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Personalizing Nursing Home Compare and the Discharge from Hospitals to Nursing Homes

Dana B. Mukamel, Alpesh Amin, David L. Weimer, Heather Ladd, Joseph Sharit, Ran Schwarzkopf, and Dara H. Sorkin

Objective. To test whether use of a personalized report card, Nursing Home Compare Plus (NHCPlus), embedded in a reengineered discharge process, can lead to better outcomes than the usual discharge process from hospitals to nursing homes.

Data Sources/Setting. Primary data collected in the Departments of Medicine and Surgery at a University Medical Center between March 2014 and August 2015.

Study Design. A randomized controlled trial in which patients in the intervention group were given NHCPlus. Participants included 225 patients or their family members/surrogates.

Data Collection. Key strokes of NHCPlus users were recorded to obtain information about usage. Users were surveyed about usability and satisfaction with NHCPlus. All participants were surveyed at discharge from the hospital. Survey data were merged with medical records.

Principal Findings. About 85 percent of users indicated satisfaction with NHCPlus. Compared to controls, intervention patients were more satisfied with the choice process (by 40 percent of the standard deviation $p < .01$), more likely to go to higher ranked five-star nursing homes (OR = 1.8, $p < .05$), traveled to further nursing homes (IRR = 1.27, $p < .10$), and had shorter hospital stays (IRR = 0.84, $p < .05$).

Conclusions. Personalizing report cards and reengineering the discharge process may improve quality and may lower costs compared to the usual discharge process.

Key Words. Nursing homes, report cards, hospital discharge, nursing home compare, quality

The vast majority of patients, about 90 percent, enter nursing homes from hospitals.[1] By law (United States Congress 1997) and as per the hospitals' conditions of participation in Medicare (United States Department of Health & Human Services and Centers for Medicare & Medicaid Services 2013), hospitals must have a discharge plan developed for each patient by a registered nurse, a social worker, or other qualified professional. They are required to

provide each patient discharged to a nursing home with a list of nursing homes in the geographic area requested by the patient. The regulations recommend, although do not require, that hospitals obtain the list of nursing homes from the quality report card published by the Centers for Medicare & Medicaid Services (CMS) and Nursing Home Compare (NHC) (Medicare.gov 2016). Hospitals are not required to provide information about quality of nursing homes and, in fact, are not allowed to steer patients to a specific nursing home, but they are not prohibited from providing information about quality or making patients and families aware of NHC and discussing the information it provides with patients and families (Raffa 2012).

Since the introduction of NHC, the expectation among professionals and policy makers has been that NHC would become a major information resource in the discharge process and would aid patients and families in making their nursing home choices. The empirical evidence on its use is mixed. On one hand, Castle (2009) reported that 31 percent of families of nursing home residents used report cards. On the other hand, Mukamel et al. (2007) found that most nursing home administrators did not think that their clients were influenced by NHC, and a recent paper by Konetzka and Perraillon (2016) found that use of NHC was limited by both awareness and trust. Werner et al. (2012) found that patients tend to seek nursing homes with better reported performance in NHC, but they concluded that the effect was relatively small.

We hypothesized that these mixed findings and somewhat unimpressive record of NHC might be traced to two factors. The first is the limited availability of NHC at the time and place when patients and families are making their choice of a nursing home, which for the majority is the hospital bed where a computer with Internet connectivity is not available. While NHC has recently been made available on a smartphone-compatible platform, most patients and families, unless prompted and directed to the NHC site, are not likely to find it on their own and consult it when they need to choose a nursing home

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(Konetzka and Perraillon 2016). Therefore, unless the hospital discharge planner brings the information to patients, the patients remain unaware of NHC and do not access it.

The second limitation of NHC is that it has a large number of clinical quality measures (QMs), as well as measures of staffing levels and health inspections, about 20 altogether. Studies have shown that the human mind has difficulty making choices when faced with several options that differ on a large number of attributes (Scammon 1977; Malhotra 1982). To help consumers, CMS has introduced four 5-star measures. These combine the individual QMs into four composites, that is, summary statistics, and assign each provider stars based on their performance—five stars to the best performers and one star to the worst (Medicare.gov 2015). The limitation of the five-star measures, however, is that they are "one size fits all" measures. The individual QMs that are included in the five-star measures and the rules that determine how to combine the QMs into the star measures reflect importance weights determined by CMS with the advice of experts (Centers for Medicare & Medicaid Services 2010). These measures do not recognize that patients' medical needs and preferences vary. A recent study (Mukamel et al. 2016) has shown that when patients are given the opportunity to construct their own composite measures from the NHC QMs, staffing and health inspections information, they construct measures that are substantially different from the NHC five-star measures. These individual composite measures also vary substantially across patients. When using their personal composite measures, only about a third of patients ranked nursing homes in their choice set the same as if they would have used the overall NHC five-star measure. The other two-thirds of patients ranked nursing homes differently than does the NHC five stars. These patients perceive quality and make nursing home choices that differ from choices based on the NHC five-star rankings.

To address these two limitations, personalization and accessibility, we developed an alternative to the "usual discharge process," or UDP, called the NHCPlus discharge. We report here on the results of a randomized controlled trial (RCT) in which we tested the NHCPlus discharge process against the UDP.

The NHCPlus Discharge Process

The NHCPlus discharge process has two elements: the NHCPlus app and the reengineered discharge process in which the app is embedded.

The NHCPlus app has three modules: (1) an educational module provides information to users about each of the QMs, staffing, and health inspections measures, and their implications for nursing home residents; (2) a preference elicitation module allows users to identify the QMs, staffing, and health inspections measures they wish to include in their composite and their relative importance; and (3) a results module provides a sorted list of nursing homes in the users' choice sets and the QMs of these nursing homes. NHCPlus has two versions. One is designed for short-stay nursing home patients, which are those who enter primarily for rehabilitation and postacute care with the expectation of returning to the community after 1 or 2 weeks. The other is designed for long-stay patients who are likely to stay in the nursing home indefinitely. NHCPlus combines the user's ranking of the QMs with the CMS published values for each QM to obtain the individualized composite quality score. Users have the option to add price information and consider distance as well. NHCPlus allows patients and families to create their own personal composite measure based on their own medical needs and preferences, and the NHC QMs.

The reengineered discharge process begins as soon as the decision of discharge to a nursing home has been made by the clinical team. The decision is relayed to the patient and the family, and an iPad with NHCPlus on it is given to the patient and left at the bedside to ensure early engagement and accessibility. The patient and family can continue to use NHCPlus until they have made a decision, at which time they send their final sorted list of nursing homes electronically to the discharge planner to begin placement. This process contrasts with the UDP, in which patients and families often are not aware of the discharge decision for several hours to a day, at which time they are given a list of nursing homes and told to choose one. Under the UDP, they are typically not offered any information about the nursing homes on the list, except for address and phone number.

Hypotheses and Outcomes Tested in the RCT

The design of the NHCPlus app, which includes both an educational and a preference elicitation module, led us to expect that compared with the UDP, NHCPlus patients will be better informed about their decisions and, therefore, will be more satisfied with their decision-making process and make better choices. Hence, we expected them to go to better quality nursing homes and to be willing to travel further, as they trade off distance from their home in favor of going to a better nursing home. Furthermore, we expected them to be

discharged earlier for two reasons. First, by providing patients with access to NHCPlus at the bedside as soon as the decision to discharge to a nursing home was made, patients and families were able to start "shopping" for nursing homes early and were likely to finish earlier. Second, having understandable information about what is important when choosing a nursing home, and having gone through the preference elicitation exercise, users were likely to be more confident in their decision (as we hypothesize above) and might have required less time to reach a decision.

We, therefore, tested the following four main hypotheses.

Compared with the UDP group, the NHCPlus group would have on average:

H1: More confidence in the decision/choice of nursing home they made;

H2: Higher satisfaction with the decision process;

H3: Higher likelihood of discharge to a better quality nursing home in the patient choice set;

  H3a: Measured by the NHC expert benchmark;

  H3b: Inferred from travel to further nursing homes;

H4: Shorter hospital length of stay.

METHODS

Description of the RCT and Data

The NHCPlus discharge was tested in an RCT with 225 patients admitted from the community and discharged to nursing homes from a University Medical Center, Departments of Medicine and Surgery, between March 2014 and August 2015. The discharge process began as soon as the medical team informed the patient that a nursing home discharge was needed. Potential patients or their families (if the patient was unable to consent) were recruited into the study, consented, and then randomized into two groups. The intervention group (118 patients) received NHCPlus to assist them and their families in choosing a nursing home. The control group (107 patients) received the UDP only.

For patients randomized to NHCPlus, the project coordinator secured the iPad to the patient's bed, provided background on NHCPlus and how to use it, and started the patient on the app. Patients and families (the users) were allowed to interact with the app for as long as they needed in order to reach a decision. Patients kept the iPad anywhere from a few hours to a few days. Often NHCPlus was used by patients together with their families or by the

families alone. It is not atypical for nursing home placement decisions to be made by family members, as many patients are cognitively unable to make the decision (Castle 2003). Therefore, we view the decision-making unit in this study as the patient and the family. More details about NHCPlus and the RCT were reported in Sorkin et al. (2016).

Usability Data. We collected key strokes as well as all other data that were entered into the iPads by the 118 patients and family members randomized to the NHCPlus group. This included information about who were the users (patient or family), information about their use of the educational module, information about their preferences, and information about their choices of nursing homes. Of the 118 in the NHCPlus group, 116 responded to a usability survey about their experience with NHCPlus. This survey was collected on the iPad and was administered once the users sent their final list of nursing homes to the discharge planner, indicating that they were finished using NHCPlus.

Medical Records. Data for all 225 patients were obtained. These data included admission and discharge dates, MS-DRG codes, primary and secondary diagnoses and procedure codes, date of birth, gender, zip code of residence, the nursing home that the patients were discharged to, and the patients' discharge planners.

Exit Survey. Of the 225 study participants, 196 responded to an exit survey administered at discharge from the hospital: 29 (13 percent) did not complete the exit survey, with equal attrition rates for both groups. The exit survey included information about the patient and the decision maker (if different), including race and ethnicity, income, and education. It also measured conflict with the decision and satisfaction with the decision process. To assess decisional conflict, participants were asked five questions that assessed decision uncertainty, specific factors contributing to the uncertainty, and perceived effectiveness of the decision making. For example: "The decision to select [fill in name of the nursing home] was hard for me to make." Items were adapted from O'Connor (1995) and Wills and Holmes-Rovner (2003). Ratings were made on a 5-point scale (1 = *strongly agree*, 5 = *strongly disagree*). Responses were reverse coded if needed and averaged to create a variable representing less conflict, which we label as "confidence in the decision." Satisfaction with

the decision was assessed using a five-item scale adapted from Wills and Holmes-Rovner (2003). For example: "I am satisfied with my decision to go to [fill in name of the nursing home]." Ratings were made on a 5-point scale (1 = *strongly agree*, 5 = *strongly disagree*). All responses were reverse coded and averaged.

Analyses

We performed five analyses, one describing users' experience with the NHCPlus app and four testing the hypotheses stated above.

   We assessed users' experience based on responses to the usability survey. We report the percent of patients who used NHCPlus alone, percent of family members who used it alone, and percent of patients and families who used it together. We also present the percent of users who report using NHCPlus a lot or very little and users' agreement with several statements about their experience using NHCPlus.

   Because confidence in the decision and satisfaction with the decision variables were calculated as averages of five-item scale, we excluded subjects with three or more missing items. Three subjects were, therefore, deleted from the confidence measure and four from the satisfaction measure.

   Testing the general hypothesis about discharge to better quality nursing homes is not feasible. Data show that the various dimensions of nursing home quality are not correlated, and, hence, there is no "one best nursing home." Furthermore, because preferences for which quality dimensions matter differ across individuals (Mukamel et al. 2016), nursing homes' quality can only be judged within each individual's framework, which was the motivation for personalizing NHCPlus. Because of this inherent limitation, we address this question by testing two subhypotheses. The first is motivated by the fact that about a third of patients have been shown to agree with the NHC five-star expert ranking of nursing homes (Mukamel et al. 2016). These patients should increase the probability that the NHCPlus group on average would enter nursing homes ranked higher by the NHC five-star measures. We, therefore, test whether the intervention patients were more likely to be discharged to nursing homes with higher NHC overall five-star measure and the three five-star subcomponents—health inspections, the QMs, and staffing. For these tests, we accounted for the fact that nursing home choice is typically made within a small geographic area and that the nursing homes in that area may not all be of four- or five-star ranking. We defined an indicator variable for each

patient that assumed the value 1 if the patient was discharged to the nursing home with the highest rating among all nursing homes in their geographic area (i.e., their choice set) based on the five-star composite, and 0 otherwise. The choice set for the NHCPlus group was defined by the users, as part of using the app. Because we did not have this information for the UDP group, we assumed their search zip code to be their zip code of residence, obtained from the medical record, and imputed their search radius based on the NHCPlus group, conditional on the zip code.

The second subhypothesis is that patients in the intervention group will on average choose nursing homes that are further away from their residence. This is likely to be the case if patients using NHCPlus understand that there are quality differences between nursing homes and are able to identify those that are of higher quality and hence are willing to travel further in order to benefit from the better quality they offer. Travel distance was measured using the geodetic distance between the patient residence zip code centroid reported in the medical record and the nursing home zip code. Eleven patients were excluded from this analysis because they were out of state residents or their travel distance exceeded 60 miles.

Hospital length of stay (LOS) was defined as the difference between discharge and admission dates as recorded in the medical record.

Because initial analyses showed differences between those who did not complete the exit survey (noncompleters) and those who did, we tested all hypotheses using regression models that included indicator variables for the NHCPlus group, noncompleters, and an interaction of the two. The intervention effect for noncompleters was calculated as the sum of the coefficients for the intervention and the interaction terms. We also controlled for patient's age, gender, patient case mix index, and whether or not the patient had a surrogate. For the LOS model, we also included discharge planners random effects to account for potential correlation between patients whose discharge plan was handled by the same staff person. Random effects were not significant for any of the other models. Inference was based on robust standard errors to account for any remaining unaccounted-for heteroscedasticity.

FINDINGS

Table 1 describes the study patient population and the RCT outcomes. There were no statistically significant differences in patient characteristics between the

Table 1:   Descriptive Statistics of the Patients and RCT Outcomes—Comparison of the NHCPlus Discharge Process Group and Usual Discharge Process Group

	Usual Discharge Process Group[†] (N = 107)	*NHCPlus Discharge Process Group[†] (N = 118)*
Age, mean (SD)	75.6 (10.5)	74.9 (9.9)
Gender, *N*(%)		
Male	47 (43.9)	47 (39.8)
Female	60 (56.1)	71 (60.2)
Race, *N*(%)		
Non-Hispanic white	49 (53.3)	55 (54.5)
Hispanic	22 (23.9)	26 (25.7)
Asian or Pacific Islander	16 (17.4)	11 (10.9)
African American/black	5 (5.4)	5 (5.0)
Other	0 (0)	4 (3.9)
Total	92	101
Surrogate, *N*(%)		
No	34 (31.8)	40 (33.9)
Yes	73 (68.2)	78 (66.1)
Education, *N*(%)		
Grade school or none	19 (21.4)	21 (21.2)
High school diploma or equivalent	35 (39.3)	41 (41.4)
Postsecondary	35 (39.3)	37 (37.4)
Total	89	99
Household income, *N*(%)		
$0–$20,000	36 (46.2)	46 (49.5)
$20,001–$50,000	28 (35.9)	24 (25.8)
More than $50,000	14 (18.0)	23 (24.7)
Total	78	93
Marital status, *N*(%)		
Married or living with a partner	43 (46.7)	50 (49.0)
Divorced, widowed, separated, never married	49 (53.3)	52 (51.0)
Total	92	102
CMS MS-DRG weights[‡], mean (SD)	2.55 (1.71)	2.69 (2.21)
Noncompleters[§], *N*(%)		
Yes	14 (13.1)	15 (12.7)
No	93 (86.9)	103 (87.3)
Randomized control trial outcomes		
Confidence in decision (1–5 range 5 = best), mean (SD)	3.73 (0.65)***	3.99 (0.63)
Satisfaction with decision (1–5 range 5 = best), mean (SD)	4.06 (0.69)***	4.33 (0.55)
Distance between patient residence and discharge nursing home (in miles), mean (SD)	6.2 (6.4)*	7.9 (10)

Table 1. *Continued*

	Usual Discharge Process Group[†] (N = 107)	NHCPlus Discharge Process Group[†] (N = 118)
Hospital average length of stay (days), mean (SD)	9.00 (6.94)	8.88 (8.32)
Patients discharged to nursing homes with best five-star rating—overall, %	40.2**	52.5
Patients discharged to nursing homes with best five-star rating—health inspections, %	13.1***	27.1
Patients discharged to nursing homes with best five-star rating—QMs, %	68.2***	83.1
Patients discharged to nursing homes with best five-star rating—staffing %	11.2	12.8

[†]Patient characteristics were not significantly different between the two groups at the .05 level.
[‡]From table 5, 2014 Final Rule. https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY-2014-IPPS-Final-Rule-Home-Page-Items/FY-2014-IPPS-Final-Rule-CMS-1599-F-Tables.html
[§]A subject was defined as a noncompleter if he or she were discharged to a skilled nursing facility but did not complete an exit survey.
Significance level for unidirectional hypotheses that outcomes for the NHCPlus group are better than for the UDP group: *p < .1; **p < .05; ***p < .01.

NHCPlus and UDP groups at the .05 level. RCT outcomes were better for all eight study measures, as hypothesized. Six were statistically significant at the .05 level (for a unidirectional hypothesis). These included higher confidence in and satisfaction with the decision, and larger percents of patients discharged to nursing homes with the highest ranking by NHC five-star in their choice set based on the overall measure, the health inspection measure, and the QMs measure. Distance from patient resident to the chosen nursing home was significantly longer for the NHCPlus group at the 0.1 (unidirectional) level. Hospital LOS and percent of patients discharged to the highest ranking nursing home based on the NHC five-star staffing measure were not significantly different.

Table 2 presents findings from the usability survey for the 116 individuals who used NHCPlus: 16 percent were patients who used the app by themselves, 62 percent were family members who used it by themselves, and 22 percent used it jointly, with 11 percent indicating that they used it equally. The majority indicated that they used it a great deal or a lot, 20 percent used it somewhat, and only 10 percent said they did not use it very much or did not use it at all. Most users agreed that the information was useful and that they would want to

Table 2:   User's Experience with NHCPlus ($n = 116$)

	Patient Only (%)	Patient and Family Equally (%)	Family Only (%)
Who used NHCPlus?	16	11*	62

	A great deal/A lot (%)	Somewhat (%)	Not very much/ Not at all (%)
How much did you personally use NHCPlus?	70	20	10

	Strongly Agree/ Agree (%)	Neither Agree/ Disagree (%)	Disagree/Strongly Disagree (%)
The information was very useful	88	4	8
I would use NHCPlus again	86	5	9
I would recommend NHCPlus to family and friends	84	9	8
I did not understand the screens with all the colors (rankings) and did not know what I am supposed to do	8	15	78
I had difficulty deciding which QMs were important	15	22	64

*Another 11% of the sample used it jointly to varying degrees.

use it again and would recommend it to others. They understood the preferences elicitation screens and were able to decide which QMs were important.

Table 3 summarizes the results of the regression models comparing the outcomes of the NHCPlus to the UDP groups. The full models are shown in the appendices. The results are shown for both the completers (87 percent) and the noncompleters group (13 percent) for all outcomes. For the completers and all outcomes, except for quality measured by the staffing five-star measure, the NHCPlus effect is, as hypothesized, positive and significant at the $p < .05$ level or better, and for distance at the $p < .10$ level, when testing for unidirectional hypotheses. For the noncompleters none of the results are significant.

For completers, the effect of the NHCPlus process on confidence with the decision was 40 percent of the standard deviation of this measure (0.26 compared with 0.65). The effect on satisfaction was 43 percent of the standard deviation (0.27 compared with 0.63). The odds of the patient being discharged to the highest ranked five-star nursing home in his or her choice set were 80 percent higher for the NHCPlus group when quality was measured by the

Table 3:   Results of Regression Models Comparing Outcomes between the NHCPlus Discharge Process and the Usual Discharge Process Groups[†]

		Effect of Using NHCPlus	
	Units	*Completers (n = 196)*	*Noncompleters (n = 29)*
Confidence in decision	1–5 range: 5 = Best	0.26***	N/A
Satisfaction with decision	1–5 range: 5 = Best	0.27***	N/A
Overall quality of nursing homes—five-stars	Odds ratio for choosing the best nursing home available in the patient's choice set	1.8**	1.3
Health inspections five-stars		3.0***	0.97
QMs five-stars		2.8***	1.60
Staffing five-stars		1.2	0.92
Distance from zip code of patient residence to zip code of discharge nursing home	Incidence rate ratio for further distance from residence	1.27*	1.27
Hospital length of stay	Incidence rate ratio for having a shorter stays	0.84**	1.6

[†]Summary results from eight separate regression models controlling for completers status, interaction between completer status and intervention, case mix, age, gender, and having a surrogate. Full models are available in the Appendices.
Significance level for unidirectional hypotheses that outcomes for the NHCPlus groups are better than for the UDP group: *$p < .1$; **$p < .05$; ***$p < .01$.

overall five-star measure. They were 3 times higher when measured in terms of health inspections, and almost as high, at 2.8, when measured in terms of the QMs five stars. Distance from residence was 27 percent higher with an incidence rate ratio (IRR) of 1.27. Hospital stays were on average 16 percent shorter, with an IRR of 0.84.

DISCUSSION

We report on testing of an alternative to the usual discharge process to nursing homes that about 3 million hospital patients experience annually.[2] The NHCPlus app and discharge process were designed to address the limitations of current practice. Our RCT findings demonstrate that they lead to greater patient confidence and satisfaction; higher probability of discharge to better

quality nursing homes based on two indicators of quality: the NHC expert benchmarks and the willingness of patients to travel further from home; and shorter hospital stays.

Impact on Health Outcomes

We can infer the impact of the NHCPlus discharge process on health outcomes from three findings of the RCT:

- *Higher probability of discharge to higher NHC expert-ranked nursing homes in the intervention group*: This finding is likely driven by and applies to the one-third of patients whose medical needs and preferences coincide with the importance ranking of the NHC experts. Based on findings by Unroe et al. (2012), we can surmise that these patients are likely to have better health outcomes compared to similar patients in the UDP group with similar medical needs who went to lower star ranked nursing homes. In this RCT, we do not have similar quality benchmarks for the nursing homes to which the other two-thirds of the NHCPlus group patients were discharged. However, it is reasonable to assume that as their placement was guided by matching their medical needs and preferences to the performance of nursing homes as measured by the CMS QMs that they also would experience better health outcomes compared with their UDP counterparts who chose a nursing home without the advantage of such a matching process.
- *Further distance traveled by the intervention group*: The literature has shown that the likelihood of choosing a nursing home increases the closer the nursing home is to the patient's home (Hill 2001; Pesis-Katz et al. 2013). Therefore, the finding that the intervention patients are entering nursing homes that are further away from their residence suggests that they are trading off quality for distance. While indirect, this is evidence suggesting that intervention patients are discharged to higher quality nursing homes and hence are likely to experience better health outcomes. We note that this finding was significant only at the .1 level, unlike all other findings which were significant at the .05 level or better. This more marginal level of significance, despite the relatively large effect size of 27 percent, might be due to one or both of two factors. First, our precision in measuring distance was limited to zip code centroid rather than actual addresses of patient/family residences and nursing homes. This measurement error is likely to increase the standard error and lower the significance. Second,

we measured the distance of the UDP group with additional error. Because we did not have actual data about their choice set, we imputed the choice set for the control group based on the zip code of residence reported in the medical record and the observed choice set for the NHCPls group. This likely introduced a bias against the null for cases in which choice sets were defined by a family member's residence rather than the patient's. Such a bias dampens the measured effect and its statistical significance.

- *Shorter hospital stays among the intervention patients*: The shorter LOS among the intervention patients lowers the probability of hospital acquired infections and diseases—an additional day in the hospital was found to increase the probability of infections by 1.37 percent (Hassan et al. 2010).

Cost Implications

The shorter LOS also has important cost implications. Using our institution's financial data, we calculated that a 16 percent reduction in LOS translates to approximately $1,500 in cost savings per discharge to nursing home. Our 400 bed hospital had 1,600 nursing home discharges in a year. If all patients experience this LOS reduction, then total cost savings due to shorter LOS would amount to about $2.4 million. To properly evaluate these savings, they have to be assessed against the costs of implementing NHCPlus, which we did not measure in this RCT.

Generalizability

To address generalizability, we consider impact on and acceptance by the discharge planners and the patients and their families.

Each hospital has its own culture, work environment, and "ways of doing things." While there are similarities across hospitals, some in fact imposed by the regulations that all have to meet, there are also many idiosyncrasies. In particular, in some hospitals the discharge planning is done by RNs, in some by case managers who are RNs with additional training, in some by social workers, and in others by other professionals specifically trained for this function. Despite these differences, we believe that NHCPlus can be adapted into the workflow of most hospitals. One of the more important factors contributing to its success is offering NHCPlus to patients and families early in their decision-making process, as soon as

the choice to discharge to a nursing home has been made. While discharge planners are typically very busy and may not be able to get to all patients right away, the time required to initiate the process with the patient or family is short, on the order of 5–10 minutes. Once users have been set up and given a short orientation, most can proceed on their own. Of course, further testing at other hospitals, including community hospitals, would offer direct evidence about generalizability.

The second group to consider is patients and their families, the users of NHCPlus. We were unable to find statistics describing patients discharged from hospitals to nursing homes and, therefore, compared our sample to the general U.S. population aged 65 and over, those at highest risk for nursing home admission. The racial and ethnic mix of the patients discharged from our institution tends to be skewed toward a larger percent of Hispanics (25 percent vs. 7 percent nationally), more Asians and Pacific Islanders (around 15 percent vs. 3 percent), and fewer blacks (5 percent vs. 8 percent) (West et al. 2014). In terms of education, our sample had a similar percent of patients without high school degree as nationally (around 20 percent), but had more with postsecondary degrees (39 percent compared to about 30 percent) (West et al. 2014). The income distribution in our patient population (when compared to those that are 75 years old and over nationally) was skewed toward lower incomes, with almost 50 percent with annual income below $20,000 compared with 35 percent nationally (Census.gov 2013). These data suggest that our patient population may not be generalizable to the United States as a whole, and further testing, particularly with blacks and individuals of mid-level educational attainment, may be warranted.

We note, however, that while our sample was not large enough to allow subanalyses of the outcomes by patient characteristics, including race and education, anecdotal evidence provided by the project coordinator and the discharge planners indicated that all patients and all families were able to interact effectively with NHCPlus with only a handful requiring assistance. We also note that NHCPlus was designed to be easy to use, with large fonts and many white spaces, easy navigation, and emphasis on understanding by elderly patients through the use of vignettes and video demonstrations. Furthermore, the design of NHCPlus and its use protocol were developed to ensure integration into the workflow for the discharge planners at the hospital. We believe that these features contributed to its success. These features should also

contribute to its sustainability, once adopted into usual care at our institution, and with the proper adaptation, at other hospitals.

A limitation of this study is our inability to test the hypothesis of discharge to a better quality nursing home with respect to a direct, objective, universally agreed-upon measure of quality. This is due to the intrinsic nature of quality, which is multidimensional, with dimensions that are uncorrelated or only minimally correlated and, therefore, not reducible to a single metric. This is not something that we can hope to overcome with more resources or better methodology. We can, however, learn from the different perspectives on quality—experts in NHC five stars versus patients and families in NHCPlus—and the relationships between them. Our findings show a large effect of NHCPlus compared to the UDP on the odds of discharge to nursing homes with better five-star health inspections and QM ratings, but not staffing. One might speculate that staffing is a quality signal that is easily understood by all. Therefore, the marginal value of the NHCPlus educational module for this measure is negligible and probably did not affect the choice of a nursing home. On the other hand, both health inspections and QMs are not familiar to the typical user, and having had the opportunity to learn about it in NHCPlus enabled users in this group to make better choices with respect to these dimensions of quality. Further studies with different patient populations are required.

Summary

We developed an alternative to the NHC report card that allows patients and families to individualize their choices of nursing homes to their medical needs and preferences, and embedded it in a delivery model that brings it to the decision-making nexus. We conducted an RCT, comparing NHCPlus to the usual discharge process, in which patients and families may or may not consult NHC on their own. The RCT has shown that the NHCPlus discharge process increases patients' and families' satisfaction with their decisions, lowers their cognitive conflict, increases the probability of placements in higher five-star-rated nursing homes, leads patients to accept placement in nursing homes that are farther away, presumably trading off distance and quality, and shortens hospitals stays.

Our RCT, due to limited resources, compared only the NHCPlus discharge to the UDP and did not include a third comparison, with an NHC discharge. We expect that some patients may prefer to rely on experts' opinion

and may be more comfortable with the five-star ranking then their own personal composite ranking. Therefore, we recommend that the NHCPlus discharge process be improved by adding to the NHCPlus app the option of accessing NHC and allowing patients to choose a nursing home based on either the expert or the personal composites.

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NOTES

1. Authors calculations from the Minimum Data Set.
2. Authors calculations from the Minimum Data Set.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Appendix SA2: Confidence in the Choice of Nursing Home (Model: Ordinary Least Squares with Robust Standard Errors).

Appendix SA3: Satisfaction with the Decision Process (Model: Ordinary Least Squares with Robust Standard Errors).

Appendix SA4: Odds Ratios for Discharge to the Highest Quality Nursing Home in the Choice Set (Models: Logistic with Robust Standard Errors).

Appendix SA5: Driving Distance from Patient Zip Code of Residence to Discharge Nursing Home Zip Code (Model: Poisson Regression with Robust Standard Errors).

Appendix SA6: Hospital Length of Stay (Model: Poisson with Random Case Manager Effects and Robust Standard Errors).