

Technical Report: Nursing Home Clinical Quality Measures Literature Review (QI/QM Literature Review)

Evaluation of the NF Payment Reform Legislation

2021 Report to the Legislature

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Study of the Nursing Home Quality Measures: A Literature Review

Executive Summary

A search of the academic literature from 2010 to 2019 was completed to capture recent evidence surrounding nursing home quality measures. A total of 34 primary research articles from peer reviewed journals contributed to this report. Evidence fell into 3 broad categories: correlations between CMS 5-star quality ratings and ratings from other resources, relationships between nursing home quality measures and outcomes including quality of life, satisfaction, patient safety, negligence litigation, depression, urinary tract infection, and hospitalization or potentially preventable hospitalizations, and psychometric performance of individual quality measures.

The CMS 5-star ratings did not necessarily correlate with social media or online ratings. There was only minimal agreement on ranking of nursing homes between 5-star ratings and resident/family ratings. The 5-star ratings did not adequately reflect residents' quality of life, resident and family satisfaction, and resident safety. Certain quality ratings were related to negligence litigations, severity of depressive symptoms, or urinary tract infections; however, the effects were small. Available nursing home quality performance was not strongly or consistently associated with the risk of hospitalization or potentially preventable hospitalization. Only certain quality indicators appear to tap dimensions of clinical quality directly related to hospitalizations. Nursing homes with higher serious mental illness concentrations or higher proportion of African American residents were related to poorer care quality, which nursing homes with special care unit for dementia were related to better care quality. Moreover, the psychometric performance of individual quality measures was poor with low reliability and validity.

Search results are presented in the form of synthesized key findings, a summary of study findings organized by theme, and a table to provide an overview of individual studies.

Introduction

This report describes a search and review of academic literature that was completed to identify and summarize recent research regarding the correlations between different quality rating systems and between different raters, relationships between nursing home (NH) quality and outcomes, and psychometric performance of quality measures. The search addressed the following questions:

- 1) What is correlation between different quality rating systems, and between different raters?
- 2) What is the relationship between NH quality and outcome variables such as quality of life, satisfaction, patient safety, negligence litigation, depression, urinary tract infection, and hospitalization?
- 3) What is psychometric performance of NH quality measures or quality indicators (QIs) such as reliability and validity?

Search Methods

A search of PubMed was completed using the search terms (nursing home or nursing facility) AND (quality measure or quality indicator), resulting in 512 papers. Search limiters were published in English within the past 10 years since 2010 to highlight recent additions to the literature and peer-reviewed journals. Abstracts were reviewed and 24 usable papers were obtained. An additional 10 articles were identified through an ancestry search of the reference list of identified articles. A total of 34 primary research articles from peer reviewed journals contributed to this summary.

Search Results

Identified studies ranged in publication date from 2010-2019, and came from a wide variety of high quality nursing, gerontology, medical, economics and health services journals. Studies were most commonly retrospective analyses of large government databases such as the MDS, OSCAR, Medicare Claims Data, and the Area Resource File, with the exception of 1 qualitative study and 1 systematic review. Two studies conducted outside the United States with one study in Canada and 1 study in England.

Key Takeaways from the Synthesized Findings

1. Correlations between CMS 5-star ratings, and ratings from other sources

- The CMS Nursing Home Compare (NHC) 5-star ratings did not necessarily correlate with social media or online ratings including Facebook, Yelp, and Google Consumer Reviews. Only one study found a moderate correlation.
- There was only minimal agreement on ranking of NHs between NHC 5-star ratings and resident/family ratings.
- There was a weak or no relationship between nursing home quality indicator performance and inspection deficiencies or complaints, although one study found 3 individual quality indicators (restraint use, worsened pressure ulcer, and experiencing worsened pain) predicted poor performance on inspections.

2. Relationships between NH quality measures and different outcomes

- The NHC 5-star ratings did not necessarily reflect nursing home residents' quality of life.
- The NHC 5-star ratings did not adequately reflect resident and family satisfaction.
- The relationships between NHC 5-star rating and resident safety measures were weak and inconsistent.
- There were significant associations between certain quality measures and negligence litigations; however, all the effects were small.
- The NHC 5-star ratings were not associated with new onset of depression; however, certain quality domain ratings were related to the severity of depressive symptoms.
- One study found that NHC 5-star ratings were significantly related to the occurrence of urinary tract infections.
- Available NH quality performance was not strongly or consistently associated with the risk of hospitalization or potentially preventable hospitalization. Only certain quality indicators appear to tap dimensions of clinical quality directly related to hospitalizations.
- Nursing homes with higher serious mental illness concentrations were related to poorer care quality.
- Nursing homes with special care unit for dementia were related to better care quality.

- Nursing homes with higher proportion of African American residents were related to worse care quality.

3. Psychometric performance of quality measures

- The agreements between falls recorded by facility staff in the MDS and falls recorded in the medical charts were fair or moderate.
- Depression QI was not a reliable and valid measure since it measured the ability of staff to detect depressive symptoms rather than the actual prevalence rate of depression.
- Incontinence QIs were not associated with clinically important differences in related care processes.
- Urinary tract infection QI overestimated the number of cases while adequately screening out residents without infections.
- Weight loss QI was able to discriminate differences in prevalence of weight loss between facilities.
- Restraint QI was not able to discriminate differences in the use of restraining devices.
- Pressure ulcer QI was not an effective measure of the quality of pressure ulcer care in facilities and the QI score could be misleading.
- There was potential systematic bias in reporting pain QI.
- Three short-stay quality measures (rehospitalizations, ED visits, and successful discharges to the community) were weakly correlated.

Summary of Study Findings

1. CMS Nursing Home Compare 5-star ratings vs. ratings from other sources (8 studies)

1.1 social media ratings (3 studies with inconsistent findings: 1 moderate correlation; 1 weak correlation; and 1 no correlation)

Li et al. (2019) studied the correlations between NHC 5-star overall ratings, experience-of-care survey ratings from family members or legal guardians/representatives, and average score of 5-star ratings from 4 popular social media or online review sites (Facebook, Yelp, Google Consumer Reviews, and Caring.com) among 196 NHs in Maryland from July 2015 to July 2017 (Li, Cai, & Wang, 2019). They found the moderate correlation ($\rho=0.41$, $p<0.001$) between social

media rating and NHC overall rating, moderate-to-strong correlations (ρ ranged from 0.40-0.57, $p < 0.001$) between social media rating and experience-of-care ratings, and moderate correlations (ρ about 0.35, $p < 0.001$) between social media rating and individual NHC quality measures including number of deficiency citations, adjusted RN staffing, adjusted total nurse staffing and number of complaint. The NHC overall rating was moderately to strongly correlated with experience-of-care ratings (ρ ranged from 0.30-0.53, $p < 0.001$), and moderately correlated with individual NHC quality measures (ρ ranged from 0.39-0.49, $p < 0.001$). Johari et al. (2018) compared Yelp ratings with NHC ratings among 675 NHs in California between September and November 2016 and found weak correlations (Johari et al., 2018). Hefele et al. (2018) compared Facebook user ratings with NHC ratings and resident/family satisfaction/experience survey ratings among 35 NHs in Maryland and 78 NHs in Minnesota. They found Facebook ratings were not significantly correlated with NHC ratings or survey-based resident/family satisfaction ratings (Hefele, Li, Campbell, Barooah, & Wang, 2018).

1.2 resident/family ratings (3 studies: 2 studies with minimal agreement on ranking of NHs and 1 qualitative study)

Mukamel et al (2016) asked residents and family members to use the Nursing Home Compare Plus app to create their own composite quality scores based on their own preferences and medical needs among 146 patients who were discharged from the hospital to NHs (Mukamel et al., 2016). They found that residents differed from each other and from CMS in the number of quality measures they chose to include in their composite and in their weighting of each quality measure. Moreover, there was only minimal agreement on ranking of NHs (Kappa statistics ranged from 0.22-0.38) between NHC 5-star ratings and resident/family ratings (Mukamel et al., 2016). Çalıkoğlu et al. (2012) also found very low agreement (Kappa statistics ranged from 0.15 for health inspections to 0.04 for quality measures) between NHC 5-star ratings and the ranking based on family experience survey results among 208 NHs in Maryland between September and December 2009. Moreover, family ratings of experience of care were significantly related to two 5-star domains (health inspections and nursing staff), but not to the quality domain (Çalıkoğlu, Christmyer, & Kozlowski, 2012).

Schapira et al. (2016) conducted a qualitative study among 35 persons or family members recently admitted or anticipating admission to a NH in Philadelphia from October 2013 to

August 2014 and explored their responses to both content and format of the NHC report card. Although star ratings, clinical quality measures, and benchmarking information were salient to their decision-making process, participants had confusions about 1) the mathematical relationship between the overall rating composite score and the three components: health inspection, staffing, and quality measure ratings (participants expected the overall rating to be an average of the three domain-specific ratings.), and 2) the inconsistent direction of the quality measures rates (high quality could be indicated by lower values or higher values) (Schapira, Shea, Duey, Kleiman, & Werner, 2016).

1.3 quality indicators and inspection performance or NH complaints (2 studies: little relationships between quality indicators and inspection performance or complaints)

Mashouri et al. (2019) investigated whether quality indicators (2016-2017) could predict future inspection performance (2017-2018, three classes: in good standing, needing improvement, and needing significant improvement) in 594 LTC facilities in Ontario, Canada and found a weak relationship with a classification accuracy of 40.1%. They also found only 3 individual quality indicators (restraint use, worsened pressure ulcer, and experiencing worsened pain) predicted poor performance on inspections and one quality indicator (improved physical functioning) had a unexpected, inverse relationship with LTC facilities predicted as being in good standing (Mashouri, Taati, Quirt, & Iaboni, 2019).

Troyer and Sause (2013) examined the associations between 4 quality indicators (incontinence without a toileting plan, indwelling catheters, decline in late-loss ADLs, and pressure sores among high-risk residents) and two sources of resident- and caregiver-derived NH complaints (North Carolina Long-Term Care Ombudsman Program and state certification agency) from 2002-2006. They found that quality indicators were unrelated to the volume of both types of complaints, and inspection deficiencies were positively associated with state certification agency complaints (Troyer & Sause, 2013).

2. Quality measures and different outcomes (14 studies)

2.1 quality of life (2 studies: star rating did not reflect quality of life)

Netten et al. (2012) found no significant relationship between NH star rating and social care-related quality of life after controlling for resident and NH characteristics in England (Netten et

al., 2012). Similarly, Kim et al. (2014) found no significant relationship between NHC's overall 5-star quality rating and quality of life ($p=0.12$) among 251 long-stay NH residents with preserved cognition in 32 NHs in Detroit (S. J. Kim et al., 2014).

2.2 satisfaction (one study: star rating did not reflect consumer satisfaction)

Williams et al. (2016) indicated that 5-star NHs had significantly higher satisfaction score than 1-star NHs, however, there were inconsistencies in the categorical comparisons between the NHC overall ratings and the consumer satisfaction categories in 918 NHs in Ohio. Many 5-star NHs had moderate to very low consumer satisfaction (54% compared with resident satisfaction and 41% compared with family satisfaction), and many 1-star NHs had high to very high consumer satisfaction (19% compared with resident satisfaction and 20.0% compared with family satisfaction). The findings indicate that NHC 5-star rating system does not adequately reflect resident and family satisfaction (Williams, Straker, & Applebaum, 2016).

2.3 patient safety (one study: star rating did not reflect patient safety)

Brauner et al. (2018) found the relationship between NHC 5-star rating and six measures of resident safety (injurious falls, urinary tract infections, pressure sores among long-stay residents, pressure sores among short-stay residents, and two measures of medication errors) was weak and somewhat inconsistent (ρ ranged from 0.05-0.21) in 15652 NHs in the first quarter of 2017. Although 1-star NHs had higher rates of adverse safety events and 5-star NHs had the lowest rates, for NHs with two, three, or four stars, there was no meaningful difference in adverse safety events (Brauner et al., 2018).

2.4 negligence litigation (two studies: weak or small associations)

Studdert et al. (2011) examined whether high-quality NHs were less likely to be sued for negligence among 1465 NHs between 1998 and 2006, and found that NHs with more deficiencies (OR=1.09), with more serious deficiencies (OR=1.04), having more residents with weight loss (OR=1.05), and with pressure ulcers (OR=1.09), had higher odds of being sued; however, all these effects were relatively small (Studdert, Spittal, Mello, O'Malley, & Stevenson, 2011). Stevenson et al. (2013) investigated whether the experience of being sued and incurring litigation costs impacted the quality of care subsequently delivered in 1514 NHs between 1998 and 2010, and found that higher litigation costs were related to lower subsequent quality and

only four of the 27 examined associations were statistically significant with small effect sizes (Stevenson, Spittal, & Studdert, 2013).

2.5 depression (one study: significant association with severity of depressive symptoms, not with new onset of depression)

Yuan et al. (2019) examined the association between NHC star ratings and new onset of depression and severity of depressive symptoms at 90 days in 129837 long-stay residents without indicators of depression admitted to 13921 NHs. They found that star quality ratings was not associated with new onset of depression and lower quality domain ratings were related to more severe depressive symptoms (Yuan, Lapane, Baek, Jesdale, & Ulbricht, 2019).

2.6 urinary tract infection (one study with significant association with UTI)

Gucwa et al. (2016) investigated the association between NHC 5-star quality rating and urinary tract infection among 1523 residents in 12 skilled nursing facilities in Long island and found that overall star ratings were significantly related to the occurrence of urinary tract infections (Gucwa, Dolar, Ye, & Epstein, 2016). The interpretation of findings needs to be cautious because there were only 12 facilities and overall quality ratings and three domain ratings (health inspection, nursing staff, and quality) were included in the models at the same time.

2.7 hospitalization or potentially preventable hospitalization (6 studies: no or weak associations)

Using 2003 to 2006 Medicaid data in Florida, a study found that a lack of association between quality deficiencies and time to first potentially preventable hospitalization (PPH) (Becker, Boaz, Ansel, Gum, & Papadopoulos, 2010). A study used 1998 to 2004 MDS state data in New York to show that facility-level deficiencies were associated with a decreased time to first hospitalization or the time between subsequent hospitalizations (O'Malley, Caudry, & Grabowski, 2011). A study using national Medicare data on fee-for-service Medicare beneficiaries discharged to a skilled nursing facility after an acute care hospitalization between 2009 and 2010, indicated that quality deficiency rating (5 star vs. 1 star; the higher star means less deficiencies) and the proportion of post-acute care residents with new or worsening pressure ulcers (25th percentile vs. 75th percentile) were negatively associated with 30 days hospital readmission and death, respectively (Neuman, Wirtalla, & Werner, 2014). However, the

difference was very small (Neuman et al., 2014). Using national data of long-stay NH residents, a study indicated that the NHC star rating had weak correlations with rates of PPH and potentially preventable ED visits (Fuller, Goldfield, Hughes, & McCullough, 2019). Xu et al. (2019) found that available quality indicators were not strongly or consistently associated with the risk of hospitalization (neither overall nor PPH). Among these 23 quality indicators, 5 quality indicators (antipsychotics without a diagnosis of psychosis, unexplained weight loss, pressures sores, bladder continence, and ADL dependence) were related significantly to hospitalization and only 4 quality indicators (antipsychotics without a diagnosis of psychosis, unexplained weight loss, ADL dependence, and urinary tract infections) were related to PPH (Xu, Kane, & Arling, 2019). Snyder et al. (2019) found that NHC overall rating and two domain ratings (health inspection and quality measure) were not associated with 90-day readmission/major complications, >75th percentile post-acute cost, and 90-day bundle cost exceeding the target price among 488 patients who discharged to 105 skilled nursing facilities after primary total joint arthroplasty. The higher level of nursing staff domain rating was significantly associated with a decreased odds of the two cost outcomes (Snyder et al., 2019).

3. Nursing homes with higher prevalence of serious mental illness or dementia (7 studies)

3.1 NHs with higher serious mental illness (SMI) concentrations (3 studies: associated with poorer quality)

Kim et al. (2013) examined the prevalence of SMI and three mental health-related quality measures (depression without antidepressant therapy, bladder/bowel incontinence without a toileting plan, and the use of physical restraint in residents with dementia) among 135 Veterans Affairs (VA) NHs between fiscal years 2005-2007. They found that NHs with higher prevalence of SMI was associated with poorer quality of the three measures after adjusting for time and other facility-level characteristics (H. M. Kim et al., 2013). In addition, the presence of special care unit for dementia was associated with higher odds of physical restraint use (H. M. Kim et al., 2013). McGarry et al. (2019) found similar results that admission to NHs with high concentration of residents with SMI (at least 10% of a facility's proportion having an SMI diagnosis) was related to poorer quality for both residents with and without SMI among 58571 residents in 12027 NHs from 2006-2010. Particularly, relative to residents admitted to a low-SMI facility, for residents with SMI, admission to a high-SMI facility was associated with a 3.7

percentage point increase in the probability of feeding tube use; for residents without SMI, admission to a high-SMI facility was associated with higher probability of catheter use (a 1.7 percentage point increase), being hospitalized (a 3.8 percentage point increase), and having a feeding tube (a 2.1 percentage point increase) (McGarry et al., 2019). Rahman et al. (2013) found that NHs with an increase in the share of SMI was related to higher rates of hospitalization for residents without SMI and lower staffing skill mix and level (ratio of RN to total nurses and direct care hours per resident day) (Rahman, Grabowski, Intrator, Cai, & Mor, 2013).

3.2 presence of special care unit (SCU) for dementia (3 studies)

Joyce et al. (2018) found that NHs with an SCU was associated with a decrease in inappropriate antipsychotics (-9.7 percent), physical restraints (-9.6 percent), pressure ulcers (-3.3 percent), feeding tubes (-8.3 percent), and hospitalizations (-14.7 percent) among 704782 residents with dementia. They found no association with the use of indwelling urinary catheters (Joyce, McGuire, Bartels, Mitchell, & Grabowski, 2018).

Nazir et al. (2011) found that the incidence rates of the worsening behavior QI was significantly higher for residents on SCUs than for residents on conventional unit, and the worsening behavior QI scores after adjusted for cognitive impairment and presence of SCU produced significant shifts in NH rankings, which providing fairer comparison for NHs to take care of residents with dementia (Nazir, Arling, Perkins, & Boustani, 2011). Nazir et al. (2012) found similar results regarding the prevalence of falls QI among 21587 residents in 381 NHs, that is, the prevalence of falls was significantly higher for residents on SCUs than for residents on conventional unit, and there was a non-linear and significant association between the prevalence of falls and residents' level of cognitive impairment. The fall QI adjusted for cognitive impairment and presence of SCU provided a more accurate measure of NH care (Nazir, Mueller, Perkins, & Arling, 2012).

3.3 NHs with higher proportion of African American residents (one study)

Rivera-Hernandez et al. (2019) found that skilled nursing facilities with higher proportions of African American residents had worse quality of post-acute care as measured by 30-day rehospitalization rate, successful discharge from the facility to the community, and five-star quality ratings among 649187 Medicare beneficiaries from 8375 facilities (Rivera-Hernandez, Rahman, Mukamel, Mor, & Trivedi, 2019).

4. Reliability and validity of quality measures (4 studies, one of them is a systematic review)

Hutchinson et al. (2010) conducted a systematic review about the reliability and validity of RAI-MDS 2.0 quality indicators (14 articles and 1 report were included) and concluded that the strength of the evidence was limited (Hutchinson et al., 2010). Regarding *falls* QI, the agreements between falls recorded by facility staff in the MDS and falls recorded in the medical charts were fair (Kappa statistic = 0.29) for a 30-day timeframe and moderate (Kappa statistic = 0.29) for a 180-day timeframe, and MDS underreported falls (Hill-Westmoreland & Gruber-Baldini, 2005). Regarding *depression* QI, all included 3 studies suggested depression QI was not a reliable and valid measure: it measured the ability of staff to detect depressive symptoms rather than the actual prevalence rate of depression (Schnelle et al., 2001), it should not be interpreted as discriminating either differential rates of depression or care quality in relation to depression (Simmons et al., 2004), and it correlated poorly with the valid instruments and exhibited inferior sensitivity and specificity (Heiser, 2004). Regarding *incontinence* QIs, they were not associated with clinically important differences in related care processes (Schnelle et al., 2003). Regarding *urinary tract infection* QI, it overestimated the number of cases (only 13.9% could be validated as correct) while adequately screening out residents without infections (98.2% of residents without experiencing UTI could be validated as correct) (Stevenson et al., 2004). Regarding *weight loss* QI, it may have concurrent validity since it was able to discriminate differences in prevalence of weight loss between facilities (Simmons et al., 2003). Regarding *restraint* QI, it was not able to discriminate differences in the use of restraining devices when the resident was out of bed (Schnelle et al., 2004). Regarding *pressure ulcers* QI, it was not an effective measure of the quality of pressure ulcer care in facilities and the QI score could be misleading (Bates-Jensen et al., 2003). Regarding *pain* QI, high prevalence scores were associated with more frequent pain assessment and appropriate pain-related care practices, as opposed to poor care quality (Cadogan et al., 2004), and there was potential systematic bias in reporting pain QI (Roy & Mor, 2005).

Estabrooks et al. (2013) used modified Delphi technique and asked 16 experts to rank a list of 13 MDS 2.0 quality indicators based on practice sensitivity. In the top 5, pressure ulcers were the most practice sensitive QI, followed by worsening pain, physical restraint use, the use of

antipsychotic medications without a diagnosis of psychosis, and indwelling catheters (Estabrooks, Knopp-Sihota, & Norton, 2013).

Werner et al. (2013) explored the link between processes and outcomes of care and tested the extent to which improvements in outcomes of care were explained by changes in nursing home processes among 16,623 NHs from 2000 to 2009. They found that of the 5 outcome quality measures examined (pain, incontinence, pressure scores, and weight loss), only improvements in the percentage of long-stay NH residents in moderate or severe pain were associated with changes in NH processes of care with very small effect (Werner, Konetzka, & Kim, 2013).

Saliba et al. (2018) found that the three short-stay quality measures (rehospitalizations, ED visits, and successful discharges to the community) were weakly correlated. The correlation between the ED and the rehospitalizations measures was 0.25, between discharge to community and rehospitalization was -0.3 , and between ED visits and discharge to the community was -0.05 (Saliba, Weimer, Shi, & Mukamel, 2018).

5. A composite measure of quality (one study)

Shwartz et al. (2013) compared composite scores calculated from the 28 QIs using both observed rates and shrunken rates derived from a Bayesian multivariate normal-binomial model in 112 Veterans Health Administration NHs in fiscal years 2005–2008. They found that shrunken-rate composite scores in 1 year had better prediction of the observed total number of QI events or the observed-rate composite scores in the following year (Shwartz, Peköz, Christiansen, Burgess Jr, & Berlowitz, 2013).

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- Xu, D., Kane, R., & Arling, G. (2019). Relationship between nursing home quality indicators and potentially preventable hospitalisation. *BMJ quality & safety, 28*(7), 524-533.
- Yuan, Y., Lapane, K. L., Baek, J., Jesdale, B. M., & Ulbricht, C. M. (2019). Nursing Home Star Ratings and New Onset of Depression in Long-Stay Nursing Home Residents. *Journal of the American Medical Directors Association, 20*(10), 1335-1339. e1310.

Table 1. Summary of Studies

Citation	Study Objective	Study Design	Sample and Data	Outcome of Interest	Findings	Limitations	Implications
Becker, M. A., Boaz, T. L., Andel, R., Gum, A. M., & Papadopoulos, A. S. (2010). Predictors of preventable nursing home hospitalizations: the role of mental disorders and dementia. <i>The American Journal of Geriatric Psychiatry</i> , 18(6), 475-482.	To examine risk factors for hospitalization of Medicaid-enrolled NH residents with “ambulatory care-sensitive” conditions	retrospective secondary data analyses	72,251 Medicaid-enrolled NH residents in 647 NHs in Florida during fiscal year 2003–2006	quality measures and hospitalization	Residents from for-profit facilities, facilities that were not a member of a chain, had more Medicaid recipients, and fewer than 120 beds had greater risk of “ambulatory care-sensitive” hospitalizations. There was no association between quality deficiencies and potentially preventable hospitalization.	single state	Attention to the identified predictors of hospitalization for “ambulatory care-sensitive” conditions, which are potentially preventable, could reduce the risk and cost of these hospitalizations among Medicaid-enrolled NH residents.
Brauner, D., Werner, R. M., Shippee, T. P., Cursio, J., Sharma, H., & Konetzka, R. T. (2018). Does nursing home compare reflect patient safety in nursing homes? <i>Health Affairs</i> , 37(11), 1770-1778.	To compare NHs’ performance on several composite quality measures from NHC to their performance on measures of patient safety in NHs such as pressure sores, infections, falls, and medication errors.	retrospective secondary data analyses	15652 NHs in the first quarter of 2017	quality measures and patient safety	Although NHC captures some aspects of patient safety, the relationship was weak and somewhat inconsistent, leaving consumers who care about patient safety with little guidance.	national data	NHC should be refined to provide a clearer picture of patient safety and quality of life, allowing consumers to weight these domains according to their preferences and priorities.

Çalikoğlu, Ş., Christmyer, C. S., & Kozlowski, B. U. (2012). My Eyes, Your Eyes—The Relationship between CMS Five-Star Rating of Nursing Homes and Family Rating of Experience of Care in Maryland. <i>Journal for Healthcare Quality</i> , 34(6), 5-12.	To look at the relationship between NHC QMs obtained from assessments conducted by NH staff and the family rating of overall care using data from Maryland NHs.	retrospective secondary data analyses	208 NHs in Maryland between September and December 2009	resident/family ratings	strong positive correlation between family experience of care score and two five-star domains, namely health inspections and nurse staffing, and no relationship with the quality domain	single state	The lack of relationship between the quality domain and the family score may be due to inadequate risk adjustment or that each rating system measures different aspects of quality
Estabrooks, C. A., Knopp-Sihota, J. A., & Norton, P. G. (2013). Practice sensitive quality indicators in RAI-MDS 2.0 nursing home data. <i>BMC research notes</i> , 6(1), 460.	to identify practice sensitive QIs which believed to be the most sensitive to clinical practice.	qualitative study	16 experts to rank a list of 13 MDS 2.0 quality indicators based on practice sensitivity	validity and reliability of the QIs	Pressure ulcers were identified as the most practice sensitive QI followed by worsening pain, physical restraint use, the use of antipsychotic medications without a diagnosis of psychosis, and indwelling catheters. When stratified by informant group, although the top five QIs stayed the same, the ranking of the 13 QIs differed by group	qualitative study	Focusing on these 13 practice sensitive QIs provides both the greatest potential for improving resident function and slowing the trajectory of decline that most residents experience.
Fuller, R. L., Goldfield, N. I., Hughes, J. S., & McCullough, E.	To examine the NHC Stars measure and the rates of potentially preventable hospital	retrospective secondary data analyses	a subset of 439,011 long-term residents residing in	quality measures and hospitalization	the NHC Stars measure has limited correlation with rates of the potentially preventable hospital	national data	weak correlations

C. (2019). Nursing home compare star rankings and the variation in potentially preventable emergency department visits and hospital admissions. Population health management, 22(2), 144-152.	admissions and potentially preventable ED visits		12,883 NHs from 2010–2011		admissions and potentially preventable ED visits		
Gucwa, A. L., Dolar, V., Ye, C., & Epstein, S. (2016). Correlations between quality ratings of skilled nursing facilities and multidrug-resistant urinary tract infections. American journal of infection control, 44(11), 1256-1260.	To determine risk factors for the acquisition of urinary tract infections and multidrug-resistant organisms in residents of skilled nursing facilities	primary and secondary data analyses	1523 residents in 12 skilled nursing facilities in Long island	quality measures and urinary tract infections	Overall quality rating predicted the occurrence of urinary tract infections, whereas identification of multidrug-resistant organisms was dependent on the level of nursing care received. The mean predicted probability of urinary tract infections and receipt of contaminated samples was inversely dependent on the facility's rating, where the likelihood increased as overall quality ratings decreased.	There were only 12 facilities and overall quality ratings and three domain ratings (health inspection, nursing staff, and quality) were included in the models at the same time.	The CMS's quality rating system may provide some insight into the status of infection control practices in SNFs.
Hefele, J. G., Li, Y., Campbell, L., Barooah, A., &	To examine the relationship between Facebook user-	retrospective secondary data analyses	35 NHs in Maryland and	NHC 5-star ratings vs.	Facebook ratings were not significantly correlated with the CMS 5-star rating	two states	Given the disconnect between

Wang, J. (2018). Nursing home Facebook reviews: who has them, and how do they relate to other measures of quality and experience? <i>BMJ Qual Saf</i> , 27(2), 130-139.	generated NH ratings and other measures of NH satisfaction/experience and quality		78 NHs in Minnesota	ratings from other sources	or survey-based resident/family satisfaction ratings.		Facebook ratings and other, more scientifically grounded measures of quality, concerns about the validity and use of social media ratings are warranted.
Hutchinson, A. M., Milke, D. L., Maisey, S., Johnson, C., Squires, J. E., Teare, G., & Estabrooks, C. A. (2010). The resident assessment instrument-minimum data set 2.0 quality indicators: a systematic review. <i>BMC health services research</i> , 10(1), 166.	to systematically examine published and grey research reports in order to assess the state of the science regarding the validity and reliability of the RAI-MDS 2.0 QIs	systematic review	14 articles and one report examining the validity and/or reliability of the RAI-MDS 2.0 QIs were included. All studies were conducted in the US and included from one to a total of 209 facilities.	validity and reliability of the QIs	Studies about 10 QIs including falls, depression, depression without treatment, urinary incontinence, urinary tract infections, weight loss, bedfast, restraint, pressure ulcer, and pain, have revealed the potential for systematic bias in reporting, with under-reporting of some indicators and over-reporting of others.	systematic review	Evidence for the reliability and validity of the QIs remains inconclusive. Caution should be exercised when interpreting the QI results and other sources of evidence of the quality of care processes should be considered in conjunction with QI results.
Johari, K., Kellogg, C., Vazquez, K., Irvine, K., Rahman, A., & Enguidanos, S.	To examine Yelp ratings for NHs in California and compares these ratings with NHC ratings.	retrospective secondary data analyses	675 NHs in California between September and November 2016	NHC 5-star ratings vs. ratings from other sources	Correlations between the Yelp and NHC ratings were relatively weak. The Yelp rating was significantly lower than the 5-star NHC rating and the	single state	When consumers rate NHs on Yelp, their ratings differ considerably from NHC ratings

(2018). Ratings game: an analysis of nursing home compare and Yelp ratings. <i>BMJ quality & safety</i> , 27(8), 619-624.					NHC ratings for staffing and QMs. It was significantly higher than the NHC inspection rating.		
Joyce, N. R., McGuire, T. G., Bartels, S. J., Mitchell, S. L., & Grabowski, D. C. (2018). The impact of dementia special care units on quality of care: An instrumental variables analysis. <i>Health services research</i> , 53(5), 3657-3679.	To compare the quality of care following admission to a NH with and without a dementia special care unit (SCU) for residents with dementia	retrospective secondary data analyses	704782 residents with dementia during 2005–2010	presence of special care unit (SCU) for dementia	Admission to a facility with an SCU led to a reduction in inappropriate antipsychotics (9.7%), physical restraints (9.6%), pressure ulcers (3.3%), feeding tubes (8.3 %), and hospitalizations (14.7%). No impact was found on the use of indwelling urinary catheters.	instrumental variable approach	Facilities with an SCU provide better quality of care as measured by several validated quality indicators.
Kim, H. M., Banaszak-Holl, J., Kales, H., Mach, J., Blow, F., & McCarthy, J. F. (2013). Trends and predictors of quality of care in VA nursing homes related to serious mental illness. <i>Medical Care</i> , 659-665.	To examine recent trends in quality indicators measuring poor performance of VA NHs and whether the facility-level QIs vary with SMI concentration within the facility	retrospective secondary data analyses	135 Veterans Affairs (VA) NHs between fiscal years 2005-2007	NHs with higher serious mental illness (SMI) concentrations	Higher SMI prevalence was associated with higher odds of physical restraint use and lack of toileting plan. Higher SMI prevalence was also associated with higher frequency of untreated depression	VA NHs	Overall poorer quality was observed at sites with higher SMI concentrations

<p>Kim, S. J., Park, E.-c., Kim, S., Nakagawa, S., Lung, J., Choi, J. B., . . . Kim, K. (2014). The association between quality of care and quality of life in long-stay nursing home residents with preserved cognition. <i>Journal of the American Medical Directors Association</i>, 15(3), 220-225.</p>	<p>To assess the overall quality of life of long-stay NH residents with preserved cognition, and to examine whether the NHC 5-star quality rating system reflects the overall quality of life of such residents</p>	<p>primary and secondary data analyses</p>	<p>251 long-stay NH residents with preserved cognition in 32 NHs in Detroit</p>	<p>quality measures and quality of life</p>	<p>Quality of life was associated with physical impairment and depression but not NHC overall star rating and not pain.</p>	<p>resident-level</p>	<p>The 5-star quality rating system did not reflect the quality of life of long-stay NH residents with preserved cognition</p>
<p>Li, Y., Cai, X., & Wang, M. (2019). Social media ratings of nursing homes associated with experience of care and “Nursing Home Compare” quality measures. <i>BMC health services research</i>, 19(1), 260.</p>	<p>To determine if aggregated ratings from 4 popular social media or online review sites (Facebook, Yelp, Google Review, and Caring.com) were associated with family-reported care experience scores, and with CMS’ NHC 5-star ratings and other quality measures.</p>	<p>retrospective secondary data analyses</p>	<p>196 NHs in Maryland from July 2015 to July 2017</p>	<p>NHC 5-star ratings vs. ratings from other sources</p>	<p>The overall ratings were 3.11 on average on these sites and 3.03 on the NHC website, with a Pearson correlation of 0.41 ($p < 0.001$) between the 2 sets of ratings. The correlations between the social media rating and survey-based experience-of-care ratings ranged from 0.40 to 0.60, and the correlations between the social media rating and individual NHC quality measures of citations, nurse staffing, and complaints were about 0.35 (in absolute values).</p>	<p>single state</p>	<p>The 5-star ratings collected from 4 social networking sites was correlated with and predictive of the NHC and survey-based experience-of-care measures for Maryland NHs.</p>

<p>Mashouri, P., Taati, B., Quirt, H., & Iaboni, A. (2019). Quality Indicators as Predictors of Future Inspection Performance in Ontario Nursing Homes. Journal of the American Medical Directors Association.</p>	<p>To examine whether quality indicators could predict future inspection performance in LTC homes across Ontario, Canada</p>	<p>retrospective secondary data analyses</p>	<p>594 LTC facilities in Ontario, Canada from 2017 to 2018</p>	<p>quality indicators and inspection performance</p>	<p>After running a wide range of models, only a weak relationship was found between quality indicators and future inspection performance. The best-performing model was able to achieve a classification accuracy of 40.1%. Experiencing worsened pain, restraint use, and worsened pressure ulcers were correlated with homes predicted as needing significant improvement. Counterintuitively, improved physical functioning had an inverse relationship with homes predicted as being in good standing.</p>	<p>Canada</p>	<p>Most quality indicators are poor predictors of inspection performance</p>
<p>McGarry, B. E., Joyce, N. R., McGuire, T. G., Mitchell, S. L., Bartels, S. J., & Grabowski, D. C. (2019). Association between High Proportions of Seriously Mentally Ill Nursing Home Residents and the</p>	<p>To examine the association between the quality of care delivered to NH residents with and without a serious mental illness (SMI) and the proportion of NH residents with SMI.</p>	<p>retrospective secondary data analyses</p>	<p>58571 residents in 12027 NHs from 2006-2010</p>	<p>NHs with higher serious mental illness (SMI) concentrations</p>	<p>For individuals with SMI, admission to a high-SMI facility was associated with a 3.7 percentage point increase in the probability of feeding tube use relative to individuals admitted to a low-SMI facility. Among individuals without SMI, admission to a high-SMI facility was associated with a 1.7 percentage point increase in the probability of catheter use, a 3.8</p>	<p>national data</p>	<p>Admission to NHs with high concentrations of residents with SMI is associated with worse outcomes for both residents with and without SMI</p>

Quality of Resident Care. Journal of the American Geriatrics Society, 67(11), 2346-2352.					percentage point increase in the probability of being hospitalized, and a 2.1 percentage point increase in the probability of having a feeding tube.		
Mukamel, D. B., Amin, A., Weimer, D. L., Sharit, J., Ladd, H., & Sorkin, D. H. (2016). When patients customize nursing home ratings, choices and rankings differ from the government's version. Health Affairs, 35(4), 714-719.	To compare data with 146 residents who used the individualized nursing home compare plus composite measure with the CMS composite measure	Demonstration project comparing personalized selection of measures, weighting and subsequent rankings with the 'one size fits all' model	146 patients and families (42 were patients) who were discharged from hospital to the nursing home	Difference between measures, weighting, rankings	Almost all users (97%+) selected PT and nurse staffing in their measure; high variability among other measures; <15% chose restraints or catheters; substantial disagreement between CMS and CMSplus	May not be a feasible approach to VBP	Personalized measures differed enough between individuals and from CMS that such a model should be considered for nursing home selection
Nazir, A., Arling, G., Perkins, A. J., & Boustani, M. (2011). Monitoring quality of care for nursing home residents with behavioral and psychological symptoms related to dementia. Journal of the	To evaluate the performance of a new QI for the incidence of worsening behaviors in NH residents with behavioral and psychological symptoms association with dementia.	retrospective secondary data analyses	381 Minnesota NHs with 26,165 residents for the first 2 calendar quarters of 2008.	presence of special care unit (SCU) for dementia	The incidence rates of the worsening behavior QI in SCU ranged from 14% in residents with very severe cognitive impairment to 30% in those with moderate cognitive impairment. The incidence QI rates among residents residing in conventional unit ranged from 15% among those with very severe cognitive	single state	Resident cognitive function and the facility utility of SCU are associated with worsening behavior QI and should be adjusted for in any NH quality reporting measure.

<p>American Medical Directors Association, 12(9), 660-667.</p>					<p>impairment to 20% among those with moderate cognitive impairment. These differences in QI rates between the 2 units were statistically significant. After risk adjustment for level of cognitive impairment, number of facilities with SCUs that flagged for problem behaviors dropped from 18.4% to 12.4% and the number of conventional units in the low-risk category from 16.8% to 4.7%.</p>		
<p>Nazir, A., Mueller, C., Perkins, A., & Arling, G. (2012). Falls and nursing home residents with cognitive impairment: new insights into quality measures and interventions. Journal of the American Medical Directors Association, 13(9), 819. e811-819. e816.</p>	<p>To examine the relationship between cognitive impairment, residence on dementia special care units (SCUs) and other resident characteristics and likelihood of residents experiencing new falls in NHs</p>	<p>retrospective secondary data analyses</p>	<p>21,587 residents from 381 Minnesota NHs</p>	<p>presence of special care unit (SCU) for dementia</p>	<p>The likelihood of a new fall had a nonlinear association with cognitive impairment. Compared with residents with normal or mild cognitive impairment, the likelihood of a new fall was significantly higher among residents with moderate cognitive impairment. The risk decreased slightly for residents with more advanced cognitive impairment, whereas the presence of severe cognitive impairment was not significantly associated with new falls. Overall the</p>	<p>single state</p>	<p>Severity of cognitive impairment and residence on SCU impact fall incidence and should be accounted for in future fall-prevention interventions and quality-reporting indicators and measures.</p>

					likelihood of new falls was significantly higher for residents on SCUs compared with those on conventional units.		
Netten, A., Trukeschitz, B., Beadle-Brown, J., Forder, J., Towers, A.-M., & Welch, E. (2012). Quality of life outcomes for residents and quality ratings of care homes: is there a relationship? Age and ageing, 41(4), 512-517	To capture social care-related quality of life (SCRQoL) outcomes for residents and investigate the relationship between outcomes and regulator quality ratings of homes	primary data analyses	366 residents of 83 English care homes for older people inspected during 2008	quality measures and quality of life	Care homes were delivering substantial gains in SCRQoL, but were more successful in delivering 'basic' (e.g. personal cleanliness) than higher-order domains (e.g. social participation). Outcomes were associated with quality ratings of residential homes but not of NHs.	England	Future quality indicators need to demonstrate their relationship with quality of life outcomes if they are to be a reliable guide to commissioners and private individuals purchasing care.
Neuman, M. D., Wirtalla, C., & Werner, R. M. (2014). Association between skilled nursing facility quality indicators and hospital readmissions. JAMA, 312(15), 1542-1551.	To measure the association between SNF performance measures and hospital readmissions among Medicare beneficiaries receiving postacute care at SNFs	retrospective secondary data analyses	14251 SNFs between September 1, 2009, and August 31, 2010	quality measures and hospitalization	The unadjusted risk of readmission or death was lower at SNFs with better staffing ratings and better facility inspection ratings. Adjustment for resident factors, facility factors, and the discharging hospital attenuated these associations; small differences were observed in the adjusted risk of readmission or death according to SNF facility inspection ratings.	national data	Available performance measures were not consistently associated with differences in the adjusted risk of readmission or death.

O'Malley, A. J., Caudry, D. J., & Grabowski, D. C. (2011). Predictors of nursing home residents' time to hospitalization. <i>Health services research, 46</i> (1p1), 82-104.	To model the predictors of the time to first acute hospitalization for NH residents, and accounting for previous hospitalizations, model the predictors of time between subsequent hospitalizations.	retrospective secondary data analyses	677 NHs in New York State for the period 1998–2004	quality measures and hospitalization	Pressure ulcers and facility-level deficiencies were associated with a decreased time to first hospitalization, while the presence of advance directives and facility staffing was associated with an increased time. These predictors of the time to first hospitalization model had effects of similar magnitude in predicting the time between subsequent hospitalizations.	single state	Modifiable patient and NH characteristics are associated with the time to first hospitalization and time to subsequent hospitalizations for NH residents
Rahman, M., Grabowski, D. C., Intrator, O., Cai, S., & Mor, V. (2013). Serious mental illness and nursing home quality of care. <i>Health services research, 48</i> (4), 1279-1298.	To estimate the effect of a NH's share of residents with a serious mental illness (SMI) on the quality of care	retrospective secondary data analyses	13793 NHs over the period 2000 through 2008	NHs with higher serious mental illness (SMI) concentrations	An increase in the share of SMI NH residents positively affected the hospitalization rate among non-SMI residents and negatively affected staffing skill mix and level. There was no statistically significant effect on inspection-based health deficiencies or the hospitalization rate for SMI residents.	instrumental variables approach	Across the majority of indicators, a greater SMI share resulted in lower NH quality.
Rivera-Hernandez, M., Rahman, M., Mukamel, D. B., Mor, V., & Trivedi, A. N. (2019). Quality of	To investigate racial and ethnic disparities in the quality of post-acute care in SNFs	retrospective secondary data analyses	649,187 Medicare beneficiaries 65+ from 8,375 SNFs	NHs with higher proportion of African American residents	SNFs with higher fractions of African American patients had worse performance for three publicly reported quality measures: rehospitalization,	national data	Efforts to address disparities should focus attention on NHs that disproportionately serve minority patients and

post-acute care in skilled nursing facilities that disproportionately serve black and Hispanic patients. The Journals of Gerontology: Series A, 74(5), 689-697.					successful discharge to the community, and the star rating indicator.		monitor unintended consequences of value-based payments to SNFs
Saliba, D., Weimer, D. L., Shi, Y., & Mukamel, D. B. (2018). Examination of the new short-stay nursing home quality measures: rehospitalizations, emergency department visits, and successful returns to the community. INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 55	To examine 3 new short-stay quality measures (QMs) — rehospitalizations, emergency department visits, and successful discharges to the community	retrospective secondary data analyses	31, 312 NHs between April 2016 and October 2017	short-stay quality measures	similar to other QMs, performance varies across the country, and that there is very minimal correlation between these 3 new QMs as well as between these QMs and other NHC QMs. Better performance on these QMs tends to be associated with fewer deficiencies, higher staffing and more skilled staffing, nonprofit ownership, and lower proportion of Medicaid residents.	national data	These QMs are important by demonstrating their large variation across the country, suggesting substantial room for improvement
Schapira, M. M., Shea, J. A., Duey, K. A., Kleiman, C., & Werner, R. M. (2016). The	To evaluate the perceived usefulness of the report card to residents and families	Primary data collection, structured interviews	Convenience sample of 35 residents (6) or families (29) newly	Perceptions of star ratings, comparisons, and use of the	Positive perception of quality information overall but confusion over how the quality was actually measured and the	Convenience sample in a single geographic area	When made aware of the report card people like it, but more clarity is needed

nursing home compare report card: perceptions of residents and caregivers regarding quality ratings and nursing home choice. Health services research, 51, 1212-1228.			admitted to the nursing home in the Philadelphia area	report card for decision making	relationship between domain specific and overall quality score		for the public to understand the methodology
Shwartz, M., Peköz, E. A., Christiansen, C. L., Burgess Jr, J. F., & Berlowitz, D. (2013). Shrinkage estimators for a composite measure of quality conceptualized as a formative construct. Health services research, 48(1), 271-289.	To demonstrate the value of shrinkage estimators when calculating a composite quality measure as the weighted average of a set of individual quality indicators	retrospective secondary data analyses	112 Veterans Health Administration NHs in fiscal years 2005–2008	A composite measure of quality	Usually, shrunken-rate composite scores in 1 year are better able to predict the observed total number of QI events or the observed-rate composite scores in the following year than the initial year observed-rate composite scores.	method to construct a composite measure of quality	Shrinkage estimators can be useful when a composite measure is conceptualized as a formative construct
Snyder, D. J., Kroshus, T. R., Keswani, A., Garden, E. B., Koenig, K. M., Bozic, K. J., . . . Moucha, C. S. (2019). Are	to evaluate whether NHC ratings are valid predictors of 90-day complications, readmission, and bundle costs for patients discharged to an SNF after primary	retrospective secondary data analyses	488 patients who discharged to 105 skilled nursing facilities after primary total	quality measures and hospitalization	Overall NHC rating was not predictive of 90-day readmission/major complications, >75th percentile postacute cost, or 90-day bundle cost exceeding the target price. SNF health inspection and	patients discharged to an SNF after primary total joint arthroplasty (TJA)	Results of our study suggest that Medicare's NHC tool is not a useful predictor of 90-day costs, complications, or readmissions for

Medicare's Nursing Home Compare Ratings Accurate Predictors of 90-Day Complications, Readmission, and Bundle Cost for Patients Undergoing Primary Total Joint Arthroplasty? The Journal of arthroplasty, 34(4), 613-618.	total joint arthroplasty (TJA).		joint arthroplasty		quality measure ratings were also not predictive of 90-day readmission/major complications or bundle performance. A higher SNF staffing rating was independently associated with a decreased odds for >75th percentile 90-day postacute spend and a 90-day bundle cost exceeding the target price but was similarly not predictive of 90-day readmission/ complications.		SNFs within our health system
Stevenson, D. G., Spittal, M. J., & Studdert, D. M. (2013). Does litigation increase or decrease health care quality? A national study of negligence claims against nursing homes. Medical Care, 51(5), 430.	To assess whether the experience of being sued and incurring litigation costs affects the quality of care subsequently delivered in NHs	retrospective secondary data analyses	1514 NHs between 1998 and 2010	quality measures and negligence litigation	Nearly all combinations of the 3 litigation exposure measures and 9 quality measures (27 models in all) showed an inverse relationship between litigation costs and quality. However only a few of these associations were statistically significant, and the effect sizes were very small.	linked information on negligence claims to indicators of NH quality drawn from two national data sets	Tort litigation does not increase the NH quality performance, and may decrease it slightly.
Studdert, D. M., Spittal, M. J., Mello, M. M., O'Malley, A. J., & Stevenson, D. G. (2011). Relationship	To investigate whether high-quality NHs are less likely to be sued for negligence than their low-performing counterparts	retrospective secondary data analyses	1465 NHs between 1998 and 2006	quality measures and negligence litigation	NHs with more deficiencies and those with more serious deficiencies had higher odds of being sued; this was also true for NHs that had more residents with weight loss	linked information on tort claims to 10 indicators of NH quality drawn from	The best-performing NHs are sued only marginally less than the worst-performing ones. Such weak

between quality of care and negligence litigation in nursing homes. New England Journal of Medicine, 364(13), 1243-1250					and with pressure ulcers. The odds of being sued were lower in NHs with more nurse's aide-hours per resident-day. However, all these effects were relatively small.	two national data sets	discrimination may subvert the capacity of litigation to provide incentives to deliver safer care.
Troyer, J. L., & Sause, W. (2013). Association between traditional nursing home quality measures and two sources of nursing home complaints. Health services research, 48(4), 1256.	To test for an association between traditional NH quality measures and two sources of resident- and caregiver-derived NH complaints	retrospective secondary data analyses	379 NHs in North Carolina from 2002-2006	quality measures and NH complaints	There is little relationship between MDS-QIs and complaints. Ombudsman complaints and inspection violations are generally unrelated, but there is a positive relationship between state certification agency complaints and inspection violations.	single state	Ombudsman and state certification agency complaint data are resident and caregiver-derived quality measures that are distinctive from and complement traditional quality measures.
Werner, R. M., Konetzka, R. T., & Kim, M. M. (2013). Quality improvement under nursing home compare: the association between changes in process and outcome measures.	To test the extent to which improvements in outcomes of care are explained by changes in NH processes	retrospective secondary data analyses	16,623 NHs from 2000 to 2009	process and outcome measures	Of the 5 outcome measures examined, only improvements in the percentage of NH residents in moderate or severe pain were associated with changes in NH processes of care. Furthermore, these changes in the measured process of care explained only a small part of the overall improvement in pain prevalence.	national data	A large portion of the improvements in NH outcomes were not associated with changes in measured processes of care suggesting that processes of care typically measured in NHs do little to

Medical Care, 51(7), 582.							improve NH performance on outcome measures.
Williams, A., Straker, J. K., & Applebaum, R. (2016). The nursing home five star rating: How does it compare to resident and family views of care? The Gerontologist, 56(2), 234-242.	To compares the CMS star rating system to NH satisfaction data reported by residents and their families in Ohio	retrospective secondary data analyses	918 NHs in Ohio	quality measures and satisfaction	Many 5-star NHs had moderate to very low consumer satisfaction (54% compared with resident satisfaction and 41% compared with family satisfaction), and many 1-star NHs had high to very high consumer satisfaction (19% compared with resident satisfaction and 20.0% compared with family satisfaction)	single state	Findings indicate that the star rating system does not adequately reflect consumer satisfaction
Xu, D., Kane, R., & Arling, G. (2019). Relationship between nursing home quality indicators and potentially preventable hospitalisation. BMJ quality & safety, 28(7), 524-533.	To examine the relationship between quality indicators and overall and potentially preventable hospitalizations among Medicaid beneficiaries aged 65 years and older receiving care at NHs in Minnesota.	retrospective secondary data analyses	20 518 Medicaid beneficiaries aged 65+ in 345 NHs during the 2011-2012 period	quality measures and hospitalization	Available quality indicators were not strongly or consistently associated with the risk of hospitalization. Among these 23 quality indicators, five quality indicators (antipsychotics without a diagnosis of psychosis, unexplained weight loss, pressures sores, bladder continence and activities of daily living [ADL] dependence) were related significantly to hospitalization and only four quality indicators (antipsychotics without a diagnosis of psychosis,	single state	Although general quality indicators can be informative about overall NH performance, only selected quality indicators appear to tap dimensions of clinical quality directly related to hospitalizations.

					unexplained weight loss, ADL dependence and urinary tract infections) were related to potentially preventable hospitalization.		
Yuan, Y., Lapane, K. L., Baek, J., Jesdale, B. M., & Ulbricht, C. M. (2019). Nursing Home Star Ratings and New Onset of Depression in Long-Stay Nursing Home Residents. <i>Journal of the American Medical Directors Association</i> , 20(10), 1335-1339. e1310.	To examine the association between NH quality and new onset of depression and severity of depressive symptoms in a national cohort of long-stay NH residents	retrospective secondary data analyses	29,837 long-stay residents without indicators of depression in 13,921 NHs	quality measures and depression	Using minimal depressive symptoms as the reference, residents in NHs with 5-star overall ratings were 12% less likely than those in 3-star NHs to experience mild and 31% less likely to experience moderate symptoms. In NHs with 1-star staffing compared to 3-star, residents had 37% higher odds of moderate symptoms and 57% higher odds of moderately severe to severe depressive symptoms. The odds of any above-minimal depressive symptoms decreased as quality measure ratings increased.	national data	Lower NH quality ratings were associated with more severe depressive symptoms.