was shared with case manager's for each enrolled patient by documenting the information in the case manager's note section of the electronic record. We checked every instance of information transfer for accuracy prior to inclusion in the data analysis. Currently, this process is automated, but during the study, an administrative assistant entered the information.

Data Analysis

Subjects in each phase were stratified into two score groups, those who scored “do not refer” (low-risk) and those who scored “refer” (high-risk). Subject characteristics were described using means, standard deviations, and percents. Between- and within-phase comparisons were made to ensure that we had similar patients in both time frames. Any differences were accounted for statistically. Knowing our tool identifies patients with more needs and therefore risk, it was hypothesized that within the usual care phase, differences in outcome would be evident by high- or low-risk score group, and within the experimental phase any differences would decrease because of improved DP and postacute support. Therefore, we compared the time to readmission for the high-risk and low-risk patients in the control phase to high-risk and low-risk patients in the experimental phase.

Results

Overall Sample

The usual care phase included 281 subjects. The average age was 69 years; 55 male, 58% were White race and 40% African American, and 68% saw their physician at least four times in the past 6 months. The experimental phase included 252 subjects. Similar to those

in the control phase, the average age was 69 years; 58% male, 66% were White race with 32% African American, and 66% saw their physician at least four times in the last 6 months.

Comparison of *Refer* Versus *Do Not Refer* Patients Within Usual Care Phase

The most common diagnoses were heart failure, circulatory disorders with cardiac catheterization (with and without complication), and percutaneous cardiovascular (CV) procedure with major CV diagnosis. The average age of the patients identified as *refer* was significantly older with an average age 69.7 (SD = 10.1) years, compared to those scored as *do not refer* (average age = 67.3 years, SD = 7.7 years; $p = .037$). They also had significantly more medications (average 10.4 vs 8.4, $p = .001$), more comorbid conditions (6.8 vs 5.7, $p = .003$), saw their physicians more often ($p = .038$), and had more frequent hospital admissions in the past 6 months ($p < .001$) than *do not refer* patients. In addition, APR-DRG severity levels were significantly higher among those identified as needing a referral ($p < .001$). D2S2 recommended *refer* for 61%. Case managers recommended *refer* for 76%. Discharge referral status showed that 31% of those recommended for referral did not have services scheduled because of 22% refusing and 9% not ordered. Therefore, at discharge the postacute referral rate was 55% (154/281).

Comparison of *Refer* Versus *Do Not Refer* Patients Within Experimental Phase

Similar to usual care phase patients, the most common diagnoses were heart failure, circulatory disorders with cardiac catheterization (with and without complication), and percutaneous CV procedure with major CV diagnosis. Again, the age of patients identified by the D2S2 as *refer* was significantly more with an average age of 70.7 versus 65.5 years ($p < .001$), with more comorbid conditions (average 7.6 vs 6.5, $p = .039$), more frequent hospital admissions in the past 6 months ($p = .030$), and higher APR-DRG severity levels than *do not refer* patients ($p < .001$). D2S2 recommended *refer* for 69%. Case managers recommended referrals for 74%. Discharge referral status showed that 23% of those recommended for referral did not have services scheduled due to 17% refusing and 6% not ordered. Therefore, at discharge the postacute referral rate was 57% (144/252).

Comparison Between Phases: *Do Not Refer* (Low-Risk Patients)

There were no significant differences between *do not refer* patients in the usual care phase and *do not refer* patients in the experimental phase (see Table 2).

Comparison Between Phases: *Refer* Patients (High-Risk Patients)

Patients in the experimental phase of the study, with a D2S2 *refer* status, had significantly more comorbid conditions (average 7.6 vs 6.8, $p = .024$) and a higher proportion of emergency admissions (72% vs 54%, $p < .001$) than in the usual care phase. However, patients in the usual care phase had a higher frequency of physician visits (52% vs 39% more than six times) and previous hospital admissions (36% vs 28% with two or more) than the experimental phase patients (see Table 3). Patients offered referrals in the usual care phase were not actually referred upon discharge 31% of the time. During the experimental phase, this failure to convert a recommendation to service decreased by 8% to 23% and was statistically significant ($p = .041$).

Time to Readmission in Usual Care Phase

The time to readmission in the usual care *refer* group demonstrated an increased number of readmissions over time compared with the *do not refer* patients. The readmission rate for these high-risk patients at 30 days was 23% and at 60 days was 34%. The *do not refer* or low-risk group 30- and 60-day readmissions reached 18% and 27%, respectively (see Figure 1). Larger numbers of high-risk patients identified by the D2S2 were readmitted significantly sooner than low-risk patients, indicating the ability of the tool to identify high-risk patients.

Time to Readmission After Decision Support

The time to readmission in the experimental phase patients recommended as *refer* showed a readmission rate at 30 and 60 days of 17% and 25%, respectively. The low-risk or *do not refer* group 30- and 60-day readmissions reached 16% and 24%, respectively (see Figure 2). The adjusted difference between time to readmission for *refer* and *do not refer* patients was no longer significant ($p = .495$), indicating that high-risk patients achieved readmission rates similar to low-risk patients.

Readmission Outcomes by Phase

After decision support, the percentage of *refer* or high-risk patients readmitted by 30 and 60 days decreased by 6% and 9%, respectively, representing a 26% relative reduction for both time periods. In addition, when comparing differences in the patterns of hospital readmissions according to D2S2 referral by study phase, there were significant differences in rates over time ($p < .0001$), after adjusting for APRDRG class, the number of comorbid conditions, admission type, physician office visits, previous over-night hospitalization, and clustering at the medical unit level.

Historical Control Readmissions

The average readmission rate on the study units for *all* patients (those enrolled and not enrolled in the study) during the control phase was 17.8%, and the enrolled study patients' rate was 17%. In the experimental phase, the overall rate for *all* patients on the units was 17.3% and the enrolled patients' rate was 14%, demonstrating stability over time, except for effect seen with enrolled patients in the experimental phase.

Conclusion

Evidence-based tools are much needed because nationally there is great variability in risk tolerance and decision making regarding referral decisions; some places over refer, wasting precious resources, whether others under refer, leaving patients without needed services.

Results suggest that after sharing decision support from the D2S2, time to readmission was extended for high-risk patients decreasing the relative rates of readmission by 26% at both 30- and 60-day time points. The D2S2 provides a standardized way to assess patients for characteristics commonly associated with inability to provide self-care and risk of readmission. Factors on the D2S2 tool are frequently shown to be linked to the risk of readmissions such as mobility (Callen, Mahoney, Wells, Enloe, & Hughes, 2004; Cornette et

al., 2006; Preyde & Brassard, 2011), depression (Blaylock & Cason, 1992; Hasan et al., 2010; Mitchell et al., 2010; Preyde & Brassard, 2011; Rosati, Huang, Navaie-Waliser, & Feldman, 2003), the number of comorbid conditions (Garcia-Perez et al., 2011; Preyde & Brassard, 2011; Rosati et al., 2003; Shalchi, Saso, Li, Rowlandson, & Tennant, 2009), age (Anderson, Clarke, Helms, & Foreman, 2005; Preyde & Brassard, 2011; van Walraven et al., 2010), length of stay (García-Pérez et al., 2011; Preyde & Brassard, 2011; Shalchi et al., 2009) and self-rated health (Boult et al., 1993; Pacala, Boult, Reed, & Aliberti, 1997). Based on how patients or caregivers answer the D2S2 questions, the combination of factors equates to the need for postacute support to mitigate the risk of readmission. The significant differences on sociodemographic and clinical characteristics seen between low- and high-risk patients confirm the tool performed as expected in differentiating patients.

Evidence-based teams such as Coleman's Care Transitions (Coleman et al., 2006) and project RED (Jack et al., 2009) develop and test strategies to address weaknesses in DP, but none recognized the importance of discharge referral decision making. As researchers and clinicians attempt to improve the quality of care coordination and the safety of transitions, the D2S2 contributes at a pivotal point in that process.

Implications for Case Management

In the experimental phase when case managers used decision support, high-risk patients achieved read-mission rates similar to those of low-risk patients and the difference in rates between high-risk and low-risk patients was no longer significant compared with the usual care phase. The tool may have helped the case managers identify high-risk patients early in the hospital stay and prompted them to meet PAC needs through more targeted teaching, case management, and appropriate referrals. In addition, recommended referrals were converted to actual discharge referral status significantly more often as well. Patients refused the service less often and receiving physician orders for service improved. Perhaps the case managers were identifying patients who are more appropriate or the early identification gave them more time to work with patients, families, and providers on a mutually agreeable plan of care.

Limitations

Given that this was a two-phase study, another explanation may be that over time additional interventions were implemented that affected the readmission rates over time. There were several hospital-wide transitional care interventions in place prior to the usual care phase and these remained in place throughout the experimental phase. These included unit-based pharmacists, interdisciplinary discharge rounds, and a focus on discharge teaching. However, the overall readmission rates for the study units revealed no significant variation over the course of the study. Because of limited availability of RAs, on average across the two study phases, we enrolled 13% of admitted patients from the units. Therefore, the D2S2 had its effect on a subsample of the patients admitted to those units. Although we have no reason to suspect bias, we do not know whether the impact would be the same if the tool is used on all admitted patients. Ongoing work will explore that.

The study was limited to medical patients at one academic medical center within one DP model. The tool may not perform similarly with other patient populations or DP models. Further use of the D2S2 in various hospitals and geographic locations will provide more data and refinements. In addition, there are other factors associated with risk of readmission not included in this study. Hospital characteristics such as variations in length of stay (O'Connor & Fiuzat, 2010), geographic location, teaching status, and volumes of specific procedures/patients treated (Barbieri et al., 2007; Kane, Lin, & Blewett, 2002), acuity levels, and PAC availability may impact readmissions (Jencks, Williams, & Coleman, 2009; McCarthy, How, Schoen, Cantor, & Belloff, 2009; Medicare Payment Advisory Commission, 2003). However, these characteristics were not relevant to our study because it was at one site, but they could affect generalizability elsewhere.

Another threat to validity could be differences between patients in Phases 1 and 2. However, we subsequently adjusted statistical models to account for such differences and clustering at the unit level was incorporated into the statistical modeling.

The BOOSTing Care Transitions program recognized that there are no externally validated tools to risk-stratify older patients transitioning out of the hospital. They compiled a “user-friendly” risk tool of seven variables (BOOSTing Care Transitions Resource Room Project Team, 2008). The BOOST protocol suggests that if any one of these variables exists, risk-specific interventions should be considered. However, the majority of hospitalized patients are likely to screen in. As seen in this study, the D2S2 discriminates high- and low-risk patients. The D2S2 is complementary to another screening tool, the Early Screen for Discharge Planning (ESDP) (Holland & Hemann, 2011). The ESDP identifies patients who need comprehensive assessment by a discharge specialist versus those managed by the bedside nurse. The use of the ESDP engages discharge specialists, whereas the D2S2 assists another critical decision point, who to refer for PAC.

Studies on the effects of decision support on patient outcomes are much needed. A review of the RePORT NIH database of studies 2005-2012 reveals only one study (by our team) that examines referral decision making within the DP process. The significance of the problem, the complexity, and the costly human and financial consequences of poor decisions make this an important area for research. Standardized, evidence-based DP decision support could reform how referral decision making is conducted. This study attempted to standardize a common and important step in the DP process and showed promising improvements in care.

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Biography

Kathryn H. Bowles, PhD, RN, FAAN, FACMI, Is a Professor and Director of the Center for Integrative Science in Aging at the University of Pennsylvania School of Nursing. Dr. Bowles has more than 20 years of experience and sustained NIH funding in translational care and informatics research. Her program of research focuses on using Information technology to improve care for older adults.

Alexandra Hanlon, PhD, Is a Research Associate Professor of Biostatistics at the University of Pennsylvania School of Nursing. Her methodological research focus is in longitudinal data analysis, while her collaborative endeavors can be found in the design and analysis of research studies involving oncology, women's and infant health, risk perceptions of various diseases, adolescent obesity and mental disorders, telemedicine, and bilingual language development.

Diane Holland, PhD, RN, is an Assistant Professor and Clinical Nurse Researcher at the Mayo Clinic in Rochester, MN. Dr. Holland has more than 15 years of hospital discharge planning experience and more than 10 years of experience in discharge planning and transitional care research. Her program of research focuses on improving the experience of care for patients transitioning from the hospital to home.

Sheryl L. Potashnik, PhD, is a Project Manager at the University of Pennsylvania School of Nursing. Dr. Potashnik has 28 years of experience in project management of NIH-funded RO1 and PO1 grants in the areas of gerontology, cancer epidemiology, nursing, and genetic-related research.

Maxim Topaz, MA, is a doctoral student at the University of Pennsylvania School of Nursing. Mr. Topaz is a Fulbright Scholar from Israel. His research focuses on Informatics, specifically on using clinical decision support tools to support transitions from hospitals to post-acute care settings.

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The Discharge Decision Support System (D2S2) provides a standardized way to assess patients for characteristics commonly associated with inability to provide self-care and risk of readmission.

Results suggest that after sharing decision support from the D2S2 time to readmission was extended for high-risk patients decreasing the relative rates of readmission by 26% at both 30- and 60-day time points.

FIGURE 1.

Time to readmission in usual care phase by D2S2 referral status. D2S2 = Discharge Decision Support System.

FIGURE2.

Time to readmission in experimental phase by D2S2 referral status. D2S2 = Discharge Decision Support System.

TABLE 1

The Discharge Decision Support System Assesses important Patient Needs Such as:

Mobility
Disease complexity
Mental status
Emotional status
Financial status
Caregiver availability

TABLE 2

Characteristics of the D2S2 “Do Not Refer” Group by Study Period (Usual Care Phase Compared With Experimental)

Variable	Usual Care Phase	Experimental Phase	<i>p</i>
<i>N</i>	110	77	
Mean age (SD, median)	67.3 (7.65, 67)	65.5 (7.3, 65)	.116
Mean number of medications (SD, median)	8.4 (5.1, 8)	9.84 (5.2, 10)	.061
Comorbidities (SD, median)	5.7 (2.9, 5)	6.6 (3.4, 6)	.069
Male gender (%)	67 (60.9%)	48 (62.3%)	.843
Ethnicity: non-Hispanic or Latino	109 (99.1%)	75 (97.4)	.368
Race			.630
American Indian or Alaska Native or Asian or Hispanic	4 (2.8)	5 (6.5%)	
White (%)	64 (58.7%)	50 (64.9%)	
Black or African American (%)	40 (36.7%)	22 (28.6%)	
Other (%)	2 (1.8%)	—	
Marital status			.194
Divorced or separated or single or widowed (%)	49 (44.5%)	27 (35.1%)	
Married (%)	61 (55.5%)	50 (64.9%)	
Education			
Less than high school	14 (12.7%)	9 (11.7%)	
High school complete	28 (25.5%)	27 (35%)	
Some college/college	67 (60.9%)	41 (53.3%)	
Other	1 (0.9%)	—	
Insurance			.348
Medicare	38 (34.6%)	26 (33.8%)	
Managed Medicare	28 (25.4%)	12 (15.5%)	
Medicaid	—	—	
Managed Medicaid	5 (4.6%)	4 (5.2%)	
Other Insurance	39 (35.4%)	35 (45.5%)	
Type of admission			.26
Elective	27 (24.6%)	12 (15.6%)	
Emergency	68 (61.8%)	56 (72.7%)	
Transfer	15 (13.6%)	9 (11.7%)	
Physician visits during the previous 6 months			.601
Not at all	8 (7.3%)	4 (5.2%)	
One time	10 (9.1%)	4 (5.2%)	
Two to three times	22 (20%)	21 (27.3%)	
Four to six times	30 (27.3%)	24 (31.2%)	
More than six times	40 (36.4%)	24 (31.2%)	
Overnight hospitalizations in the past 6 months			.529
Not at all	64 (58.2%)	52 (67.5%)	
One time	24 (21.8%)	14 (18.2%)	

Variable	Usual Care Phase	Experimental Phase	<i>p</i>
Two or three times	15 (13.6%)	9 (11.7%)	.675
More than three times	7 (6.4%)	2 (2.6%)	
APR-DRG severity of Illness/risk of mortality group			
minor	36 (32.7%)	19 (24.6%)	
moderate	42 (38.2%)	32 (41.6%)	
major	28 (25.5%)	22 (28.6%)	
extreme	4 (3.6%)	4 (5.2%)	

Note. APR-DRG = all patient refined diagnosis-related groups; D2S2 = Discharge Decision Support System.

TABLE 3

Characteristics of the D2S2 Refer Group by Study Period (Usual Care Phase Compared With Experimental)

Variable	Usual Care Phase	Experimental Phase	<i>p</i>
<i>N</i>	171	175	
Mean age (SD, median)	69.7 (10.1, 68)	70.68 (10.2, 69)	.352
Mean number of medications (SD, median)	10.5 (5.5, 10)	10.3 (5.4, 10)	.700
Number of comorbid conditions (SD, median)	6.8 (2.9, 7)	7.6 (3.8, 7)	.024
Male gender (%)	87 (47.3%)	97 (52.7)	.396
Ethnicity: non-Hispanic or Latino	170 (99.4%)	171 (97.7%)	.372
Race			.088
American Indian or Alaska Native or Asian or Hispanic (%)	2 (1.2%)	2 (1.3%)	
White (%)	94 (56.6%)	109 (64.5%)	
Black or African American (%)	70 (42.2%)	57 (33.7%)	
Other (%)	–	1 (.6%)	
Marital status			.134
Divorced or separated or single or widowed (%)	89 (52%)	77 (44%)	
Married (%)	82 (48%)	98 (56%)	
Education			.061
Less than high school	30 (17.5%)	31 (17.7%)	
High school complete	39 (22.8%)	59 (33.7%)	
Some college/college	109 (59.7%)	85 (48.6%)	
Other	–	–	
Insurance			.137
Medicare	71 (41.5%)	95 (54.3%)	
Managed Medicare	39 (22.8%)	35 (20%)	
Medicaid	2 (1.2%)	2 (1.1%)	
Managed Medicaid	14 (8.2%)	7 (4%)	
Other insurance	45 (26.3%)	36 (20.6%)	
Type of admission			.000
Elective	38 (22.2%)	15 (8.6%)	
Emergency	92 (53.8%)	125 (71.8%)	
Transfer	41 (24%)	34 (19.6%)	
Physician visits during the previous 6 months			.026
Not at all	3 (1.7%)	12 (6.7%)	
One time	13 (7.6%)	12 (6.9%)	
Two to three times	32 (18.7%)	32 (18.3%)	
Four to six times	35 (20.5%)	51 (29.2%)	
More than six times	88 (51.5%)	68 (38.9%)	
Overnight hospitalizations in the past 6 months			.034
Not at all	59 (34.5%)	87 (49.7%)	
One time	51 (29.8%)	39 (22.3%)	
Two or three times	41 (24%)	30 (17.1%)	

Variable	Usual Care Phase	Experimental Phase	<i>p</i>
More than three times	20 (11.7%)	19 (10.9%)	.319
APR-DRG severity of illness/risk of mortality group			
Minor	24 (14.1%)	19 (10.9%)	
Moderate	65 (38%)	60 (34.3%)	
Major	58 (33.9%)	59 (33.7%)	
Extreme	24 (14%)	37 (21.1%)	

Note. APR-DRG = all patient refined diagnosis-related groups; D2S2 = Discharge Decision Support System.