



Consistency of priorities for quality improvement for nursing homes in Italy and Canada: A comparison of optimization models of resident satisfaction



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ABSTRACT

The paper seeks to identify aspects of care that may be easily modified to yield a desired level of improvement in residents' overall satisfaction with nursing homes, comparing data across Canada and Italy. Using a structured questionnaire, 681 and 1116 nursing home residents were surveyed in Ontario in 2009 and in Tuscany in 2012, respectively. Fourteen items were common to the surveys, including willingness to recommend (WTR), which was used as the dependent variable and measure of global satisfaction. The other analogous items were entered as covariates in ordinal logistic regression models predicting residents' WTR in each jurisdiction separately. Regression coefficients were then incorporated into a constrained nonlinear optimization problem selecting the most efficient combination of predictors necessary to increase WTR by as much as 15%. Staff-related aspects of care were selected first in the optimization models of each jurisdiction. In Ontario, to improve WTR the primary focus should be on staff relationships with residents, while in Tuscany it was the technical skill and knowledge of staff that was selected first by the optimization model. Different optimization solutions might mean that the strategies required to improve global satisfaction in one jurisdiction could be different than those for the other jurisdictions. The optimization model employed provides a novel solution for prioritizing areas of focus for quality improvement for nursing homes.

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1. Introduction

Measuring the quality of nursing homes (NHs) has become a generally accepted practice, to varying degrees of formality, in many developed nations [1]. In some OECD countries, such as Australia, England, Finland, the Netherlands, Canada, and the United States, NH quality measurement is understood to include subjective resident perceptions of quality, such as residents' satisfaction, which are complementary to the more objective clinical indicators of quality, such as the incidence of pressure ulcers or pain, available from resident functional assessment data [2,3]. The extent to which subjective measures are included in systematic quality measurement, however, has been limited [1].

Surveys to measure perceptions and experience typically include various items relating to different domains (as combina-

tions of items) such as comfort, safety, dignity, and involvement in care among others. Subjective resident perceptions of quality may include overall ratings of care or experience or "willingness to recommend" (WTR). Examining the relationships between overall ratings and specific items or domains can provide policy makers and providers with guidance on which domains are most important to NH residents and might be prioritized for quality improvement. One such analysis found that being treated with dignity and staff-resident relationships were the two domains most strongly associated residents' overall ratings of quality in Ontario, Canada [4]. Similarly, of 11 domains tested, Burack et al. [5] found that being treated with dignity had the strongest association with resident's overall satisfaction with NHs in New York State, concluding that this domain should be a starting point for NH improvement. In making this conclusion, Burack et al. [5] failed to consider how well NHs were already performing on each of the domains tested. In fact, being treated with dignity was their highest rated domain and, therefore, had the least room for improvement.

More detailed studies have assessed both NH performance on specific items or domains alongside approaches to identifying pri-

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orities for improvement. One study conducted in the Netherlands prioritized items for NH improvement based on both their current ratings and respondent ratings of the importance of each item [7]. They identified working with a care plan and shared decision making as priorities for quality improvement. In a study from the United States, Becker & Kaldenberg identified priorities by combining (low) performance and (high) correlations with willingness to recommend the NH [6]. Although being treated with dignity, nurses' skill and nurses' friendliness were most strongly correlated with willingness to recommend, they identified services provided by aides (items included information provision, assistance with meals, response to the call button and responsiveness to ideas) as the domain that should be the top priority for quality improvement because of its high correlation with willingness to recommend and its low rating.

Implementation of user-oriented care (stressing personal autonomy, dignity, respect, quality of life, etc.) is still an ongoing challenge for elderly care [8]. As jurisdictions seek to improve NH quality, if there is limited local data, policy makers and NH providers may look elsewhere, particularly to territories with broadly similar structural characteristics, for change ideas and opportunities. The above cited studies suggest services provided by aides and care planning should be prioritized. However, these priorities are only valid if: 1) the selected domains have the same importance in each jurisdiction, and 2) current performance levels on these domains are the same in each jurisdiction. It is not clear whether the distinct priorities across countries, as identified above, reflect differences in the value placed on particular domains in different countries or differences in performance of NHs in different countries. To the best of our knowledge, no study has compared which domains of NHs are associated with overall measures of satisfaction and should be prioritized for quality improvement across multiple jurisdictions.

The purpose of this paper is to address this gap in knowledge. We propose that optimization techniques [9–11], that identify domains with low current performance, but strong relationships with overall performance ratings, can be applied to resident survey data from Ontario, Canada, and Tuscany, Italy, separately, to identify priorities for improvement in NHs. We explore whether the items selected by optimization models, and, therefore, those domains on which healthcare managers and professionals should focus their improvement strategies, are the same in the two jurisdictions. Such information can be taken into account to improve service by targeting and prioritizing those important, but low performing, domains [12].

2. Methods

2.1. Study setting

Tuscany (Italy) and Ontario (Canada) were selected as the settings for this study because NHs in these jurisdictions have many similarities and because they both have a strong interest in health care quality measurement. With respect to the first reason, regulation and quality assurance for NHs is the purview of the centralized government (national and provincial governments in Italy and Ontario, respectively), but other activities, including distributing funding and access to NHs, have been regionalized in both Italy and Ontario. NHs receive public funding for nursing and personal care, but residents are required to contribute a co-payment, the amount of which is conditional on the resident's, and, in Tuscany, also their family's ability to pay, and is subsidized by the government. While NHs are publicly funded in both Tuscany and Ontario, there are both privately and publicly owned facilities. In both jurisdictions, admission to NHs is needs-based (individuals requiring frequent

assistance with personal care and onsite 24-h nursing care and supervision), but once eligibility has been determined by regional authorities, residents may select which homes to apply to. A more detailed description of LTC in Ontario and in Tuscany is reported in the appendix of this manuscript.

Regarding the second reason for the study setting, Tuscany and Ontario are two jurisdictions with strong interest in health care performance measurement and management [13–15] and both are at formative stages in the development of their performance measurement and management for LTC [16–18]. Moreover, Tuscany and Ontario both have a particular interest on patient and resident satisfaction [19–21], which is less commonly, included in performance measurement systems for LTC [4,18]. At the provincial-level, Ontario relies mostly on objective measures of quality from administrative datasets and has had little systematic measurement of user-reported indicators. In Italy, quality measures have been mostly limited to measures of service coverage for older people [22]; however, quality measures in some regions, such as Tuscany, include patient reported indicators [18].

2.2. Data collection

2.2.1. Ontario

Structured interviews with residents from 30 NHs in Ontario were conducted from November 2008 to February 2009 using a modified version of the Smaller World Survey of Resident Satisfaction [23]. This survey included 66 items on a variety of domains including (the number of questions pertaining to each domain is shown in parentheses): comfort (7), privacy (2), spiritual (1), security (5), food (7), activity (9), staff (3), dignity (8), autonomy (10), relationships (4), clinical care (5) and global satisfaction (5). Most items used a three point scale (Yes, Sometimes, No) with not applicable and do not know options.

The sample of 30 NHs was selected from a group of 72 NHs, which had previously participated in senior management and staff surveys conducted by the study team. All NHs in Ontario were first invited to participate in the senior management survey. Of the 353 NHs that participated in this survey, 100 were randomly selected, stratified by profit-status, and invited to participate in the staff survey. In addition to participating in these surveys, to be eligible for the resident survey, NHs had to have at least 80 English-speaking residents, have adopted the Minimum Data Set Resident Assessment Instrument, and be located within a 2-h drive from Ottawa or Toronto, Ontario. Of the 72 homes that participated in both the senior management and staff surveys, 40 met these criteria. 30 homes were randomly selected to participate in the resident survey; 6 homes refused and were replaced from the remaining 10 homes using random selection. Residents were pre-screened by NH staff for inclusion in the study. Exclusion criteria included severe cognitive impairment measured using the Minimum Data Set Cognitive Performance Score (CPS 5 and 6) and non-English speaking. Home administrators compiled a list of eligible residents and provided their names, birthdates and length of stay to the study team, which was used to randomly select a target of 30 residents per home. Trained interviewers approached these residents to seek their participation. Agreeable residents were brought to a private location within the home where consent was taken and the structured interviews took place. If residents were unwilling to be approached by study interviewers to explain the study or were unable to provide informed consent, they were replaced using random substitution. Data collection followed the protocol approved by the University of Toronto Health Sciences Research Ethics Board.

2.2.2. Tuscany

In 2011, all 298 NHs in Tuscany were first invited by the Regional Authorities to participate in the development of a performance

evaluation system (PES) [18]. Ninety NHs participated in the development of the PES from which a sample of 60 NHs were selected for this study. NHs were randomly selected, stratified by geography, so that the sample included at least one NHs from each of the 34 local health district. In 2012, face-to-face interviews were conducted, using a structured questionnaire, with residents from the 60 NHs in Tuscany. The number of residents approached in each home was a function of its size. Residents were pre-screened by NH staff for inclusion in the study using the Pfeiffer Test, with the exclusion of residents with 7 or more errors to the test. On a pre-determined day for the interviews, home administrators compiled a list of present residents and provided their details to the study team, which was used to randomly select a target group of residents in each NH. Trained interviewers approached residents seeking their participation. If residents were unwilling to be approached by interviewers to explain the study or were unable to provide informed consent or to reply to the three first question of the Pfeiffer test at the time of the interview, they were replaced using random substitution. Questions from the Ontario survey were incorporated into the Tuscan survey. The questionnaire, which was pre-tested in a NH not participating in this study, included 57 closed-ended questions covering the following nine domains (the number of questions pertaining to each domain is shown in parentheses): 1. Reception and orientation (3); 2. Environment and comfort (7); 3. Services (8); 4. Leisure activities (9); 5. External relationships (4); 6. Assistance and care (12); 7. Staff (9); 8. Privacy (3); and 9. Overall quality (2). In addition, the questionnaire included questions about residents' socioeconomic status and other general information (e.g. whether s/he is in a wheelchair, whether s/he is blind or deaf, whether s/he has relatives, the municipality of residence prior to admission to the NH, the length of stay in the NH, whether s/he suffers from a chronic illness). Most questions used a "Yes, always", "Yes, sometimes" and "No, never" rating scale.

2.2.3. Selection of common items

The surveys used in Ontario and Italy were compared for analogous items. 14 items, including willingness to recommend (WTR) the NH, were identified as being conceptually equivalent, though there were differences in syntax, mostly attributable to the language in which the survey was conducted. The 14 items asked about the predominant domains highlighted in the literature [24–26]. Questions are reported in Table 1. The items refer to security (question Q1), comfort (questions Q2–Q4), autonomy (questions Q7–Q9), staff (questions Q10–Q13), services and facilities (questions Q5–Q6), which are all modifiable.

Table 1 Items, domains, questions and descriptive statistics for the comparison in Tuscany and Ontario

2.3. Analysis

Data analysis for this study followed the approach described in Brown et al., Sandoval et al. and Seghieri et al. [9–11]. For each country, the 13 items that were comparable across the two surveys were first entered as covariates in an ordinal logistic regression model to predict residents' overall WTR their NH. The two ordinal regression models (separately, one for Canada and the other for Tuscany) were used to obtain estimates of the coefficients of the predictors that are then incorporated into the optimization model. In this sense, the adjustment for sex, age or other individual factors is not necessary for the regression model. In other studies [5–7] only variables related to experience/satisfaction are used in the regression model. Furthermore, the aim of the study is not to make predictions for the dependent variable or to compare the performance between the two countries. Regression coefficients of the predictors from the logistic model were incorporated into the optimization model to select the most efficient combination of predictors necessary

to increase the overall WTR measure by up to 15%. The optimization technique was a constrained nonlinear optimization problem selecting the combination of items requiring the lowest total relative improvement to achieve pre-set increases in the dependent variable [9]. The optimization model combined information from the average values of the predictors and the regression estimates in order to identify the predictors (items) that were most strongly related to the dependent variable (WTR) (i.e. those predictors with large regression coefficients) and that had a relatively low current performance (average value in the population). Restrictions imposed on the optimization model included: 1) predictors could not improve by more than 15% beyond their current performance (e.g. a predictor with a current value of 2 on a 3 point scale, where 1 is the best possible rating, could only be improved to 1.7); and 2) the improvement in the dependent variable, WTR, was capped at 15%. To determine which items were selected first by the optimization models, the level of improvement in WTR was first pre-set at 1% and then, subsequently, increased by increments of 1 percentage point, until either the maximum 15% improvement in WTR was achieved or the number of predictors required to achieve an additional one percentage point improvement in WTR became impracticable.

Before running the regression and optimization models, missing values and answers of "don't know" and "not applicable" were replaced using the multiple imputation by chained equations algorithm [27]. Missing data for the selected questions ranged from 3% to 16%. Data analysis was performed using SAS 9.3 software. Values of $p \leq 0.05$ were considered statistically significant in all analyses.

3. Results

3.1. Descriptive statistics

Face-to-face interviews were conducted, using structured questionnaires, with 1116 residents from 60 NHs in Tuscany and 681 residents from 30 NHs in Ontario. Table 2 presents demographics characteristics for residents surveyed in each jurisdiction. There were no statistically significant differences between jurisdictions with respect to sex, age and perceived health status at the 5% level of significance. The groups were similar in age distribution, with a majority, as expected, of patients in each country aged >65 years. Approximately 70% of the residents surveyed were women in both Tuscany and Ontario. Almost half of all residents interviewed rated their health status as very good or excellent, whereas 13% of the sample from both regions reported poor health status. Length of stay was slightly, but statistically significantly, longer in Ontario with 75% of residents reporting a stay of one year or more versus 70% of their Tuscan counterparts.

Means and standard deviations of the 13 comparable items from the two regions are shown in Table 1. All items were answered on a 3-point scale. For positively worded items, the scale was coded as Yes = 1, Sometimes = 2 and No = 3. Scales of negatively worded questions were coded in reverse (Yes = 3, Sometimes = 2 and No = 1), so that for all items, values closer to 1 indicate a more positive result. In both regions, the worst-rated item was being able to choose to have a shower or bath when they wanted to. The average rating of this item was slightly higher (i.e. worse) in Tuscany compared to Ontario (2.55 versus 2.08). As for the most positively rated item, NH residents in Ontario and Tuscany were both most satisfied with being called by name by the staff. NH environment and comfort (room, smell and state of repair of the home), and staff skills and knowledge and relationships with staff were also rated positively in both jurisdictions. NH resident perceptions of staff continuity were, however, on average, worse in Tuscany than in Ontario, though this was one of the worst rated items in both regions. Additionally, residents in Ontario NHs reported greater freedom to leave the NH if they wished, more flexibility in their eating schedule and felt

Table 1
Items, domains, questions and descriptive statistics for the comparison in Tuscany and Ontario.

Code and Item	Domain	Tuscany Question	Tuscany Mean (SD)	Ontario Question	Ontario Mean (SD)	p-value
Q1 Safe Place	Security	Is there a safe place in your room where you can keep your belongings?	1.348 (0.313)	Do you feel your possessions are safe at this home?	1.342 (0.503)	0.8468
Q2 Room	Comfort	Do you like your room?	1.911 (0.625)	Is your room how you would like it to be?	1.348 (0.476)	0.0000
Q3 Renovation*	Comfort	Do you think that this Home needs renovation (e.g. reparations, e.g. painting...)?	1.477 (0.454)	Does this place need fixing up (for example, repairs, decorating, or painting)?	1.418 (0.621)	0.1800
Q4 Smells*	Comfort	Are there any unpleasant smells in the rooms and halls (bedrooms, living rooms, toilets, dining room, hallways...) of this Home?	1.231 (0.219)	Does the smell around here bother you?	1.239 (0.303)	0.7458
Q5 Food	Services	Are you allowed to have a snack if you are hungry during the day?	2.150 (0.599)	When you are hungry is food available?	1.331 (0.494)	0.0000
Q6 Laundry*	Services	Have your clothes ever been damaged or lost in the laundry?	1.357 (0.335)	Do your clothes get lost or damaged in the laundry?	1.683 (0.710)	0.0000
Q7 Activities	Autonomy	During the day, are you allowed to do other activities you like (reading, watching TV, knitting...)?	1.241 (0.234)	Do you decide what you are going to do each day?	1.492 (0.661)	0.0000
Q8 Come and go	Autonomy	During the day, are you allowed to leave the Home if you wish (going to Mass, to a bar, downtown, meeting friends, graveyard...)?	2.267 (0.613)	Are you free to come and go as you please?	1.316 (0.485)	0.0000
Q9 Bath and Shower	Autonomy	Are you allowed to have a bath or a shower when you want to?	2.554 (0.507)	Can you choose when to have your bath or shower?	2.076 (0.945)	0.0000
Q10 Skilled staff	Staff	Are the staff capable? (Does the resident feel the staff members are professionally capable?)	1.202 (0.180)	Are the staff skilled and knowledgeable?	1.257 (0.303)	0.0233
Q11 Relationship with the staff	Staff	Do the staff ask you how you feel?	1.322 (0.348)	Do the staff try to understand what you're feeling?	1.460 (0.531)	0.0002
Q12 Call by name by the staff	Staff	When the staff are talking to you, do they call you by your name (either first or last name)?	1.066 (0.073)	Do the staff call you by name?	1.132 (0.172)	0.0001
Q13 Staff change too often	Staff	Do the staff who care for you change often?	2.251 (0.443)	Do the staff who care for you change too often?	1.845 (0.852)	0.0000
WTR	Willingness to recommend	Would you recommend this Home to friends and relatives?	1.497 (0.488)	Would you Recommend this Home?	1.286 (0.383)	0.0000

* indicates negatively worded items whose scales have been reversed.

Table 2
Sample Demographic Characteristics in Tuscany and Ontario and willingness to recommend.

	Tuscany		Ontario		X ² p-value
	Frequency	Percentage	Frequency	Percentage	
Age					
18–45	2	0.20%	5	0.80%	0.09
46–65	95	8.70%	55	8.81%	
66–85	569	52.40%	299	47.92%	
Over 85	420	38.70%	265	42.47%	
Sex					
Male	359	32.20%	205	30.42	0.44
Female	757	67.80%	469	69.58	
Self-Perceived Health Status					
Very Bad or Bad	146	13.20%	69	12.38%	0.64
Satisfactory	432	39.10%	231	41.47%	
Very Good or Excellent	527	47.70%	257	46.14%	
Length of Stay					
Less than 6 months	174	17.10%	66	11.54%	0.01
6 months to almost a year	131	12.90%	76	13.29%	
One year or more	709	70%	430	75.17%	
Willingness to recommend					
Yes, always	615	61.25%	445	81.05%	
Yes, sometimes	264	26.29%	58	10.56%	
No, never	125	12.45%	46	8.37%	

that their belongings were safer than did their Tuscan counterparts. By contrast, Tuscan NH residents reported slightly greater autonomy to choose what to do each day and were less likely to report that their clothes were damaged or lost in the laundry. Overall, Ontario NH residents had better WTR scores (1.29) compared to NH residents in Tuscany (1.50).

3.2. Ordinal logistic regression

Table 3 shows the regression results for WTR for Tuscany and Ontario expressed in terms of standardized coefficients in order to make comparisons between the two regions. In both regression models the assumption of proportional odds was tested through the Brant test [28]. For both countries we obtained a non-significant test statistic providing evidence that the proportional odds assumption was not violated (p -value = 0.20 for Tuscany region and 0.46 for Ontario). Additionally, diagnostics for presence of multicollinearity and outliers were performed and results showed neither multicollinearity nor outlier observations. Positive predictors of WTR in both jurisdictions included living in rooms matching the resident's preferences, the NH not needing a renovation, staff asking the resident how they feel, and being allowed to do the activities they like. In Ontario, staff members' attempts to understand what the resident was feeling was the strongest positive predictor of WTR, but was the fifth strongest predictor in Tuscany. By contrast, being able to come and go as they please, having staff the don't change too often and being allowed to take a bath or shower when they choose were not statistically significant positive predictors of WTR in either Ontario or Tuscany.

There were a number of predictors that were only statistically significant in one of the two jurisdictions. In Tuscany, residents who perceived staff as being technically skilled was one of the strongest predictors. In addition, WTR was significantly associated with being allowed to have a snack when hungry, the smell around the NH and being called by name. In Ontario, not having clothes damaged or lost in the laundry and having a safe place in their room to keep their belongings had significantly positive relationships with WTR.

3.3. Optimization models

The optimization models set out to improve WTR by up to 15%, but it was not practical to improve WTR by more than 10% in Tuscany NHs and 7% in Ontario, because beyond this, the number of predictors needed increased substantially. The total number of items identified by the optimization model required to increase WTR in Tuscany's and Ontario's NHs by 10% and 7%, respectively is reported in Table 2 of the Appendix of this manuscript.

Table 4 shows the improvements required to increase WTR by up to 10% in Tuscany and 7% in Ontario. For example, to increase "willingness to recommend" by 8%, meaning that the current performance of the WTR, which was 1.497, would improve to 1.377 (0.92×1.497), nursing homes would need to improve Q1 "room comfort" by 15%, which means that with a current performance of 1.348 on Q1, Q1 would need to improve to 1.146 (0.85×1.348).

In Tuscany, the first item selected by the optimization model was staff knowledge and skill, which, by itself, could lead to a 4% improvement in WTR. To achieve this 4% increase in WTR, resident ratings of staff knowledge and skill would have to increase by 14%. Based on the optimization model, the most efficient way to increase WTR by 5% would be to focus on improving both the capability of NH staff, which would require an improvement of 15%, and on the comfort of the resident's room, which would also need to be improved by 4%. To increase WTR by a further 5%, the optimization model selected 3 additional predictors. These were the availability of food, which would need to be improved by 15%, residents' autonomy to decide what to do each day and the staff calling the residents by name, which would need to be improved by 2% and 6%, respectively. In addition, to achieve the 10% increase in WTR, resident ratings of the capability of staff and the comfort of their rooms would each need to improve by a total 15%.

In Ontario, the first item selected by the optimization model was the willingness of staff to try to understand what residents were feeling. Alone, a 13% improvement in this item could result in a 2% improvement in WTR. To increase WTR by 5%, according to the optimization model, QI efforts in Ontario should focus on improving 4 items. These were the comfort of the resident's room, which would need to be improved by 6%, and staff willingness to

Table 3
Ordinal Logistic Regression for willingness to recommend for Tuscany Region and Ontario.

Independent Variables	Item (Domain)	Tuscany		Ontario	
		Std. Coefficients	p- value	Std. Coefficients	p- value
Q1	Safe Place (Security)	0.250*	0.000	0.242 [†]	0.003
Q2	Room (Comfort)	0.063	0.319	0.223 [†]	0.006
Q3	Renovation (Comfort)	0.131 [†]	0.019	0.227 [†]	0.020
Q4	Smells (Comfort)	0.098 [†]	0.004	0.014	0.823
Q5	Food (Services)	0.202 [†]	0.001	0.059	0.463
Q6	Laundry (Services)	0.065	0.200	0.307 [†]	0.017
Q7	Activities (Autonomy)	0.117 [†]	0.002	0.301 [†]	0.005
Q8	Come and go (Autonomy)	0.106	0.097	0.037	0.652
Q9	Bath and Shower (Autonomy)	-0.040	0.490	-0.369 [†]	0.006
Q10	Skilled staff (Staff)	0.216 [†]	0.000	0.059	0.385
Q11	Relationship with the staff (Staff)	0.121 [†]	0.008	0.426 [†]	0.000
Q12	Call by name by the staff (Staff)	0.059 [†]	0.002	-0.031	0.524
Q13	Staff change too often (Staff)	-0.036	0.479	-0.160	0.237

* p-value < 0.05.

Table 4
Tuscan and Ontario optimization model results.

Independent Variables	Item (Domain)	Region	Improvements required										
			1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
Q1	Safe Place (Security)	Tuscany											
		Ontario							8%	15%	\	\	\
Q2	Room (Comfort)	Tuscany					4%	9%	14%	15%	15%	15%	15%
		Ontario					6%	15%	15%	\	\	\	\
Q3	Renovation (Comfort)	Tuscany											
		Ontario							14%	\	\	\	\
Q4	Smells (Comfort)	Tuscany											
		Ontario											
Q5	Food (Services)	Tuscany										6%	15%
		Ontario											
Q6	Laundry (Services)	Tuscany											
		Ontario			8%	15%	15%	15%	15%	\	\	\	\
Q7	Activities (Autonomy)	Tuscany											2%
		Ontario				6%	15%	15%	15%	\	\	\	\
Q8	Come and go (Autonomy)	Tuscany											
		Ontario											
Q9	Bath and Shower (Autonomy)	Tuscany											
		Ontario											
Q10	Skilled staff (Staff)	Tuscany	3%	7%	10%	14%	15%	15%	15%	15%	15%	15%	15%
		Ontario											
Q11	Relationship with the staff (Staff)	Tuscany											
		Ontario	6%	13%	15%	15%	15%	15%	15%	\	\	\	\
Q12	Call by name by the staff (Staff)	Tuscany									6%	6%	6%
		Ontario											
Q13	Staff change too often (Staff)	Tuscany											
		Ontario											

try to understand what residents were feeling, the laundry service (clothes not getting lost or damaged in the laundry) and, finally, resident autonomy to decide what to do each day, which would each need to improve by 15%. To achieve a 7% improvement in WTR, two additional predictors were selected by the model. The first was related to security of the resident's possessions, and, the second, to whether the NH needs fixing up.

4. Discussion

This study used optimization techniques to predict the most efficient way to improve the overall satisfaction of NH residents in Tuscany, Italy, and Ontario, Canada. These methods take into consideration: (1) the relationships between the predictors and the measure of overall satisfaction, and (2) the current performance levels of each of the predictors. This allows researchers to suggest areas where, if quality improvement activities were focused, overall satisfaction might be improved.

Rodriguez-Martin et al. [29], through interviews with NH residents in Spain, identified domains related to the persons providing

care as the “pillar of quality”. Our results confirm this assertion; the primary focus for quality improvement in both Tuscany and Ontario should be on domains related to NH staff. This result is also congruent with Becker & Kaldenberg's [6] study that recommended that NHs in the United States should prioritize services provided by aides. It holds face value as well because quality in NH occurs in the interactions between staff and residents [30].

Our results also highlight an important distinction in how quality care is defined in different jurisdictions. A number of papers have conceptualized different domains of quality of care. For example, Rodriguez-Martin et al. [29] divided domains related to the persons providing care into either emotional competencies, such as staff affect and quality of relationships, or technical competencies, which included, in part, technical skills and training of staff. Bowers et al. [24] established three different conceptualizations of quality of care: (1) care-as-service; (2) care-as-relating; and (3) care-as-comfort. The first of these conceptualizations focuses on the technical/instrumental domains of care, the second relates to staff affect and friendship, and the third defined quality based on

maintaining resident physical comfort. To improve WTR in Tuscany, the primary focus should be on the professional capability of NH staff (their skill and knowledge), indicating residents in Tuscany conform to the care-as-service/technical competency conceptualization of quality. By contrast, in Ontario, the focus should be on the willingness and ability of NH staff to understand what residents are feeling, which reflects the care-as-relating/emotional competency domain. This item was the most important predictor of WTR in Ontario and was the 5th worst performing item, and was, as a result, the first predictor selected in Ontario's optimization model. In Tuscany, staff members' relationships with residents (trying to understand how they were feeling), was only the 5th most important predictor of WTR and was the 5th best performing item at baseline, based on the ordinal logistic regression models, and was not selected by Tuscany's optimization model. Having skilled staff, however, was among the most important predictors of WTR in Tuscany and showed up first in its optimization results. In Ontario, this item was not a statistically significant predictor of WTR and was already among the best performing items, so was not among those selected by the optimization model.

Rodriguez-Martin et al. [29] discussed the possibility that structural characteristics of the NH industry could lead to different conceptualizations of quality of care. For example, if residents pay for services, they may feel entitled to other rights as a client as compared to residents in publicly funded NHs. Other studies have stressed the effect that different cultural beliefs and values can have on the relative importance of different domains of quality of care [31,32]. For example, in Taiwanese NHs, Chao and Roth [31] link the cultural value placed on self-suppression to residents being reluctant to share their preferences with care providers.

Of secondary importance to domains related to the persons providing care, Rodriguez-Martin et al. [29] included institutional domains, which include facilities, cleanliness and food. Institutional domains of quality also included standards and rules. Only two of the predictors selected by our optimization models were common to both regions. These were resident ratings of the comfort of their room and having the autonomy to choose what activities they would like to do each day. The latter of which was the last predictor selected in Tuscany's optimization model, but was selected much earlier in Ontario's.

There was substantial consistency in both jurisdictions among predictors that were not selected by the optimization process to improve overall WTR. Notably, staff continuity, resident autonomy to choose when to have a bath or shower, resident autonomy to choose when to come and go, and smells within the NH were not selected in either jurisdiction. In both Tuscany and Ontario, many residents reported that they weren't bothered by smells in their NH. There was, thus, little room for improvement and this predictor was not selected by either optimization model, despite its statistically significant relationship to WTR in Tuscany. In both Tuscany and Ontario, WTR was not statistically significantly positively related to resident autonomy to choose when to have a bath or shower, resident autonomy to choose when to come and go or staff continuity.

This study only included one measure of overall satisfaction. That was resident's WTR the home. While a large proportion of residents from both regions were already willing to recommend their NH, because residents' WTR was initially higher in Ontario it may be more difficult to improve than in Tuscany. To improve resident WTR by 5% in Ontario requires 4 predictors to be improved by 15% and another by 6%, whereas in Tuscany, a similar level of improvement would only require improvements to 2 predictors. In addition, it was only possible to increase WTR by 7% and 10% in Ontario and Tuscany, respectively, because, as described in Seghieri et al. [10], any increase above this would require improvement to an

infeasible number of predictors. It is possible that, similar to studies in other care settings [9,10], other measures of overall satisfaction (for example overall ratings of care) might not have such high initial resident ratings and could produce slightly different optimization results.

5. Limitations of the study

Our paper described similarities in some broad structural characteristics of NHs in Tuscany and Ontario (public funding of nursing and personal care, resident co-payment, for-profit and not-for-profit NH ownership, etc.). It is possible, however, that there are other structural characteristics and/or socio-cultural differences (e.g. continued role of the family for emotional support in Italy) that explain why the willingness and ability of NH staff to understand what residents were feeling was most important for Ontario NH residents, whereas for NH residents in Tuscany it was staff members' professional capability (skill and knowledge) that was most important. Alternatively, length of stay was found to be longer in Ontario NHs than in Tuscany, it is possible that relationships with staff become more important the longer residents live in a NH, whereas shorter stay individuals are more concerned with technical competences of staff. Future research may wish to consider if the quality improvement priorities vary by resident characteristics (e.g. length of stay or health status). Our small sample size, however, limits our ability to stratify based on resident characteristics (e.g. we only have 69 residents that feel very bad in Ontario). Finally, in both Tuscany and Ontario, the resident samples excluded individuals with severe cognitive impairment. Cognitive impairment, however, was determined using difference scales, Cognitive Performance Scale in Ontario and the Pfeiffer test in Tuscany. This study is further limited by the inclusion of only the 13 predictors of overall NH quality that were common to the surveys conducted in Tuscany and Ontario. These predictors cover a range of quality domains identified as important in prior literature, but may not be inclusive of all elements of NH quality. While the data were collected a few years ago, the issues raised and the approach to comparing priorities for quality improvement are current. Further, there have been no major system innovations that would suggest changes in resident experience between the time of data collection and today.

6. Conclusion

The paper provides an important contribution to the literature in a number of ways. First, by comparing optimization models of similar predictors of NH quality in various jurisdictions, researchers may attempt to establish whether the selected items reflect a shared quality phenomena for NH residents, or whether perceptions of quality differ based on the local context. This paper confirms the importance of staff on residents' perceptions of quality of care, something that is common across jurisdictions, but highlights differences in the specific staff-related aspects that are important to resident perceptions of quality and target areas for quality improvement.

Second, the paper describes a unique methodology, the optimization model, which had not, to our knowledge, been used previously in studies of NH quality. When selecting areas of focus for quality improvement, it is important that stakeholders (managers, policy makers) focus not only on the domains of quality within NHs that are most strongly associated with overall perceptions of quality, but also those with the most room for improvement; the optimization model provides a unique solution for doing this.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.healthpol.2017.06.004>.

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