Original Study

Successfully Reducing Hospitalizations of Nursing Home Residents: Results of the Missouri Quality Initiative

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ABSTRACT

Purpose: The goals of the Missouri Quality Initiative (MOQI) for long-stay nursing home residents were to reduce the frequency of avoidable hospital admissions and readmissions, improve resident health outcomes, improve the process of transitioning between inpatient hospitals and nursing facilities, and reduce overall healthcare spending without restricting access to care or choice of providers. The MOQI was one of 7 program sites in the United States, with specific interventions unique to each site tested for the Centers for Medicaid and Medicare Services (CMS) Innovations Center.
Design and methods: A prospective, single group intervention design, the MOQI included an advanced practice registered nurse (APRN) embedded full-time within each nursing home (NH) to influence resident care outcomes. Data were collected continuously for more than 3 years from an average of 1750 long-stay Medicare, Medicaid, and private pay residents living each day in 16 participating nursing homes in urban, metro, and rural communities within 80 miles of a major Midwestern city in Missouri. Performance feedback reports were provided to each facility summarizing their all-cause hospitalizations and potentially avoidable hospitalizations as well as a support team of social work, health information technology, and INTERACT/Quality Improvement Coaches.
Results: The MOQI achieved a 30% reduction in all-cause hospitalizations and statistically significant reductions in 4 single quarters of the 2.75 years of full implementation of the intervention for long-stay nursing home residents.
Implications: As the population of older people explodes in upcoming decades, it is critical to find good solutions to deal with increasing costs of health care. APRNs, working with multidisciplinary support teams, are a good solution to improving care and reducing costs if all nursing home residents have access to APRNs nationwide.

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The Missouri Quality Initiative (MOQI) was developed in response to a 2012 call from the Centers for Medicaid and Medicare Services (CMS) Innovations Center for the Initiative to Reduce Avoidable Hospitalizations among Nursing Facility Residents. The goals of the Initiative for long-stay nursing home residents were to reduce the frequency of avoidable hospital admissions and readmissions, improve resident health outcomes, improve the process of transitioning between inpatient hospitals and nursing facilities, and reduce overall healthcare spending without restricting access to care or choice of providers. The MOQI, a 4-year study fall 2012-2016, is a multifaceted intervention implemented within 16 nursing homes in the Midwestern United States. The intervention includes an advanced practice registered nurse (APRN) embedded full-time within each nursing home (NH) to influence resident care outcomes. Other key elements of the intervention include the use of the INTERACT III processes,[1] improved health information exchange through technology, and an expert MOQI support team including a care transitions

coach [Master of Social Work (MSW)–prepared social worker with skills to facilitate end-of-life decision making, quality improvement activities around transitions, and psychosocial care], INTERACT/quality improvement (QI) coach (nurse with skills to facilitate quality improvement and use of INTERACT), health information technology (HIT) coordinator (nurse with HIT skills), and medical director (physician with expertise in geriatrics and nursing home practices).[2–4] Long-stay residents—those residing in the nursing home more than 100 days—were the focus of the Initiative. As part of the MOQI intervention, all-cause hospitalizations and potentially avoidable hospitalizations of long-stay nursing home residents were monitored and reported back to the participating facilities throughout the project.

Background and Significance

Reducing avoidable hospitalizations is a common concern for nursing home residents as disability, functional decline, morbidity, and mortality are all associated with hospitalizations for older adults.[5] Spector and colleagues[6] developed and used a nursing home–sensitive measure of avoidable hospitalization that identified diagnostic, clinical, and facility factors to explain avoidable hospitalizations, finding that 60% of all hospitalizations from nursing homes were potentially avoidable. Furthermore, these authors suggest a combination of approaches to reduce nursing home hospitalizations, including better infection control practices, improved medication management, and fall and pressure ulcer prevention approaches. Unlike other studies, Spector et al noted that cognitive impairment does increase hospitalization risk as a result of increased risk of infection, falls, sepsis, and dehydration.

Hospitalizations often harm residents because of the stress of relocation, as well as unintended consequences of skin, nutritional, cognitive, and functional decline.[7,8] Additionally, nursing home residents are vulnerable to harm upon entering the nursing home because poorly executed transfers increase the risk of problems related to multi-morbidities, advancing age, and dependence upon caregivers to manage their care and meet daily needs.[9]

Avoidable hospitalizations come at a steep cost. Ouslander et al[5] found that the average hospital diagnosis-related group (DRG) payment was $6,500, and in one state alone avoiding hospitalization would result in a cost savings to Medicare of $47 million. Mor et al[10] suggested that in 2006, costs to Medicare for potentially avoidable rehospitalizations from long-stay nursing home residents who had been rehospitalized exceeded $2 billion and accounted for 45% of skilled nursing episodes of care. Ingber et al[11] reported on all seven sites (including the MOQI site) of the CMS Initiative to Reduce Avoidable Hospitalizations of Nursing Facility Residents; researchers calculated a per resident reduction in cost for potentially avoidable hospitalizations of $98 to $577. This cost saving varied across the seven models tested, but there was an estimated spending reduction of nearly $11 million in 2015.

Studies have identified that potentially avoidable hospitalizations of nursing home residents cannot be achieved without critical changes in nursing home organization and practice. Several studies have noted that for-profit nursing home status is correlated with increased hospitalizations of nursing home residents.[6,12] Additionally, there is regional variation on hospitalization rates, with Missouri being among the highest at nearly 24% compared to Wyoming, the lowest, at 16%.[10] Ouslander et al[5] noted the need to improve nursing home infrastructure and warned that increasing financial incentives without improving infrastructure, for example, more registered nurses, and capabilities for patient management, may worsen resident outcomes by incentivizing keeping sicker residents who cannot be adequately managed. Additionally, there is a need to improve medical management through the use of APRNs to increase access to expert clinical

care. This improvement was demonstrated as MOQI was associated with "consistent and significant" reductions in outcome measures, with larger reductions in 2015 than in 2014.[11] Analyses of MOQI conducted by the CMS independent evaluation contractor for the Initiative, using a comparison they selected from the state, found significant reductions in all-cause hospitalizations of 40.0%; in avoidable hospitalizations of 57.7%; in all-cause emergency room visits of 54.1%; and in avoidable emergency room visits of 65.3%.[13]

All-cause hospitalizations and potentially avoidable hospitalizations of long-stay nursing home residents were monitored and feedback reports provided to participating facilities throughout the MOQI intervention by the MOQI team. This report summarizes results from these key outcomes for 2 years 9 months, the duration that the intervention was fully implemented in all facilities (January 1, 2014–September 30, 2016).

Design and Methods

MOQI did not have access to the comparison data sets of the CMS independent contractor referenced above, so a single group analysis was conducted using data collected by MOQI APRNs and staff of the participating nursing homes. Data were analyzed using descriptive methods of both aggregate and individual facilities' rates per 1000 resident days, changes per quarter of all-cause hospitalizations, and an aggregate analysis of rates of avoidable, not avoidable, and percent avoidable hospitalizations, key outcomes of MOQI intervention. Hospitalizations were defined as any transfer to hospital in this analysis.

Sample

Participating nursing homes were purposefully selected from an area of the state with the highest re-hospitalization rates of key diagnoses of acute myocardial infarction, congestive heart failure, and pneumonia.[14] Specific facilities were identified within that area of the state with good quality of care and survey history, yet with high hospitalization rates and that both admitted to and discharged from high re-hospitalization hospitals within the same area. Sixteen facilities meeting these criteria were recruited for participation in the MOQI Initiative.

These 16 facilities ranged in size from 120 to 321 beds with a total of 3160 beds in urban, metro, and rural communities within 80 miles of a major Midwestern city. Participants were limited to the long-stay nursing home residents who have lived in the nursing home more than 100 days, are not enrolled in a Medicare Advantage plan (have traditional fee for service Medicare), and/or are a Medicaid enrollee. The sample included private pay residents with Medicare in state licensed only beds; residents in state licensed only beds were excluded in the CMS analyses of Ingberg and colleagues[11,13] referenced in the Background above. All potential residents were identified in each of the participating facilities, and provided informed consent to participate. New residents were continuously enrolled as they met eligibility criteria throughout the study. Average enrollment was 1750 residents over the course of the 2 years 9 months. The total number of residents enrolled was 5168 with a median age of 82 (range 20-104 years), similar to other nursing home residents throughout the country.

Theoretical Framework

Complexity Science provided the theoretical underpinnings of the intervention as a way to understand the nursing home environment. Complexity science suggests key components of communication relationships, and diversity of ideas are essential to influence organizational outcomes.[15] Anderson et al[16] found that open communication, and positive relationships between leaders and staff,

and sharing of diverse ideas were associated with positive nursing home outcomes.

Intervention

An APRN, either nurse practitioner or clinical nurse specialist, was hired for each nursing home[3] to provide direct services to residents while also mentoring, role-modeling, and educating nursing staff about early symptom/illness recognition, assessment, and management of health conditions commonly affecting nursing home residents. The APRN focused on common reasons for rapid functional decline that also increased risk of hospitalization such as pneumonia, congestive heart failure, chronic obstructive pulmonary disease and asthma, urinary tract infections, dehydration, skin ulcers, and falls.[14,17-19] Although the primary focus of the work was to provide services to dual Medicare/Medicaid beneficiaries, it was anticipated that all residents living in the facility would benefit from the work of the APRN.

Focused on early recognition, assessment, and management of residents' conditions, as well as developing positive relationships with primary care providers of the residents in the facility, the APRN intervened early when changes in health status occurred. Early intervention was used to stabilize and treat conditions, putting in place approaches to care that followed best practices, thus avoiding hospitalization. It was anticipated that faster recovery from acute changes would occur if conditions were managed within the nursing facility proactively with early detection and management.

The Project Medical Director assisted in the continuing education of the APRNs on geriatric principles and provided the MOQI team with advice on consistent management of medical illnesses in the facility. This physician acted as a liaison between the participating physicians, the facilities, and the MOQI team. The Project Medical Director and MOQI team also provided educational information and comparative reports to the participating physicians on areas such as hospitalization rates and antipsychotic use.

A critical element of the intervention was the use of INTERACT, particularly for early illness identification (stop and watch) and communication with providers (SBAR). The APRNs initially worked with the INTERACT/Quality Improvement Coach to improve health systems through quality improvement endeavors. The need to train both APRNs and facility staff in quality improvement methods required that all members of the MOQI team work with nursing homes to improve quality improvement processes. Additionally, each APRN completed an adapted INTERACT Root Cause Analysis (RCA) tool specific to MOQI for each transferred resident. As part of the quality improvement process, study staff reviewed the RCA tool with APRNs on a monthly basis to challenge conventional thinking about the nature of each resident's clinical experience and ask critical questions about how to improve nursing home systems and processes. Quality Improvement Feedback Reports of Hospital.

Transfers were generated monthly and shared with the MOQI research team and nursing home leadership. These reports graphically displayed actual hospital transfer numbers compared to the monthly hospital transfer goals (calculated for each facility based on number of study participants), number of residents with change in condition reports, percent penetration of INTERACT tool use, and risk factors for hospital transfers noted by APRNs.

It is essential that residents receive the services that are appropriate and fit with their long-term health goals. Proactive discussions about end-of-life decision making are essential in nursing homes and community-based care.[8] A key focus of the intervention, through the MSW Care Transitions Coach, was to develop and implement end-of-life decision-making and communication systems to honor residents' and family wishes and enhance psychosocial care that would impact care wishes and transitions.[2] The MSW Care

Transitions Coach worked with participating nursing homes in the Initiative so that working relationships were developed with staff, residents, and families. The Care Transitions Coach worked closely with social services/social service designee, primary care providers, nursing staff, and APRNs, to put communication systems to place that assured consistent communication of each resident's (or proxy's) decisions about advance care directives (including code status, hospitalization, and specific treatments such as antibiotics), while residing in the home and during transitions of care. The Care Transitions Coach and the APRN modeled effective communication strategies when discussing end-of-life decision making and goals of care.

Although our MOQI Intervention model was primarily designed to prevent and reduce avoidable hospitalizations, it was also to improve unavoidable hospital transitions, improve communication between care providers and settings, and reduce polypharmacy. The MOQI Intervention team focused on these processes at many levels. The Care Transitions Coach built relationships with hospital staff and nursing homes by implementing effective processes for transitions of care that occur when Medicare/Medicaid beneficiaries are transferred between the nursing homes and hospitals. Another critical team member, the HIT Coordinator, worked with nursing homes and hospitals to assure that health information exchange was initiated in the nursing homes so that hand-offs improved and necessary information flowed accurately in both directions (bidirectional exchange). It is widely recognized that HIT supports accurate information flow about health conditions, and that *not* having systems in place results in unnecessary healthcare procedures, medication errors, and other adverse events.[20] The HIT Coordinator used Missouri Health Connection's statewide health information network tools. These tools supported enhanced communication by allowing authorized nursing home, hospital, and Initiative staff to send and receive secure e-mails with encrypted health information and to view the beneficiaries' comprehensive medical history. The HIT Coordinator first focused on medication reconciliation between agencies (nursing home, pharmacy, hospital, primary care). Similarly, the APRNs worked collaboratively with the Project Medical Director to role-model assessing residents' medication necessity to reduce polypharmacy with nursing staff. Later, the HIT Coordinator focused on more advanced tools for the nursing facilities to use for hospital electronic health record access.[21]

Data Analysis

The hospital transfer rate was calculated for each of the 16 participating nursing facility for each quarter. The hospital rate is calculated as the transfer rate per 1000 resident days. Using the following formula:

$$\frac{\text{no. of hospital transfers}}{\text{no. of days (all residents) stayed in a nursing home}} \times 1000$$

Rates were summarized across all 16 homes for each quarter with mean, median, and standard deviations, as well as minimum, maximum, and lower and upper confidence levels. Similarly, difference scores were summarized. Wilcoxon signed rank tests were used to test the rate changes. The *P* values indicate if the change was statistically different from zero.

Individual facility changes were examined over time for transfer trends in improvements (fewer) or worse (more) hospital transfers using descriptive methods because of examination at the single facility level. Linear regression lines were calculated and used to visually examine for trend improvements, slight improvements, worse, slightly worse, and same trends.

Results

Table 1 displays the summary statistics for hospital transfer rate per quarter and rate changes from baseline (January 2014–September 16). There were 4 quarters that had significantly lower (better) rates as compared to baseline, illustrated by grey shading.

Figure 1 displays the relative hospital transfer rate of change per quarter from baseline (January 2014–September 16). As an aggregate, the 16 facilities had an overall improvement of approximately 30% reduction in all-cause hospitalizations from study beginning to end. There were some key events that occurred throughout the progress of the study that likely affected the changes at different quarters. For example, in March 2014 the MOQI team supervisor and project coordinator began meeting monthly with each APRN to review their INTERACT RCA tool (discussed in Methods) that was required to be completed by the APRN for each transfer to the hospital. Then, during a leadership meeting with all facilities in July of 2014, the study team began providing Quality Improvement Feedback Reports of Hospital Transfers (described in methods) to each facility about their transfer rates so they could track their progress and see how they compared to each other and to the group average. Later in 2014, the study team implemented a weekly check in the report system for each APRN to submit the prior week's planned and unplanned hospital transfers. This one-page simple report included total transfers each week for the month so the APRNs and study team could readily track how they were doing compared to each other and compared to each facility's monthly transfer goal. APRNs were challenged each week to work with the nursing home staff to identify root causes of each hospitalization. Then, they were challenged to take the next important step, to help their nursing home direct care staff correct systems of care (hydration, nutrition, mobility, etc) to prevent similar declines in health status or detect them earlier so the health status could be improved before needing hospitalization.

Figure 2 displays the analysis of all-cause hospitalization rates categorized using avoidable and nonavoidable definitions guided by the INTERACT route cause analysis (RCA) tool.[22] These tools were applied to each transfer throughout the study by the MOQI team with the APRNs, and then the APRNs reviewed results with their respective nursing home staff at routine quality improvement/assurance meetings. Results illustrated in Figure 2 show that avoidable transfers (solid line) remained fairly consistent throughout (approximately 53% to 50%). However, the relationship between the percentage of avoidable (dot and dash line) and nonavoidable (dash line) hospital transfer rates reversed themselves in the first quarter of 2015; fewer nonavoidable transfers were identified (declined from 64% to 47%) whereas the percentage of avoidable transfers increased (from 48% to
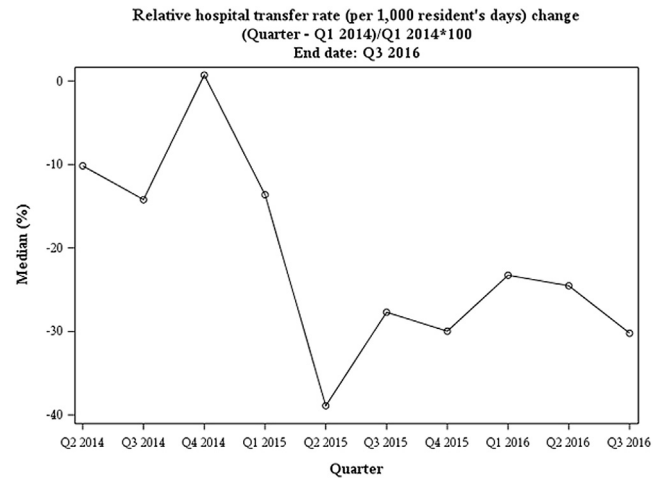

Fig. 1. Hospital transfer rates percent change per quarter.

54%). This relationship may have been affected by the monthly quality improvement feedback and weekly transfer reporting systems implemented in 2014 that challenged APRNs (and likely they challenged their nursing home staff) to more systematically think through and identify root causes. With accurate RCA, they were expected to take corrective actions with systems of care (hydration, nutrition, mobility, etc) to improve the root causes.

Figure 3 displays regression lines of trends in improvements or worse hospitalization rates. Lower hospitalization rates (improvements) are seen in seven facilities (2, 6, 7, 9, 11, 12, 14, 16); slight improvements in three facilities (5, 10, 13); two facilities (1, 15) had more hospitalizations (worse); two were slightly worse (3, 8); and one stayed the same (4). Although the majority improved or slightly improved, it is important to explore those that did not. The two homes that had more hospitalizations (worse) experienced several changes in leadership (multiple changes in administrators, directors of nursing, and other key personnel) and one also experienced a corporate buyout. With the changes in leadership, these facilities also experienced more changes in their MOQI APRN than the others. The one that stayed the same had an administrator leader who always expressed priorities other than MOQI.

Discussion

The MOQI Initiative resulted in a 30% reduction in all-cause hospitalizations and statistically significant reductions in 4 single quarters of

Table 1
Rates All-Cause Hospital Transfers All Participating Nursing Facilities (n = 16)

	Summary Statistics on Hospital Transfer Rates at All Facilities (n = 16)							Summary Statistics on Difference Scores (From First Quarter to Every Other Quarter)					
Quarter	Mean	SD	Median	Min	Max	Lower 95% CL for Mean	Upper 95% CL for Mean	Mean of Difference	SD	Median	Lower 95% CL for Mean Difference	Upper 95% CL for Mean Difference	P*
01/14–03/14	2.75	1.03	2.59	1.47	4.98	2.20	3.30	N/A	N/A	N/A			
04/14–06/14	2.48	0.86	2.32	1.12	3.9	2.03	2.94	−0.26	0.73	−0.21	−0.65	0.12	0.09
07/14–09/14	2.21	0.67	2.32	1.12	3.47	1.85	2.56	**−0.54**	**1.02**	**−0.40**	**−1.08**	**0.01**	**0.04**
10/14–12/14	2.49	0.76	2.26	1.34	4.13	2.08	2.90	−0.26	1.07	0.00	−0.83	0.31	0.67
01/15–03/15	2.27	0.78	2.29	0.83	3.64	1.86	2.69	−0.47	1.26	−0.40	−1.14	0.20	0.14
04/150–6/15	1.83	0.67	1.77	1.09	3.62	1.47	2.19	**−0.92**	**1.15**	**−0.82**	**−1.53**	**−0.30**	**0.00**
07/15–09/15	2.07	0.63	1.84	0.98	3.14	1.73	2.41	**−0.68**	**1.19**	**−0.85**	**−1.31**	**−0.04**	**0.03**
10/15–12/15	1.89	0.69	1.80	0.82	3.73	1.52	2.26	**−0.85**	**1.44**	**−0.85**	**−1.62**	**−0.09**	**0.04**
01/16–03/16	2.17	0.95	2.32	0.41	3.73	1.67	2.68	−0.57	1.45	−0.76	−1.35	0.20	0.13
04/14–06/16	2.23	0.97	2.12	0.76	3.67	1.71	2.74	−0.52	1.29	−0.65	−1.21	0.17	0.07
07/16–09/16	2.08	0.91	2.08	0.23	4.08	1.60	2.57	−0.66	1.40	−0.83	−1.41	0.08	0.07

CL, confidence limit; SD, standard deviation.
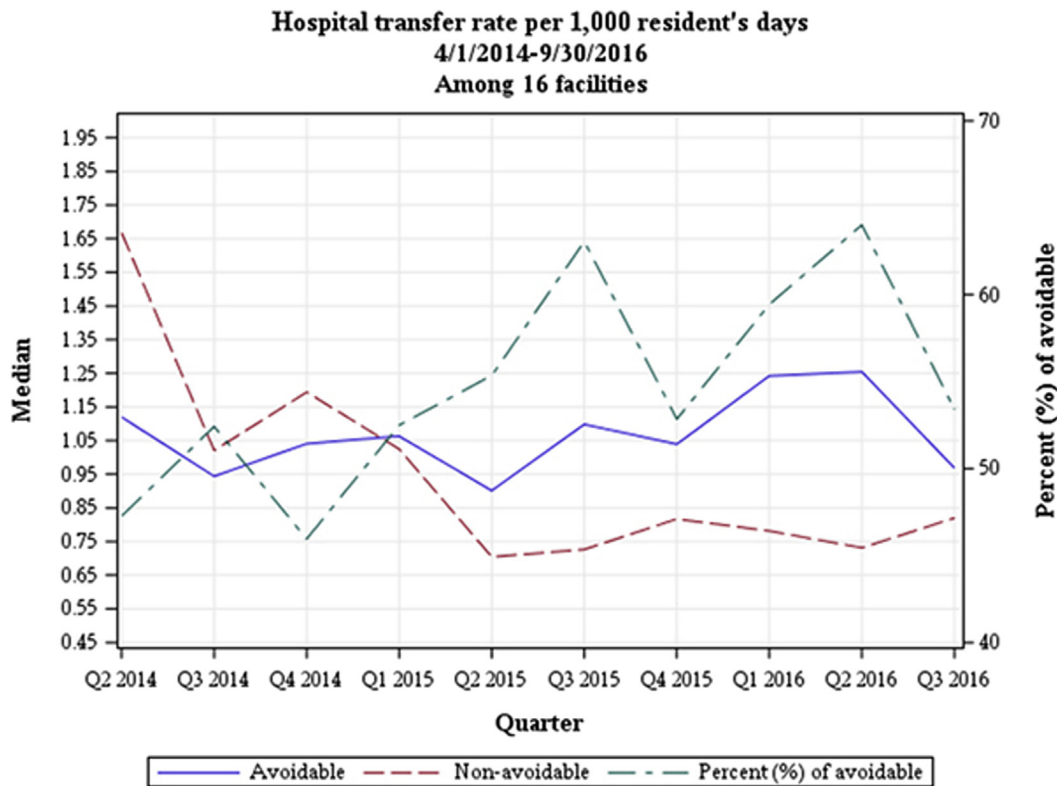*Significant results are highlighted in bold.

Fig. 2. Avoidable, non-avoidable, and percent avoidable hospital transfer rates percent change per quarter.

the 2.75 years of full implementation of the intervention for long-stay nursing home residents (n = average of 1750 residents per day). This reduction is important for nursing home residents who are most frail and vulnerable when experiencing health declines and for whom hospitalization poses a significant risk. This large reduction was achieved with full-time APRNs working in each facility and supported by the MOQI team to assist with quality improvement activities, consistent use of INTERACT, increased end-of-life decision making, and improved use of HIT for secure communication. APRNs and the nursing staff they worked with in each of the nursing homes were able to detect the health conditions earlier and manage them effectively before residents experienced serious health events requiring hospitalizations. Our results of 30% reduction of all-cause hospitalizations are similar to, but exceed, the findings of Ouslander and colleagues,[22] who found that nursing home staff identified 23% of their facilities' transfers to hospital as potentially preventable if health conditions had been detected earlier and managed better within the facility, and if earlier advance care planning discussions with family and residents had occurred.

Studies have reported a range of variability of hospitalization rates of nursing home residents. For example, an Office of Inspector General Report[23] found that rates varied from 1% to 69.7% (average 25%), with 7% of nursing homes having rates of 40% or more. Discovering ways to effectively reduce hospitalizations is critical for the health and well-being of nursing home residents and to better manage the growing problem of rising health care costs in the United States. Hospitalization costs for nursing home residents account for 11.4% of all Medicare Part A spending and cost more than 33% higher per hospitalization than for all Medicare beneficiaries.[23]

Our findings about avoidable hospitalizations are different from studies by other researchers. Although there was a large reduction (30%) of all-cause hospitalizations, there was a decline in the non-avoidable transfers from 64% to 47% and an increase in the percentage of avoidable from 47% to 54% (as seen in Figure 2). The research team

believes that over time, and through ongoing RCA of each transfer, APRNs identified more hospitalizations as avoidable and took action to correct problems in the care delivery systems that had previously forced transfers. In other words, their idea of what was avoidable changed over time. The APRNs were able to help nursing staff implement systems of care to improve hydration, nutrition, mobility, engagement with life, making decisions about advance directives, consistently using INTERACT, etc, and were able to influence the nursing home direct care staff and leadership to build these systems.[24] They were also able to help staff and leadership maintain important systems of care designed to keep people healthy and identify and reverse illnesses earlier, avoiding the dramatic declines in health status that staff formerly considered inevitable. For example, staff would frequently claim that there was nothing to be done for falls, particularly for falls with injuries. The MOQI team and APRNs would challenge these false claims, helping the staff explore potential underlying causes of dehydration, muscular weakness, changes in other health conditions, medication side effects or interactions, and other possible causes.

Other researchers have explored the potential occurrence of hospitalizations that are considered avoidable. Spector and colleagues[6] constructed a competing risks proportional hazards analysis of a national sample of nursing home long-stay residents using a CMS data set, the Nursing Home Stay file. They found that 60% of hospitalizations for long-stay nursing home residents were potentially avoidable. Their finding more closely matches the MOQI experience of 54% of hospitalizations of the long-stay residents found to be avoidable by study end, using the INTERACT RCA tools completed for all hospitalizations for MOQI participants. Ouslander and colleagues[5] found a higher rate of potentially avoidable hospitalizations of 67% in a cross-sectional sample of 200 hospitalizations of both long-stay and short-stay residents in 20 nursing homes (10 with high hospitalization rates and 10 with low hospitalization rates) in one state; experts did retrospective, structured chart reviews to determine if the hospitalization was potentially

Hospital transfer rate per 1000 resident days per quarter
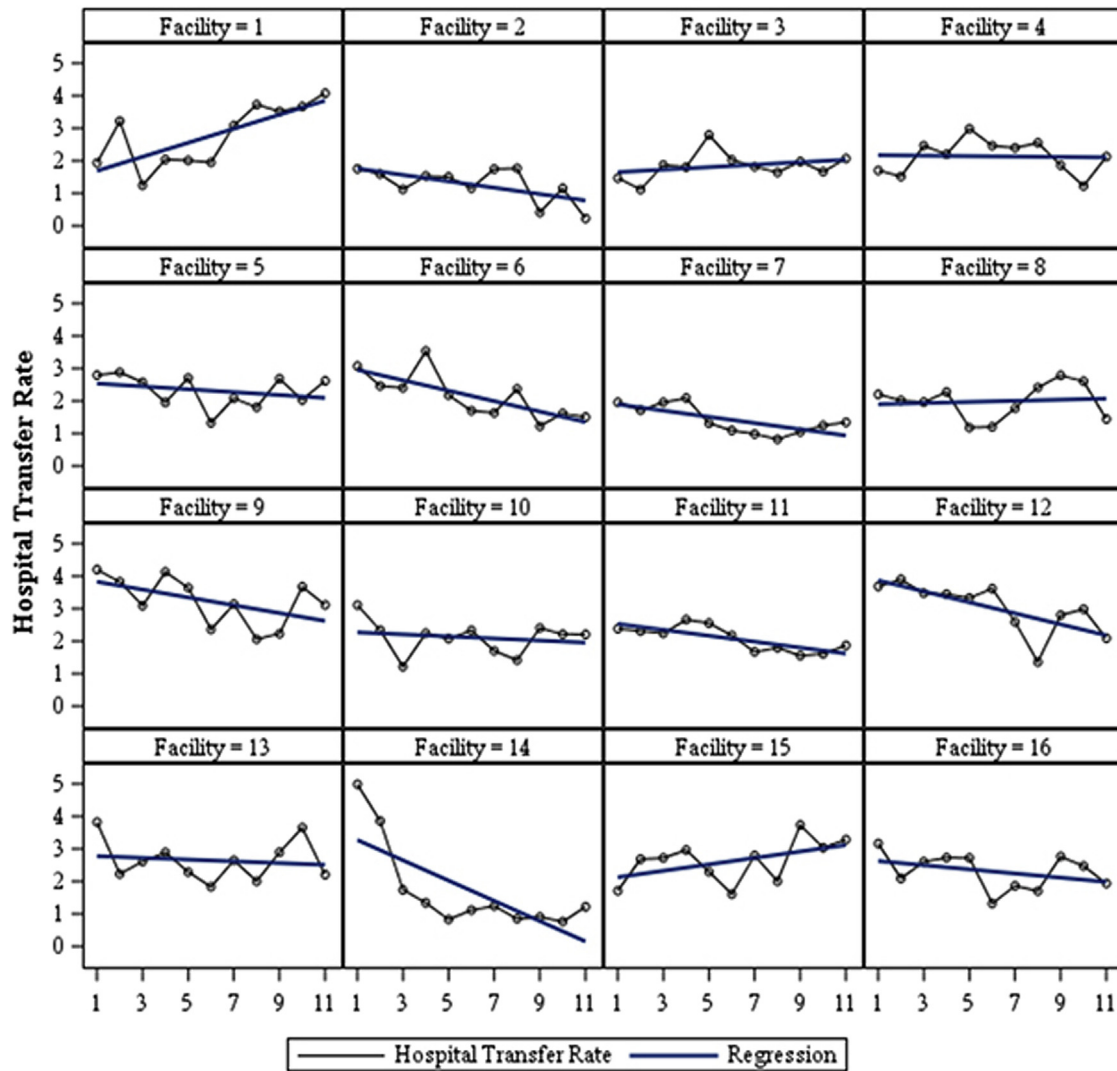1/1/2014-9/30/2016
For 16 individual facility

Fig. 3. All cause hospitalizations transfer rate for each facility per quarter.

avoidable or not. Lamb and colleagues[25] did a mixed methods analysis of 1347 INTERACT RCA tool reviews and found that nursing home staff perceive most hospitalizations (76%) as *not avoidable*. They rated only 4% as avoidable and 20% as possibly avoidable. These results point out the disparity in perspectives of the direct care staff in nursing homes, the different views of experts doing chart reviews, and the results experienced by the MOQI APRNs and the nursing home staff working with them to actively build care systems to reduce avoidable hospitalizations, the primary focus of the MOQI Initiative.

An important strategy used by the MOQI team was preparing and providing to participating nursing home leaders and APRNS comparative feedback reports illustrating the rates of hospitalizations and other key outcome variables. These reports were prepared from the data collected real time within each nursing home and summarized each month from the prior month's data. In this way, it was possible to visualize each facility's progress each month, so corrective actions could be taken without long time delays between feedback. The MOQI research team has designed and provided feedback reports as a part of other nursing home research.[26,27] In those studies, comparative reports

of quality of care were effective in helping nursing home staff interpret accurately how well they are performing and see improvements each month as they focus efforts to build and improve basic systems of care to better manage nutrition, hydration, mobility, skin condition, continence, and others. Having ways to accurately measure performance and take corrective actions to improve is essential to moving an organization, such as nursing home, to provide a higher standard of care.[28]

Similarly, comparative feedback reports were provided to primary care physicians responsible for the residents participating in MOQI. The MOQI Medical Director followed up with physicians with high hospitalization rates in an effort to engage them more fully in the initiative and work more closely with the APRNs and nursing staff to better manage residents within the facility. Nursing home staff frequently expressed frustration with some physicians who insisted on transferring residents for evaluation at the emergency room or hospital. The comparative reports helped the medical director educate outlying physicians on value-based medicine principles of effective, safe, evidence-based care that their peers were able to accomplish. This was reinforced by physician newsletters on the principles of the

INTERACT system and on evidence-based medicine in common conditions causing hospitalizations. Many but not all of the physicians did improve their use of the expertise of the APRN and the improved skills of the MOQI-educated nursing staff and decreased their hospitalization rates.

There are limitations of the MOQI intervention and evaluation. These include the targeted sample of facilities willing to participate in the region of the state and country where readmission to hospital of nursing home Medicare beneficiaries are high. Targeting the sample in this way limits the generalizability of results. Although limiting the nursing homes to one state helps to control regulatory and regional differences for interpretation of results, it also limits generalizability. The lack of a comparison group also limits interpretation and methods of analysis.

In the larger evaluation of all sites in the CMS Initiative, of which MOQI is a part, there were matched comparison groups selected from each state in the evaluation for use by the independent evaluation team.[11,13] The independent evaluation contractor, Research Triangle Institute (RTI) International, used large data sets to compare all-cause and potentially avoidable hospitalizations, and Medicare expenditures associated with hospitalization. Potentially avoidable hospitalizations were defined by conditions identified by experts as potentially preventable or manageable in nursing homes.[29] For the MOQI Initiative, using this comparison group, there was a 40% reduction in all-cause and 57.7% reduction in potentially avoidable hospitalizations ($P = .001$); all-cause ED visits were reduced 54.1% and potentially avoidable ED visits reduced 65.3% ($P = .001$).[13] Medicare expenditures were reduced 33.6% in all-cause and 45.2% in potentially avoidable hospitalizations ($P = .001$); all-cause ED visits were reduced 50.2% and potentially avoidable ED visits reduced 59.7% ($P = .001$).[13] Additionally, the MOQI Initiative was associated with a 5.9% reduction in the probability for any hospitalization in 2014 and more reduction in 2015 to 9.5%.[11] Findings using the comparison group not only confirmed the findings reported in the analysis reported in this paper but also found that larger effects than this analysis could measure without a comparison group.

As the population of older people increases in the upcoming decades, finding good solutions to deal with the increasing costs of health care expenditures is urgently needed. The MOQI intervention tested and evaluated in the CMS Innovations Center for the Initiative to Reduce Avoidable Hospitalizations among Nursing Facility Residents provides such an excellent solution. APRNs working with multidisciplinary support teams of social work, HIT, and INTERACT/QI coaches has the potential for large-scale implementation nationwide. It is critical for older people living in nursing homes to have access to care provided by APRNs to help the nursing home staff to implement and maintain systems of care delivery that can prevent avoidable changes in health status. When there are changes in health status, APRNs can help to detect those quickly, get interventions in place to restore health, and help people be comfortable at end of life. It is time for all nursing homes to have full-time access to APRNs nationwide.

Acknowledgments

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