

Interventions to Reduce Hospitalizations from Nursing Homes: Evaluation of the INTERACT II Collaborative Quality Improvement Project

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A substantial proportion of hospitalizations of nursing home (NH) residents may be avoidable. Medicare payment reforms, such as bundled payments for episodes of care and value-based purchasing, will change incentives that favor hospitalization but could result in care quality problems if NHs lack the resources and training to identify and manage acute conditions proactively. Interventions to Reduce Acute Care Transfers (INTERACT) II is a quality improvement intervention that includes a set of tools and strategies designed to assist NH staff in early identification, assessment, communication, and documentation about changes in resident status. INTERACT II was evaluated in 25 NHs in three states in a 6-month quality improvement initiative that provided tools, on-site education, and teleconferences every 2 weeks facilitated by an experienced nurse practitioner. There was a 17% reduction in self-reported hospital admissions in these 25 NHs from the same 6-month period in the previous year. The group of 17 NHs rated as engaged in the initiative had a 24% reduction, compared with 6% in the group of eight NHs rated as not engaged and 3% in a comparison group of 11 NHs. The average cost of the 6-month implementation was \$7,700 per NH. The projected savings to Medicare in a 100-bed NH were approximately \$125,000 per year. Despite challenges in implementation and caveats about the accuracy of self-

reported hospitalization rates and the characteristics of the participating NHs, the trends in these results suggest that INTERACT II should be further evaluated in randomized controlled trials to determine its effect on avoidable hospitalizations and their related morbidity and cost. *J Am Geriatr Soc* 59:745–753, 2011.

Key words: hospitalizations; nursing home residents

Hospitalization of nursing home (NH) residents, although often essential for safe and high-quality care of acute conditions, can result in many iatrogenic complications, morbidity, and excess healthcare expenditures. Up-to-date national data on the frequency of hospitalization of NH residents are difficult to obtain. The rate of hospitalization of residents in Georgia NHs in a 15-month period in 2006/07 varied from 0 to 4.81 per 1,000 resident days.¹ A recent study that includes a state-by-state analysis reported that, of people admitted to skilled nursing facilities in 2006, 23.5% were hospitalized within 30 days.² In addition to being common, previous research suggests that a substantial proportion of hospitalizations of NH residents may be avoidable.^{1–10} Reforms to the Medicare fee-for-service system, such as pay-for-performance (or value-based purchasing) and bundling of payments for episodes of care,^{11–17} have the potential to mitigate financial incentives that currently favor hospitalization of NH residents.^{18,19} However, changing the financial incentives could also result in inadequate care if NHs do not have the infrastructure to manage residents with acute changes in clinical condition, including clinical practice tools, adequate numbers of NH staff (especially licensed practical and registered nurses) with training in the assessment and management of acute changes in status, primary care clinicians to use the tools, and rapid access to ancillary services such as diagnostic testing,

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intravenous or subcutaneous fluid administration, and antibiotics and other medications.

Disseminating and implementing interventions that can assist NH staff in managing acute changes in resident clinical status are, therefore, critical to reducing avoidable hospitalizations of NH residents and their associated morbidity and costs. Interventions to Reduce Acute Care Transfers (INTERACT) is a set of evidence-based clinical practice tools and strategies initially developed under a Centers for Medicare and Medicaid Services (CMS) contract to the Georgia Medical Care Foundation (the Medicare Quality Improvement Organization in Georgia). The original INTERACT tools were developed with input from a panel of expert NH clinicians and pilot tested in three Georgia NHs with high hospitalization rates. A substantial reduction in the proportion of hospitalizations rated as potentially avoidable, as well as in overall hospitalization rates, occurred during the 6-month implementation of the INTERACT tools.²⁰ This article describes findings from a multistate quality improvement project in which a refined set of these tools and strategies (INTERACT II) was implemented.

METHODS

The INTERACT II intervention was conducted as a quality improvement project. A hospital and a university institutional review board in Florida reviewed the project and granted a waiver of informed consent. Corporate (for chains) and facility-based leadership of the participating NHs also approved the project as a quality improvement initiative.

Identification and Enrollment of Participating NHs

The project sought to recruit 30 community-based NHs in Florida, Massachusetts, and New York. These states were selected because the principal investigator and two collaborators are based in Florida and Massachusetts and at the request of the funder, who already supported a project on potentially avoidable hospitalizations in New York NHs. NHs were recruited by obtaining suggestions from state organizations and through contacts of the investigators with leadership of NH chains and individual NHs. Variation was sought in size, profit status, proportion of short-stay residents, and geographic location. Hospital-based NHs were excluded because they commonly have higher acuity levels and transfer rates related to their proximity to an acute care hospital. Administrative support was required for participation, as was willingness to identify an on-site champion to educate the staff, encourage the use of the tools, participate in twice-monthly conference calls, and complete required administrative surveys and quality improvement forms.

The INTERACT II Intervention

To refine the INTERACT tools and implementation strategies used in the CMS pilot test, focus groups and interviews were conducted with direct care staff from approximately 10 NHs in the three participating states. All levels of staff were involved, including certified nursing assistants, licensed nurses (including registered nurses and licensed practical nurses), administrators, nurse practitioners, physician

assistants, and physicians. Staff members were shown the original INTERACT tools relevant to their everyday practice and asked to provide input on content, format, and strategies to implement them. In addition, several national organizations nominated experts in the clinical care of NH residents, and these individuals reviewed the INTERACT tools on-line and provided feedback in response to a set of structured and open-ended questions. The project leadership team reviewed suggested changes; several changes were made in the content and formatting of the tools, and specific strategies for implementation were identified for use in the INTERACT II quality improvement intervention.

Important components of the INTERACT II intervention are outlined in detail in Table 1. All of the INTERACT II tools and educational resources are available at <http://interact2.net>. The multicomponent INTERACT intervention was developed based on detailed analyses of data on hospitalizations rated by experts as potentially avoidable and on recommendations of this expert panel on the feasibility and importance of a variety of potential interventions.^{1,20} The intervention addresses three strategies: identifying, assessing, and managing conditions proactively to prevent them from becoming severe enough to require hospitalization (e.g., dehydration, exacerbation of congestive heart failure); managing selected conditions in the NH when the resident does not meet specific criteria that suggest the need for acute hospital care (e.g., respiratory and urinary tract infections, fever); and improving advance care planning and considering a palliative care plan as an alternative to acute hospitalization for residents at the end of life (e.g., end-stage dementia or Parkinson's disease with recurrent aspiration pneumonia).

Each NH selected a champion who was preferably a knowledgeable, experienced, and respected individual capable of educating staff and facilitating project implementation. The vast majority of NHs selected licensed nurses with some administrative role in the facility; a small number of NHs selected the administrator or medical director as the champion. Staff education was conducted in May and June 2009, and the implementation phase spanned July through December 2009. NHs were expected to use the Stop and Watch Tool; the Situation, Background, Assessment, Recommendation Communication Form and Progress Note; the Resident Transfer Form and Transfer Checklist; and to complete Quality Improvement Review Tools on residents transferred to the acute hospital. The other tools, including the Care Paths, Change in Condition File Cards, and Advance Care Planning Tools, were available for staff education and decision support. Conference calls were held every 2 weeks for each state. Facility-based project champions participated in these calls, which an experienced gerontological nurse practitioner facilitated. The calls were used to discuss lessons learned, challenges in implementation, and case examples involving use of the INTERACT II tools.

Evaluation

Descriptive data were collected on participating NHs at project initiation and completion using the Online Survey and Certification and Reporting (OSCAR) file, and Nursing

Table 1. Important Components of the Interventions to Reduce Acute Care Transfers (INTERACT) II Quality Improvement Collaborative

INTERACT II Components	Description
Orientation and support	
Leadership education	Corporate and facility leadership participated in in-person and telephone meetings describing project goals and expectations. The NH administrator received a nonbinding letter of agreement.
Facility champion	Each NH appointed a “champion” for the project responsible for ongoing staff education and implementation of the INTERACT II intervention.
Nursing home staff education	Staff at each facility attended a 4- to 6-hour orientation to INTERACT II conducted by the project team members.
Collaborative telephone conference calls	Conference calls facilitated by the senior project coordinator were held every 2 weeks with facility champions (up to 10 at a time). Calls were used to discuss progress on project implementation, successes, barriers, and case examples.
Tools	
Communication tools	
Early warning tool (“Stop and Watch”)	Pocket card and half-page report forms for certified nursing assistants to: <ul style="list-style-type: none"> ■ Identify changes in residents under their care ■ Report changes to licensed nurses
Situation-Background-Assessment-Recommendation communication tool and progress note	Progress note templates for licensed nursing staff to: <ul style="list-style-type: none"> ■ Evaluate and communicate acute changes ■ Document evaluation and communications
Change in condition file cards	Laminated resource cards for licensed nursing staff to: <ul style="list-style-type: none"> ■ Identify critical vital signs and laboratory results ■ Guide when to communicate acute changes in status to doctor, NP, or PA
Resident transfer forms	Template forms for all nursing home and emergency room staff to: <ul style="list-style-type: none"> ■ Communicate and document critical clinical and administrative information at the time of transfer
Acute care transfer envelope with checklist	Envelopes for transfer documents with a checklist of recommended items stamped on the outside to: <ul style="list-style-type: none"> Ensure necessary documents are transferred Organize the transfer documents Document what was transferred
Care Paths	
Mental status change Fever Symptoms of lower respiratory infection Symptoms of congestive heart failure Symptoms of urinary tract infection Dehydration	Posters and individual 8.5” by 11” pages for licensed nursing staff, administrative nurses, medical director, primary care physicians, nurse practitioners, physician assistants to: <ul style="list-style-type: none"> ■ Guide evaluation of specific symptoms that commonly precipitate acute care transfers ■ Identify criteria for immediate notification and consideration of acute care transfer ■ Provide options to manage conditions in the NH
Advance care planning tools	
Identifying residents to consider for palliative care and hospice	Pocket card for all staff to: <ul style="list-style-type: none"> ■ Guide how to identify residents who may be appropriate for a palliative or comfort care plan or hospice care
Advance care planning communication guide	Laminated bound cards for social workers, licensed nurses, doctors, NPs, PAs to: <ul style="list-style-type: none"> ■ Guide communication with residents and family members for residents for whom a palliative or comfort care plan or hospice care would be appropriate
Comfort care order set	Laminated cards for doctors, NPs, PAs, licensed nurses to assist with guidance on examples of orders that may be appropriate for residents on palliative or comfort care plans
Acute care transfer reviews (quality improvement analysis)	Printed forms for NH administrative staff to assist with quality improvement to review acute care transfers, assess what was done, and determine whether anything could have been done to avoid the transfer

The INTERACT II tools and resources are available at <http://interact2.net>.
NH=nursing home; NP=nurse practitioner; PA=physician assistant.

Home Compare (<http://www.medicare.gov/NHCompare/>), and facility administrators completed surveys. Administrator surveys asked for information about occupancy rates, staff turnover, payer mix, availability of primary care providers (physicians, nurse practitioners, and physician assistants), and access to tests and procedures. Annualized turnover rates were calculated using the formula used by the Advancing Excellence Campaign (<http://www.nhqualitycampaign.org/>): number of staff employed on the first day

of each month minus the number of staff terminated by the last day of the month divided by the number of staff employed on the first day of the month. These data were collected for the month preceding project implementation and the last month of implementation. Participating NHs also were asked to conduct a 1-day review of all medical records at project inception and completion for rates of hospice use and advance directives. Feedback on the implementation of the project was obtained regularly on the collaborative

conference calls with facility-based champions every 2 weeks. Champions also completed surveys in the middle and end of the project estimating the time NH staff spent on INTERACT II–related activities.

Data on hospitalization rates were obtained from participating NHs. Each NH was asked to provide data on hospitalizations and their census for each of the months during the 6-month implementation of the INTERACT II intervention (July–December 2009) and for the corresponding months in 2008. The same months were used because hospitalization rates are often seasonal (related largely to an increase in respiratory illnesses during winter months). The average daily census for the month was used to calculate resident days, and hospitalization rates are reported in hospitalizations per 1,000 resident days to account for differences in census between participating NHs. Although not a component of the original project design, an attempt was made to obtain hospitalization data on a group of comparison NHs who were not involved in the INTERACT II project. Data from the OSCAR file were used to identify three NHs matched to each of the 10 participating NHs in each state based on a set of important characteristics, including ownership status, chain membership, facility size, Nursing Home Compare rating, and geographic market. Project staff called NHs starting with the best-matched facilities and asked whether hospitalization data were readily available and whether the NH was willing to share them. Of the 90 matched facilities identified, the project team was able to contact approximately half of the administrators; 11 of these administrators were able to provide hospitalization data. The 11 facilities providing hospitalization data were offered an educational session on INTERACT II for their participation.

To estimate the costs of the INTERACT II intervention, multiple aspects of the intervention were considered. These included the costs of printing and distributing the tools, the time that project leadership spent providing NH staff education at the initiation of the project, the senior project coordinator's time on the collaborative telephone calls, and the time that NH champions estimated for project implementation at each facility. The latter data were collected using a structured survey conducted during project Months 3 and 6. Average time reported spent on the project by each level of staff was multiplied by hourly wages based on national data for 2010 (certified nursing assistants, \$10.23/h; licensed practical nurses, \$18.46/h; registered nurses, \$24.51/h; directors of nursing, \$31.87/h; and administrators, \$35.93/h). For estimates of the costs of multidisciplinary meetings, which included mainly certified nursing assistants, with some higher-level staff, an average wage of \$15/h was used.

RESULTS

Thirty NHs agreed to participate in the project, 10 from each of the three participating states. The INTERACT II tools and on-site education were provided to all 30 facilities. Complete data on hospitalizations were available from 25 of these NHs. Four NHs dropped out of the project because of loss of the project champion, other administrative changes, or both (two in Florida and two in Massachusetts; one of the Florida NHs never submitted

the baseline administrator survey); one NH in New York participated throughout the course of the project but could not provide accurate data on hospitalizations for June to December 2008 and was eliminated from the analyses. Attempts were made to contact the majority of the 90 matched nonparticipating NHs, and 11 of these, mainly from New York and Massachusetts, provided data on hospitalization rates for the two 6-month periods.

The 25 NHs that participated in the 6-month intervention and for which hospitalization rates were available were divided into two groups; 17 were characterized as moderately or highly engaged in the project, and eight were characterized as minimally or not engaged. The ratings of engagement were assigned after the last month of the collaborative, independent of knowledge of hospitalization rates. The senior project coordinator who conducted the collaborative calls every 2 weeks rated each NH and assigned an engagement score. The coordinator's ratings were significantly associated with rates of participation in the collaborative calls (correlation coefficient (r) = 0.45; P = .01) and submission of required quality improvement tools (r = 0.70; P < .001).

Table 2 describes the participating NHs grouped according to level of engagement and the four NHs that submitted baseline administrator survey data but did not complete the project. In general, the average size of the participating NHs (166 average census) was larger than the average size nationally (~100 beds), and a smaller percentage were for-profit than the national figure (~75%), but the percentage of residents on Medicare Part A as well as Medicaid were similar to national data. The four NHs that dropped out were generally similar to the NHs that completed the project, except that they tended to have a lower annualized turnover rate of registered nurses, a shorter time the current director of nursing had been in place, a longer time the current medical director had been in place, and lower rates of availability of laboratory results within 4 hours. NHs categorized as engaged were similar to those categorized as not engaged, except they were less often for profit and had a longer time with the current administrator in place, a lower annualized turnover of registered nurses, and higher rates of residents with durable power of attorney for health care in the records.

Figure 1 and Table 3 illustrate hospitalization rate data. Overall, the 25 NHs that completed the 6-month INTERACT II intervention had a 17% reduction in hospitalization rates (95% confidence interval (CI) = -0.08 to -1.30), representing a mean absolute reduction of 0.69 hospitalizations per 1,000 resident days (P = .02 relative to comparison NHs). Engaged NHs had the highest reduction (24%, 95% CI = 0.23 to -1.56; P = .01 relative to comparison NHs), representing a mean absolute reduction of 0.90 hospitalizations per 1,000 resident days. NHs that were not engaged had only a 6% reduction. The 11 comparison facilities had a 3% reduction in hospitalization rates (from 2.69 to 2.61 hospitalizations per 1,000 resident days). The 11 participating NHs with which the 11 comparison facilities were directly matched had a 17% reduction hospitalizations per 1,000 resident days, representing a mean absolute reduction of 0.64 hospitalizations per 1,000 resident days (95% CI = 0.12 to -1.36; P = .12).

Table 2. Characteristics of the Participating Nursing Homes (NHs)

Characteristics Reported on the Baseline Administrator Survey	Engaged Homes (n = 17)	Not Engaged Homes (n = 8)	NHs with Complete Data (n = 25)	NHs without Complete Data (n = 4)*
State, n (%)				
Florida	4 (24)	4 (50)	8 (32)	1 (25)
Massachusetts	6 (35)	3 (38)	9 (36)	1 (25)
New York	7 (41)	1 (12)	8 (32)	2 (50)
Facility characteristics				
For profit, n (%)	9 (53)	6 (75)	15 (60)	2 (50)
Total census per month, average	161.9	175.9	166.3	167
Medicare Part A, %	15.6	11.4	14.1	15.9
Medicaid, %	57.8	60.5	59.6	63.7
Medicare managed care, %	8.9	6.8	7.8	7.6
Other, %	17.7	21.3	18.5	12.8
Medical staff characteristics				
Medical director hours per week, n (%)				
1–4	6 (35)	3 (38)	9 (36)	1 (25)
5–8	5 (30)	1 (12)	6 (24)	1 (25)
> 8	6 (35)	4 (50)	10 (40)	2 (50)
Number of doctors caring for residents, average	5.9	7.7	6.5	6.5
Number of NPs caring for residents, average	2.0	2.5	2.1	1.0
Number of PAs caring for residents, average	0.4	0.5	0.4	0
Days/week when at least one doctor is on site, average	4.3	4.1	4.3	4.5
Days/week when at least one NP or PA is on site, average	3.2	3.2	3.2	2.7
Administrative turnover, average				
Number of times administrator changed in past 3 years	0.4	1.9	0.9	1.0
Number of times director of nursing changed in past 3 years	0.6	1.5	0.9	1.5
Number of times medical director changed in past 3 years	0.2	0.5	0.32	0
Registered nurse annualized turnover rate [†]	18.8	24.6	20.6	10.0
Licensed practical nurse annualized turnover rate [†]	22.1	18.5	21.0	21.4
Certified nursing assistant annualized turnover rate [†]	32.8	16.0	27.5	12.1
On-site available services, n (%)				
Diagnostic testing				
Stat laboratory test < 4 hours	9 (53)	6 (75)	15 (60)	1 (25)
Stat X-rays < 4 hours	16 (94)	8 (100)	24 (96)	4 (100)
Interventions				
IV capabilities				
IV fluids	17 (100)	8 (100)	25 (100)	4 (100)
IV antibiotics	17 (100)	8 (100)	25 (100)	4 (100)
Other IV drugs	6 (35)	8 (100)	14 (56)	2 (50)
Total parenteral nutrition	5 (29)	4 (50)	9 (36)	2 (50)
Pharmacy services				
Stat medications < 4 hours, n (%)	10 (59)	6 (75)	16 (64)	1 (25)
Advanced care planning and hospice, %				
Residents on hospice benefit per month	5.1	7.0	5.7	4.0
Residents with a durable power of attorney for health care [‡]	31.3	19.1	27.2	25.2
Residents with a living will [‡]	9.9	9.5	9.8	11.0
Residents with a do-not-resuscitate order [‡]	56.6	35.9	50.0	58.7
Residents with a do-not-hospitalize order [‡]	8.2	8.0	8.1	6.3
Nursing home quality measures[§]				
Overall five-star rating	3	3	3	3
Deficiencies, n	5.0	9.7	5.6	6.2
Selected long-stay quality measures, % of residents				
Influenza vaccination during the influenza season	88.2	80.6	85.8	83.7
Pressure sores (high risk)	12.6	10.6	12.0	15.2

(Continued)

Table 2. (Contd.)

Characteristics Reported on the Baseline Administrator Survey	Engaged Homes (n = 17)	Not Engaged Homes (n = 8)	NHs with Complete Data (n = 25)	NHs without Complete Data (n = 4)*
Bladder catheter	3.7	3.6	3.7	5.5
Weight loss	7.9	8.1	7.9	12.7
Short-stay quality measures, % of residents				
Delirium	1.9	1.1	1.7	1.0
Moderate to severe pain	18.1	14.1	16.8	15.0
Pressure sores	21.2	17.0	19.7	21.5

* One of the 30 facilities that enrolled did not complete the baseline administrator survey.

† See text for definition of annualized turnover rates.

‡ Rates of advance directives were calculated based on a 1-day chart review (see text).

§ Publicly available quality data on the Medicare Nursing Home Compare Web site (<http://www.medicare.gov/NHCompare/>).

NP = nurse practitioner; PA = physician assistant; IV = intravenous.

The costs of the INTERACT II intervention were estimated as follows. Costs that the study team (rather than the facility) bore (printing and mailing of a 6-month supply of the INTERACT II tools (~\$850 per facility); on-site education of the NH staff, based on an hourly rate of \$150 per hour for two senior project staff for an average of 6 hours (\$1,800 per facility); advanced practice nurse time on collaborative telephone calls based on 4 hours per week (~10% effort) for 6 months at a salary plus benefit level of \$100,000/year (average cost of \$200 per facility) were estimated at \$2,850. Costs that the facility bore were mainly staff-related expenses to implement the program, including effort by the champion, effort by other facility staff, and meeting time related to the toolkit. The total estimated cost was approximately \$4,500 per facility based on the data collected 3 months into the program and \$5,200 per facility based on data collected at the conclusion of the program, for an average 6-month cost of \$4,850 per facility. Thus, when combining costs borne by the study team and costs borne by the facility, the estimated average total cost of the 6-month INTERACT II intervention was approximately \$7,700 per facility.

DISCUSSION

Implementation of the INTERACT II tools and strategies in a 6-month collaborative quality improvement project supported by regular teleconferences facilitated by an advance practice nurse resulted in a significant reduction in hospitalizations from the same 6-month period 1 year before in the 25 NHs that completed this project. The reduction was substantially higher in NHs that were rated as engaged in the project (independent of knowledge of the baseline or intervention hospitalization rates). Although there were several challenges to project implementation and important caveats about the hospitalization rate data, the trends in the relative and absolute reduction in hospitalization rates strongly suggest an effect of the intervention, with engaged homes having a four and eight times greater relative reduction than the nonengaged and comparison homes, respectively. The absolute magnitude of the reduction is substantial when viewed from the perspective of the potential for fewer complications and less morbidity from hospitalizations, and potential reductions in Medicare expenditures. For example, if a 100-bed NH achieved a 0.69 reduction in hospitalizations per 1,000 resident days

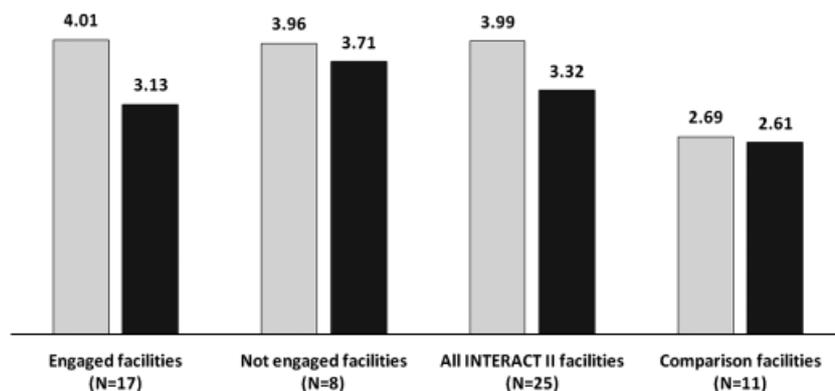


Figure 1. Hospitalizations per 1,000 resident days for July to December 2008 (gray bars) and July to December 2009 during the Interventions to Reduce Acute Care Transfers (INTERACT) II intervention (black bars). Standard deviations, absolute and relative changes in hospitalization rates, confidence intervals, and statistical values comparing baseline and intervention hospitalization rates are illustrated in Table 3. The 25 nursing homes (NHs) that completed the 6-month intervention for which complete data on hospitalization are available were divided into two groups based on their level of engagement in the project (see text). The 11 comparison facilities were each matched to one of the 25 participating NHs based on selected characteristics (see text) but did not participate in the INTERACT II intervention. (See text for additional data related to the 11 comparison NHs.)

Table 3. Absolute and Relative Changes in Hospitalization Rates*

Facilities [†]	Hospitalization Rate per 1,000 Resident Days, Mean ± SD		Change, Mean ± SD	95% Confidence Interval	P-Value	Reduction, %
	Before Intervention	During Intervention				
Engaged facilities (n = 17)	4.01 ± 2.56	3.13 ± 2.27	-0.90 ± 1.28	-0.23 to -1.56	.01	24
Not engaged facilities (n = 8)	3.96 ± 1.79	3.71 ± 1.53	-0.26 ± 1.83	-1.79 to 1.27	.69	6
All participating facilities (n = 25)	3.99 ± 2.30	3.32 ± 2.04	-0.69 ± 1.47	-0.08 to -1.30	.02	17
Comparison facilities (n = 11)	2.69 ± 2.23	2.61 ± 1.82	-0.08 ± 0.74	-0.41 to 0.58	.72	3

*Hospitalizations per 1,000 resident days are for the periods of July to December 2008 and July to December 2009 (during the Interventions to Reduce Acute Care Transfers (INTERACT) II intervention).

[†]The 25 nursing homes (NHs) that completed the 6-month intervention for which complete data on hospitalization are available were divided into two groups based on their level of engagement in the project (see text). Each of the 11 comparison facilities was matched to one of the 25 participating NHs based on selected characteristics (see text) but did not participate in the INTERACT II intervention. (See text for additional data related to the 11 comparison NHs.)

SD = standard deviation.

(the average reduction and baseline rate in the 25 participating NHs) from a baseline rate of 3.99 hospitalizations per 1,000 resident days, the result would be 25 fewer hospitalizations over the course of a year (3.99 hospitalizations × 36,500 resident days per year divided by 1,000 = 146 hospitalizations, vs 3.30 hospitalizations × 36,500 resident days per year divided by 1,000 = 121 hospitalizations). If one assumes an average Medicare Diagnosis-Related Group (DRG) payment per hospitalization of \$5,000, this would represent a savings to Medicare of \$125,000 in 1 year. This DRG payment probably represents a conservative estimate; in a previous study, the average DRG payment for hospitalizations rated as potentially avoidable was \$6,500.¹ The projected savings would be enough to support a full-time advance practice nurse or physician assistant in the NH (approximate cost of \$100,000 per year), an intervention that has been shown in several studies to improve care and reduce hospitalization rates,^{9,21–23} as well as the average cost of implementing the intervention for a year (\$15,400 based on the costs presented above).

The reduction in hospitalization rates was achieved despite several challenges that reduced the strength of the INTERACT II intervention. First, regardless of verbal support from corporate and facility leadership, no potent incentives, financial or otherwise, were offered to NHs for participation in this project. In fact, the majority of financial, legal, and regulatory incentives favor hospitalization, rather than taking the risks and costs of managing acute illnesses in the NH.^{11,17–19,24–26} Second, NHs often have competing priorities that can take higher precedence than voluntary participation in a quality improvement collaborative, including meeting census goals, preparation for state and federal surveys, responding to complaints, and other ongoing quality initiatives. For example, most of the participating NHs reported being involved in one to two quality improvement initiatives in addition to the INTERACT II during the project period. Third, considerable turnover in facility leadership and staff occurred during the 6-month project in several participating facilities, including changes in administrators, directors of nursing, and project champions, as well as turnover in other direct care staff. Such turnover makes consistent implementation of any quality initiative challenging. Fourth, this project was conducted

for only 6 months, and the sustainability of the INTERACT II intervention over longer periods of time is uncertain. Finally, with only a few exceptions, medical directors, attending physicians, nurse practitioners, and physician assistants were not highly involved in implementing and using the INTERACT II tools. Facility champions were asked to provide these individuals with written information, but project leadership had little direct contact with them during the educational sessions and collaborative telephone calls. This is an important challenge, because these providers generally make the decision to transfer NH residents to the acute hospital. Further research is needed to determine the components of the intervention most strongly associated with changes in hospitalization rates. It was beyond the scope and resources of the current project to evaluate the mechanisms by which the intervention reduced hospitalizations. The project team is currently analyzing qualitative data from the collaborative telephone calls and approximately 1,400 quality improvement review tools submitted during the 6-month project. These tools focus on transfers that occurred, although only anecdotal information from the collaborative teleconferences is available to describe cases in which the INTERACT II intervention was perceived as instrumental in preventing a hospital transfer. Strong support of corporate and facility leadership and the involvement of a dynamic and respected project champion appear to have been important factors in the engaged NHs. The willingness of nursing and medical staff to manage acute changes in status in the NH before hospital transfer, nursing staff's perceptions of how to define an "avoidable" transfer, and the preferences of some family members for care of all acute changes in a hospital also appear to be important factors listed in the review tools. More-detailed evaluations of the INTERACT II intervention, including comparing it with less-intensive (and less costly) facility-based quality improvement initiatives focused on reducing hospital transfers, are needed to help determine the most cost-effective strategies to achieve reductions in hospitalization rates in the NH setting.

Important caveats about the hospitalization data must be taken into account when interpreting the results of this quality improvement project. Hospitalization rates were based on self-reports from participating facilities, because

there is no up-to-date publicly available source for these data. NHs commonly track transfers to acute hospitals in their business offices. During the 6-month project, participating NHs were asked to keep a log of all transfers, but the accuracy of these data is not known. Moreover, reporting hospitalization rates from a year before the intervention may have been even less accurate than during the intervention, although if lower rates were reported for the 2008 months, this would have biased against finding a reduction in hospitalization rates. It is also possible that participating NHs did not accurately report all hospitalizations during the intervention period, which would have biased the results in favor of finding a reduction in rates. A second caveat about the hospitalization data is that the diagnoses associated with hospitalizations could not be determined. In addition to the lack of resources to obtain these diagnoses, attempting to do so would have created additional challenges and expense in terms of obtaining informed consent from NH residents or their proxies to review hospital records, approval by local hospital institutional review boards, and access to hospital medical records. Data on the symptoms associated with hospital transfers are available on many of the quality improvement review tools that are currently being analyzed, but these symptoms are unlikely to provide a specific and accurate diagnosis. Finally, the absolute hospitalization rates for the 11 comparison facilities were substantially lower than for the 25 NHs that participated in the project. The fact that these 11 facilities volunteered their data without prior knowledge about the project and may have been more likely to be focusing on hospitalization in their own quality improvement activities and, as a result, had lower rates may explain this in part. Another factor underlying this difference may be the relatively high rates of hospitalization in the participating NHs, which are in the highest range of rates reported for NHs in the state of Georgia in 2005/06.¹ Regression to the mean could, therefore, have contributed to the decreases in hospitalization rates observed, although the strong trend in lower hospitalization rates observed in engaged NHs than non-engaged and comparison NHs to some extent mitigate these important caveats about the limitations of the hospitalization data.

The results of this quality improvement initiative are encouraging and have important implications for efforts to reform the Medicare fee-for-service system by changing the current financial incentives that favor hospitalizing NH residents. The INTERACT II tools and strategies can play a critical role in assisting NH staff to improve the quality of care they provide and at the same time contribute to national efforts to reduce the morbidity and expense of hospitalizations and re-hospitalizations in the NH population. Further evaluations of the INTERACT II intervention in more-definitive studies, including randomized controlled trials, will provide better insight into the most cost-effective strategies to achieve these goals.

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