Impact of a national campaign on hospital readmissions in home care patients

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Abstract

Objective. Assess impact of nationwide home health quality improvement campaign to reduce acute care hospitalization of home health recipients.

Design. Observational pre–post comparison of self-selected participating and non-participating agencies’ quality performance; survey to determine uptake of program materials.

Setting. US home health care agencies.

Participants. A total of 147 agencies with 147 non-participating agencies matched on patient length of service, pre-intervention hospitalization rate and pre-intervention rate of change in hospitalization rate.

Intervention(s). Public events; provision of educational packages and technical assistance; quality measure feedback.

Main outcome measure(s). Post-intervention difference in risk-adjusted acute care hospitalization rate between participants and non-participants; difference in self-reported campaign material use between agencies whose hospitalization rate declined 2% or more and those whose rates increased by 2% or more.

Results. Hospitalization rate had a negative trend beginning before the campaign. In the matched pairs studied, it did not differ significantly between participants and non-participants, or from pre- to post-intervention period (28% in every case). Agencies that improved were more likely to report activities consistent with the campaign and using campaign interventions than those not improving (P < 0.001), regardless of participation status.

Conclusions. Merely agreeing to participate in the campaign did not improve performance, but effective participation through adoption of campaign methods did.

Keywords: home care services, patient readmission, program evaluation

Introduction

In the USA, home-bound patients needing intermittent skilled nursing care, physical therapy, speech-language pathology services or continued occupational therapy following an episode of acute medical care (usually in a hospital) may receive care from organized home health service agencies [1]. Concerned with both increasing cost and evidence of variation in quality of home health care, the US Medicare agency (the Centers for Medicare & Medicaid Services) began collecting and reporting quality measures for these services earlier in the present decade. During the years which followed, Medicare increasingly emphasized quality improvement in home care, developing and promoting a system of outcome-based quality improvement measures [2].

In January 2007, Medicare launched the Home Health Quality Improvement National Campaign. Supported by Quality Insights of Pennsylvania, a Medicare Quality Improvement Organization, the voluntary campaign worked to improve quality of care by reducing avoidable hospitalizations during Medicare-paid home health episodes. (Quality Improvement Organizations contract with Medicare to conduct quality improvement projects on behalf of Medicare beneficiaries in the USA.) Using an interdisciplinary approach to quality improvement, the campaign delivered quality performance information and improvement methods to individual home health providers nationwide. Approximately 5600 Medicare-certified home health agencies enrolled as participants in the year-long campaign.
This report presents an evaluation of the campaign, based on a matched pair analysis of participating and non-participating agencies’ quality data, to assess whether participation was associated with improvement in acute care hospitalization rates and a follow-up survey, to test whether campaign interventions were associated with improvement, regardless of agency participation status.

Methods

Interventions

The National Campaign consisted of a series of efforts aimed at encouraging home health providers to adopt best practices to reduce unnecessary acute care hospitalization of home health patients. We offered agencies monthly evidence-based Best Practices Intervention Packages on topics related to prevention of avoidable hospitalizations (Table 1). The National Campaign and these intervention packages are more completely described in a previous article [3]. Campaign material was available from a national Web site where agencies could enroll as participants. We encouraged agencies to enroll in the campaign, but did not require enrollment for access to the Web-based materials. We provided participants monthly reports of their acute care hospitalization rates.

Evaluation overview

After a preliminary regression analysis to identify characteristics of agencies associated with risk of acute care hospitalization, we evaluated the campaign in two stages: (i) a matched sample of participating and non-participating agencies to assess whether participation in the campaign was associated with reduction in hospitalization and (ii) a survey of the agencies in the sample to determine their usage of campaign materials and assess whether interventions were associated with improvement.

Definitions

Agencies included in the evaluation were Medicare-certified home health agencies having at least 10 episodes of care completed each month between 1 January 2004 and 31 December 2007. Of that group of agencies, a participating agency was one that enrolled in the campaign’s online registry by 28 February 2007. A non-participating agency was one that met the inclusion requirement, but never enrolled in the campaign’s online registry. All other agencies were excluded from the evaluation.

The acute care hospitalization rate was the number of patients who were admitted to an acute care hospital while under the care of a home health agency during a particular month divided by the number of patients discharged from the agency that month, as described in the National Guidelines Clearinghouse [4]. To control for case mix across agencies, we risk adjusted using the method of Shaughnessy and Hittle [5].

Outcome measure

We used absolute percentage change in acute care hospitalization rates between pre- and post-intervention period as the measure of improvement. We considered an agency’s performance better if the rate declined by 2% or more and worse if it increased at least 2%. Otherwise, we said the rate exhibited little change.

Data sources

Medicare supplied two data sets: (i) patient-level data from the outcome and assessment information set (OASIS) from 2004 to 2007 that identified episodes of home care and hospitalization during the episode and provided information for risk adjustment and (ii) Home Health Agency Cost Reports for the same period to identify and characterize the home health agencies.

Preliminary analyses

Using time series analysis and descriptive statistics, we examined the agency-level acute care hospitalization measure for bivariate association with potential confounders and tested for secular trends. The potential confounders included agency characteristics such as geographic region, ownership (voluntary, for-profit and government), rural location and average time agency patients received services (length of service). The results (available from the authors) showed the length of service was the most significant predictor of hospitalization as well significant secular trends beginning before the National Campaign. The risk of hospitalization increases naturally with increasing length of service when the hospitalization rate is defined as above. Seasonal and weekday/weekend factors as well as the other agency characteristics had smaller influence.

Informed by this analysis, we selected a sample of participating and non-participating agencies matched on length of service in pre- and post-intervention periods, pre-intervention hospitalization rate and secular trend in hospitalization rate (slope of trend line) during the 2 years preceding the pre-intervention period. We did not control for other agency characteristics.

Survey of agencies in the matched group

We conducted a follow-up survey in the matched group to determine the extent of participation in the campaign, as measured by self-reported downloading and use of monthly intervention packages, as well as the adoption of behaviors.
which were believed important to improving performance such as setting targets for improvement. We also asked agencies whether they had taken actions to reduce the hospitalization rate during the campaign period; if so, the nature of the actions; and if not, why.

We pre-tested the survey in nine home health agencies in three states, excluding agencies that were in the final survey sample. We fielded the survey between June and July 2008 using a fax back form. For agencies not responsive to two mailings,
we attempted telephone interviews (twice). Interviewers were aware of the agency’s participant/non-participant status, but not of its hospitalization rate change.

**Analysis**

In the matched population, we used a paired *t*-test to assess whether the change in hospitalization rate in the participants differed from that in the non-participants. We computed one- and two-way frequency tables of the survey findings, comparing the agency responses among participants and non-participants, as well as among respondents classified by pre-post change in acute care hospitalization as defined previously (better, little change, worse).

We compared responses among the three pre-post change groups across 52 distinct items in the survey. We calculated composites counting total responses of four collections of detail items in response to a stem question, e.g. if an agency had taken action to reduce hospitalization, how many such actions had it taken?

We examined patterns of responses to individual items against pre–post hospitalization change to see if patterns suggesting an association were evident. Specifically, we examined ordering of rates of response to individual items across improvement groups.

There are six possible permutations in ordering of responses, *r*1, *r*2, *r*3, where *r*1 is the item response frequency in agencies where the hospitalization rate improved; *r*2, where it was unchanged and *r*3, where it got worse. Each permutation is equally likely when the rate of improvement is not associated with item responses. The expected frequency of the ordering *r*1 > *r*2 > *r*3 is 1/6. We counted the occurrence of *r*1 > *r*2 > *r*3 ordering and used a chi-square statistic to assess whether the observed frequency would be likely to occur by chance.

We performed Pearson correlation analysis for the composite count measures associated with each main survey question, regressing the change in hospitalization rate against the count of activities undertaken, strategies used and packages downloaded and used.

**Human subjects considerations**

In this study, individual patients were not subjects of research. The evaluation sought to determine the impact of an uncontrolled, voluntary quality improvement program on aggregate patient outcomes. The unit of analysis was the agency, not the individual Medicare beneficiary. Therefore, Institutional Review Board approval was neither needed nor obtained.

**Results**

**Preliminary analysis**

Time series data showed that campaign participants’ monthly hospitalization rates had a negative trend, which was apparent from before the start of the campaign. Figure 1 illustrates this point, depicting the rate by month for participants and non-participants. Examination of time series also indicated a secular trend of increased length of service across the campaign period.

After excluding smaller agencies and those with extreme values of the outcome and stratification variables, there were 147 non-participating agencies eligible for matching (Fig. 2). In the final matched pair sample, there were no significant differences in means of the stratifying variables between participating and non-participating agencies. However, non-participating agencies averaged 50 fewer episodes per month than participants (*p < 0.005*); there were also significant differences in ownership (proprietary agencies were less likely to have been participants) and regional distribution, but not in urban/rural status. None of these variables was matched, and distributions reflected characteristics of the underlying population.

Participating and non-participating agencies had nearly equal hospitalization rates pre- and post-intervention (28%); pre–post changes in both groups were <0.1% and did not differ significantly (*P = 0.95*). Individual agencies’ performance varied: 41 (28%) of the non-participants and 45 (31%) of participants improved 2% or more; similar proportions showed worse performance.

**Survey findings**

Of the 296 matched pairs available for surveying, we were able to obtain address information on 294, the survey population. One hundred and eighty-four of these responded (63%). Among the respondents, there were more participants than non-participants (112 vs. 72); however, there was no significant difference in the proportions of respondents whose hospitalization rates improved by 2% or more (54; 29%) compared with non-respondents (32; 29%)

Participating agencies reported significantly more actions consonant with campaign goals than non-participants (Table 2). However, appreciable proportions of non-participants said they
had used campaign materials, set improvement goals or taken other actions to reduce hospitalizations.

Examining the entire list of 52-item responses by agency performance regardless of participant status, 23 exhibited the $r_1 \geq r_2 \geq r_3$ ordering (Expected frequency 8.7; $P < 0.001$). An example of the general pattern across improvement groups is shown in Fig. 3, which illustrates self-reported use of downloaded campaign packages.

The median proportion of downloaded packages used was 50% among agencies that performed better, compared with 36% in agencies whose performance declined and 46% in those with little change. Regression of hospitalization change on number of packages used was statistically significant (mean change in rehospitalization rate per package used = $-0.2\%$, $P = 0.0137$). None of the other three composite measures was significantly correlated with hospitalization, although the regression slopes were in the same direction.

**Conclusions**

Hospitalization rates appeared to improve in agencies participating in the National Campaign compared with those not participating. These differences were eliminated in matched pairs that controlled for baseline performance, secular trends and length of service. Campaign materials were said to have been widely used among both participating and non-participating agencies. Use of these materials was significantly more common among agencies whose performance improved.

**Figure 2** Matching procedure for selecting home health agencies. HHAs are home health agencies, ALOS is average length of service for each agency and ACH is acute care hospitalization rate. The chart shows exclusion of late-enrolling agencies, agencies having one or more months with fewer than 10 discharges, and agencies with extreme values of length of service or rehospitalization. The horizontal arrows at the bottom of the figure identify the variables on which participating and non-participating agencies were matched.

**Table 2** Percent of participating and non-participating home health agencies reporting actions consistent with the Home Health Quality Improvement National Campaign

<table>
<thead>
<tr>
<th>Survey item</th>
<th>Participants (%)</th>
<th>Non-participants (%)</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Had acute care hospitalization action plan</td>
<td>91</td>
<td>68</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Had 2007 acute care hospitalization reduction target</td>
<td>88</td>
<td>65</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Took action to reduce acute care hospitalization</td>
<td>96</td>
<td>72</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Downloaded campaign materials</td>
<td>89</td>
<td>49</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Figure 3 Home health agency self-reported use of campaign packages. The percent of agencies who reported using each of the home health quality improvement campaign's intervention packages. Bars in each group represent the percentage in agencies whose acute care hospitalization rate decreased by 2% or more (‘better’—light shading), changed less than 2% in absolute value (‘little change’—dark shading) or increased by 2% or more (‘worse’—striped shading).

Discussion

Descriptive studies of home health care related to rehospitalization have identified factors that distinguish home health patients likely to be readmitted to the hospital [6, 7]. Researchers have also described impacts of focused interventions in heart failure patients [8–11] or other disease states on readmission rates [12, 13]. In contrast, Li et al.'s [14] study showed no impact of home health services on heart failure readmission when other patient-level factors, such as duration of heart failure, were considered [14]. Several studies of risk factors for readmission among patients discharged from acute care (mostly with heart failure) did not identify the use of home health services as a protective factor against early readmission, even though information on home health services use should have been available to the investigators [15–19]. None of these studies tested interventions to reduce hospitalization where the agency, not the patient, was the unit of analysis.

This study offers evidence that home care agencies adopting research-driven practices might reduce hospitalization rates in their patients. We examined whether ‘participation’ in a national quality improvement campaign was associated with improvement (no association), and whether the use of quality improvement tools, some of which were distributed and promoted through the campaign, was more prevalent in agencies that improved (positive association).

Why were there no performance differences between participants and non-participants in the matched pairs, although differences were evident in the total agency population? The time trend of hospitalization rates in the two groups (Fig. 1) suggested that the two groups’ performance diverged in early 2005, before the campaign began. There was little change among non-participants, whereas participants improved about 1% thereafter.

We interpret these findings as follows: agencies volunteering for the campaign included those which either knew they could improve, or believed improvement was likely. Many were already improving before the campaign began. Agencies not volunteering may have believed that improvement was either not necessary or not possible. We speculate that participation mirrored propensity to improve, and was not a cause of improvement.

Furthermore, contamination of the non-participant group clearly occurred. Non-participants were not denied access to campaign materials; many used them. This mixture of secular trending and contamination of control subjects may have had a similar impact on the Multiple Risk Factor Intervention Trial, which almost certainly reduced coronary artery disease, while unintentionally impacting both intervention and comparison communities [20].

Survey findings supported this interpretation. We observed substantial differences between participants and non-participants in actions they took to reduce hospitalization. However, many non-participants reported taking such actions and using campaign materials. Agencies with better outcomes tended to use more campaign materials and follow campaign recommendations, whether or not they were participants.

The 5600 participating agencies plus the additional non-participants who used campaign materials demonstrated that such a campaign can reach the majority of agencies in the country. The use of campaign materials was associated with improvement. It appears that this National Campaign, which was a relatively economical intervention without known negative side effects, at least had salutary impact on agency use of appropriate educational materials, contributing thereby to modest, but important, improvement in utilization outcomes in some of the agencies.

Limitations

Limitations to interpretation are related to the method of assessing adoption of campaign materials, the relatively short time following interventions to re-measurement, the power of the survey and the non-response rate.

We do not know for certain whether the campaign itself caused the performance improvement, although the results are consistent with that viewpoint. It is possible that agencies motivated to improve are also motivated to seek resources that might help them improve (or to claim that they have done so), even if the resources are not effective or not used. A more detailed assessment of the degree to which campaign materials were actually used might have shed light on this point.

The campaign’s intervention packages were made available monthly, and the survey asked about each package. Table 1 shows that some packages were distributed after the end of the post-intervention period. Even if agencies’ responses (in mid-2008) reflected their actual use of packages, use of later packages could not have influenced results. A longer observation period would be necessary to confirm that specific package use was associated with outcome.
It is possible that the non-respondents consist of a group of agencies using campaign materials extensively, having exactly the opposite relationship between use and performance as in the respondents. We view this to be unlikely because of the high proportion of non-participants in the non-respondent group, and the lower use of campaign materials among those who were sampled. A simulation of the possible distributions of individual non-respondent survey results, given their known performance outcomes confirmed that only a very unusual distribution of intervention material use in the non-respondents would have changed the conclusions of this study.

The survey findings are only applicable to the larger home health agencies in the USA. However, these account for the bulk of episodes of home care and patients served.

Finally, the survey was underpowered. It was designed with the hope that a near 100% response rate could be achieved. The lower rate made statistical inferences on individual items difficult, although there are many individual items that may well be associated with hospitalization improvement. A larger survey of a stratified random sample from participants and non-participants could address this issue in future campaign evaluations.

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**References**


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