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## Original Study

## Project ReEngineered Discharge (RED) Lowers Hospital Readmissions of Patients Discharged From a Skilled Nursing Facility

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## A B S T R A C T

**Keywords:**  
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**Context:** Patients admitted to skilled nursing facilities (SNFs) have a high risk for rehospitalization.  
**Objective:** The goal of this project was to implement Project RED in an SNF to increase patient preparedness for care transitions and lower rehospitalization rates in the 30 days after discharge from the SNF facility.

**Design:** Intervention study with historical control; phone survey 30 days after discharge from the SNF for data collection.

**Setting:** The study was conducted in an SNF admitting patients from acute care hospitals in Boston, MA.  
**Patients or Other Participants:** A consecutive sample of patients in the SNF before ( $n = 524$ ) and after initiation ( $n = 100$ ) of the intervention. Participants had an average age of 80 (SD = 10), 67% were female, and 84% were non-Hispanic white. Phone surveys were completed with 88% of participants in each group.

**Intervention(s):** We adapted Project RED for use in an SNF. This includes a comprehensive approach to transitions of care that includes creating and teaching a personalized care plan to patients and their families. Software facilitating these activities was integrated into the electronic medical record of the SNF; intervention activities were delivered by existing staff.

**Main Outcome Measure(s):** The main outcome was hospital readmission within 30 days of discharge from the SNF. Secondary outcomes included attendance to a medical appointment within 30 days of discharge from the SNF and preparedness for care transitions as measured by a 6-item survey.

**Results:** The rate of hospitalization 30 days after discharge from the SNF for participants prior to the intervention was 18.9% and for participants during the intervention was 10.2%,  $P < .05$ . This remained significant adjusting for multiple potential confounders ( $P = .045$ ). More patients in the intervention group had attended an outpatient appointment within 30 days of discharge (70.5% versus 52.0%,  $P < .003$ ). In addition, intervention participants reported a higher level of preparedness for care transitions.

**Conclusions:** Patients in the intervention had a lower rate of returning to the hospital within 30 days of discharge from the SNF, were more likely to attend medical appointments, and were better prepared for their care transition.

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Rehospitalizations of patients from skilled nursing facilities (SNFs) are costly and contribute to fragmentation of medical care.<sup>1,2</sup> It is

R.E.B. is the primary investigator and had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. R.E.B., R.S., R.N.J., Z.F., and B.K.I.H. report no financial disclosures or conflicts of interest. The Hebrew SeniorLife Physician-in-Chief fund supported the time of the staff for this improvement project.

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estimated that 23% of Medicare patients being discharged from a SNF will be rehospitalized within 30 days.<sup>3</sup> Some of the avoidable admissions stem from lack of resources in the SNF, poor communication during transitions of care, and lack of patient and family engagement in understanding their medical problems and plan of care.<sup>3–5</sup>

Most of the literature on interventions to improve care transitions has come from acute care settings; there have been fewer studies examining interventions conducted at SNFs.<sup>6,7</sup> Presence of onsite medical practitioners, comprehensive nursing assessment programs, palliative care consults for high-risk patients, and team conferences have been associated with declines in acute hospital transfers.<sup>8–10</sup>

Project RED (Project ReEngineered Discharge) has been shown in an acute care setting to lower rehospitalization rates by 30%.<sup>11</sup> Project RED uses a checklist to ensure delivery of a comprehensive care transition process, includes a method for patient and family education and engagement, and emphasizes proper connection with community clinicians after discharge. We adapted Project RED for use in an SNF and implemented the program in the subacute unit of our facility. Our primary hypothesis was that the 30-day rate of rehospitalization to an acute care facility after discharge from the SNF would be lower than we observed before the intervention. Secondary hypotheses were that patients in the intervention phase would have a higher rate of attendance to outpatient provider visits and be better prepared for discharge.

The Hebrew SeniorLife (HSL) institutional review board approved this study.

## Methods

Project RED was adapted for implementation at an SNF by a planning committee composed of a patient who had been discharged from the unit, floor nurses, the medical director of the SNF (R.E.B.), the license administrator for the SNF, the director of nursing, a staff therapist, a dietician, and both social work case managers. The committee sought input from a range of stakeholders, including

patient family members, home care nurses and administrators, clergy, and experts in interventions for care transitions.

The intervention consisted of a modified version of Project RED (Table 1). Specific modifications included (1) printing and reviewing a draft of the care plan with the patient and family at the time of the first care plan meeting and a final draft on day of discharge; (2) all the SNF medical records are electronic and the Project RED server was integrated with the SNF data repository so that all elements other than the name of the primary care physician and visiting nurse information were automatically transferred to the Project RED software without manual data entry; (3) the care plan contained the elements in the original Project RED (eg, medication list, follow-up appointments, and primary care doctor contact information), as well as additional data regarding advance directive orders, durable medical equipment, and visiting nurse contact information; and (4) a copy was made for caregivers who were designated by the patient as the coordinator for care in the home. A copy of the care plan was left in the patient room in a designated spot to help all staff locate it and use it for daily patient and caregiver education, particularly when family visited in the evening hours. Staff reviewed the care plan with a caregiver if a patient was noted to be cognitively impaired.

The intervention was implemented on a 50-bed subacute unit at the Hebrew Rehabilitation Center in Boston, MA. This SNF is housed within a 450-bed long term care hospital facility that contains both long term care and long term acute care units. There are

**Table 1**  
Components of Project RED

	As Implemented in the Original Project RED	As Implemented in the Skilled Nursing Facility
1. Make appointments for follow-up medical appointments and postdischarge tests/labs	<ul style="list-style-type: none"> <li>• Social worker: Determine providers names and numbers</li> <li>• Nurse practitioner: Call primary care before discharge</li> <li>• Secretary: Make appointments when transport available</li> <li>• Home care liaison: Plan initial services</li> </ul>	<ul style="list-style-type: none"> <li>• As in original program</li> </ul>
2. Plan for follow-up of test/study results pending at discharge	<ul style="list-style-type: none"> <li>• Designated "Discharge Advocate" nurse: Review plan for results still pending at discharge</li> </ul>	<ul style="list-style-type: none"> <li>• Implemented by regular staff nurse with focus instead on tests/studies to be done after discharge</li> </ul>
3. Organize postdischarge services and equipment	<ul style="list-style-type: none"> <li>• Home care coordinator: Ensure durable medical equipment is arranged</li> </ul>	<ul style="list-style-type: none"> <li>• As in original program</li> </ul>
4. Identify correct medicines and a plan for the patient to obtain and take them	<ul style="list-style-type: none"> <li>• Designated "Discharge Advocate" nurse: Review medicine list with patient and medical team, including purpose, instructions, side effects, and changes, and addressing concerns</li> </ul>	<ul style="list-style-type: none"> <li>• Implemented by regular staff nurse</li> </ul>
5. Reconcile discharge plan with national guidelines	<ul style="list-style-type: none"> <li>• Designated "Discharge Advocate" nurse: Resolve discordance between discharge plan and guidelines with team</li> </ul>	<ul style="list-style-type: none"> <li>• Not implemented</li> </ul>
6. Teach a written discharge plan	<ul style="list-style-type: none"> <li>• Designated "Discharge Advocate" nurse: Create After Hospital Care Plan (AHCP) and use AHCP to teach patient and family</li> </ul>	<ul style="list-style-type: none"> <li>• Implemented by regular staff nurses: Draft of Care Plan reviewed with patient and family by end of first week</li> <li>• Finalized Care Plan printed on the evening shift on the night prior to discharge</li> <li>• Day of discharge: Staff nurse reviews Care Plan with patient and family</li> </ul>
7. Educate the patient about his or her diagnosis	<ul style="list-style-type: none"> <li>• Designated "Discharge Advocate" nurse: Meet with the patient and family to provide supplemental education and discharge preparation</li> </ul>	<ul style="list-style-type: none"> <li>• Implemented by regular staff nurses using the Care Plan</li> </ul>
8. Assess the degree of the patient's understanding of the discharge plan	<ul style="list-style-type: none"> <li>• Designated "Discharge Advocate" nurse: Ask patient to explain in his or her own words details of the plan using the teach-back technique</li> </ul>	<ul style="list-style-type: none"> <li>• Implemented by regular staff nurses: Ask patient to explain in his or her own words details of the plan using the teach-back technique</li> </ul>
9. Review what to do if a problem arises	<ul style="list-style-type: none"> <li>• Designated "Discharge Advocate" nurse: Instruct on emergencies and what to do, including PCP emergency contact numbers</li> </ul>	<ul style="list-style-type: none"> <li>• Implemented by regular staff nurses</li> <li>• Social work phone number provided to patients and families with 24/7 coverage</li> </ul>
10. Transmit discharge summary to clinicians accepting care of the patient	<ul style="list-style-type: none"> <li>• Home care coordinator: Faxed discharge summary and AHCP to clinicians (eg, PCP, visiting nurses, outpatient pharmacy) within 24 hours of discharge.</li> </ul>	<ul style="list-style-type: none"> <li>• As in original program</li> </ul>
11. Reinforcement of the Discharge Plan	<ul style="list-style-type: none"> <li>• Social worker: Call made to patient 2–3 days after discharge to reinforce plan</li> <li>• Patient: Given phone number with 24/7 coverage to call Project RED with questions or concerns</li> </ul>	<ul style="list-style-type: none"> <li>• Not implemented</li> </ul>

AHCP, after hospital care plan; PCP, primary care physician; RED, ReEngineered Discharge.

approximately 1000 admissions to the SNF per year from acute care hospitals in the Boston area. The unit is staffed by employed physicians, nurses, therapists, social workers, chaplains, and other allied staff; the average nursing staffing levels is 5.1 hours per patient per day.<sup>12</sup>

Patients discharged to home from the SNF before the intervention from September 2009 until May 2011 and during the intervention period June 2011 to February 2012 were surveyed by telephone 30 days after discharge. If patients had cognitive impairment during the interview, the patient's surrogate was surveyed to complete information unattainable from the patient. A minimum of 6 phone calls were made to complete the survey.

The intervention was implemented with a plan for continuous quality improvement. As such, data were shared with direct care staff during the course of the intervention period to stimulate ongoing commitment to the goals of improving care transitions and to provide opportunities to learn from errors. In addition, interviews with 2 intervention patients discussing their satisfaction with the program were videotaped and shown to the direct care staff as a form of motivation for staff during the implementation of the intervention.

Telephone surveys were conducted 30 days after discharge from the SNF with patients and care givers if patients were not available. These surveys included questions on (1) hospital utilization; (2) attendance to outpatient appointments; and (3) 6 items relating to preparedness for care transitions adapted from the Project RED study survey. The 6 items measuring preparedness for care transitions were adapted from the Project RED study survey to replace the word "hospital" with the words "nursing home."

To compare results to survey questions for participants in the control versus intervention periods, chi-square or *F*-statistics were calculated. As this was not a randomized study, differences in outcomes could be because of differences in the composition of the patient samples across time. To address this, we used inverse probability weighting (IPW) to understand differences in survey responses during the control versus during the intervention, independent of possible differences in the patient population across time period.<sup>13</sup> We could not directly compare all items contributing to the case mix index based on the Minimum Data Set (MDS) between the 2 groups, because during the study period the MDS changed from version 2.0 to version 3.0 (eg, dementia). Consequently, adjustment was made for factors that did not change on the MDS. A propensity score analysis, including potential confounders, was used to build a prediction model for the intervention exposure. A multivariate logistic model, with time period (and thus intervention status) as the dependent variable, was regressed on demographics (ie, age, age-squared, sex), function as measured with the activities of daily living (ADL) long form,<sup>14</sup> and chronic conditions (ie, diabetes mellitus, heart failure, asthma, chronic obstructive pulmonary disease, and pneumonia). This model fit with area under the receiver operating characteristic (ROC) curve = 0.63 and Hosmer-Lemeshow goodness-of-fit test of  $P = .08$ . From this model, we generated predicted probabilities of being included in the intervention period. Using these predicted probabilities, we used IPW to ensure conditional exchangeability, consistency, and positivity between members of the 2 groups.<sup>13</sup> After implementing IPW, we used ordinal logistic regressions to calculate the adjusted odds of differences for all outcomes for participants in the intervention versus participants in the control periods.

## Results

There were 524 participants in the control period and 100 participants in the intervention period; in both groups, 88% were

successfully surveyed by phone. Participants had an average age of 80 (SD = 10), 67% were female, and 84% were non-Hispanic white (Table 2). Participants in the intervention period did not differ with respect to age, diabetes, heart failure, or pneumonia with those before the intervention. The rate of chronic lung disease was higher before the intervention and this group also had a lower level of ADLs. The rate of rehospitalization within 30 days after leaving the SNF for participants before the intervention was 18.9% and for participants during the intervention was 10.2%,  $P < .05$ . After IPW adjustment, this difference remained ( $P = .045$ ). The adjusted odds ratio for patient rehospitalization for participants in the intervention compared with before the intervention was 0.69 ( $P = .045$ ) (Table 3). Intervention participants were more likely to have attended an appointment with a specialist or their primary care physician (70.5% versus 52.0%,  $P < .001$ ) (Table 3).

Responses for all discharge preparedness questions revealed a higher level of understanding among intervention participants, with significant results for items regarding understanding medical appointments, how to take medicines, the main health problem, and reasons for new medicines (Table 4). For example, intervention participants were more likely than control participants to indicate that they understood their appointments better (adjusted odds ratio 2.53,  $P < .001$ ) and how to take their medicines better (adjusted odds ratio 3.31,  $P < .001$ ) when leaving the nursing home.

## Discussion

Project RED was successfully adapted and implemented in an SNF and lowered the rate of hospitalization within 30 days of discharge from the SNF from 18.9% to 10.2%. Patients reported seeing their outpatient providers more frequently within 30 days of discharge from the SNF. Patients also reported a higher level of preparedness for discharge. This intervention was implemented with existing SNF staff and resulted in a 46% reduction in the number of people being readmitted within 30 days. The number needed to treat to avoid 1 person's readmission was between 11 and 12.

The strengths of this study that lend weight to our conclusions include the high level of data capture and the consistency of findings across our primary and secondary hypotheses. Nonetheless, several limitations should be kept in mind. First, as a temporal intervention we did not have the benefit of randomization between treatment arms. We accommodated for the possibility of differences in the control and intervention populations using inverse probability weighting. Although this is an excellent method for adjusting for patient-level differences, it is possible that temporal trends independent of the intervention may have also contributed to our findings. Second, the generalizability of the study is not certain, as it

**Table 2**  
Demographic Characteristics

	Control	Intervention	
Total, n (%)	524 (100)	100 (100)	
Age, y (SD)	80.2 (10.5)	79.7 (9.3)	$F = 0.3; P = .608$
Gender, n (%)			$\chi^2 = 2.2; P = .137$
Female	354 (72.1)	64 (64.6)	
Race/Ethnicity, n (%)			$\chi^2 = 2.3; P = .508$
White not Hispanic	436 (88.8)	88 (88.9)	
Black not Hispanic	46 (9.4)	7 (7.1)	
Other	9 (1.8)	4 (4.0)	
Activities of daily living long form, mean (SD)	14.2 (4.0)	15.0 (3.7)	$F = 2.9; P = .091$
Charlson comorbidity index, n (%)			$\chi^2 = 1.8; P = .398$
0	152 (31.6)	36 (36.4)	
1	139 (28.9)	31 (31.3)	
2+	190 (39.5)	32 (32.3)	

**Table 3**  
Resource Utilization

Questions	Control (%)	Intervention (%)	Univariable	Multivariable Adjustment*	
				Odds Ratio	P Value
Have you been hospitalized again since you left the nursing home?					
No	374 (81.1)	79 (89.8)	$\chi^2 = 3.8; P = .05$	0.69	.045
Yes	87 (18.9)	9 (10.2)			
Have you seen your PCP in last month since leaving the nursing home?					
No	294 (56.1)	46 (46.0)	$\chi^2 = 3.5; P = .063$	1.25	.051
Yes	230 (43.9)	54 (54.0)			
Since you left the nursing home, have you seen a specialist or your PCP?					
No	179 (48.0)	23 (29.5)	$\chi^2 = 8.9; P = .003$	1.56	.001
Yes	194 (52.0)	55 (70.5)			

PCP, primary care physician.

\*Adjusting for multivariable propensity score weight predicted by case-mix factors.

was conducted with medical and surgical patients in one SNF in Boston, Massachusetts. This population was very well connected with their health care; for example, 98% of the participants in both the control and intervention groups had primary care providers before admission to the SNF. It is possible that additional barriers would have to be overcome to replicate our results in states with lower access to primary and specialty care than exists in Massachusetts. Third, we were unable to reach 12% of the group for phone surveys. We hypothesize that nonrespondents were more likely to be in another hospital, SNF, or deceased, thus making our utilization data an underestimate of overall risk. However, this underestimation is likely to have been nondifferential between the control and intervention groups, as our data collection methods were consistent

throughout the project. Fourth, we report data on all patients who were rehospitalized and do not differentiate between appropriate and inappropriate events. Future work should expand on these findings and focus on potentially avoidable events. Fifth, although this intervention was conducted primarily by the SNF nursing staff, the fact that the study site employs its own staff physicians may mean that future program implementation would need to be adapted for SNFs that engage with community-based attending physicians. Finally, we did not perform a cost analysis for staff training and supervision, electronic medical record integration, or the time spent by staff delivering the intervention. Future studies will be needed to examine the cost-benefit ratio and to determine if this intervention represents an adequate return on the investment.

**Table 4**  
Differences in Survey Responses by Status

Questions	Control (%)	Intervention (%)	Univariable	Multivariable Adjustment*	
				Odds Ratio	P Value
1. In your opinion, were you provided with all the information you needed to care for yourself at home?					
No	39 (10.2)	5 (6.9)	$\chi^2 = 0.7; P = .39$	1.09	.748
Yes	343 (89.8)	67 (93.1)			
2. How well did you understand the information that was given to you about how to care for yourself at home?					
Not at all	12 (3.1)	1 (1.4)	$\chi^2 = 46.4; P < .001$	1.74	.001
A little bit	13 (3.4)	4 (5.8)			
Moderately	53 (13.8)	5 (7.2)			
Very well	229 (59.5)	19 (27.5)			
Extremely well	78 (20.3)	40 (58.0)			
3. How well did you understand your medical appointments after you left the nursing home?					
Not at all	16 (4.2)	1 (1.4)	$\chi^2 = 72.9; P < .001$	2.53	<.001
A little bit	14 (3.7)	2 (2.9)			
Moderately	33 (8.7)	3 (4.3)			
Very well	240 (63.0)	15 (21.7)			
Extremely well	75 (19.7)	48 (69.6)			
4. How well did you understand how to take your medicines after leaving the nursing home?					
Not at all	12 (3.1)	0 (0.0)	$\chi^2 = 109.8; P < .001$	3.31	<.001
A little bit	29 (7.6)	2 (2.9)			
Moderately	46 (12.0)	3 (4.3)			
Very well	220 (57.6)	8 (11.4)			
Extremely well	75 (19.6)	57 (81.4)			
5. How well did you understand your main health problem, or primary diagnosis, when you left the nursing home?					
Not at all	9 (2.4)	2 (2.8)	$\chi^2 = 54.1; P < .001$	1.72	.001
A little bit	28 (7.3)	3 (4.2)			
Moderately	46 (12.1)	6 (8.5)			
Very well	223 (58.5)	17 (23.9)			
Extremely well	74 (19.4)	43 (60.6)			
6. Were you able to get all your medicines after leaving the nursing home?					
No	162 (30.9)	31 (31.0)	$\chi^2 = 0.0; P = .987$	1.02	.849
Yes	362 (69.1)	69 (69.0)			

\*Adjusting for multivariable propensity score weight predicted by case-mix factors.

In nursing homes, care coordinators are frequently social workers, as a social work assessment is required by regulation and social workers are paid less than nurse case managers. In pilot work, we found that social workers and care managers without a nursing background found it difficult to help patients and families discuss their care plan, as they could not comfortably discuss future symptoms or answer questions about medications. The staff nurse is ideally suited to meet the educational needs of the patient and family, yet nurses often are not given enough time to devote to this critical function. Our program required a significant amount of nursing time, as the care plans were created by the primary staff nurse, who was also responsible for using the care plan to facilitate discharge education. Each care plan took the nurse and unit coordinator about 20 minutes to create. Once completed, nurses then spent an average of 20 minutes teaching the care plan with patients and their families on each of 2 occasions: at the first family meeting, which occurs within a week of admission, and again on the day of discharge. A key factor to the successful completion of the project was ensuring that almost all of the information on the care plan flowed directly from our electronic medical record, thus limiting the amount of manual data entry. In the absence of integration with the electronic medical record, additional time would have been needed for appropriate staff to enter medications and appointments.

Throughout the intervention period, nursing leadership met monthly with staff nurses and weekly with an interdisciplinary team of care leaders to support this initiative. The assistant director of nursing took the lead for program implementation and staff training. This included the evening shift staff to support education of family members presenting later in the day. Engaging the evening shift staff in patient and family education was a significant challenge that required additional training, supervision, and feedback. Another key factor involved teaching staff to anticipate what patients and their families would need to succeed when they go home and to do so from early in the SNF stay. There was some initial opposition by direct nursing staff because of the time involved in educating and discharging patients without changing our nursing staffing patterns. As described previously, we did not conduct postdischarge phone calls, as was done in the original Project RED acute care hospital implementation. Although this element of Project Red may be critical for patients being discharged from the hospital, we felt that the longer average length of stay at the SNF should provide ample opportunity to establish a care plan and ensure that the patient and his or her caregivers understood the plan. In addition, including the post-discharge calls would have necessitated the addition of a provider who could discuss medication management. We did not feel that the staff nurses had adequate time to fulfill this role. It is possible that including this activity could have led to a greater impact than we observed. Similarly, mechanisms to get the patient's care plan to the outpatient doctors, providers who go to the patient's home (eg, visiting nurses), and to members of the patient's social support network are excellent areas for further development and evaluation. The video of patients speaking of their experiences and the weekly encouragement by nursing leadership helped keep the momentum of this program. The medical director led the intervention and was available during weekdays and at weekly meetings to help motivate the staff and an administrative assistant helped support care plan printing.

Patients leaving SNFs are high risk for hospital readmission, yet few SNFs currently focus on ensuring that follow-up with the primary care provider is planned before SNF discharge. Some facilities have initiated the INTERACT program, which promotes the quality of care within SNFs, or other approaches to improve care transitions;

however, these activities are not widespread.<sup>10,15–17</sup> In large part this is because historically the financial model for SNFs has been driven by maintaining adequate census, a metric that is not particularly sensitive to patient outcomes. This will have to change. SNFs that participate in Accountable Care Organizations (ACO) and who are engaged in bundled payment schemes will be in the vanguard, for they have already undertaken financial risk for the outcomes of the care they provide. SNFs that can implement significant improvement in care transitions will become preferred partners in competitive markets. Review of care transitions across the SNF networks for ACOs is likely to reveal critical opportunities for investment to support implementation of projects, such as the one we describe at SNFs to improve care transitions. As organizations restructure to create incentives for outcomes rather than volume, it will be critical to incentivize nurses, physicians, nurse practitioners, and care managers to shift the focus of their work toward educating and activating patients and their families about care transitions. The adapted Project RED we describe in this article can serve as a model for fulfilling these objectives. Shifting the culture of SNFs to improve care transitions is a surmountable challenge.

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