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Does Nursing Home Compare Reflect Patient Safety In Nursing Homes?

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ABSTRACT The past several decades have seen significant policy efforts to improve the quality of care in nursing homes, but the patient safety movement has largely ignored this setting. In this study we compared nursing homes' performance on several composite quality measures from Nursing Home Compare, the most prominent recent example of a national policy aimed at improving the quality of nursing home care, to their performance on measures of patient safety in nursing homes such as pressure sores, infections, falls, and medication errors. Although Nursing Home Compare captures some aspects of patient safety, we found the relationship to be weak and somewhat inconsistent, leaving consumers who care about patient safety with little guidance. We recommend that Nursing Home Compare 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.

The Institute of Medicine (IOM) inspired the quality improvement movement for US nursing homes with its 1986 report titled *Improving the Quality of Care in Nursing Homes*.¹ The report noted the “shockingly deficient” care that people were receiving in many government-licensed nursing homes. This report led to the Nursing Home Reform Act of 1987, which mandated extensive regulatory controls; regular inspections; and the development of a resident-level assessment, data collection, and care planning system.

It wasn't until 1999 that another groundbreaking report by the IOM, *To Err Is Human*, ignited the patient safety movement.² Focusing on the prevention of medical errors in acute care, the patient safety movement inspired a proliferation of attention focused on creating evidence-based methods for improving the safety of care,^{3,4} along with systems analysts calling for an “integrated framework” to create a universally applicable and coherent approach to quality and patient

safety.⁵

However, until recently, attention to patient safety in nursing homes remained conspicuously absent. A 2015 review of evidence on patient safety in nursing homes concluded that patient safety outcomes in such facilities have not been well studied and that patient safety measures taken from the hospital setting are unlikely to apply to the nursing home context, with its unique set of resident characteristics and regulatory environment.⁶ A related article noted the weak and mixed evidence base on interventions for improving patient safety in nursing homes.⁷

At the time when patient safety in acute care was gaining momentum, policy makers remained focused on improving the quality of care in nursing homes and did not define these efforts as promoting patient safety. Notably, in 2002 the Centers for Medicare and Medicaid Services (CMS) substantially expanded its quality improvement efforts by launching Nursing Home Compare (NHC), a national effort to publicly report the quality of care in all US nursing

homes, thereby informing consumers and incenting the improvement of quality. NHC was modified to feature a five-star composite rating system for overall quality in late 2008, assigning each nursing home a rating of one to five stars (with more stars indicating higher quality).

The notions of health care quality and patient safety are often conflated. Although they overlap, patient safety—in the IOM's sense of prevention of harm to patients from medical errors²—may be considered a subdomain of quality that is associated with distinct approaches, processes, and outcomes. The emphasis in patient safety is on identifying errors, determining their cause, and preventing them from happening again, often by addressing gaps or failures in the relevant system of care. In the nursing home setting, resident falls are a good example of a typical patient safety target. If a nursing home finds that fall rates are high, a patient safety approach would examine the circumstances that lead to the falls. For example, a fall might result from a loss of balance that may be due to the side effects of medications, environmental hazards, or lack of appropriate staffing to provide oversight and assistance. To prevent future falls, each of these items might be addressed. Ultimately, these efforts can result in improved patient safety.

A quality improvement perspective, on the other hand, would consider avoiding adverse events from errors as one of a broader set of goals. Quality improvement efforts also work to enable positive health outcomes beyond improving safety. For nursing homes, some of these other goals have been defined as improving or maintaining functional status, treating pain, maintaining weight, avoiding incontinence and catheter use, avoiding depression, avoiding physical restraints and the inappropriate use of antipsychotic medications, and improving vaccination rates. There has been little attention placed on differentiating patient safety from other types of quality outcomes in tools designed to measure nursing home quality.

Our goal was to examine the relationship between nursing homes' performance on standard quality measures overall and on measures specific to patient safety in nursing homes. To do so, we focused on quality measures from NHC, a national, policy-driven public reporting system. Prior research has established that providers monitor their ratings and attempt to improve them,^{8,9} and NHC scores have generally improved over time.¹⁰ Yet it is unclear whether nursing homes that score well on NHC also perform well from a patient safety perspective. While NHC was intended first and foremost to help consumers choose high-quality nursing homes, arguably it is the extreme examples of poor patient safety

outcomes, sometimes associated with neglect, that consumers fear most when considering nursing home placement.

NHC star ratings are based on three domains of quality: state regulatory health inspections, staffing ratios, and clinical quality. Each facility is assigned a star rating for each domain. The health inspections domain rating is based on the number, scope, and severity of health deficiencies found at state inspections and the number of repeat visits needed to confirm the correction of deficiencies, all relative to other facilities in the state. One key area of patient safety, medication errors, appears in several potential health deficiencies in this domain. The staffing domain rating is based on case-mix-adjusted measures of total nurse hours per resident day and registered nurse hours per resident day, relative to specific national thresholds. The clinical quality domain rating is based on meeting national thresholds across a group of individual outcome measures, some of which are patient safety measures.

The overall star rating combines the three domains, using the health inspection star rating as a base and potentially adjusting the rating up or down depending on the staffing and clinical quality star ratings. The health inspections domain is given the greatest weight, as it is based on the results of inspections by state surveyors rather than facility self-reported data and is therefore considered the most objective. The three individual domain star ratings are reported on NHC in addition to the overall star rating. Details of the process for calculating the star ratings can be found on the NHC website.¹¹

NHC does include some patient safety measures, such as pressure sores and injurious falls, that are often associated in the minds of consumers with neglect. However, because NHC measures many factors, its signal in terms of patient safety performance may be weak. How much NHC reflects patient safety and what consumers can learn from NHC scores about patient safety have not been established.

Study Data And Methods

DATA SOURCE We merged data for the first quarter of 2017 from the Nursing Home Compare archives with data from Certification and Survey Provider Enhanced Reporting (CASPER) to create a nursing home-level data set. The archives, a historical compilation of ratings published on the NHC website, provided us with each home's overall and domain-specific star ratings and facility-level performance on individual patient safety measures that appear in the quality measures domain. CASPER is a compilation of data collected by surveyors during regular inspec-

tions of nursing facilities for Medicare and Medicaid certification. From CASPER, we obtained profit status, payer mix, and chain status, as well as whether the nursing home was cited for medication errors in its most recent prior health inspection—information not published as part of the NHC archives.

METHODS We examined six key measures of patient safety in nursing homes: injurious falls, urinary tract infections, and pressure sores among long-stay residents; pressure sores among short-stay residents; and two measures of medication errors. Applying the IOM's sense of safety as the prevention of harm to patients from medical errors,² which we took to include acts of omission and commission, we defined the domain of nursing home measures of safety as negative outcomes that were potentially avoidable. These measures have been identified as safety concerns in the literature as well.⁶ Although the distinction is not always sharp, other types of NHC quality measures (such as pain control, functional status, and vaccination rates) are typically not considered patient safety measures. Each of our selected outcomes is important in that it potentially leads to hospitalization and subsequent health consequences that are costly in terms of health care use, morbidity, and mortality. Some evidence (though mixed) exists on interventions that could help avoid each of these outcomes.⁷ Falls could be avoided through education programs, mobility aids, reducing polypharmacy, and increased or more consistent staffing levels.^{12,13} Urinary tract infections could be reduced through minimizing the use of urinary catheters and ensuring their proper use, including through better hygiene.^{14,15} Pressure sores could be reduced through frequent turning of mobility-limited residents and ensuring proper nutrition and hydration.¹⁶ Finally, medication errors could be reduced through medication review and improved communication across care providers.^{17,18}

The first four measures (injurious falls, urinary tract infections, and the two pressure sore measures) were originally based on federally mandated assessments of residents' condition at regular intervals, the data from which are compiled into the Minimum Data Set 3.0. The data are reported by the nursing homes and reviewed by nursing home inspectors. Following technical specifications for each measure,¹⁹ CMS uses the data to define the cohort at risk. *Long-stay residents* are defined as those who have been residing in the facility for at least 100 days, and *short-stay residents* as those with shorter lengths-of-stay, primarily for post-acute care rehabilitation. In addition, a resident must be considered at risk for the outcome being measured. For ex-

Our results highlight the differences between patient safety and quality improvement, two related but distinct approaches to improving health care.

ample, for the long-stay pressure sore measure, residents at risk are those with mobility limitations. Each resident who qualifies for the cohort is then coded as having had the adverse outcome or not, with regression-based risk adjustment incorporated into some measures. The resident-level binary outcomes are aggregated into a facility-level percentage that is averaged over four quarters and reported on NHC. We used these facility-level percentages in our analysis.

The two measures of medication errors are based on deficiency citations from health inspections. Each nursing home in the US that qualifies for Medicare, Medicaid, or both must be inspected by state surveyors at least once every fifteen months to ensure compliance with regulations. When a facility is found to be out of compliance, it is cited with a deficiency that needs to be corrected. There are hundreds of possible deficiencies. We focused on two related to medication errors, as these errors are prototypical safety failures across health care settings. The first identifies significant medication errors among one or more residents; the second is for a medication error rate of more than 5 percent of all doses prescribed, at any level of significance. These deficiencies are each defined as equal to 1 (cited) or 0 (not cited) at the facility level. Each deficiency is also assigned a score for the scope and severity of the violation. We ignored this information because its use complicated the measure without substantively changing our results.

ANALYSIS Our primary goal was to examine the relationship between nursing homes' performance on standard quality measures overall and on measures specific to patient safety in nursing homes. We first tested the Pearson correlation between performance on each patient safety

measure and both the NHC overall star rating and the NHC health inspection star rating. Next, we tested the correlation between patient safety measures and NHC ratings graphically by stratifying nursing homes on overall star level and displaying the average percentage for each measure. The average percentage was calculated as the unweighted average across facilities in each star category of the reported percentage of residents who trigger each measure—that is, the average of facility-level percentages. The medication error measures represent the average percentage of facilities cited for the deficiency.

We used analysis-of-variance tests to test for groupwise differences. If NHC serves as a good marker for patient safety, the means should be highest for one-star homes and lowest for five-star homes, with a monotonic trend in between. The patient safety measures we studied are included in NHC, so some correlation is to be expected. At the same time, their role in the overall score may be limited. Medication errors are captured only to the extent that nursing homes are cited with a regulatory deficiency for having isolated or frequent errors and are just two possible deficiencies among hundreds that feed into a complex formula for the health inspection score. That score and associated star rating do not identify which deficiencies had an impact on the score. One can find the full health inspection results, including specific deficiencies cited, on the NHC website, but these are far less prominent than the star ratings and require multiple clicks through the website. The other four patient safety measures we studied (injurious falls, urinary tract infections, and pressure sores among long-stay residents; and pressure sores among short-stay post-acute care residents) are included as separate measures within the clinical quality domain on NHC. Although all four measures are included in the star rating for clinical quality, they constitute a minority of the twenty-four measures (sixteen of which are included in the star rating). Thus, the extent to which patient safety is reflected in NHC depends on whether patient safety variation drives, or is correlated with, overall variation in quality.

Our secondary goal was to identify the types of nursing homes in which patient safety was likely to present the greatest challenges. To do this, we compared rates of patient safety outcomes by key nursing home characteristics: profit status, chain status, and payer mix (whether the facility is dominated by Medicaid, using 90 percent of residents on Medicaid as our threshold).²⁰

LIMITATIONS Our approach was subject to several limitations. First, it is possible that neither the NHC ratings nor the individual patient safety measures reflect true quality or safety. Our goal

was to examine the relationships among types of measures, not to assess their underlying validity.

Second, we examined six typical measures of patient safety that were available in our data, but these measures might not provide a complete picture of patient safety and might not be equally important.

Third, the relationships we studied might not be causal and could be the result of unobservable factors that were correlated with both quality and safety, such as the ability of facility managers. We were mainly interested in whether the NHC ratings acted as a signal for performance in patient safety and did not intend to explore the underlying mechanisms.

Study Results

Our national sample of nursing homes in the first quarter of 2017 is summarized in online appendix exhibit 1.²¹ We analyzed data on 15,652 nursing homes, which includes all nursing homes in the country certified for Medicare, Medicaid, or both.

We expected measures of patient safety (all of which were constructed as adverse outcomes, so that lower rates are better) to have a negative correlation with the Nursing Home Compare overall star rating, in which more stars are better. Exhibit 1 shows that this expected negative relationship was the norm (with some exceptions), but the correlations were quite low. The highest correlation (in absolute value) was for pressure sores among long-stay residents (−0.21), and the lowest was for urinary tract infections among the same population (−0.05).

EXHIBIT 1

Correlations between patient safety measures and Nursing Home Compare overall and health inspection star ratings in the first quarter of 2017

Safety measure	Nursing Home Compare star rating	
	Overall	Health inspection
Pressure sores (long-stay residents only)	−0.21	−0.13
Pressure sores (short-stay residents only)	−0.12	−0.05
Urinary tract infections (long-stay residents only)	−0.05	0.04
Injurious falls (long-stay residents only)	−0.06	0.02
Medication error rate >5% (all residents)	−0.15	−0.17
Significant medication error(s) (all residents)	−0.13	−0.14

SOURCE Authors' analysis of data from Nursing Home Compare and Certification and Survey Provider Enhanced Reporting (CASPER). **NOTES** The Nursing Home Compare health inspection star rating is for the health inspections domain only, which is one of the three components used to calculate the Nursing Home Compare overall star rating. Long-stay residents are defined as people who have been residing in the nursing home for at least a hundred days. Short-stay residents are defined as people with a shorter length-of-stay, usually for post-acute care purposes. All correlations were significant ($p < 0.05$). Although we focused our analysis on a single quarter for ease of exposition, similar results were obtained for 2012–16.

This means that nursing homes with higher star ratings generally had lower rates of both pressure sores and urinary tract infections, but these relationships were quite weak. Pearson correlation coefficients in general run from 0 to 1 in absolute value, with 0 indicating no relationship between two variables and 1 indicating the strongest possible relationship. The correlations between patient safety measures and the star rating for the health inspections domain, which is one of three components used in the overall star rating, were generally even lower.

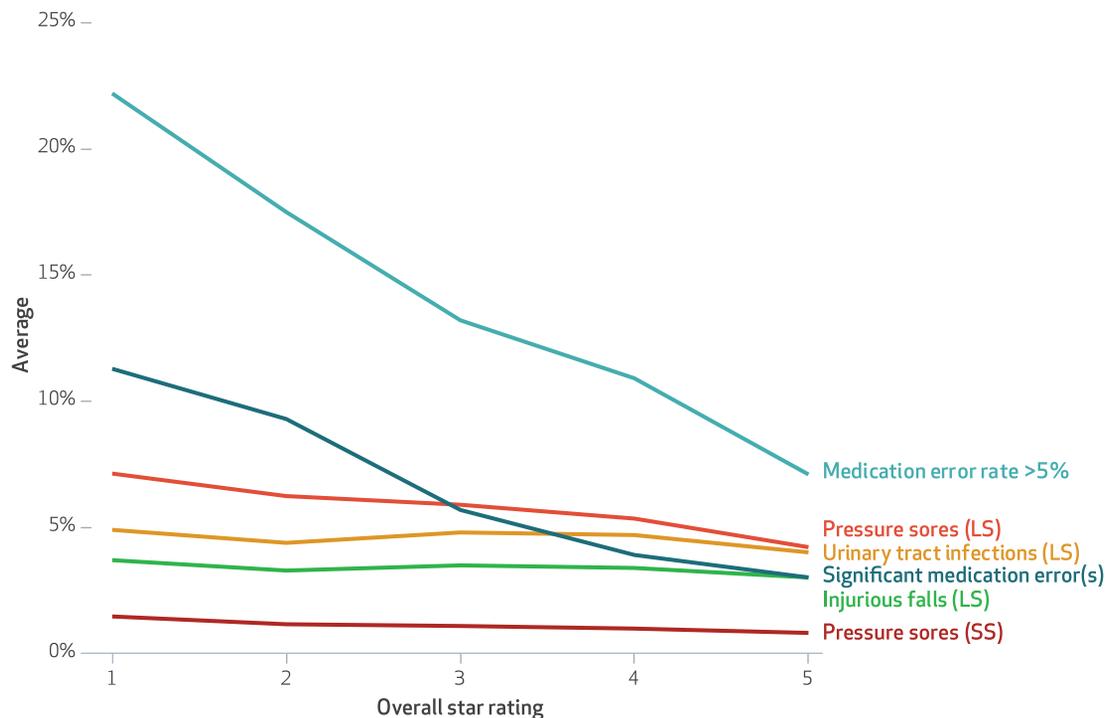
Nursing homes' performance on patient safety measures appears to track somewhat with the overall star rating. Notably, for the nondeficiency measures (injurious falls, urinary tract infections, and the two pressure sore measures), the differences were most pronounced at the extremes (one-star versus five-star ratings), with little meaningful difference between nursing homes with ratings in the two- to four-star range (exhibit 2). The one exception was pressure sores among long-stay residents, which exhibited a more monotonic trend by star rating, with the difference from one star (7.1 percent)

to five stars (4.2 percent) constituting a clinically meaningful magnitude. In contrast to most of the nondeficiency measures, the relationship between the overall star rating and deficiency citations for medication errors was more consistent.

The difference between the pattern for medication-related deficiencies and other patient safety measures is likely due to the fact that deficiencies inherently affect the health inspection rating (even if medication-related deficiencies are only two of many), and the health inspection rating is weighted more heavily than the other domains in the overall star rating. To explore this explanation, exhibit 3 displays the relationship between mean patient safety outcomes and the star rating in the health inspection domain. Other than pressure sores, the clinical outcomes had little relationship with the health inspection star rating, with two measures (urinary tract infections and injurious falls) even suggesting a positive relationship. However, medication-related deficiency rates still reflected the expected downward slope. Deficiencies for this classic patient safety issue—medication errors—appeared to be better correlated with health inspection ratings

EXHIBIT 2

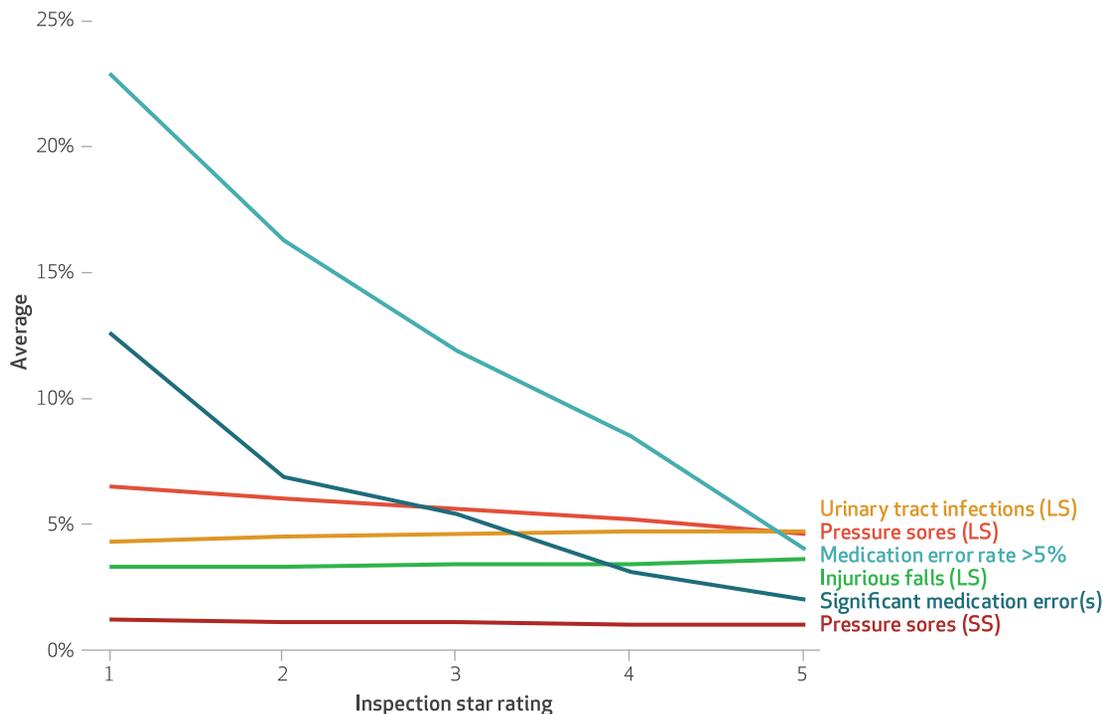
Nursing homes' performance on patient safety measures in the first quarter of 2017, by Nursing Home Compare overall star rating



SOURCE Authors' analysis of data from Nursing Home Compare and Certification and Survey Provider Enhanced Reporting. **NOTES** The average percentages are calculated as the unweighted average across facilities in each star category of the reported percentage of residents who trigger each measure—that is, the average of facility-level percentages. The medication error measures represent the average percentage of facilities cited for the deficiency. Long-stay residents (LS) and short-stay residents (SS) are defined in the notes to exhibit 1.

EXHIBIT 3

Nursing homes' performance on patient safety measures in the first quarter of 2017, by Nursing Home Compare health inspection star rating



SOURCE Authors' analysis of data from Nursing Home Compare and Certification and Survey Provider Enhanced Reporting. **NOTES** The average percentages are calculated as explained in the notes to exhibit 2. The Nursing Home Compare health inspection star rating is for the health inspections domain only, which is one of the three components used to calculate the Nursing Home Compare overall star rating. Long-stay residents (LS) and short-stay residents (SS) are defined in the notes to exhibit 1.

and therefore with overall NHC ratings.

Our exploration of heterogeneity by nursing home type (profit or nonprofit, independent or chain, and high or low Medicaid) revealed no substantial differences in the relationship

between the NHC ratings and patient safety measures, but at least one nursing home characteristic was associated with worse absolute performance on several of the patient safety measures: For-profit facilities had higher rates of both de-

EXHIBIT 4

Performance on patient safety measures in the first quarter of 2017, by key nursing home characteristics

Safety measure	Characteristic						All nursing homes
	For profit		Chain		High Medicaid		
	Yes	No	Yes	No	Yes	No	
Pressure sores (long-stay residents only)	6.0%	5.0%	5.8%	5.8%	6.2%	5.7%	5.7%
Pressure sores (short-stay residents only)	1.1	1.1	1.0	1.2	1.1	1.1	1.1
Urinary tract infections (long-stay residents only)	4.3	5.1	4.4	4.7	3.6	4.6	4.6
Falls (long-stay residents only)	3.2	3.8	3.3	3.4	2.5	3.4	3.4
Medication error rate >5% (all residents)	15.1	9.2	13.8	13.5	15.1	13.6	13.4
Significant medication error(s) (all residents)	7.3	4.0	6.4	6.0	5.7	6.3	6.3

SOURCE Authors' analysis of data from Nursing Home Compare and Certification and Survey Provider Enhanced Reporting (CASPER). **NOTES** High Medicaid is defined as having at least 90 percent of residents with Medicaid as their primary payer. Long-stay residents and short-stay residents are defined in the notes to exhibit 1. The percentages are averages, calculated as explained in the notes to exhibit 2.

iciency-based patient safety measures and pressure sores among long-stay residents (exhibit 4). As for-profit, chain, and high-Medicaid facilities also tended to score lower on health inspections and on the NHC star ratings, this result for for-profit status was consistent with expectations.^{22,23} At the same time, rates of urinary tract infections and falls exhibited the opposite pattern: For-profit, chain, and high-Medicaid facilities reported consistently lower rates than non-profit and independent facilities did.

Discussion

Our results highlight the differences between patient safety and quality improvement, two related but distinct approaches to improving health care. In nursing homes, quality improvement has been emphasized, with less attention paid to patient safety. Our results reveal that Nursing Home Compare, a key policy initiative aimed at improving quality and empowering consumers to make better choices, does not provide them with much information on which to judge patient safety in nursing homes. Triangulating among several sources of data, we found that although there was some correlation between NHC star ratings and patient safety measures, these tended to be weak—and for many safety measures, nonexistent. A rating of one star or five stars seemed to give the most information about patient safety, with one-star nursing homes having higher rates of adverse safety events and five-star nursing homes having the lowest rates. However, for nursing homes in the middle—those with two, three, or four stars—there was no meaningful difference in adverse safety events between nursing homes with different star ratings. This lack of correlation makes interpretation more difficult for consumers, as the difference between a one-star and a two-star facility is quite different from the difference between a three-star and a four-star facility. Finally, nursing home characteristics such as profit and chain status and payer mix do not serve as consistent proxies for patient safety performance.

Nursing homes that scored well on NHC did exhibit a more consistent relationship between the star ratings and two important measures of patient safety—rates of pressure sores among long-stay residents and citations for medication errors—but again, these correlations were small. Furthermore, a high star rating says little about the rates of such outcomes as falls and infections. In fact, we found that those facilities with the highest star ratings in the health inspections domain (arguably the most objective domain we studied) reported more falls and urinary tract infections. These measures may simply present

To rectify the lack of focus on patient safety, we recommend that patient safety measures be identified as a separate subset within the clinical quality measures.

different clinical challenges. However, another possible explanation for this seemingly paradoxical finding is that superior facilities may be better able to identify and track falls and urinary tract infections, which suggests an ascertainment bias that exposes an inherent problem in reporting systems such as NHC.

Overall, our findings suggest that NHC does not adequately reflect patient safety in nursing homes, even though it contains some patient safety measures. Accordingly, consumers who prioritize patient safety might not find NHC a useful tool with which to assess the performance of nursing homes. This conclusion suggests one straightforward and plausible solution: Nursing home performance on patient safety should be emphasized more in NHC. Specifically, to rectify the lack of focus on patient safety in NHC, we recommend that patient safety measures be identified as a separate subset within the clinical quality measures. Precedent exists for this type of grouping of measures in some state report cards.²⁴ The development and inclusion of a measure of medication errors would be a helpful addition to current patient safety measures, which could be as simple as explicitly reporting medication-related deficiencies as a new measure. Despite the importance of medication errors to patient safety, NHC captures this safety failure only as one deficiency among many used to calculate the health inspection star rating. Raising the visibility of patient safety measures should serve not only to inform consumers but also to provide a stronger incentive for nursing homes to improve on these measures.

More broadly, our findings suggest that the patient safety movement has not been well inte-

grated into the nursing home setting. This is a missed opportunity, but it may also reflect the challenges of patient safety in nursing homes. These include the challenges of providing appropriate care to older people with long-term care needs and the potential incompatibility between patient safety models and the nursing home setting, as the models were designed largely in the context of acute care. Not only do nursing homes serve particularly complex and vulnerable residents, they are also residents' homes. Thus, care providers must balance patient safety needs with residents' autonomy and freedom. Recent criticisms of patient safety models suggest that many aspects of medical care are too complex to be corrected using the models, which are based on industrial and occupational safety methods.²⁵ This criticism may be best exemplified by the lack of correlation we found between nursing home star ratings and rates of falls. An outcome such as a fall represents a much more complex event, the result of myriad combinations of problems—for example, cognitive impairment, arthritis, and lack of balance. In addition, other positive factors such as becoming more mobile with therapy and gaining an increasing degree of autonomy are both associated with an increasing possibility of falling, compared with being confined to one's bed. Achieving this possibility with its increased risk of falling may represent a major improvement in quality and greater resident autonomy at the same time it heralds an adverse event.

In the quest to improve patient safety in nursing homes, the need to reconcile competing priorities for long-stay residents will present an ongoing challenge in NHC and other contexts. However, the answer to this challenge is not to

deemphasize important patient safety concerns. Rather, NHC needs to do a better job of representing the competing concerns of long-stay residents by incorporating measures related to quality of life, such as resident and caregiver satisfaction. Although this would be inherently challenging because these measures are not conveniently derived from administrative data, it is feasible. Indeed, some states have made substantial progress in measuring and reporting resident and caregiver satisfaction.^{26–28} A public reporting system that included both patient safety concerns and quality of life would be the most straightforward way to represent these two potentially conflicting goals in NHC, while allowing consumers to weight the domains according to their preferences and priorities.

The challenges of patient safety in nursing homes will remain embedded in the much broader challenges of providing appropriate care to elderly people with long-term care needs. At the same time, the predominant focus in nursing homes is improving selected aspects of the quality of care, with an emphasis on nursing home star ratings. While tweaking NHC to more completely measure and report patient safety metrics is important, there remains the more central challenge of addressing the tensions and potential incompatibilities that exist between patient safety, quality of care, and quality of life in nursing homes. Within the limited scope of what a public reporting system can do, NHC should strive to achieve a more comprehensive picture that reflects all important domains of quality—including patient safety and quality of life, both of which are currently underrepresented. ■

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