


What Counts in Nursing Homes' Quality and Efficiency? Results From Data Envelopment Analysis in Italy

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Abstract

Purpose: Economic resource constrains in public spending budget in a country, such as Italy, with an ageing population with high incidence of chronic diseases calls for better strategies to improve measuring quality and efficiency in nursing homes (NHs). This paper analyses the efficiency of 40 NHs based in Tuscany considering not only structural characteristics but also quality of care, including residents, relatives and staff satisfaction.

Methodology: We run a classic data envelopment analysis (DEA) on data gathered by the NHs' regional performance evaluation system. We include as inputs the number of total work hours as labour and the daily cost for services as economic resources. As outputs we include measures for quality of care (number of falls, urinary infections and antidepressants), satisfaction (residents, relatives and professionals) and quality of life (days of recreational activities). We run a multivariate regression to analyse the determinants of previously obtained efficiency scores considering factors such as: institutional (ownership), managerial (training) and clinical (patient's severity).

Findings: Results find 35% efficient NHs. Moreover, management and the managerial factor (staff trained in end-of-life support) are predictors of the efficiency score.

Originality: Our study uses satisfaction (residents, relatives and professionals) measures as proxy for quality output in the DEA model and measures related to staff management (eg training) as predictors of the efficiency scores.

Keywords

Data envelopment analysis model, nursing homes, efficiency, quality, satisfaction

Highlights

What do We Already Know About This Topic?

The association between economic performance and quality of care is an essential aspect of the production of health services, although efficiency improvements are hard to achieve in health services and in long-term care.

How does Your Research Contribute to the Field?

Our study uses satisfaction (patients, relatives and staff) measures as proxy for quality output in the DEA

model and measures related to staff management as predictors for the efficiency scores.

What Are Your Research's Implications Towards Theory, Practice or Policy?

Both policy makers and managers of nursing homes can use DEA results to develop strategies based on the

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performance of the efficiency group and thereby improve their competitive position, considering quality as a strategic goal.

Introduction

The association between economic performance and quality of care is an essential aspect of the production of health services. However, quality and efficiency improvements are hard to achieve in health services and in long-term care. As Laine et al¹ underlined, it is appealing to think that increasing quality may require additional labour and capital resources, whilst a tendency towards efficiency improvements and cost containment can lead to a poorer performance in quality. On the other hand, better quality can be associated with better economic performance and lower production costs, that is, better efficiency. Considering the ageing population and the budget constraints, studying the quality of healthcare services, such as nursing homes (NHs), has been the focus of numerous latest publications and the recent pandemic events turned the spotlight on this setting of care.

Consistent data are collected and report on numerous aspects of NH performance, which includes costs, case-mix severity, satisfaction of residents and quality of professionals.^{2,3} This is partly because the NHs sector has been under increasing pressure for improving not only the quality of its services but also its productivity.

The data envelopment analysis (DEA) technique, introduced by Charnes et al,⁴ nowadays commonly used to calculate a single efficiency score based on multiple inputs and multiple outputs, refers to technical efficiency of decision-making unit. When units are compared, efficient units produce the same output with fewer inputs than inefficient units, or alternatively, produce more output with the same input as inefficient units.¹ Thus, tools like benchmarking are vital when considering performance in service organizations.

We run a DEA on a set of different NHs, including both quality of care and quality of life performance measures as output variables of the Italian long-term care system. The variables are described in the methodology section. Our study is unique, to the best of our knowledge, because we use satisfaction (patients, relatives and staff) measures as proxy for quality output in the DEA model and measures related to staff management as predictors for the efficiency scores. The study setting of our paper is the Tuscany Region of Italy, where both the public system and private companies manage NHs.

Efficiency and Quality in NHs

Quality in NHs

Defining and measuring the quality of care in long-term care facilities is a multidimensional and complex issue with

several pitfalls.¹ The term ‘quality’ in NHs is difficult to define. In literature, ‘quality of life’ refers to consumer choice, autonomy, dignity, individuality, comfort, meaningful activity and relationships, sense of security and spiritual well-being, whereas ‘quality of care’ refers to the technical competency of medical and quasi-medical services.^{2,5,6} These two themes may be specific for certain facilities but not for others, thus there is a controversial definition between NHs as places where people live their lives and places that take care of the most fragile.⁶

In Italy, despite single initiatives, a structured framework for measuring NH quality is still missing while investments on quality measures and data collection are needed. Tuscany Region developed a performance evaluation system (PES) for a group of 90 NHs that collect data voluntarily on four different multidimensional domains of quality:⁷ (1) clinical quality (ie number of falls; number of patients with infections...); (2) efficiency (ie social daily costs, costs per professionals,...); (3) satisfaction and experience for residents, relatives and professionals; (4) organizational variables (ie recreational activities for patients, training activities for professionals...) and (5) descriptive measures (ownership, size,...). Results are reported using a benchmarking system every two years and discussed with NHs professionals and public regional managers. Satisfaction and experience surveys are integrated in the quality systems; results show that residents’ quality of life in the NHs is mainly related to staff kindness and relationship.²

Efficiency in NHs: Non-Parametric Analysis

Productivity and efficiency are two related yet distinct concepts; while the productivity of an organization refers to the ratio of outputs (products or services) to the inputs (resources), efficiency refers to the extent to which the facility achieves the highest feasible productivity,⁸ and even technical efficiency can be applied to find out whether any waste can be eliminated without worsening any input or output.¹ Measuring efficiency and understanding the sources of inefficiencies can help facilities identify how well they are operating in relation to similar organizations and determine where to focus to improve their productivity.⁸ For example, an organization was considered technically efficient if it produced the maximum desired outputs from the minimum inputs such as labour, capital, equipment and technology. Typical inputs for a NH are the number of beds, full-time-equivalent staff hours, administration and supplies/consumables. The efficiency of a NH is affected by many factors, including resident dependency level, staffing mix, facility location, management and ownership structure, and operational objectives.^{1,8}

DEA is a non-parametric linear programming model that creates a frontier of best performing units. The model uses information about multiple inputs and outputs into a single efficiency measure to identify the set of efficient units (in our case NHs) based on how each facility used inputs to produce

outputs. Thus, efficient structures are the reference points for identifying good practices within the sample; moreover, it is possible to identify the factors that determine which are the best performers.⁹ A valuable feature of the use of DEA method is the applicability of inputs and outputs with different units of measurement, meaning no transformation into a single metric is needed.³

The literature about quality and efficiency in NHs with DEA model usually considers ownership status, quality of care, resident condition and costs. For instance, some studies^{10,11} propose an analysis of the ratio of cost to quality of services offered by NHs. Some authors argue that privately managed structures have better performance in terms of efficiency than publicly managed structures.¹¹⁻¹³ Others instead propose a comparison between facilities that are efficient and structures that are less efficient, with the aim of understanding the relationship between the quality and efficiency of structures.¹⁰

Garavaglia and Lettieri¹⁴ highlight that many of the DEA studies apply process analysis and they often refer to care and assistance activities, without mentioning aspects that generally concern residential services. In this sense, Kooreman¹⁵ took into account the study of claims management to measure quality by applying proxy measures (patients or relatives council, handling complaints and absence of restrictions on visiting hours). These variables were negatively related to efficiency because they absorb inputs. Shimshak et al³ selected output measures of both quantity and quality of services provided. They used the total number of residents for quantity of services along with the case-mix severity, whereas for quality they chose three measures that focus on the prevalence of various conditions among the NH residents: the number of residents with catheter, residents who require physical restraints, and residents with pressure sores. Some authors use proxy of quality of life in NH such as procedures for complains or patient/relatives council¹⁴ for DEA analysis. As integrated approaches, the Tobit regression is among the most used in the literature and as explanatory variables for efficiency score studies usually consider descriptive measures such as ownership, occupancy rate and clinical situation of residents.^{8,14,16}

Generally, the difficulties encountered in DEA studies applied to NHs are the definition and collection of quality measures (in particular, residents' quality of life). The analysis of residents and relatives satisfaction in NHs is widely investigated in literature. Chesteen et al¹⁷ included customer satisfaction studies in their work to analyse the quality of care in NH services. Their research shows that the quality of the process is higher in not-for-profit NHs than in profit-oriented NHs, though the quality of inputs is lower. Barsanti et al² compare the residents' satisfaction between Italy and Canada and find staff relation as the main issue for optimizing the willingness-to-recommend. However, very few studies include satisfaction measures in the DEA. A recent literature review⁸ identified 39 studies that evaluate

quality and efficiency in NHs using different techniques, including DEA and stochastic frontier method. Measurements of inputs, outputs and control variables were relatively homogenous while quality measures varied. Notably, most studies did not include all three quality dimensions (structure, process and outcome) and only one study included quality of life.

Methodology

Study Setting

In Italy, regulation and quality assurance for NHs are the purview of the national and provincial governments. Activities such as distributing funding and access to NHs have been regionalized. Although NHs receive public funding for nursing and personal care, residents are required to contribute a co-payment based on their financial situation. For families with financial difficulties, this amount is subsidized by the government. While NHs are publicly funded, there are both privately and publicly owned facilities. In Italy, the involvement of private for-profit and not-for-profit providers in the otherwise public delivery of welfare services is gradually changing towards a more market-oriented mode of service delivery.

For the purposes of our study, we focus on Tuscany (Italy) because the region has a strong interest in healthcare quality measurement both in primary and long-term care^{2,7,9,18} and because there is a good mix of public and private NHs. In 2017, Tuscany has approximately 3.7 million residents, 23% of whom are over 65 years old. The prevalence of ADL disability is approximately 81 per 1,000 older people. There are 13,769 beds in 324 charitable, public, and private for-profit and not-for-profit NHs, with an average of 45 beds per NH and 1.3 beds every 100 inhabitants over 65.

Data Collection

We collected inputs, outputs and explanatory variables from the Tuscany Performance Evaluation System of NHs.^{2,7} We selected for this study only the 40 NHs that in 2017 collected data for all five domains described in *Efficiency and Quality in NHs*. Data for clinical quality, efficiency and organization variable were collected by NHs using a structured and validated web questionnaire. Data regarding satisfaction were collected by face-to-face interviews for residents, telephone interviews for relatives and web questionnaire for professionals. All three surveys were conducted, using a structured and validated questionnaires² (please see annex material). In order to consider quality of life and workplace in the DEA we used the following questions from the surveys: residents and relatives satisfaction in terms of willingness-to-recommend and staff satisfaction in terms of overall quality of the job.

The questionnaire for residents/relatives included about 60 closed-ended questions covering the following nine domains: (1) reception and orientation, (2) environment and comfort,

(3) services, (4) leisure activities, (5) external relationships, (6) assistance and care, (7) staff, (8) privacy and (9) overall quality. The questionnaire for the professionals included questions about (1) the structure, (2) working conditions, (3) management, (4) relationship with the residents and their families, (5) communication, (6) training, (7) overall evaluation and (8) improvement. Most questions used a ‘Yes, always’, ‘Yes, sometimes’ and ‘No, never’ rating scale. For the satisfaction variables, the individual modes of response were reported on a scale from 0 to 100 and the mean value was calculated for each NH. In particular, for residents’ satisfaction, the question was ‘Do you feel comfortable in this facility?’, for relatives ‘Are you satisfied with the services that this experience offers overall?’ and for professional ‘I am proud to work in this facility’.

We include in the DEA model one input related to labour (the sum of total work hours for (1) nursing assistance, (2) nursing and (3) rehabilitation) and the daily cost for residential services such as food and lodging (‘minimum social quota’) as a proxy for the capital. We insert amongst inputs only those elements that the management can control.¹⁵ As Tran et al⁸ reported ‘when measuring nursing home efficiency, it is crucial to adjust for quality of care and resident’s quality of life because the ultimate output of nursing homes is quality-adjusted days living in the facility. Quality measures should reflect their multidimensionality and not be limited to quality of throughput (health-related events)’. Following Tran et al⁸ and other studies,¹⁹ as outputs we include three quality of care measures (number of falls, urinary infections and antidepressants), three quality of life measures considering days of recreational activities, residents and relatives

satisfaction and one quality of work measure, considering professional’s job satisfaction. The summary statistics of the selected inputs and outputs are reported in Table 1.

As explanatory variables for the efficiency scores, we include training for end-of-life, type of NH (private or public) and mini-mental test scores. We include the mini-mental test scores in the second stage of the analysis among the explanatory variables of the efficiency scores because we are interested in understanding whether the severity of the residents influenced the efficiency. The explanatory variables are listed in Table 1. For the purpose of our study, we consider a mix of ownership and management to define the provider of the NHs. We consider three group: 1. public ownership and public management; 2. public ownership and private management; 3. private ownership and private management.

DEA Model and Regression Analysis

The work is divided in two stages: the computation of the efficiency scores and the analysis of the possible impact of some factors on the obtained efficiency scores.

At the first stage, we use the traditional model to compute the DEA efficiency scores by applying to our data the BCC model²⁰ with variable returns to scale (VRS) and we only run the CCR model⁴ with constant returns to scale (CRS) in order to compute the scale efficiencies. Our choice is based on the fact that we conduct the efficiency assessment from the manager’s perspective, whereas the CRS is appropriate for the policy maker’s perspective.¹⁶ In Tuscany, the NH system focuses on maximizing the outputs, especially in terms of

Table 1. Summary Statistics of Selected Input and Output Values and Explanatory Variables.^a

DEA Variables	Min	1 st Qu	Median	Mean	3 rd Qu	Max
INPUTS						
Total work hours	20196	37832	43898	53876	60836	191819
Daily cost for services (€)	20.00	48.45	52.50	50.23	53.50	57.79
OUTPUTS						
Residents’ satisfaction	59.09	80.37	86.75	85.96	91.98	100.00
Relatives’ satisfaction	72.73	86.77	90.77	90.07	94.44	97.92
Professional’s satisfaction	65.28	83.25	90.65	87.52	93.63	100.00
Satisfaction mean ^b	78.68	84.12	88.64	87.85	90.90	97.22
Number of falls	.00	2.00	5.00	8.075	12.25	43.00
Number of urinary infections	.00	2.75	5.00	5.45	8.25	18.00
Number of antidepressants	1.00	6.75	9.00	13.62	14.25	126.00
Days of recreational activities	147	260	287.5	286.7	312.2	365
Explanatory variables	Min	1st Qu	Median	Mean	3rd Qu	Max
Training for end-of-life	.00	21.04	64.28	56.16	88.23	100.00
Mini-mental test	9.50	17.15	20.30	20.29	23.20	30.00
Type of management (2 dummy variables)	16 NHs with public management and public ownership; 7 NHs with public ownership and not-for-profit management; 17 NHs with private ownership and private management (both for-profit and not-for-profit)					

^aWe use in the model the number of falls, urinary infections and antidepressants with negative sign due to the inverse relationship of the variables with the efficiency score.

^bDue to the limitation regarding the small number of observations (NHs) available, we use the mean of residents, relatives and professional satisfaction in order to reduce the number of outputs included in the DEA model.

quality of care and customer satisfaction. Thus, we use an output-oriented model. The input and output variable we used in the model are listed in Table 1.

Next, we used the bootstrapping model to compute the DEA efficiency scores with Simar and Wilson²¹ bias-correction. By resampling the observations, the method goes beyond the simple classification of NHs in 'efficient' and 'inefficient'. It provides confidence intervals necessary to deal with uncertainty surrounding traditional estimations.²²⁻²⁴ To test for robustness of the traditional DEA scores, we applied the Spearman correlation test.¹⁴ The number of variables also obeys the trade-off between the descriptive and the discriminatory power of the model. Thus, we selected a number of inputs and outputs which sum is less than one third of the number of NHs in the sample.^{14,22}

At this second stage, we are interested in finding which variables might explain the efficiency of the obtained NHs. Given the small size of the sample, we include only three variables in the regression model. We use the Tobit model after correcting the efficiency scores for bias. For this purpose, we first test the efficiency scores for normality using the Shapiro–Wilk test.

For the traditional method, we applied the 'dea' function from the 'rDEA' package in R software. For the bootstrapped efficiency scores we used the 'dea.robust' function with 1,000 repetitions and 95% confidence level.

Results

DEA: Input, Outputs and Explanatory Variables

In order to avoid decreases in the discriminatory power of the DEA model due to high correlation among inputs and outputs,²² we applied a Pearson correlation test (annex material, Table 3). Hence, the inputs and outputs were selected to avoid strong correlation ($<|\pm.7|$) among the variables included in the DEA model. The correlation for all the pairs of variables is generally mild or low.

The summary statistics of the variables included in the DEA model highlight the existence in our sample mainly of NHs with total work hours between 40,000 and 60,000. However, NHs of only 20,000 or almost 200,000 total work hours are also present in the sample. The minimum daily cost is on average around 50€. Yet, as already pointed out, there are consistent differences among the NHs, from a minimum of 20€ up to a maximum of almost 58€.

The descriptive analysis emphasizes also differences in levels of satisfaction among the three analysed categories. No low levels of satisfaction are expressed for the analysed NHs. While none of the NHs included in the sample reaches 100% relatives' satisfaction, the minimum satisfaction score for this group is the highest (72.7%). The interval between the first and third quantile is the smallest (less than 8 percentage points) with around 90% on average. The other two group score have a lower satisfaction score on average with the

lowest percentage registered for residents with 59% and 65% for professionals.

Finally, all three variables of quality of care (number of falls, urinary infections and antidepressants) and organization of activities (days of recreational activities) vary considerably in the sample from 0 (1 for antidepressants) to, respectively, 22, 43, 18 and 126 for quality of care and from 147 to 365 for day of recreational activities.

In terms of type of management, the sample is composed by 16 NHs with public management and public ownership (1), 7 NHs with public ownership and not-for-profit management (2) and 17 NHs with private ownership and private management (both for-profit and not-for-profit) (3). Almost all the private NHs included in the sample are not-for-profit. Thus, our results refer to a comparison between the public sector and the private but not-for-profit sector. Training for end-of-life is measured as the percentage of professionals that received training regarding end-of-life management in the last three years prior to survey. The range is from 0% to 100%, with 56% on average.

Finally, the mini-mental test measures the severity of the patients in terms of cognitive function, with 30 the maximum score representing most mentally healthy. The minimum score in the sample is 9.50. We tested for correlation in order not to introduce in the regression strongly correlated variables (see annex material, Table 4).

DEA Scores

The DEA scores are reported in Table 5 of the annex material. The VRS analysis finds 14 efficient NHs (35%) with a difference in mean between traditional and bootstrapped efficiency scores around 4%, .94 for traditional and .9 for bootstrapped. In other words, the NHs should augment their outputs by 6% considering the traditional method or 10% considering the bootstrap method. The Spearman correlation test of .89 indicates a strong positive relationship between the traditional and the bootstrapped DEA scores. This confirms the robustness of the traditional DEA scores. With the CRS model, we find 8 efficient NHs (20%) and the average score of scale efficiency is .77. Almost all the inefficient NHs (93.75% of NHs with the efficiency level below 1) have increasing returns to scale except for 2 NHs. Thus, to increase their efficiency level, almost all the Tuscany NHs included in the model must adopt better practices to increase the output keeping the inputs fixed.

Examining the characteristics of the efficient and inefficient NHs (Table 2) created with the traditional DEA method, we find a difference of at least 3 percentage points for all the satisfaction measures, with higher difference considering the relatives (92.6% for efficient NHs compared to 88.7% for inefficient NHs). For the daily cost, we find 17% difference in averages for the efficient NHs compared to the inefficient ones. Moreover, inefficient units have 32%

Table 2. Characteristics of NHs: Efficient vs Inefficient.

	Efficient	Inefficient
Total work hours	44571.6	58886.1
Minimum social quota	49.7	50.5
Patients' satisfaction	88.1	84.8
Relatives' satisfaction	92.6	88.7
Professionals' satisfaction	89.6	86.4
Satisfaction mean	90.1	86.6
Number of falls	3.4	10.6
Number of urinary infections	5.6	5.2
Number of antidepressants	8.6	16.3
Days of recreational activities	316.4	270.7

more total work hours on average, whereas the number of falls and antidepressants are considerably lower in the efficient units compared to the inefficient ones. On the contrary, the number of urinary infections is similar among the two groups.

Determinants of Efficiency

The results allow the use of DEA scores to rank the NHs to investigate the factors that describe the best and worst NHs. The Shapiro–Wilk test for normality confirms the normal distribution of the efficiency score variable ($p_value = .1$) considering a 95% significance level.

The Tobit regression (Table 3) highlights significant association that regards ownership at 95% significance level and trained staff on end-of-life support at 90% significance level. Our results show how in the Tuscany NH system the efficiency score is significantly influenced by the type of ownership, meaning that NHs with public management and public ownership are less efficient compared to NHs with private ownership and private management, a result in line with some case studies.¹²⁻¹⁴ As for the NHs with public ownership and not-for-profit management, the study finds no significance. Furthermore, the efficiency scores are not associated to complexity of residents: this can reflect that NHs can adapt their organization and clinical assistance based on patient's need, without preferring high or low severity classes.

Finally, our results show a positive association with trained staff on end-of-life care: this has important implications in term of quality and management of facilities. In particular, the staff is one predictor of efficiency in terms of skilled competences.

Discussion

Care in NHs has garnered attention due to the ageing demographic. There are two competing pressures resulting from this: ensuring the use of resources as efficiently as possible while providing good outcomes of care; and a shift for a culture of care more resident-directed and homelike.²⁵

In this sense, and recognizing that NHs are places where people both live and receive care, our paper presents an approach for incorporating quality variables related to care and patients and staff satisfaction in the analysis of a service organization using DEA methodology for benchmarking. Our model includes a set of variables that measure quality of the services through different domains to estimate the efficiency of a set of public and private NHs in Tuscany Region, as follows: (i) quality of care, measured by number of falls, urinary infections and antidepressants and recreational activities; (ii) quality of life, in terms of satisfaction of residents and relatives; (iii) quality of workplace, in terms of staff job satisfaction.

According to the theoretically preferred frontier, 35% of the NHs in the sample operate efficiently. The results also show higher levels of quality, both in terms of quality of life and quality of care, considering the difference on average between the group of efficient and inefficient NHs (eg about 4% for patients, relatives and staff satisfaction). This may reflect a NH's commitment to consider the satisfaction and experience of residents, relatives and staff to optimize not only the quality of care, but also the efficiency.

As Weech-Maldonado et al²⁶ noted, improved quality in NHs, achieved through innovative or efficient care processes, may result in fewer defects and/or avoidable complications, which, in turn, will lower the amount of waste or rework, thereby reducing the costs of delivering care. However, there is the need of a detailed understanding of the relationship between quality and efficiency performance due to the twin challenge of delivering high-quality care while retaining efficiency sustainability.²⁶ Our results provide evidence of a positive relationship between quality and efficiency for two main reasons. Firstly, considering the maximization of the output in the DEA model, we show that efficiency is also related with quality of life (in terms of residents and family satisfaction) and quality of workplace (in terms of staff job satisfaction). This may identify possible managerial implication in terms of quality management strategies that do not seem to necessarily imply higher costs. In fact, the quality of clinical care is only one of the main determinants to gain in efficiency.

Secondly, the analysis of efficiency predictors reveals interesting results for the discussion. Efficiency does not seem to be associated with clinical and health needs factors such as residents' severity, while the institutional factor (ownership and management) is significant only considering the public ownership and public management compared with private NHs, while those with public ownership and private management are not significantly different from the private NHs. This difference between public and private NHs had been often highlighted in the literature.¹²⁻¹⁴

The managerial factor, measured by the staff trained in end-of-life assistance, is significantly related to the efficiency scores at 90% significance level. In this sense,

Table 3. Results of Tobit Regression.

Pearson Residuals					
	Min	IQ	Median	3Q	Max
Mu	-2.64	-.68	.11	.70	2.12
loglink(sd)	-.72	-.62	-.34	.02	4.30
	Estimate	Std. Error	z value	Pr(> z)	
(Intercept):1	.904	.030	30.04	< 2e-16***	
(Intercept):2	-3.284	.113	-28.82	< 2e-16***	
Public management and public ownership	-.028	.013	-2.10	.03***	
Public ownership and not-for-profit management	-.022	.017	-1.34	.17	
Trained staff	.0003	.0001	1.81	.06*	
Mini-mental	-.0003	.0012	-.29	.77	

Signif. codes: '***' .01; '**' .05; '*' 0.1.
 Log-likelihood: 72.76 on 72 degrees of freedom.
 Number of Fisher scoring iterations: 4.
 No Hauck-Donner effect found in any of the estimates.

managers have the chance to run efficiency not only in terms of quantity-cost saving and use of resource (economic and human), but also in terms of quality management of professionals (training).

An important limitation of our study is the small number of observation (only 40 NHs) available for our study. This number is lower than the number recommended by Banker et al²⁷ (at least 50 observation) for the application of the VRS. However, given the fact that our paper focuses on the efficiency assessment conducted on the manager's perspective, a VRS assumption seemed more appropriate.¹⁶

Conclusions

NHs are often investigated in term of quality and efficiency with DEA score. However, the definition of quality and the collection of data are quite difficult. Our study suggests a multidimensional definition of quality to measure efficiency in NHs with DEA model. Supporting the classic theory on cost-quality trade-off, results show that NHs do not have a trade-off between cost efficiency and both clinical care and experiential quality in terms of satisfaction. Results show positive association with efficiency and clinical care and satisfaction of all three analysed groups: patients, relatives and professional. Finally, trained staff on soft skills (such as end-of-life support) is a predictor of efficiency together with ownership and management (but not for public ownership with private management NHs).

Legislators, policy makers, regulators, payers and administrators can be confident that the setting of standards that encourage striving for both quality and efficiency simultaneously is indeed realistic.¹⁰

In terms of managerial implication, both policy makers and managers of NHs can run DEA to highlight efficiency ratings and develop goals based on the performance of the efficiency group and thereby improve their competitive position. Finally, by considering data aggregated over the homes in each Italian region or other geography or responsibility model, DEA can identify which regions/models are performing best and which should be considered models of best practice.

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