Preliminary Report: Pilot Field Data Collection Efforts to Validate Nursing Home Quality Indicators (Performance Measures)

CMS Contract No:
500-95-0062

Preliminary Report

August 15, 2001
Revised September 26, 2001
Revised March 20, 2002

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EXECUTIVE SUMMARY

Background: This report presents results of a pilot study to determine whether a series of MDS-based Quality Indicators, also referred to as performance measures, are valid measures of the quality of care provided by nursing homes. This pilot was conducted in a small sample of facilities within a single state. A larger validation study including more than 200 facilities in six states is now underway. The purpose of the pilot was to refine instrumentation and conduct preliminary validation analyses.

The pilot study endeavored to identify the relationship between two sets of variables -- one, a series of indicators of nursing home quality based upon aggregated resident data;; the second, theoretically relevant measures of service inputs. If the former quality indicator measures are to be considered meaningful and valid, there should be a significant relationship with the theoretically relevant service input measures.
The quality indictor measures consist of thirty-one (31) facility-level indicators of presumed nursing home (NH) quality for long-stay residents. They are based on nursing home residents' clinical and functional status as assessed by facility staff and included in the Minimum Data Set (MDS). The Center for Medicaid and Medicare Services (CMS) has mandated national use of this system since 1990, and facility staff are responsible for completing these assessments. Long-stay residents are assessed at admission and quarterly throughout their stay, and the quality indicators represent aggregated cross-sectional and change measures derived from this information set.

The second set of variables used to test the validity of these quality indicators were collected in facility site visits by trained research staff. The data gathered reflect *a priori* hypotheses regarding the determinants of quality in nursing homes. In each facility, staff were interviewed, records reviewed, and controlled observations made.

The goal of this limited pilot study was two fold -- to field the data collection instruments and to provide a provisional test of the hypothesized relationship between quality indicator measures and pertinent service input and process measures. In addition, as this work unfolded, the study team created a series of provisional quality indicators for short-stay, post acute care (PAC) patients, and these measures were compared with the service validation items.

Method: Two samples of facilities and related data sources were used, each including MDS-based Quality Indicators (QIs) derived from computerized MDS data and an array of validation elements collected by research staff from participating facilities. The first sample was from an existing data set of 45 facilities owned or managed by the National Health Corporation (NHC). These data were gathered under a National Institutes on Aging (NIA) grant [#RO1 AG 13843] in a study that focused specifically on an evaluation of the determinants of nursing home quality. The second data source was obtained with CMS contract funds for a sample of nursing homes in Massachusetts (MA) (n=45). Facilities were sampled and surveyed for the express purpose of evaluating pilot research instruments with data validation elements keyed to specific QIs.

Data collection protocols were similar for both the existing (NHC) and new primary data collection samples (MA). Staff at each facility, including the Director of Nursing and a representative from Administration, completed self-administered surveys on facility characteristics, care practices, policies, and procedures. In both samples trained research staff nurses reviewed up to one hundred resident charts per facility. Resident record reviewed were selected based on computerized algorithms using MDS data, with protocols keyed to specific Quality Indicator areas -- three in NHC and nine in MA. In addition, facility staff were asked to complete a survey on factual and attitudinal items, and research staff completed a systematic walk-through to characterize

the ambience of the nursing home and to observe facility care plan meetings.

Analysis*:* Expert panels had defined hypotheses that linked field data elements to specific QIs. In the case of the Massachusetts sample, many of the data elements were collected with the express purpose of providing data to validate the QIs. Exploratory data analysis techniques were used to combine data from staff surveys, medical record reviews, facility "walk-through" surveys, care plan observations and other forms. Our pilot results suggest that 29 of the 31 QIs examined pass a minimal threshold of provisional validity. Some QIs appear to have stronger validity evidence than others. For the 7 Post-Acute (PAC) Quality Indicators, the analyses were suggestive of the indicators' being valid. Some of the PAC QIs were validated by single chronic scales, but many demonstrated validity with multiple scales.

Conclusion: In this preliminary and exploratory study, we found that aspects of nursing home quality of care can be measured with field survey research instruments, and constructs derived from these instruments appear to be able to explain a practically and clinically significant proportion of the variability in nursing home quality indicator rates for nursing homes that are based upon aggregated MDS data. These results provide preliminary evidence that support the position that MDS-based QIs are valid measures of aspects of care quality provided by nursing facilities. If these results are replicated in the larger six state field validation effort, there will be reason to believe that the quality indicator measures are valid and broadly applicable. The next step is to test these relationships in a larger, more nationally representative sample of nursing homes. Until that work is complete, we note that the current results are from two unique data sets and the results must be considered in this light.

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I. Introduction

This report summarizes preliminary analyses of data collected using pilot field measures of nursing home (NH) quality of care for the purpose of validating nursing home quality indicators (QIs), also referred to as performance measures. QIs measure presumed quality of care based on the aggregated clinical characteristics and "outcomes" of NH residents contained in an administrative data set (the Minimum Data Set (MDS)).

This pilot was conducted in a small sample of facilities within a single state. A larger validation study including more than 200 facilities in six states is now underway. The purpose of the pilot was to refine instrumentation and to conduct preliminary validation analyses. Primary data collection instruments designed to capture observable aspects of quality care were fielded in 45 Massachusetts facilities. These data were used to define constructs in order to conceptually and statistically relate them to observed MDS-based QIs in an effort to do preliminary validation of these QIs.

II. Methods

Source of Data: Two samples of facilities and related data sources were used, each including MDS-based Quality Indicators (QIs) derived from computerized MDS data and an array of validation elements collected by research staff from participating facilities. The first sample was from an existing data set of 45 facilities owned or managed by the National Health Corporation (NHC). These data were gathered under a National Institutes on Aging (NIA) grant [#RO1 AG 13843] in a study that focused specifically on an evaluation of the determinants of nursing home quality. Data were available for forty-five (n=45) of the approximate 100 facilities owned or managed by NHC. These data pre-date the CMS contract activities and thus the validation elements are not identical to the CMS set, but they do cover a broad array of similar areas and are appropriate for this task. The second data source was obtained with CMS contract funds from a sample of forty-five (n=45) nursing homes in the state of Massachusetts, sampled and surveyed for the express purpose of evaluating pilot research instruments with data elements keyed to specific QIs.

The Quality Indicators: Thirty-one (31) chronic indicators were evaluated, each reflecting the presumed quality of care delivered to long-stay nursing home. The 31 chronic QIs were derived from one of two sources: they were either in general use in the industry prior to this study, or were designed by the study team to fill "gaps" in the coverage of the existing indicator set. All of the Post-acute Care (PAC) indicators, reflecting presumed quality delivered to short-stay residents, were created by the study team prior to conducting the pilot validation study. A complete report summarizing the review of existing measures and research conducted to create new measures has previously reported.

Service Protocols: Field data collection protocols were similar for both the existing (NHC) and new, primary data collection samples (MA). Nursing facility staff, including the Director of Nursing and a representative from Administration, completed self-administered surveys on facility characteristics and care practices, policies and procedures. Trained research staff reviewed up to one hundred resident charts (or more) per facility. Residents' records were selected using a computerized algorithm applied to recent MDS assessment data designed to identify patients whose clinical characteristics placed them at risk of having selected clinical problems that were pertinent to nine domains of clinical care addressed by specific QIs. In addition, in the MA sample, research staff observed facility care plan meetings and interviewed a facility MDS coordinator.

For the MA sample, we contacted a total of 157 facilities, of which 95 said that time and resource constraints made it impossible for them to participate in the study, 8 agreed and then never scheduled an appointment to initiate data collection and 15 canceled a scheduled appointment. Forty-five (45) facilities participated in the field effort. We compared the QI scores for these against the 112 that did not participate. Overall, the

distribution of QIs was very similar. Four significant differences were found across participating and non-participating facilities (P<.05). Results of this analysis are displayed in Appendix B, table 1. Facilities that participated had a lower QI Scores for *ADL improvement in residents with capacity* (6%, vs. 8%), *Falls change* (9% vs. 11%), *Weight loss* (12% vs. 14%) and *Pain Change* (9% vs. 11%). All of these differences are of very small magnitude. We do not believe that the relatively small number and magnitude of differences between sampled and contacted facilities threaten the validity of the preliminary validation results

Sampling: In both samples there was some attempt to identify facilities at either end of the quality continuum. Because only a limited number of facilities can be included in the field validation effort, we used a facility selection procedure that would ensure that an appropriate distribution of probable facility quality would be included. To accomplish this in MA facilities, we examined the facility level distribution of provisionally accepted quality indicators identified during Task 2 activities, ones that the steering committee felt most confident about probable validity. These QIs included *Behavioral problems, Pressure ulcers, Restraint use, Bladder Incontinence, Falls Change,* and *Locomotion*. First priority was given to homes in the top and bottom thirds of the distribution according to their number of 'good' and 'poor' values on these six QIs. In the NHC sample, the sampling was designed to test specific quality of care hypotheses relating to *Pressure ulcers, Behaviors,* and *Falls*. The sample was built that purposefully excluded facilities from the middle of the distribution of homes according to their values on these three QIs.

Analysis: Expert panels defined hypotheses linking field data elements to specific chronic QIs. In the case of the Massachusetts sample, many of the data elements were collected with the express purpose of providing validating data for the QI. Exploratory data analysis techniques were used to combine data from surveys of staff, medical record review, facility walk-through, care plan observation and other forms within the set of elements relative to each hypothesis. The goal of these analyses were to confirm that data elements identified by experts *a priori* as unified concepts and expected to be related to specific QIs, were empirically related to the intended QI. And if not, to refine scales that would better measure constructs presumably related to quality of care provided by the facility and potentially modifiable by facility staff. Care quality constructs were considered to show evidence of validity if a validity coefficient (correlation coefficient) of 0.30 or greater was observed (in the expected direction) between the defined construct and the specified QI, i.e., at least 9% of the variance in the QI was accounted for by the individual quality of care construct.

We pursued three lines of evidence to validate the QIs with specific quality of care constructs. The first, called primary validation, involved defining the constructs articulated by expert panels, and investigating the correlation of these constructs with the QI. The second line of evidence was to look at cross-validation coefficients, meaning the correlation of constructs that seem to validate the QI for which they were created with other QIs. A third line of investigation was pursued, called ex *post facto* (EHF) analysis, were items observed to be related to QIs that were otherwise not validated or did not have strong evidence was completed. These three lines of evidence represent decreasing strength of validity. All analyses regarding chronic QIs are summarized in table 1, and details are provided in Appendix A, tables 1-4.

For the 7 PAC QIs, we used the above validation constructs to identify whether they seemed to be operational in a skilled nursing environment, answering the question of whether they would also be related to PAC QIs at the .30 threshold or higher.

III. Results

Findings: Table 2 displays distributional statistics for each of the chronic Quality Indicators -- the 22 approved existing Quality Indicators and the 9 newly created quality indicators. For NHC, two are missing. There was no variance for the urinary tract infection (UTI) Quality Indicator (i.e., all residents in the 45 NHC sample homes were assessed not to have a UTI) and the data necessary to create the Care Preferences Quality Indicator was missing.

The data in Table 2 present information both on central tendency and dispersion, and in most instances the Massachusetts sample demonstrates higher levels of problems and a greater dispersion. This is an artifact of the sampling decision to use 7 QIs to over sample facilities in either tail (e.g., excellent, poor) of the quality distribution. By way of example, look at the LTCQ (Long Term Care Quality, Inc.) Cognitive Quality Indicator. The mean rate of decline over a 90-day period for a nursing home in the purposeful sample of Massachusetts nursing homes was 13.2%, with the highest rate of decline for any one facility being at the 34% level. For NHC, the comparable mean value is 8.4% and the outlier facility decline rate was at 21% over the 90-day period.

Analyses with the NHC data identified 19 service-based constructs (aspects relating to the process or presence of policies guiding care delivery); each internally reliable (range of Cronbach's alpha = (0.32, 0.96)) that demonstrated significant validity coefficients with one or more chronic quality indicators (correlation with specified QI, range = (0.30,0.50)). These results are summarized in Appendix A tables 1 and 3. Table 1 provides QIs and constructs derived from NHC field data used to provide validating evidence for the QI. Table 3 provides construct descriptions, internal consistency reliability, and cross-validation evidence with other QIs.

Analyses with the MA data identified 32 service constructs; each internally reliable (range of Cronbach's alpha = 0.32, 0.90) that demonstrated significant validity coefficients with one or more chronic QIs (correlation with specified QI, range 0.29, 0.61). These results are summarized in Appendix A tables 2 and 4. Table 2 provides construct derived for specific QIs, and Table 4 summarizes items belonging to specific constructs, their internal consistency reliability coefficients, and cross-validation analyses.

Our results indicate that appropriate validation elements are present for 29 of the 31 chronic Quality Indicators (Performance Measures) examined. Further, 20 of the 31 can be classified preliminarily as having strong validity evidence, meaning that a validation element was identified in both of the datasets. This includes positive validation for six of the ten Center for Health Systems Research and Analysis (CHSRA) Quality Indicators evaluated, the one Ramsey indicator, eight of the eleven (LTCQ) indicators, and six out of nine newly proposed indicators. For twenty-seven indicators, there are two or more significant validation elements. For two indicators, there is a single significant validation element. These results are summarized in table 1.

By way of example, for the LTCQ Cognition Indicator, in the NHC and MA samples there are eight significant validation elements. Each has a negative correlation, and those correlations can be interpreted to mean that quality is BEST when the following are true:

- Facilities provide continuing education and have policies in place regarding the use of high risk drugs and the occurrence of adverse drug reactions
- Staff monitor for changes in resident function (e.g., identify changes in cognition, monitor for changes in vital signs, monitor for changes in functional status)
- Facility has aggressive cognitive/behavioral focused care practices (e.g., behaviors are charted across shifts, cues are used to enhance the resident's cognitive performance, attentive

communication strategies were observed during a walk through)

- Staff attend to skin-care prevention strategies (e.g., use of pressure reduction devices)
- Evaluation strategies are employed (e.g., presence weekly or more frequent weight evaluations, restorative aides contribute to care plan)
- Staff are observed doing care
- Comprehensive resident evaluation strategies are employed (educational strategies with the resident and the resident's family).

For the seven Post-Acute (PAC) Quality Indicators, we found appropriate and significant validation elements from among the scales and constructs used for the chronic QIs. These analyses are summarized in Appendix C table 1. Some of the PAC QIs were validated by single chronic scales, but many demonstrated validity with multiple chronic scales. For example, the PAC "Inadequate management of pain" QI was validated by only one chronic scale, but this scale has clinical specificity for this QI: the chronic scale that captures the tendency of facility residents in pain to have evidence of clinical exams ordered to evaluate the pain in the medical record. On the other hand, the PAC "Failure to manage respiratory problems" QI was validated by four chronic scales: the presence of cognitive-behavioral care practices, therapies (PT/OT/Speech) added to the care plan, absence of a recent management change at the facility, and the availability of specialty staff training and protocols were all related to lower facility rates on this QI. We believe that the validation evidence provided by the chronic scales for the seven PAC QIs provides, preliminarily, strong evidence of their validity.

IV. Summary

This report summarizes results of a pilot field effort designed to test data collection instruments for recording care practices and policies in U.S. nursing homes. These data collection instruments were created to collect data to validate nursing home quality indicators (QIs) constructed from aggregate resident assessment data collected with the minimum data set (MDS). Important results from this field study are a demonstration of the feasibility of collecting care practice and nursing home policy data, and preliminary validation of nursing home QIs with this field data. Further, we augment these preliminary validation analyses with data collected under an NIH grant that used similar facility-level data collection instruments.

Although field design efforts were similar for the NHC and MA samples, there are important differences. Both were interested in gathering information about care practices, facility policies, and other facility level characteristics thought to have a direct relationship to health outcomes among nursing home residents. Commonalities included interviews or questionnaires delivered to nursing home administrators and/or directors of nursing. An important feature distinguishing the two is that data collection efforts in the MA sample used instruments and selection of medical records to review within facilities with the express intent of validating QIs defined using MDS data and approved in previous versions of the MegaQI project.

***Conclusion*:** Aspects of nursing home quality of care can be measured with field survey research instruments, and constructs derived from these instruments can explain a practically and clinically significant proportion of the variability in QI rates for nursing homes.

These results provide evidence that QIs measure aspects of care quality that may be amenable to modification via facility staffing, preliminary policies, practices and/or procedures.

Future activities will include completing validation analyses with the Massachusetts data, refining and streamlining field data collection forms and procedures, and commencing full-scale and representative field data collection activities in the six-state study including more than 200 facilities.

References

Cohen, J. (1969). Statistical power analysis for the behavioral sciences. New York. Academic Press.

Table 1. Summary of Preliminary Validation Analyses

Quality Indicator	Primary validation			Secondary validation		Number of times validated		
	NHC	MA	EPF	NHC	MA	NHC	MA	Tot.
Strong Validity Evidence								
physical functioning								
ADL decline (CHSRA; ADL01)	●		●	●	●	3	2	5
Mobility change (LTCQ; MOB01)	●			●	●	2	2	4
Falls change (LTCQ; FAL01)	●	●				1	2	3
Walking performance (MEGAQI; WAL0X)				●	●	1	2	3
clinical complexity								
Low BMI prevalence (MEGAQI; BMI0X)	●	●	●	●	●	4	7	11
Flare up of infections (MEGAQI; INF0X)	●	●		●	●	5	3	8
Inadequate management of pain (MEGAQI; PAI0X)	●	●	●			5	3	8
Pressure ulcer change (LTCQ; PRU04)	●			●	●	5	2	7
Tube feeding prevalence (RAMSEY; NUT01)		●		●	●	3	2	5
Pressure ulcer prevalence, high & low risk (CHSRA; PRU01)				●	●	1	2	3
continence								
Indwelling urinary catheter change (LTCQ; CAT01)	●	●			●	2	5	7
Bowel & bladder incontinence prevalence, high & low risk (CHSRA; CNT01)	●	●			●	3	2	5
Catheter prevalence (CHSRA; CAT02)	●	●		●		3	1	4
cognitive, psychological and social functioning								
Behavior problem prevalence, high & low risk (CHSRA; BEH01)		●	●	●	●	3	8	11
Cognition change (LTCQ; COG01)		●		●		5	1	6
Depressed mood change (LTCQ; MOD03)		●		●	●	1	5	6
Communication change (LTCQ; COM01)		●		●		3	1	4
New or persistent delirium change (MEGAQI; DEL0X)		●		●	●	2	2	4
Antipsychotic prevalence, high & low risk (CHSRA; DRG01)		●	●	●		1	2	3
Behavior problem change (LTCQ; BEH04)				●	●	2	1	3
Moderate Validity Evidence								
physical functioning								
ADL imp. in residents with capacity (MEGAQI; ADL03)		●	●		●	0	2	2
ADL decline following improvement (MEGAQI; ADL02)		●				0	1	1
clinical complexity								
Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)		●	●		●	0	8	8
Urinary tract infection prevalence (CHSRA; CNT04)	†		●	†	●	0	4	4
Restraint prevalence (CHSRA; RES01)			●			0	3	3
Pain change (LTCQ; PAN01)		●			●	0	3	3
Weight loss (LTCQ; WGT01)		●				0	2	2
continence								
Bladder incontinence change (LTCQ; CNT03)					●	0	1	1
cognitive, psychological and social functioning								
Little or no activities prevalence (CHSRA; SOC02)			●			0	4	4
No Validity Evidence								
Bowel incontinence change (LTCQ; CNT02)						0	0	0
Prevalence of care preferences (MEGAQI; CAR0X)	†			†		0	0	0

Strong validity implies evidence of validity was found in two datasets (NHC and MA), either in the validation of a primary hypothesis, confirmation in an Ex Post Facto (EPF) constructed scale, or in cross-validation with a scale constructed for another QI (secondary validation). No validity evidence implies no construct could be identified for the QI, and no other construct was correlated with the QI. Remaining QIs are classified as having moderate validity evidence

● - evidence of validity; validation coefficient ≥ |0.30|

† - no residents in NHC sample had urinary tract infection; care preferences data not available in NHC sample

(blank) - validity evidence pursued, but not identified in field data

Table 2. Distribution of Quality Indicators (QI) in Massachusetts Field Sample and NHC Sample.

Quality Indicator	Massachusetts (n=45 facilities)					NHC (n=45 facilities)				
	Mean	Median	SD	Min	Max	Mean	Median	SD	Min	Max
CHSRA										
ADL decline (CHSRA; ADL01)	17	16	6.9	2	32	11	10	5.2	4	27
Behavior problem prevalence, high & low risk (CHSRA; BEH01)	8.6	7.1	9.4	0	44	15	15	6.2	2	32
Bowel & bladder incontinence prevalence, high & low risk (CHSRA; CNT01)	49	44	27	0	100	57	58	9.3	41	75
Catheter prevalence (CHSRA; CAT02)	15	8.9	17	0	56	6.5	6.4	4.1	0	19
Pressure ulcer prevalence, high & low risk (CHSRA; PRU01)	23	23	16	0	60	6.7	5.6	4.1	0	19
Antipsychotic prevalence, high & low risk (CHSRA; DRG01)	16	13	15	0	55	14	13	6.9	3	35
Restraint prevalence (CHSRA; RES01)	4.6	4.1	4	0	14	5.5	5.2	4.1	0	19
Little or no activities prevalence (CHSRA; SOC02)	15	13	15	0	56	24	23	13	0	57
Urinary tract infection prevalence (CHSRA; CNT04)	23	22	17	0	62	-	-	-	-	-
Tube feeding prevalence (RAMSEY; NUT01)	4.6	4.2	3.3	0	12	9.7	9.7	4.3	1	20
LTCQ										
Bowel incontinence change (LTCQ; CNT02)										
Bladder incontinence change (LTCQ; CNT03)	13	12	6.9	4	29	11	10	5.9	0	27
Communication change (LTCQ; COM01)	16	15	6.6	5	33	16	15	7.4	0	34
Mobility change (LTCQ; MOB01)	12	10	11	0	58	8.6	8.2	4.2	2	23
Pain change (LTCQ; PAN01)	17	16	8.1	4	33	7.9	7.4	3.6	2	20
Behavior problem change (LTCQ; BEH04)	9.3	8.7	5.3	2	26	3.9	3.6	3.5	0	16
Indwelling urinary catheter change (LTCQ; CAT01)	8.3	9.1	5	0	24	4.7	4.5	3.2	0	18
Cognition change (LTCQ; COG01)	1.9	1.7	2	0	9	1.8	1.3	2.1	0	10
Pressure ulcer change (LTCQ; PRU04)	13	12	7.7	0	34	8.4	7.6	4.7	0	21
Depressed mood change (LTCQ; MOD03)	4.7	4.6	2.5	0	12	5	4.1	3.4	0	19
Falls change (LTCQ; FAL01)	21	21	7.7	7	40	9.7	8.7	5.5	0	27
Weight loss (LTCQ; WGT01)	9.4	9.7	4.3	2	19	11	12	3.9	3	20
	12	12	4.5	4	22	6.7	6	4.3	0	20
MEGAQI										
Flare up of infections (MEGAQI; INF0X)	14	14	6.2	1	28	4.2	3.6	3.5	0	18
Low BMI prevalence (MEGAQI; BMI0X)	5.6	5	3.7	0	19	21	21	5.5	10	5
New or persistent delirium change (MEGAQI; DEL0X)	2.2	1.9	1.8	0	10	1.6	1.4	1.3	0	29
Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	5.5	5.3	3.5	0	15	9.8	9.2	5.5	1	37
Inadequate management of pain (MEGAQI; PAI0X)	36	40	28	0	79	16	16	7.3	1	97
Walking performance (MEGAQI; WAL0X)	43	45	17	0	68	80	82	11	38	11
ADL decline following improvement (MEGAQI; ADL02)	5.8	5.7	3.7	0	13	3.5	3	3.2	0	49
ADL imp. in residents with capacity (MEGAQI; ADL03)	7.9	6.8	6	0	24	7.3	6.6	4.4	0	-
Prevalence of care preferences (MEGAQI; CAR0X)	5.9	6.4	19	7	88	-	-	-	-	-

SD, standard deviation; Min, minimum; Max, maximum

Figure 1. Quality Indicators, by domain, with Strong Validity Evidence following Analysis of Pilot Field Data

physical functioning
ADL decline
mobility change
falls change
walking performance

cognitive, psychological and social functioning
behavior problem prevalence
cognition change
depressed mood change
communication change
new or persistent delirium
antipsychotic drug use prevalence
behavioral problem change

clinical complexity
low BMI prevalence
flare up of infections
inadequate management of pain
pressure ulcer change
tube feeding prevalence
pressure ulcer prevalence

continence
catheter prevalence
bowel & bladder incontinence
indwelling urinary catheter change

Figure 2. Quality of Care Constructs Identified in NHC and MA Pilot Validity Analyses

clinical management, policies & procedures	*staffing & facility management*	*training and continuing education*
MA		
vigilance of resident's caloric intake	absence of frequent staff turnover	staff training regarding adverse drug reactions
vigilance of resident's nutrional status	absence of frequent staff turnover and management change	availability of specialty staff and training protocols
informal pathways for communicating about communication decline	absence of a recent management change	continuing ed. available to licensed and/or unlic. staff for functional decline
psychiatrist available, pharmacological and non-pharm. interventions	length of employment at this facility, director of nursing	staff training regarding recognition of behavioral problems
medical record reveals pharmacological interventions ordered for pain	number of nurse practitioners in-house, presence of restorative nurse	CQI activites around dehydration
medical record reveals clinical exam ordered for patients with pain	hours activity director worked last pay period	education and policies for high risk drugs and adverse drug reactions
number of policies & procedures for handling suspicious skin areas		training and poliicy regarding treatment and prevention of presure ulcers
direct care staff involved in care plan for patients that fall		number of policies reviewed with new hire
evaluation by a licensed mental health professional		number of formal communication pathways
number of select staff on falls prevention committee		
restorative programs available to address late loss ADLs		
policy and procedures for deression and delirium		
monitoring of infections, vital signs, behavior and mood		
frequency of skin observations		
referal to specialist, therapist or for pharmacological management of pain		
vigilance in monitoring resident psychological function		
NHC		
monitor functional change	emphasis on mission	
cognitive-behavioral care practices	support staff level	
skin care strategies	long stay staff	
evaluation strategies	activities staff, restorative staff, dietician involved in care planning	
therapies added to care plan	activities in the nursing home	
therapy hours	cognitive-behavioral programming	
observe doing care	staffing level (1)	
care provided	licensed nurses involved in care planning	
preventative activities	non-slippery surfaces	

APPENDIX A

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Table 1. QIs and Quality of Care Constructs defined in NHC data

Quality Indicator	Validation scale	Correlation of QI with Validation Scale
physical functioning		
ADL decline (CHSRA; ADL01)	Monitor change in function	-.33
	Observe staff doing care	-.46
Falls change (LTCQ; FAL01)	Cognitive/behavioral care practices	-.31
Mobility change (LTCQ; MOB01)	Evaluation strategies	-.32

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Table 1. QIs and Quality of Care Constructs defined in NHC data

Quality Indicator	Validation scale	Correlation of QI with Validation Scale
cognitive psychological and social functioning		
Antipsychotic prevalence, high & low risk (CHSRA; DRG01)	Evaluation strategies	-.32
Communication change (LTCQ; COM01)	Monitor change in function	-.46
	License nurses in care planning	-.30
Cognition change (LTCQ; COG01)	Monitor change in function	-.36
	Cognitive/behavioral care practices	-.32
	Skin care strategies	-.32
	Evaluation strategies	-.35
	Observe doing care	-.30
	Preventative activities	-.35
New or persistent delirium change (MEGAQI; DEL0X)	Cognitive/behavioral care practices	-.44
	Preventative activities	-.31
Behavior problem change (LTCQ; BEH04)	Licensed nurse in care planning	-.34
Depressed mood change (LTCQ; MOD03)	Licensed nurse in care planning	-.38

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Table 1. QIs and Quality of Care Constructs defined in NHC data

Quality Indicator	Validation scale	Correlation of QI with Validation Scale
clinical complexity		
Flare up of infections (MEGAQI; INF0X)	Skin care strategies	-.32
	Long-stay staff	-.32
	Preventative activities	-.32
Inadequate management of pain (MEGAQI, PAI0X)	Support-staff levels	-.30
	Long-stay staff	-.35
	Activities in nursing home	-.30
Low BMI prevalence (MEGAQI; BMI0X)	Evaluation strategies	-.36
	Care provided	-.45
Pressure ulcer prevalence, high & low risk (CHSRA; PRU01)	Skin care strategies	-.50
Pressure ulcer change (LTCQ; PRU04)	Emphasis on mission	-.37
	Support staff level	-.34
	Skin care strategies	-.40
	Evaluation strategies	-.33

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Table 1. QIs and Quality of Care Constructs defined in NHC data

Quality Indicator	Validation scale	Correlation of QI with Validation Scale
continence		
Indwelling urinary catheter change (LTCQ; CAT01)	Skin care strategies	-.34
	Preventative activities	-.30
Catheter prevalence (CHSRA; CAT02)	Support-staff levels	-.33
	Skin care strategies	-.46
Bowel & bladder incontinence prevalence, high & low risk (CHSRA; CNT01)	Skin care strategies	-.32

Appendix A
Table 2. QIs and Quality of Care Constructs defined in MA field data

Quality Indicator	Validation Scale	Validity Coefficient
physical functioning		
ADL decline (CHSRA; ADL01)	Specialty staff training (epf)	-0.44
ADL decline following improvement (MEGAQI; ADL02)	Restorative activities offered in late loss ADL areas	-0.38
ADL imp. in residents with capacity (MEGAQI; ADL03)	(reveresed) frequent staff turnover	+.37
	Evaluation by licensed mental health staff	+.49
Falls change (LTCQ; FAL01)	Select staff on falls committee	-0.34
	Direct care staff involvement with care plan of residents that fall	-0.35

Appendix A
Table 2. QIs and Quality of Care Constructs defined in MA field data

Quality Indicator	Validation Scale	Validity Coefficient
cognitive psychological and social functioning		
Behavior problem prevalence, high & low risk (CHSRA; BEH01)	Training in recognition of behavioral problems	-0.45
	Number of policies reviewed with new hires (epf)	-0.32
	Targeted training (epf)	-0.37
Cognition change (LTCQ; COG01)	Education and policy for use of high risk drugs and adverse drug reactions	-0.32
Communication change (LTCQ; COM01)	Informal communication pathways for resident's communication decline	-0.31
New or persistent delirium (MEGAQI; DEL0X)	Monitoring of infections, vital signs, mood and behavioral symptoms	-0.31
Depressed mood change (LTCQ; MOD03)	Psychiatrist involvement, pharmacological or non-pharmacological therapy	-0.31
Antipsychotic prevalence, high & low risk (CHSRA; DRG01)	Evaluation by a licensed mental health professional	-0.34
	Staff activity and training regarding adverse drug reactions	-0.34
Little or no activities (CHSRA; SOC02)	Targeted training (epf)	-0.50

Appendix A
Table 2. QIs and Quality of Care Constructs defined in MA field data

Quality Indicator	Validation Scale	Validity Coefficient
clinical complexity		
Low BMI prevalence (MEGAQI; BMI0X)	Vigilance in monitoring resident nutrition	-0.44
	Targeted training (epf)	-0.45
	Number of policies reviewed with new hires (epf)	-0.41
	Training for functional decline (epf)	-0.34
Flare up of infections (MEGAQI; INF0X)	DON length of employment	-0.42
	Number of NP in-house, presence of restorative nurse	-0.51
Tube feeding prevalence (RAMSEY; NUT01)	CQI activities regarding dehydration	-0.51
Inadequate management of pain (MEGAQI; PAI0X)	Medical record evidence of pharmacological intervention for pain	-0.37
	Referral to specialist or therapist and/or or effective pharm. management of pain	-0.38
	Targeted staff training (epf)	-0.43
Pain change (LTCQ; PAN01)	Physical examination ordered w/in 72 hours of new onset pain	-0.39
Weight loss (LTCQ; WGT01)	Vigilance in resident caloric intake	-0.35
Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	Number of formal communication pathways (epf)	-0.40
	More frequent skin observation (epf)	-0.34
	Number of P&P for suspicions skin areas (epf)	-0.36
	Training and policies regarding treatment of pressure ulcers (epf)	-0.32
	Policy, procedures and staffing for mental health problems (epf)	-0.56
Restraint prevalence (CHSRA; RES01)	Vigilance in monitoring psychological function (epf)	-0.61

Appendix A
Table 2. QIs and Quality of Care Constructs defined in MA field data

Quality Indicator	Validation Scale	Validity Coefficient
continence		
Indwelling urinary catheter change (LTCQ; CAT01)	*no* recent facility management change	-0.35
Catheter prevalence (CHSRA; CAT02)	*low* staff turnover and/or *no* recent facility management change	-0.43
Bowel & bladder incontinence prevalence, high & low risk (CHSRA; CNT01)	*infrequent* staff turnover	-0.46
Bladder incontinence change (LTCQ; CNT03)	Training for functional decline (epf)	-0.38
Urinary tract infection prevalence (CHSRA; CNT04)	Number of policies reviewed with new hire (epf)	-0.30
	Training for functional decline (epf)	-0.32

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Table 3. NHC Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators

Validation Scale and the Items that compose it	Alpha for the Validation Scale	Validated QIs	Correlation of QI with Validation Scale
Monitor change in function			
ADM1: Care practice - Monitor change in functional status	.83	ADL decline (CHSRA; ADL01)	-.41
ADM1: Care practice - Identify abnormal vital signs		Communication change (LTCQ; COM01)	-.41
ADM1: Care practice - Identify changes in eating, sleeping, bowel, etc.		Cognition change (LTCQ; COG01)	-.39
ADM1: Care practice - Identify changes in cognitive status			
Cognition/Behavior care practices			
ADM1: Care practice - Inquire of resident, family, or staff, reason for cognitive change	.63	New or persistent delirium change (MEGAQI; DEL0X)	-.44
ADM1: Care practice - Behavior charted across shifts		Cognition change (LTCQ; COG01)	-.32
ADM1: Care practice - Use cues to enhance resident's cognitive performance needs		Falls change (LTCQ; FAL01)	-.32
ADM1: Care practice - Look for changes in a resident's medication or medical cognition when they fall			
WTO: Walk through - Communication strategy, listening actively, one step prompts, etc.			
Emphasis on mission			
ADM1: Mission statement - Employee evaluation as related to mission status	.76	Pressure ulcer change (LTCQ; PRU04)	-.38
ADM1: Mission statement - Explained to new residents/family			
ADM1: Mission statement - Included in facility brochure			
Support staff levels			
ADM2: Hours of work - Nurse Assistants/CNAs/Unit Secretaries	.91	Catheter prevalence (CHSRA; CAT02)	-.37
ADM2: Hours of work - Activity directors,/Therapist/Aide			
ADM2: Hours of work - Housekeeping staff			
Skin care strategies			
ADM1: Care - Whirlpool (therapeutic) soaks	.32	Cognition change (LTCQ; COG01)	-.31
ADM1: Message reddened		Indwelling urin cath (LTCQ; CAT01)	-.34
ADM1: Applies lotion or cream		Catheter (CHSRA; CAT02)	-.46
WTO: Use pressure reduction device		Incontinence hi & lo risk (CHSRA; CNT01)	-.32
		Infection flare-up (MEGAQI; INF0X)	-.32
		Pressure ulcer prevalence, high & low risk (CHSRA; PRU01)	-.50
		Pressure ulcer change (LTCQ; PRU04)	-.40

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Table 3. NHC Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators

Validation Scale and the Items that compose it	Alpha for the Validation Scale	Validated QIs	Correlation of QI with Validation Scale
Long Stay Staff			
ADM2: 2+ years RN/LPN	.66	Infection flare-up (MEGAQI; INF0X)	-.32
ADM2: 2+ years Nursing Assistants/ Unit Secretaries		Tube feeding (RAMSEY; NUT01)	-.30
ADM2: 2+ years Activity staff		Inadequate management of Pain (MEGAQI; PAI0X)	-.35
Evaluation strategies			
ADM1: Regular screening using standardized tool	.61	Low BMI prevalence (MEGAQI; BMI0X)	-.36
ADM1: Restorative Aide full time		Mobility change (LTCQ; MOB01)	-.41
ADM1: Restorative Aides contribute to care plan		Cognition change (LTCQ; COG01)	-.35
ADM1: Weekly or more frequent weight evaluation		Pressure ulcer change (LTCQ; PRU04)	-.33
		Antipsychotic prevalence, high & low risk (CHSRA; DRG01)	-.32
Therapies added to care plan			
ADM1: Speech therapy	.97	Infection flare-up (MEGAQI; INF0X)	-.32
ADM1: Physical therapy		Low BMI (MEGAQI; BMI0X)	-.32
ADM1: Occupational therapy			
Licensed Nurses involved in care planning			
ADM1: Routinely contribute to care plan - LPN	.74	Communication change (LTCQ; COM01)	-.30
ADM1: Routinely contribute to care plan - RN		Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.34
ADM1: Routinely contribute to care plan - Charge Nurse		Depressed mood change (LTCQ; MOD03)	-.38
Activities staff, restorative staff, dietician involved in care planning			
ADM1: Activities staff	.68	Low BMI (MEGAQI; BMI0X)	-.32
ADM1: Restorative aides			
ADM1: Dietician			

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Table 3. NHC Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators

Validation Scale and the Items that compose it	Alpha for the Validation Scale	Validated QIs	Correlation of QI with Validation Scale
Observe doing care			
ADM1: How assure good PU preventative care - observe staff administering care	.69	ADL decline (CHSRA; ADL01)	-.46
ADM1: How assure good Fall preventative care - observe staff administering care		Mobility decline (LTCQ; MOB01)	-.31
ADM1: How assure good Behavior preventative care - observe staff administering care			
Care Provided			
ADM1: Provided in past week - Swallowing / meal training	.92	Low BMI (MEGAQI; BMI0X)	-.45
ADM1: Provided in past week - Bladder / Bowel training			
ADM1: Provided in past week - Train in dressing / grooming			
ADM1: Provided in past week - Locomotion / mobility			
ADM1: Provided in past week - Weekly and weight evaluation			
ADM1: Provided in past week - Regular between meal snacks			
ADM1: Provided in past week - Use of finger foods			
ADM1: Provided in past week - Range of motion			
ADM1: Provided in past week - Reminiscence groups			
ADM1: Provided in past week - Exercise			
Activities in Nursing Home			
ADM1: Encourage participation in activities	.82	Inadequate management of pain (MEGAQI; PAI0X)	-.30
ADM1: Volunteers are often involved in activities			
ADM1: Residents from other units involved in activities on the unit			
ADM1: Residents encouraged to participate in facility-wide activities			
Cognitive-behavioral programming			
ADM1: Behavior charted across shifts	.67	ADL imp res w/capacity (MEGAQI; ADL03)	-.30
ADM1: Referral to other professional/consultant			
ADM1: Allows resident to wander freely			
ADM1: Inquiry regarding reason for change in cognition			
ADM1: Look for and identify change in behaviors, activities, and ADLs			
Preventative activities			
ADM1: Preventative activities at nursing home - educate resident to prevent Falls	.87	Cognition worsening (LTCQ; COG01)	-.34
ADM1: Preventative activities at nursing home - educate families		Delirium not remitting (MEGAQI; DEL0X)	-.31
		Little or no activities (CHSRA; SOC02)	-.31
		Infection flare-up (MEGAQI; INF0X)	-.32

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Table 3. NHC Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators

Validation Scale and the Items that compose it	Alpha for the Validation Scale	Validated QIs	Correlation of QI with Validation Scale
Staff level (1)			
ADM1: RN/LPN employed 2+ years	.91	Infection flare-up (MEGAQI; INF0X)	-.30
ADM1: CNA employed 2+ years		Inadequate management of pain (MEGAQI; PAI0X)	-.32
ADM1: Housekeeping hours			
ADM1: LPN hours			
ADM1: Activity director/therapy aide hours			
ADM1: Social worker hours			
ADM1: CNA hours			
Therapy hours			
ADM1: Occupational therapist hours	.87	Inadequate management of pain (MEGAQI; PAI0X)	-.33
ADM1: Physical therapist hours			
ADM1: Speech therapist hours			
Non-slippery surfaces			
WTO: Hallways	.85	Walking performance (MEGAQI; WAL0X)	+.38
WTO: Floors in shared areas (dining, activity rooms)		Behavior high & low risk (CHSRA; BEH01)	-.49
		Behavior worsening (LTCQ; BEH04)	-.31

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Table 4. Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators: MA facilities (n=45)

Field Validation Scales And Items that Compose it	Reliability Coefficient	Correlation with Quality Indicators	Validity Coefficient
Specialty staff and training (ADLJNM2)	.65	ADL decline (CHSRA; ADL01)	-.44
DN: availability of geriatric nurse specialist (29a3)		New or persistent delirium (MEGAQI; DEL0X)	-.33
DN: availability of psyc/clinical social worker (29a5)		Indwelling urinary catheter change (LTCQ; CAT01)	-.32
DN: CQI activities for pain (55aj)		Bowel & bladder incontinence, high & low risk (CHSRA; CNT01)	-.31
DN: CQI activities for urinary catheters (55an)			
DN: CQI activities for pressure ulcers (55ak)			
DN: Nutrition committee at facility (56b)			
AD: hours worked for activity director (9c)			
Absence of **Management Change** (ADM4A, reversed)	na	Mobility change (LTCQ; MOB01)	-.46
AD: facility management change in past two years (4a)		ADL decline following improvement (MEGAQI; ADL02)	-.32
		Depressed mood change (LTCQ; MOD03)	-.33
		Behavior problem change (LTCQ; BEH04)	-.30
		Indwelling urinary catheter change (LTCQ; CAT01)	-.35
Absence of **Staff turnover** (BB2, reversed)	.45	Mobility change (LTCQ; MOB01)	-.32
AD: Facility management contract change in past 2 years (4A)		Depressed mood change (LTCQ; MOD03)	-.33
AD: DON contract change in past 2 years (4B)		Behavior problem change (LTCQ; BEH04)	-.30
AD: Rehab services contract change in past 12 months (4C)		Bowel & bladder incontinence, high & low risk (CHSRA; CNT01)	-.46
AD: Nurse agency contract changes in past 12 months (4F)		ADL imp. in residents with capacity (MEGAQI; ADL03)	+.37
Training in recognition of behavioral problems (BEH3)	.78	Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.45
DN: CNAs rec'd cont ed regarding dep/anx (16Ab)		Little or no activities (CHSRA; SOC02)	-.32
DN: CNAs rec'd cont ed regarding pain in cog imp (16Ai)		Urinary tract infection prevalence (CHSRA; CNT04)	-.34
DN: Lic'd staff rec'd cont ed regarding dep/anx (16Bb)		Low BMI (MEGAQI; BMI0X)	-.48
DN: Lic'd staff rec'd cont ed regarding pain in cog imp (16Bi)			
DN: Policy assm't & mangm't depression reviewed with lic'd staff at hire (10c)			
Policy and procedures for depression and delirium (BURJNM1)	.77	Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	-.57
DN: Standardized protocol for assessment of depression (34ad)			
DN: Standardized protocol for assessment of delirium (34ae)			
DN: Care plan notes psychiatric social work interventions (29cd)			
DN: verbal formal communication for delirium (35d2)			
DN: written formal communication for delirium (35d4)			

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Table 4. Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators: MA facilities (n=45)

Field Validation Scales And Items that Compose it	Reliability Coefficient	Correlation with Quality Indicators	Validity Coefficient
Absence of **Staff turnover and/or management change** (CAT01S1, reversed)	.57	Little or no activities (CHSRA; SOC02)	-.36
AD: Facility ownership change in last two years (6)		Catheter prevalence (CHSRA; CAT02)	-.44
AD: Staff turnover: nurse assistant working <6 months (10AB1)		Pressure ulcer prevalence, high & low risk (CHSRA; PRU01)	-.42
AD: Staff turnover: nurse assistant stopped working last 6 months (10AB3)			
AD: Staff turnover: RN/LPNs working <6 months (10AA1)			
Evidence of facility policy & educ on polypharmacy, ADR & high risk drugs (cog4)	.45	Cognition change (LTCQ; COG01)	-.37
DN: Continuing education offered to CNA on polypharm/high (16Ak)		Low BMI (MEGAQI; BMI0X)	-.36
DN: Continuing education offered to lic. staff on polypharm/high (16Bk)			
DN: Medical director recently involved in review of facility drug use (25Dd)			
DN: cog status of residents on high risk medications monitored w/cog assessments (38A)			
DN: cog status of residents on high risk medications monitored w/memory checks (38B)			
DN: cog status of residents on high risk medications monitored for behavior change (38C)			
Informal pathways for communicating about communication decline (COM3B)	.52	Communication change (LTCQ; COM01)	-.31
DN: High proportion of residents receiving restorative care (24Aa)		Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.32
DN: Verbal, informal communication re: depression/mood/anxiety (35C1)			
DN: Verbal, informal communication re: delirium (35D1)			
Vigilance in identification, evaluation and tx of delirium (DELSUM)	.86	New or persistent delirium (MEGAQI; DEL0X)	-.31
MRR: any reference of delirium in medical record			
MRR: cbc referenced for possible infection			
MRR: electrolyte referenced for possible dehydration			
MRR: creatinine referenced for possible dehydration			
MRR: BUN levels referenced for possible dehydration			
MRR: cognitive/behavioral symptoms recorded more than daily			
MRR: documentation of vital signs taken daily			

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Table 4. Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators: MA facilities (n=45)

Field Validation Scales And Items that Compose it	Reliability Coefficient	Correlation with Quality Indicators	Validity Coefficient
More frequent skin observation (EPF07)	na	ADL decline (CHSRA; ADL01)	-.33
DN: single item (45a)		Indwelling urinary catheter change (LTCQ; CAT01)	-.32
		Pain change (LTCQ; PAN01)	-.32
		Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	-.34
		Restraint prevalence (CHSRA; RES01)	-.42
Direct care staff involved in care plan for patients that fall (FALH3C2)	.60	Falls change (LTCQ; FAL01)	-.34
DN: Unit staff where resident lives represented on falls committee (44c)			
DN: Fall committee reviews care plan following every fall (44ec)			
Number of select staff on falls prevention committee (FALH3C1)	.79	Falls change (LTCQ; FAL01)	-.35
DN: number of medical directors that sit on falls committee (44aa)		Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.35
DN: number of RN's that sit on falls committee (44ac)		Little or no activities (CHSRA; SOC02)	-.34
DN: number of CNA's that sit on falls committee (44ad)		Bowel & bladder incontinence, high & low risk (CHSRA; CNT01)	-.30
DN: number of physical therapists that sit on falls committee (44ae)			
DN: number of occupational therapists that sit on falls committee (44ag)			
Late-loss ADL restorative programming available (FTIH4C1)	.90	ADL decline following improvement (MEGAQI; ADL02)	-.38
DN: transfer restorative nursing program in place (24b)		Little or no activities (CHSRA; SOC02)	-.32
DN: eating self-performance restorative nursing program in place (24f)			
DN: range of motion (passive) restorative nursing program in place (24g)			
DN: range of motion (active) restorative nursing program in place (24h)			
Number of NP in-house, presence of restorative nurse (INF0XH31)	.57	Falls change (LTCQ; FAL01)	-.32
DN: Over the past three months, what is the average num. NP in-house per week? (27a)		Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.33
AD: What supervisory staff positions do you have in your facility: QA Nurse (7af)		Depressed mood change (LTCQ; MOD03)	-.40
		Flare up of infection (MEGAQI; INF0X)	-.51
Length of employment at this facility, director of nursing (INF0XH21)	na	Flare up of infection (MEGAQI; INF0X)	-.42
DN: *single item* (2)		Tube feeding (RAMSEY; NUT01)	-.36
		Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	-.47

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Table 4. Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators: MA facilities (n=45)

Field Validation Scales And Items that Compose it	Reliability Coefficient	Correlation with Quality Indicators	Validity Coefficient
Psychiatrist Involvement in management of mood symptoms (INTRVNTN)	.65	Depressed mood change (LTCQ; MOD03)	-.31
MRR: patient received antidepressant		Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	-.32
MRR: depressive symptoms reviewed by psychiatrist or other MH professional		Restraint prevalence (CHSRA; RES01)	-.31
DN: psychiatrist involved with family			
DN: psychiatrist involved with liaison activities			
DN: psychiatrist provides Pharmacologic oversight			
DN: psychiatrist on staff			
Vigilance in resident nutrition (LOWBMI)	.31	Low BMI (MEGAQI; BMI0X)	-.44
MRR: Nutritional consult by Registered Dietician in past 30 days (3)			
MRR: Resident assessed for need for assistance with eating (2e)			
DN: Malnutrition instrument used weekly (34Bh2)			
CQI activities regarding dehydration (NUT01)	.78	Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.36
AD: forms project teams to improve quality (11AB)		Depressed mood change (LTCQ; MOD03)	-.32
AD: uses project team findings to improve quality (11AC)		Indwelling urinary catheter change (LTCQ; CAT01)	-.39
AD: train management in CQI/TQM methods (11AE)		Tube feeding (RAMSEY; NUT01)	-.51
AD: incorporates CQI/TQM criterion in reward and performance appraisal system (11AG)		Pressure ulcer change (LTCQ; PRU04)	-.45
AD: conducts overall review/evaluation approach to improve quality (11AF)			
DN: Dehydration included in facility CQI monitoring protocols (55AB)			
Staff Involvement in Medication Committee and Education (OVRSIGHT)	.51	Walking performance (MEGAQI; WAL0X)	+.40
DN: Nurses on Medication/Pharmacy Committee		Pressure ulcer change (LTCQ; PRU04)	-.36
DN: Physicians on Medication/Pharmacy Committee		Weight loss (LTCQ; WGT01)	-.33
DN: Cont ed CNAs on polypharm/high risk drugs & ADR		Antipsychotic prevalence, high & low risk (CHSRA; DRG01)	-.34
DN: Cont ed lic staff on polypharm/high risk drugs & ADR			
Medical record reveals pharmacological interventions ordered for pain (pa13)	na	Inadequate management of pain (MEGAQI; PAI0X)	-.37
MR: single item (13)			

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Table 4. Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators: MA facilities (n=45)

Field Validation Scales And Items that Compose it	Reliability Coefficient	Correlation with Quality Indicators	Validity Coefficient
Referral to specialist, therapist or for pharmacological management of pain (PANH3C1)	.79	Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.32
MR: referral to specialist (8)		Low BMI (MEGAQI; BMI0X)	-.33
MR: documentation of effective pharmacological intervention (13a1)		Weight loss (LTCQ; WGT01)	-.30
		Pain poorly managed (MEGAQI; PAI0X)	-.38
		Pressure ulcer prevalence, high & low risk (CHSRA; PRU01)	-.34
Medical record reveals clinical exam ordered for patients with pain (PB7)	na	Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.35
MR: *single item* (7)		Flare up of infection (MEGAQI; INF0X)	-.33
		Pain change (LTCQ; PAN01)	-.39
Training and policy regarding treatment and prevention of pressure ulcers (PUH1C1)	.57	Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.37
SS: proportion of licensed staff rec'd special education on treatment of PU (17a)		Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	-.32
SS: NP are alerted to the presence of suspicious skin areas (5b, maximum RN response)			
DN: frequency nurses request skin status from CNAs (18f)			
DN: continuing education offered to lic'd staff for pressure ulcers (16bf)			
Number of policies & procedures for handling suspicious skin areas (PUH34C1)	.55	Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	-.36
DN: schedule more frequent skin observations (45a)			
DN: schedule in-depth risk assessment (45b)			
DN: re-observation on frequent basis (45c)			
DN: implement treatment or intervention (45d)			
DN: obtain consultation (45e)			
DN: other policy, procedure response to suspicious skin areas (45f)			
Vigilance in monitoring resident psychological function (RESJNM1)	.57	Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	-.35
DN: Standard protocols for assessment of depression (34AD)		Restraint prevalence (CHSRA; RES01)	-.61
DN: Standard protocols for assessment of adverse drug reactions (34AA)			
DN: Facility policy for documtentation and rationale for monitoring neuroleptics (41)			
AD: Extent to which care practices for monitoring cognitive change exist (17B)			
Vigilance of resident's caloric intake (WGTLOS)	.48	Weight loss (LTCQ; WGT01)	-.31
Nutritional Assm't: Medical record cites resident receiving insufficient calories (a1d)			
Nutritional Assm't: Calorie count assessment completed in past 30 days (a2b)			
Nutritional Assm't: Albumin lab values checked in past 30 days (a5b)			
DN: Malnutrition assessment completed weekly (34BH2)			

Appendix A

Table 4. Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators: MA facilities (n=45)

Field Validation Scales And Items that Compose it	Reliability Coefficient	Correlation with Quality Indicators	Validity Coefficient
Hours activity director worked last pay period (ZADM9C)	na	ADL decline (CHSRA; ADL01)	-.30
AD: hours worked for activity director (9c)			
Number of formal communication pathways (ZEPF6)	.90	Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	-.40
DN: Verbal, written formal communication - falls (35A2,4)			
DN: Verbal, written formal communication - PU (35B2,4)			
DN: Verbal, written formal communication - dep, anx (35C2,4)			
DN: Verbal, written formal communication - delirium (35D2,4)			
DN: Verbal, written formal communication - ADR (35E2,4)			
DN: Verbal, written formal communication - malnutrition (35F2,4)			
DN: Verbal, written formal communication - pain (35G2,4)			
DN: Verbal, written formal communication - function (35H2,4)			
Continuing ed. available to licensed and/or unlic. staff for functional decline (ZEPF04)	.90	Walking performance (MEGAQI; WAL0X)	+.40
DN: Continuing education offered to CNA regarding functional decline risk (16ag)		Bladder incontinence change (LTCQ; CNT03)	-.38
DN: Continuing education offered to licensed staff regarding functional decline risk (16bg)		Urinary tract infection prevalence (CHSRA; CNT04)	-.32
		Low BMI (MEGAQI; BMI0X)	-.34
Number of policies reviewed with new hire (ZEPF03)	.73	Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.32
DN: P&P-pressure relieving devices (10A)		Urinary tract infection prevalence (CHSRA; CNT04)	-.30
DN: P&P-document PU wounds (10B)		Low BMI (MEGAQI; BMI0X)	-.41
DN: P&P-management dep, anx (10C)			
DN: P&P-use high-risk meds (10D)			
DN: P&P-use feeding tubes (10E)			
DN: P&P-physical restraints (10F)			
DN: P&P-indwelling catheters (10G)			
DN: P&P-assmt, mang pain (10H)			
DN: P&P-safety issues (10I)			
DN: P&P-facility mission (10J)			
DN: P&P-infection control (10K)			
DN: P&P-patient rights (10L)			
DN: P&P-abuse, neglect (10M)			
DN: P&P-body mechanics (10N)			
DN: P&P-other (10O)			

Appendix A

Table 4. Quality of Care Constructs, Internal Consistency Reliability Coefficients, and Cross-Validation with Quality Indicators: MA facilities (n=45)

Field Validation Scales And Items that Compose it	Reliability Coefficient	Correlation with Quality Indicators	Validity Coefficient
Availability of specialty staff and training protocols (ZEPF01)	.65	Behavior problem prevalence, high & low risk (CHSRA; BEH01)	-.37
DN: P&P-management dep, anx (10C)		Little or no activities (CHSRA; SOC02)	-.50
DN: P&P-physical restraints (10F)		Low BMI (MEGAQI; BMI0X)	-.45
DN: P&P-safety issues (10I)		Inadequate management of pain (MEGAQI; PAI0X)	-.43
Evaluation by a licensed mental health professional (ZEPF02)	.87	Antipsychotic prevalence, high & low risk (CHSRA; DRG01)	-.34
DN: Evaluation by a psychiatrist (29CA1)		ADL imp. in residents with capacity (MEGAQI; ADL03)	+.49
DN: Evaluation by a psychologist (29CA2)			
DN: Evaluation by a geriatric nurse specialist (29CA3)			
DN: Evaluation by a psychiatric nurse spec (29CA4)			
DN: Evaluation by a psyc/clin social worker (29CA5)			
DN: Evaluation by a other social worker (29CA6)			

APPENDIX B

Appendix B.
Table 1.
Quality indicator scores for facilities that were included and those not included (n=45) and those not included (n=112) in pilot validation study.

Quality Indicator	Sampled	Refused	
ADL decline (CHSRA; ADL01)	.17	.18	
ADL decline following improvement (MEGAQI; ADL02)	.08	.09	
ADL imp. in residents with capacity (MEGAQI; ADL03)	.06	.08	*
Mobility change (LTCQ; MOB01)	.17	.18	
Walking performance (MEGAQI; WAL0X)	.42	.43	
Falls change (LTCQ; FAL01)	.09	.11	*
Cognition change (LTCQ; COG01)	.13	.12	
Communication change (LTCQ; COM01)	.12	.13	
New or persistent delirium change (MEGAQI; DEL0X)	.02	.02	
Behavior problem prevalence, high & low risk (CHSRA; BEH01)	.09	.10	
Behavior problem change (LTCQ; BEH04)	.08	.09	
Depressed mood change (LTCQ; MOD03)	.21	.22	
Little or no activities prevalence (CHSRA; SOC02)	.15	.16	
Prevalence of care preferences (MEGAQI; CAR0X)	.59	.62	
Indwelling urinary catheter change (LTCQ; CAT01)	.02	.02	
Catheter prevalence (CHSRA; CAT02)	.15	.13	
Bowel & bladder incontinence, high & low risk (CHSRA; CNT01)	.49	.48	
Bowel incontinence change (LTCQ; CNT02)	.13	.15	
Bladder incontinence change (LTCQ; CNT03)	.16	.17	
Urinary tract infection prevalence (CHSRA; CNT04)	.23	.23	
Flare up of infections (MEGAQI; INF0X)	.14	.15	
Tube feeding prevalence (RAMSEY; NUT01)	.05	.05	
Low BMI (MEGAQI; BMI0X)	.06	.06	
Weight loss (LTCQ; WGT01)	.12	.14	*
Inadequate management of pain (MEGAQI; PAI0X)	.36	.38	
Pain change (LTCQ; PAN01)	.09	.11	*
Pressure ulcer prevalence, high & low risk (CHSRA; PRU01)	.23	.20	
Pressure ulcer change (LTCQ; PRU04)	.05	.05	
Prevalence of burns, abrasions, bruises (MEGAQI; BUR0X)	.06	.06	
Restraint prevalence (CHSRA; RES01)	.05	.06	
Antipsychotic prevalence, high & low risk (CHSRA; DRG01)	.16	.16	

**, P<.05; **, P<.01; ***, P<.001. P-values refer to test of equivalent means for included and not-included facilities.*

APPENDIX C

Appendix C. Table 1.
Cross-Validation of Seven Post-Acute Quality Indicators with Chronic Validation Scales.
NHC & MA Pilot Field Study.

Chronic Scale	PAC Quality Indicator: Inadequate Pain Management	Fail To Improve/Manage Delirium Symp	Fail To Prevent/Imprv Pressure Ulcers	Failure To Improve ADL Status	Failure To Manage Respiratory Problems	Fail To Improve Bladder Incontinence	Improvement In Walking†
Clinical Management, Policies & Procedures							
informal pathways for communicating about communication decline				-.35			+.39
infrequent staff turnover						-.34	
direct care staff involved in care plan for patients that fall							
restorative programs available to address late loss ADLs			-.40				
psychiatrist available, pharmacological and non-pharm. interventions						-.45	
medical record reveals pharmacological interventions ordered for pain							+.30
medical record reveals clinical exam ordered for patients with pain				-.48			+.34
vigilance of resident's caloric intake	-.47						
evaluation by a licensed mental health professional		-.50					+.37
cognitive-behavioral care practices						-.32	
skin care strategies					-.40		
therapies added to care plan							+.33
care provided					-.32		
preventative activities						-.36	
Staffing & Facility Management							
absence of a recent management change							+.39
number of select staff on falls prevention committee			-.57		-.57		
length of employment at this facility, director of nursing			-.39				
hours activity director worked last pay period				-.30			
long stay staff			-.34				
activities in the nursing home						-.32	
cognitive-behavioral programming						-.35	
Training & Continuing Education							
availability of specialty staff and training protocols			-.34				
education and policies for high risk drugs and adverse drug reactions			-.52		-.35		
CQI activities relative to dehydration						-.32	
continuing ed. available to licensed and/or unlic. staff for functional decline			-.38				

† Improvement in walking is a so-called 'good' QI: higher values imply better performance in maintaining or improving walking performance. Therefore, preliminary evidence of validity will be demonstrated by a positive correlation coefficient, whereas for other PAC QIs preliminary evidence of validity will be represented by a negative correlation coefficient.