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REVISTA IBERO-AMERICANA DE SALUD Y ENVEJECIMIENTO

QUINN'S LEADERSHIP ROLES: A CONFIRMATORY FACTOR ANALYSIS STUDY IN PORTUGUESE HEALTH SERVICES

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VOL. 1 N.º 2 AUGUST 2015

ABSTRACT

Purpose: To assess the psychometric properties of Quinn's leadership questionnaire (CFV questionnaire; 1988) in Portuguese health services. **Design**: Cross-sectional study, using Quinn's leadership questionnaire, administered to registered nurses and physicians in Portuguese health services (N = 687). **Method**: Self-administered survey applied to two samples. In the first sample (convenience; N = 249 Portuguese health professionals), exploratory factor and reliability analyses were performed to the CFV questionnaire. In the second sample (stratified; N = 50 surgical units of 33 Portuguese hospitals), confirmatory factor analyses were performed using LISREL 8.80. **Findings**: In the first sample, an eight--factor solution emerged accounting for 65.46% of the total variance, in an interpretable factor structure (loadings> .50), with Cronbach's α greater than .79. This factor structure, replicated in the second sample, showed reasonable goodness-of-fit of the model to each of the leadership roles, that is, to the eight quadrants and global model. Overall, the models showed nomological validity, with scores between good and acceptable ($.235 < x^{2/df} < 2.055$ and $.00 < RMSEA < .077$). **Conclusions**: Quinn's leadership questionnaire showed good reliability and validity for the eight leadership roles, proving to be suitable for use in health care/hospital settings.

Keywords: Leadership; Quinn's competing values framework; Quinn's CVF questionnaire; health services

INTRODUCTION

Over the last decade, we have been witnessing deep changes and reforms worldwide in the organizations in general, and in the health systems in particular. In Portugal, the operating model of health organizations, particularly in public hospital management, has also changed based on a type of management focused on business models. According to Martins, Detmer, and Rubery (2005), we have been witnessing, particularly in recent years, the introduction of a more professional type of management with special focus on models and values associated with the private sector. An example of this was the transformation, in 2005, of the 31 Portuguese public enterprises (EPEs) so as to modernize and revitalize the Portuguese Health System (SNS - *Serviço Nacional de Saúde*) through an innovative type of entrepreneurial management focused on satisfying the needs of the stakeholders, particularly the client. This transformation aimed to improve citizens' access to health care, promote a culture of meritocracy and accountability, facilitate the implementation of best management practices in health care units and promote the economic-financial

balance of the SNS by monitoring performance and improving efficiency. Thus, this change of management paradigm and transformation also required (new/more) leadership skills to cope with the complexity of the system, particularly of the health care units in Portugal. These leadership skills of hospital managers are, therefore, essential for the system to be able to respond to the needs for systematic changes and to function in an optimal manner.

Mountford and Webb (2009) argue that this transformation will require leadership of health professionals directly or indirectly involved in organizational management roles. In fact, an effective leadership is the key to an effective performance (Kim & Thompson, 2012). As stated by McAleamey (2010), dealing with multiorganizational health systems, which are particularly complex, requires a competent leadership. Hence there is a growing need to analyze the roles performed by the leaders (Hart & Quinn, 1993) based on a meritocratic culture of accountability with a view to implementing the best management practices in health care units.

The analysis and review of studies conducted on leadership roles by means of a comparative assessment of the taxonomic categories suggested by Mintzberg (1973), Morse and Wagner (1978), Stogdill (1948), Bowers and Seashore (1966), House and Mitchell (1974) and Yukl (1994) culminated in 14 behavioral categories (Hooijberg 1996; Hooijberg, Hunt & Dodge, 1997). This diversity was based on different conceptualizations of leadership models, including Quinn's Competing Values Framework which is one of the 40 most cited models in organizational literature.

Quinn's Competing Values Framework (CVF) emerged from a series of studies conducted at the end of the 1970s and beginning of the 1980s and resulted from the most widely known and cited article in organizational literature on the criteria of organizational effectiveness by Quinn and Rohrbaugh (1983). These authors aimed at creating an empirical model of organizational effectiveness that would be sufficiently flexible and integrating of the diversity of existing models, reflecting on the main milestones in the evolution of the theory on this topic, without disregarding the theoretical/conceptual and methodological aspects. Based on the review of organizational literature conducted by Campbell (1977) on the critical measures of organizational effectiveness, Quinn and Rohrbaugh (1983) interviewed 45 experts on organizational effectiveness with a view to obtaining information on their opinion regarding effective organizations (instead of trying to identify the characteristics of the so-called effective organizations).

Following the analysis of similarities and differences based on pairs of effectiveness criteria that emerged from the study, Quinn and Rohrbaugh (1983), using the multidimensional staggering technique, arranged the 17 criteria of effectiveness on a three-axis structure,

which they named *Competing Values Framework*. The first axis refers to the attention paid by the organization to its internal processes, internal dynamics and external environment, i.e. internal emphasis versus external focus. The second axis refers to the preference in terms of organizational structure for more flexibility versus more control, i.e. innovation and adaptation versus predictability and stability. Finally, the third axis refers to the means and ends, i.e. efficient production of results versus planning and goal setting.

Given the characteristics and potential of the model under analysis, the purpose of this study is to assess the psychometric properties of Quinn's leadership scale (1988), which is based on Quinn's Competing Values Framework, for the Portuguese population in the context of health services. After a description of Quinn's Competing Values Framework (1988), we will describe the eight leadership roles suggested by the model. The results of the factor analyses (exploratory and confirmatory) on the leadership roles will be presented based on the model quadrants and on the global model of leadership.

Competencies to perform Leadership roles

The model in which we based our analysis on the leadership competences of managers establishes eight leadership roles: mentor (four items), facilitator (four items), broker (four items), monitor (four items), director (four items), and producer innovator (four items) and coordinator. According to Quinn (1988), these eight roles refer to the two key dimensions of leadership (flexibility versus stability and external focus versus internal focus) based on which the four quadrants, designated by the author as models, emerged. On the one hand, the **Human Relations** Model and the **Open Systems** Model focus on flexibility, whereas the **Rational Goal** Model and the **Internal Process (Hierarchy)** Model focus on stability. On the other hand, the **Human Relations** Model and the **Hierarchy** Model represent the *internal focus*, whereas the **Rational Goal** Model and the **Open Systems** Model represent the *external focus*.

The **Human Relations** model is represented by the leadership roles designated as *Mentor* and *Facilitator*. The *Mentor* advocates staff development by providing an empathic orientation, creating opportunities for skill development and training. The *Facilitator* is expected to foster collective efforts, as well build cohesion, union and team spirit.

The **Open Systems** model is represented by the leadership roles designated as *Broker* and *Innovator*. The *Broker* is expected to be concern with the maintenance of external legitimacy and with obtaining resources. The *Broker* is the politically astute, persuasive, influential and powerful leader. The *Innovator* envisions the necessary changes, being at the same time a facilitator of the adaptation and change processes. The *Innovator* is a creative and visionary dreamer.

The **Internal Process** model is represented by the leadership roles designated as *Monitor* and *Coordinator*. The *Monitor* is expected to control all issues related to the unit and to ensure compliance with the rules and accomplishment of objectives. The *Coordinator* is expected to maintain an organized structure and work flow, minimizing interruptions and conflicts.

The **Rational Goal** model is represented by the leadership roles designated as *Producer* and *Director*. The *Producer* is expected to ensure a focus on the task and on the work to be performed. The *Director* should clarify expectations, through planning and goal setting, as well as define the problems, duties and tasks, as well as their assessment.

As previously mentioned, on the one hand, the **Human Relations** model and the **Open Systems** model pose a great emphasis on *flexibility*, whereas the **Rational Goal** model and the **Hierarchy** model focus on *stability*. On the other hand, the **Human Relations** model and the **Hierarchy** model emphasize their *internal focus*, whereas the **Rational Goal** model and the **Open Systems** model represent the *external focus*. According to the model under analysis, within these four quadrants/models, eight roles emerge that the manager is expected to have to effectively manage a situation, as presented in Table 1 and Figure 1.

Table 1- Leadership roles

Leadership roles
Facilitator - Promotor of the development of collective effort, creator of cohesion, union and team spirit.
Mentor - Promotor of the development of the people by an empathic orientation, facilitating opportunities for training and skills development.
Innovator - This leader conceptualizes and designs the necessary changes, being a facilitator in adaptation and change.
Broker - Represents the politically astute, persuasive, influential and powerful leader who promotes the maintenance of external legitimacy and the acquisition of the necessary resources.
Producer - Represents the leader focused on the tasks, on the work at hand.
Director - Represents the leader who clarifies expectations through planning and setting goals.
Coordinator - Represents the leader who maintains the structure and flow of the system to operate continuously, protecting / minimizing failures of the system and conflicts.
Monitor - Represents the leader who always knows what is happening, ensuring that people comply with the rules and are achieving the goals set out.

Source: Parreira et al. (2006) *Liderança em contexto de organizações de saúde: Um instrumento de avaliação.* Encontro Nacional de Sociologia Industrial e Organização do Trabalho. Associação Portuguesa de Sociologia Industrial e Organização do Trabalho.

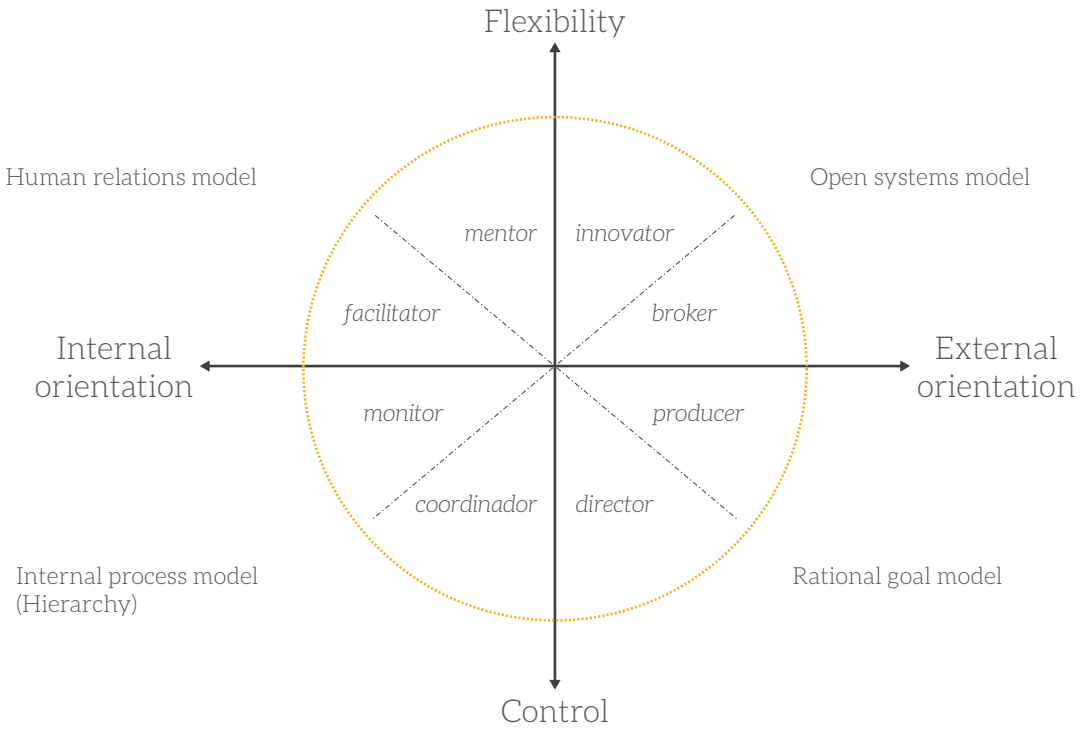

Figure 1. Competing values framework: Model of leadership roles

Some studies conducted with the CVF

The eclecticism of the structure of the CFV model adapts well to the study of multiple organizational realities. To underline the extensive applicability of the model developed by Quinn and collaborators, we make reference to some empirical studies conducted in different contexts, such as: diagnosis and guide for organizational assessment (Walton & Dawson, 2001), complex and paradoxical nature of organizational effectiveness (Doty, Glick, & Huber, 1993; Ostroff, & Schmitt, 1993; Walton, & Dawson, 2001; Parreira, 2005b; Parreira, 2007; Parreira, 2009; Parreira et al, 2011), planning of information systems (Premkumar & King, 1994), managers' skills (Stefl, 2008), leadership effectiveness (Parreira, 2011; Vilkinas, & Ladyshewsky, 2012), leadership profile (Wilkinson, 2010), organizational culture (Neves, 2000; Parreira, 2008a; Zammuto, Gifford & Goodman, 2000), development of learning management (Quinn, Sendelbach, & Spreitzer, 1991), leadership and relational skills (Melo & Parreira, 2009; 2010), Leadership in Health (2005c), organizational networks and effectiveness in alliances (Nygaard, & Dahlstrom, 2002), leadership styles (Martin, & Simons, 2002), evaluation of leadership roles (Martin, 1992; Melo et al, 2010; Vilkinas, & Ladyshewsky, 2012; Zammuto, Gifford, & Goodman, 2000), leadership traits and patterns of influence and behavior (Deninson, Hooijberg, & Quinn, 1995), leadership traits and

behavior (Strang, 2007), organizational culture (Helfrich, Mohr, Meterko, & Sales, 2007), behavioral complexity in leadership (Lawrence, Lenk, & Quinn, 2009; Parreira, 2005d; Parreira, 2008b), leadership in self-managing teams (Zafft, Adams, & Matkin, 2009), communication (Belasen, & Frank, 2010), leadership roles (Wilkinson, 2010), leadership roles and organizational learning (Kinghorn, Black, & Oliver, 2011), organizational values (Reino & Vadi, 2012), hospital effectiveness (Parreira, 2013), and mergers and acquisitions (Dias & Parreira, 2011; Dias et al, 2011; Lopes et al, 2010).

The paradoxical nature of hospital complexity

According to Mintzberg (1973), hospital organization can be classified as a professionalized bureaucratic structure with a complex nature, in which the notion of overall effectiveness seems difficult to operationalize, given the diversity of actors (stakeholders) and processes involved. It is up to those who assume the management and leadership positions of an organization to care for the targets of their action, choosing the most appropriate measures to achieve the goals (Carvalho & Gomes, 2008). The action of organizing involves joint efforts or action, implying the need to generate agreements and manage expectations, create common languages and find acceptable solutions to problems that organizational actors face together (Carvalho, 2007). The health sector has increasing levels of complexity given the large differentiation of professionals (Parreira, 2005) and the power that results from their skills (French & Raven, 1959). In addition, the vast technological differentiation associated with the need to make urgent decisions (Nunes, 1994; Parreira, 2005) contribute to this complexity. In this sense, it is the leaders' responsibility, in their multiple roles, to promote compatibility of interests (plural and legitimate), meeting the expectations and demands of stakeholders in order to prevent conflicts of interest which may hamper organizational effectiveness (Carvalho & Gomes, 2010).

All these aspects contribute to emphasize leadership issues, particularly due to the turbulence of the environment where they are integrated, requiring leadership skills to tackle the complexity of the demands, which are often presented as conflicting and paradoxical. Indeed, the effectiveness and success of organizations is largely related to the ability of the leaders to assume multiple roles depending on the situations and the stakeholders, to manage sometimes conflicting relationships and expectations (Carvalho, 2007), to properly use their influence and power, to manage vital resources for the system in which they operate to properly function, and to manage vital processes for the survival and sustainability of the organization (Carvalho & Gomes, 2011).

In this context, the study of leadership in a hospital setting should be encouraged and developed. In the article by Reeleder, Goel, Singer and Martin (2006), "Leadership and

priority setting: The prospect of hospital CEOs," the authors mention that the role of leadership in setting health priorities remains largely unexplored. For these reasons, we consider that it is necessary to conduct studies on leadership in a hospital environment, creating the need for the use of context-appropriate tools.

METHOD

Population, sample and data collection procedures

Our sample was composed of 70 hospitals with different levels of complexity and legal frameworks and in different parts of the country, as shown in Table 2.

To accomplish the objectives set out, data were collected in two different samples. The first sample was a convenience sample composed of nurses attending the complementary year of training at the Nursing School of Coimbra, Portugal. A total of 249 questionnaires were completed in the classrooms after a brief explanation of the study objectives. The researcher applied the questionnaires.

In the second data collection, 70 Portuguese public hospitals/hospital centers with surgical units were contacted to participate in the study. Of the hospitals/hospitals centers that accepted to participate in the study (the Boards of Administration of each institution gave their authorization in writing), 50 surgical units agreed to participate. The questionnaires were applied to both physicians and nurses. The respondents were asked to assess the leadership skills of their superiors (physicians with management positions in the surgical units and head nurses/ nurses in leading positions). Of a total of 2500 questionnaires sent to those units, a response rate of 27.48% was obtained, being common to obtain low response rates in this context (Parry & Proctor-Thomsom, 2003; Waldman, Ramirez, House, & Puranam, 2001).

Representation of the hospitals, surgical units and health professionals in the sample

Taking into account the complexity of the hospital structure, the 33 hospitals included in our sample are mainly district hospitals (59.3%). As for the regional distribution in the country, 43.7% are located in the central regional of Portugal. In terms of the legal framework, 46.9 % of the hospitals are public administrative services (SPA) and 53.1% are public enterprises (EPE).

As for the distribution of the surgical units, 36.7% of the surgical units were located in the Lisbon and Tejo Valley region, 34.7% in the central region, 16.33 % in the north, 8.2% in the Alentejo, and 4.1% in the south (Algarve). Of these surgical units, 55.1% are SPA and

44.9% are EPE, 12.2% are level 1 complexity units (less differentiated), 59.2% are district units and 28.6% are central units (higher level of complexity).

In terms of representation of the professionals in the surgical units, 89.1% (612) of the 687 respondents are nurses and 10.9% (75) are physicians, of whom 75.8% (496) are female and 56.4% married. The mean age is 35 years (SD = 10.02). As for the length in the profession, the respondents have a mean of 12 years (SD= 9.53). As for professional experience in the hospital, the respondents have a mean of 9.64 years in profession and a mean of 6.47 years in the unit.

In this study, to assess how the sample differed in the different regions (five regions) by level of hospital complexity (level 1 hospital, regional or central) and legal management framework (EPE/SPA), the proportions were assessed, and no statistically significant differences were found. Although the sample was not randomized, no statistically significant differences were found: hospitals/ hospital centers* hospital characterization (level 1, regional, central) (x^2 (2)= 5.96, p < .51); hospitals/hospital centers * legal framework (x^2 (1)=.92, p <.99); hospitals/hospital centers * regions in Portugal (x^2 (4)= 2.433, p < .66).

Table 2- Distribution of the hospitals/hospital centers by level of complexity, geographic region and legal status

Region in Portugal			Level of hospital complexity *			
			level 1	regional	central	Total
North	Legal status	EPE	1	8	1	10
		SPA	5	2	3	10
Centre	Legal status	EPE	0	6	0	6
		SPA	10	6	2	18
Lisbon and Tejo Valley	Legal status	EPE	0	7	4	11
		SPA	2	2	5	9
Alentejo	Legal status	EPE		1		1
		SPA		3		3
South	Legal status	EPE		1		1
		SPA		1		1

EPE- Public Enterprise, SPS- Public Administrative Service
*Tree levels of hospital complexity (level 1 hospital, regional hospital and central hospital)

Leadership questionnaire

The original version of Quinn's CVF questionnaire (Quinn, 1988) was adapted to Portuguese health settings by Parreira, Felício, Lopes, Nave and Parreira (2006). This version comprises a total of 32 items which assess the eight leadership roles, respectively: mentor (4 items), facilitator (4 items), broker (4 items), innovator (4 items), monitor (4 items), coordinator (4 items), director (4 items), and producer (4 items). Each item was measured on a 7-point Likert-type scale ranging from 1= "almost never" to 7= "almost always".

The scale was previously translated from English into Portuguese by a Master's degree holder in the area of organizational behavior and management, and then it was compared to the back-translated version (Parreira et al., 2006). These versions were analyzed by a panel of five experts created for that purpose to ensure the semantic, conceptual and operational equivalence, and the content validity in relation to the initial version. Some changes were made to adapt it to the health care setting, bearing in mind the questionnaire's conceptual structure and facial validity.

Statistical procedures adopted and considerations about the confirmatory factor analyses and fit Indices

After data collection, descriptive statistics were calculated using SPSS, version 20.0. The psychometric properties of the scale were assessed through exploratory factor analyses (EFA) using SPSS and confirmatory factor analyses using LISREL 8.80[1]. The method of estimation *Robust Maximum Likelihood* was used. The variables were considered ordinal variables and polychoric correlations were estimated.

Evaluation of Model Fit

According to Doll, Raghunathan, Lim, and Gupta (1995), given the fact that there is no single universally accepted statistic to calculate the model adequacy, several goodness-

1 The CFA in LISREL allowed us to test the unidimensionality of the scales and their nomological, convergent and discriminant validity. The unidimensionality presupposes that the indicators of a construct have a good fit only in that construct. To test the unidimensionality of the latent construct, the reliability and validity of the indicators that compose the latent variable must be tested. To that end, reliability must be assessed, i.e. the internal consistency of the measure, through the assessment of Cronbach's alpha coefficient to sets of two or more indicators. It is also shown in R^2 (equal to loading^2) of each indicator, which should be >.50, that corresponds to a standardized loading close to .70. The reliability of each latent variable should also be assessed through the assessment of the internal consistency of all indicators of that variable. **Convergent validity** refers to the homogeneity of the constructs, and it is expressed in the loadings of the standardized solution of standardized factor loadings of each indicator with the respective latent variable, as well as in the t-values associated with the levels of significance of those loadings (t-values >1.96 or 2.58 depending on α =.05 or α =.01, respectively). **Discriminant validity** is shown in the extent of separation between constructs, i.e. to what extent the indicators of a given construct are more related to that construct than to others. **Nomological validity** refers to the validity of a model as a whole, and it is accomplished through the comparison of the value of x^2 with the degrees of freedom (*df*). The $x^{2/df}$ ratio, despite not increasing with sample size, is considered a valid indicator. Although the goodness-of-fit values are not consensual in the literature, for some authors values up to 5 are adequate. The RMSEA is also considered an indicator of nomological validity. Values of RMSEA <.05 indicate a good fit, with values between .05 and .08 being also considered acceptable.

-of-fit indices should be used to assess model fit. In the present study, we use the x^{2/df^2}, the Root Mean Square Error of Approximation (RMSEA), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the Parsimonious Goodness-of-Fit Index (PGFI) and the comparative fit index (CFI).

There are indexes to assess model fit that are not sensitive to sample size and assess the overall goodness-of-fit of each model (Bagozzi & Yi, 1988; Bagozzi, Yi, & Phillips, 1991): $x^{2/df}$, normed fit index (NFI), goodness-of-fit index (GFI), adjusted goodness of fit index (AGFI) and root mean square residual (RMSR)[3]. The relative or incremental fit indexes should be higher than .90 (Somers, Nelson, & Karimi, 2003) and used to assess an improvement in fit of one model over another (Doll, Raghunathan, Lim, & Gupta, 1995). The $x^{2/df}$ ratio demonstrates the relative efficiency of competing models. Researchers have recommended using ratios as low as two to indicate good fit or as high as 5 to indicate a reasonable fit (Marsh & Hocevar 1985). The $x^{2/df}$ ratio is to be used in preference to x^2, and should be lower than three (Carmines & McIver, 1981).

The GFI and AGFI assess the variance and covariance implicit in the data set presented in the model. The AGFI differs from the GFI as it adjusts the model taking into account the degrees of freedom (Somers, Nelson, & Karimi, 2003). They range from 0 to 1 with higher values indicating better fit (Jöreskog & Sörbom, 1989). Many researchers consider a reasonable fit to range from .80 to .89 and a good fit equal to 0.90 or higher (Somers, Nelson, & Karimi, 2003).

The Parsimonious Goodness-of-Fit Index (PGFI) is a modification of the GFI and NFI, ranging from 0 to 1. Higher scores in these indices indicate a better fit, being considered adequate to choose between alternative models.

Overall, the indices which are often selected to decide on the level of fit of the model are: x^2 and its p value (signification), $x^{2/df}$, *RMSEA* and its confidence interval. The fit indices *RMSEA* and *CFI* do not depend on sample size as much as x^2 (Engel & Moosbrugger, 2003;

2 Although the x^2 test is used to assess the ability of the model to reproduce the matrix of variance/covariance of the sample, its levels of significance are sensitive to sample size. Thus, the x^2 statistics are very sensitive to large and significant sample sizes (Byrne, 1998; Hoyle, 1995; Maruyama, 1998; Schumacker, & Lomax, 1996). It is recommended that the x^2 be cautiously interpreted in most applications (Jöreskog & Sörbom 1989). Other authors (e.g., Hair, Anderson, Tatham, e Black, 1998; Somers, Nelson, & Karimi, 2003) consider that the use of x^2 is adequate for sample sizes between 100 and 200, with the significance test becoming less reliable with sample sizes outside of this range. The x^2 test is event more sensitive to the violation of normality, so it should not be the only criterion used to assess model fit. It is more appropriate to simultaneously integrate several indexes that represent different classes of goodness-of-fit criteria (Bollen & Long,1993; Engel & Moosbrugger, 2003; Mueller, 1996).

3 The RMSR reflects the residual mean obtained by the difference between the model and the matrixes of variance/covariance generated by the sample (Jöreskog & Sörbom 1984). Low values are associated with a better model fit, and scores lower than .05 indicate a good fit. Premkumar and King (1994) consider that values lower than .10 indicate a good fit.

Fan, Thompson, & Wang, 1999; Hu & Bentler, 1998; Rigdon, 1996). As for the decision on model fit, Engel and Moosbrugger (2003) argue that:

> "It should be clear that rule of thumb cutoff criteria are quite arbitrary and should not be taken too seriously. Fit indices may be affected by model misspecification, small--sample bias, effects of violation of normality and independence, and estimation method effects. Therefore it is always possible that a model may fit the data although one or more fit measures may suggest bad fit" (p. 52).

As we are aware of these limitations, **Table 3** displays the recommendations suggested by Engel and Moosbrugger (2003) to decide on model fit.

Table 3- Recommendations for model evaluation (goodness-of-fit index)

Measure to Assess Goodness-of-fit Indices	Good Fit	Acceptable Fit
$\chi 2$	$0 \leq \chi 2 \leq 2df$	$2df < \chi 2 \leq 3df$
p value	$.05 < p \leq 1.00$	$.01 \leq p \leq .05$
$\chi 2/df$	$0 \leq \chi 2/df \leq 2$	$2 < \chi 2/df \leq 3$
RMSEA	$0 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$
p value for test of close fit (*RMSEA*<.05)	$.10 < p \leq 1.00$	$.05 \leq p \leq .10$
Confidence interval (CI)	close to *RMSEA*, left to CI =.00	close to *RMSEA*
SRMR	$0 \leq SRMR \leq .05$	$.05 < SRMR \leq .10$
NFI	$.95 \leq NFI \leq 1.00$a	$.90 \leq NFI < .95$
NNFI	$.97 \leq NNFI \leq 1.00$b	$.95 \leq NNFI < .97$c
CFI	$.97 \leq CFI \leq 1.00$	$.95 \leq CFI < .97$c
GFI	$.95 \leq GFI \leq 1.00$	$.90 \leq GFI < .95$
AGFI	close to *GFI*	close to*GFI*
AIC	lower than *AIC* for model comparison	
CAIC	lower than *CAIC* for model comparison	
ECVI	lower than *ECVI* for model comparison	

Note: *AGFI* = Adjusted Goodness-of-Fit-Index, *AIC* = Akaike Information Criterion, *CAIC* = Consistent AIC, *CFI* = Comparative Fit Index, *ECVI* = Expected Cross Validation Index, *GFI* = Goodness-of-Fit Index, *NFI* = Normed Fit Index, *NNFI* = Nonnormed Fit Index, *RMSEA* = Root Mean Square Error of Approximation, *SRMR* = Standardized Root Mean Square Residual. a) *NFI* may not reach 1.0 even if the specified model is correct, especially in smaller samples (Bentler, 1990); b) As *NNFI* is not normed, values can sometimes be outside the 0-1 range; c) *NNFI* and *CFI* values of .97 seem to be more realistic than the often reported cutoff criterion of .95 for a good model fit.

Source: Adapted from Engel, K. & Moosbrugger, H. (2003) Evaluating the Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-Fit Measures. *Methods of Psychological Research*, 8, 2, 23-74, Department of Psychology, University of Koblenz-Landau.

RESULTS

Description of Quinn's competing values framework: Exploratory factor analysis

Table 4 summarizes the descriptive statistics of the 32 items of the scale under analysis, ranging from 1 (almost never) to 7 (almost always). We observed that the mean overall scores are above the mean point, especially as a result of a low percentage of "almost never", "seldom" and "very seldom" answers and a higher percentage of "frequent" and "very frequent" answers, indicating an overall recognition by the subordinates of the leaders' leadership skills.

Items 1, 14 and 27 had the lowest mean scores (respectively 4.43, 4.63 and 4.61), reflecting the leader's less creativity and persuasive skills in relation to the hierarchical superiors. On the other hand, items 17, 18 and 21 had the highest mean scores (respectively 5.46, 5.69 and 5.77), showing that the leader was competent in performing his/her functions based on technical information and a concern to be aware of what is happening at the surgical unit, controlling it. We observed that the scale has a good discriminative power because respondents' answers covered all answer options.

The exploratory factor analysis was carried out through a principal component analysis, explaining 65.46% of total variance. The psychometric characteristics revealed, in this first moment (sample 1; N = 249), a good discriminative power of the answers in all items of the questionnaire. An interpretable factor structure emerged with factor loadings >.50, indicating adequate psychometric characteristics (Parreira et al., 2006).

The results in Table 4 show high item-item and item-dimension correlations, suggesting that the items of each dimension are familiar enough to constitute a dimension (discriminant convergent validity). However, some items have moderate item-dimension correlations (corrected for overlapping). The fact that some items did not show a stronger correlation with the respective factor (correlation without overlapping) may be due to the fact that some factors are moderately correlated, despite being correlated with the corresponding factors. Overall, the analysis of the two-tailed correlation of each item with the factors found that each item is more strongly correlated with the factor to which it belongs (shaded values; (>.73) than with other factors, being this evidence of validity.

Table 4 – Descriptive statistics of the items of Quinn's leadership scale and two-tailed correlations of the items by factor (N = 620)

Item	variable	M	SD	Without item overlapping	Mentor	Facilitator	Innovator	Broker	Producer	Director	Monitor	Coordinator
1 - Comes up with inventive ideas	LID1_B1	4.43	1.42	.75	.550	.716	.866	.670	.673	.665	.682	.615
2 - Protects continuity in day-to-day operations	LID2_D1	5.26	1.29	.61	.486	.651	.638	.575	.692	.664	.625	.778
3 - Exerts upward influence in the organization	LID3_B2	5.14	1.35	.64	.701	.748	.730	.813	.696	.733	.636	.764
4 - Carefully reviews detailed reports	LID4_D2	5.05	1.35	.66	.574	.644	.680	.639	.682	.715	.813	.680
5 - Maintains a "results" orientation in the unit	LID5_C1	5.20	1.28	.73	.551	.688	.707	.648	.851	.751	.680	.714
6 - Facilitates consensus building in the work unit	LID6_A1	5.01	1.27	.70	.682	.834	.676	.634	.656	.673	.595	.692
7 - Defines areas of responsibility for subordinates	LID7_C2	5.31	1.28	.57	.412	.511	.550	.506	.601	.763	.562	.587
8 - Listens to the personal problems of subordinates	LID8_A2	5.03	1.51	.70	.825	.600	.555	.552	.504	.560	.494	.604
9 - Minimizes disruptions to the work flow	LID9_D1	4.77	1.38	.50	.625	.650	.543	.582	.537	.590	.490	.706
10 - Experiments with new concepts and procedures	LID10_B1	4.81	1.32	.75	.566	.682	.862	.646	.682	.698	.705	.619
11 - Encourages participative decision making in the group	LID11_A1	4.99	1.37	.73	.696	.856	.719	.684	.706	.686	.640	.670
12 - Makes sure everyone knows where the unit is going	LID12_C2	5.27	1.34	.71	.607	.742	.690	.649	.767	.841	.707	.700
13 - Influences decisions made at higher levels	LID13_B2	4.74	1.45	.65	.508	.563	.595	.827	.535	.532	.540	.549
14 - Compares records, reports, etc. to detect discrepancies	LID14_D2	4.63	1.44	.53	.331	.456	.539	.432	.548	.547	.738	.464
15 - Sees that the unit delivers on stated goals	LID15_C1	5.31	1.23	.78	.506	.659	.689	.615	.879	.777	.721	.727
16 - Shows empathy and concern in dealing with subordinates	LID16_A2	5.19	1.49	.82	.904	.748	.649	.642	.612	.622	.568	.679
17 - Works with technical information	LID17_D2	5.46	1.21	.63	.644	.701	.737	.657	.714	.719	.796	.669
18 - Gets access to people at higher levels	LID18_B2	5.69	1.11	.42	.356	.361	.429	.619	.410	.409	.373	.333
19 - Sets clear objectives for the work unit	LID19_C2	5.21	1.23	.79	.622	.747	.781	.687	.833	.888	.771	.767
20 - Treats each individual in a sensitive, caring way	LID20_A2	5.38	1.44	.73	.855	.610	.522	.544	.491	.527	.482	.574
21 - Keeps track of what goes on inside the unit	LID21_D1	5.77	1.16	.73	.679	.656	.646	.624	.729	.727	.662	.860
22 - Practises problem solving in a creative, clever way	LID22_B1	5.08	1.36	.78	.725	.796	.874	.790	.751	.746	.730	.754
23 - Pushes the unit to meet objectives	LID23_C1	5.35	1.25	.83	.631	.805	.803	.723	.906	.827	.763	.783
24 - Encourages subordinates to share ideas in the group	LID24_A1	4.93	1.38	.73	.633	.846	.743	.610	.692	.684	.627	.683
25 - Searches for innovations and potential improvements	LID25_B1	5.00	1.33	.82	.591	.762	.899	.688	.797	.768	.725	.676
26 - Clarifies priorities and direction	LID26_C2	504	1.24	.73	.645	.765	.750	.693	.821	.852	.768	.765
27 - Persuasively sells new ideas to higher-ups	LID27_B2	4.61	1.43	.70	.572	.693	.731	.850	.666	.650	.657	.653
28 - Brings a sense of order into the unit	LID28_D1	5.08	1.46	.73	.650	.706	.699	.695	.776	.739	.689	.867
29 - Shows concern for the needs of subordinates	LID29_A2	4.95	1.49	.82	.897	.780	.719	.698	.669	.687	.677	.731
30 - Emphasizes the achievement of stated purposes of the unit	LID_30C1	5.09	1.26	.79	.603	.725	.723	.624	.884	.770	.745	.707
31 - Builds teamwork among group members	LID31_A1	5.02	1.38	.71	.651	.847	.718	.643	.710	.724	.706	.715
32 - Analyzes written plans and schedules	LID32_D2	5.00	1.44	.66	.478	.628	.636	.537	.655	.675	.830	.552

1- Almost never ; 7- Almost always

Validity and Reliability

In order to assess the reliability of the scale, Cronbach's alpha was calculated for the leadership roles both in the first and in the second study (Table 5). Overall, all leadership roles showed higher scores than those obtained by the author of the original scale.

Table 5- Items, minimum, maximum, mean, standard deviation and Cronbach's alpha of each dimension of Quinn's Leadership Questionnaire (1988) (n= 620 listwise)

Leadership Roles	Items	Min.	Max.	Mean	Stand. Dev.	*Cronbach's Alpha*
Facilitator	6,11,24,31	1	7	4.99**	1.19	.87*/.91** (.89)***
Mentor	8,16,20,29	1	7	5.14**	1.31	.89*/.89** (.87)***
Innovator	1,10,22,25	1	7	4.84**	1.18	.90*/.89** (.90)***
Broker	3,13,18,27	1	7	5.04**	1.09	.79*/.86** (.85)***
Producer	5,15, 23, 30	1	7	5.23**	1.11	.90*/.91** (.72)***
Director	7,12,19,26,	1	7	5.21**	1.10	.85*/.89** (.79)***
Coordinator	2,9,21,28	1	7	5.23**	1.11	.82*/,86** (.77)***
Monitor	4,14,17,32	1	7	5.03**	1.15	.80*/.86** (.73)***

**1st sample; **2nd sample; ***values obtained by the author of the scale (Quinn, 1988)*

Confirmatory Factor Analysis

In order to assess the fit of the data in our sample to the theoretical model of CVF, a CFA was performed using the LISREL 8.8. The analysis was conducted in three phases. In the first phase, the eight leadership roles were assessed. Each role is composed of four items, as shown in Table 6. In a second phase, the model quadrants were tested, as shown in Table 7. Finally, in a third phase, the global leadership model was tested (Table 8).

Leadership roles, Quadrants and Global Model

We started by the analysis of the eight models of Confirmatory Factor Analysis (CFA), one for each leadership role. The evaluation of the eight roles showed satisfactory values concerning the goodness-of-fit indicators, suggesting a fit of the date to the model (Table 6). The results showed goodness-of-fit values between good and acceptable, with convergent validity (acceptable t-values with loadings between 20.87 and 83.25, $p<.01$).

Table 6 - Goodness-of-fit indices for the eight leadership roles (CFA)

	χ2/df	RMSEA	GFI	AGFI	PGFI	CFI
Facilitator	**.405**	**.000**	**1.00**	**.99**	**.20**	**1.00**
Mentor	4.680	**.077**	**.99**	**93**	**.20**	**1.00**
Innovator	8.175	.110	**.97**	**.87**	**.19**	**.99**
Broker	**2.055**	**.041**	**.99**	**.97**	**.20**	**1.00**
Producer	**.235**	**.000**	**1.00**	**.99**	**.20**	**1.00**
Director	5.435	.085	**.98**	**.90**	**.20**	**1.00**
Coordinator	**.855**	**.000**	**1.00**	**.99**	**.22**	**1.00**
Monitor	**.430**	**.000**	**1.00**	**.99**	**.20**	**1.00**

$x^{2/df}$ = Chi-square/degrees of freedom; **RMSEA** = Root mean square error of approximation; **GFI** = Goodness of Fit Index; **AGFI** = Adjusted Goodness of Fit Índex; **PGFI** = Parsimonious Goodness of Fit Index; **CFI** = Comparative Fit Index. Acceptable or good values of goodness of fit (**bold**)

In a second phase, the measure models of the four quadrants of the leadership model were assessed. As shown in Table 7, the scores of the four models were statistically significant and the goodness-of-fit indices were satisfactory. The four latent constructs showed nomological validity for all quadrants ($x^{2/df}$ between 1.099 and 2.922; RMSEA between .013 and .056). Convergent validity (*t-values* of *loadings*) ranged from 21.40 to 90.61 ($p < .01$).

Table 7- Goodness-of-fit indices for the four quadrants (CFA)

Quadrants	Leadership roles	χ2/df	RMSEA	GFI	AGFI	PGFI	CFI
Human Relations	Facilitator, Mentor	**2.626**	**.051**	**.96**	**.92**	**.51**	**1.00**
Open Systems	Innovator, Broker	**2.922**	**.056**	**.97**	**.93**	**.45**	**1.00**
Rational Goal	Producer, Director	**1.099**	**.013**	**.97**	**.94**	**.51**	**1.00**
Internal Process	Coordinator, Monitor	**1.706**	**.034**	**.98**	**.95**	**.52**	**1.00**

$x^{2/df}$ = Chi-square/degrees of freedom; **RMSEA** = Root mean square error of approximation; **GFI** = Goodness of Fit Index; **AGFI** = Adjusted Goodness of Fit Index; **PGFI** = Parsimonious Goodness of Fit Index; **CFI** = Comparative Fit Index. **Model A** = Human Relations; **Model B** = Open Systems; **Model C** = Rational Goal; **Model D** = Internal Process. Acceptable or good values of goodness of fit (**bold**)

In a third phase, the global model of leadership was assessed. The solution generated from the analysis of the global leadership model (which included the four latent constructs: 1-Human Relations; 2-Open Systems; 3-Rational Goal; and 4-Internal Process) was not acceptable, with a high x^2 in relation to the degrees of freedom, a RMSEA value outside of the acceptance limits, way above the maximum possible limit (.08). After some of the items being removed based on the modification indexes and the analysis of standardized residuals (Byrne, 1998), a model composed of 17 items emerged with reasonable values of

goodness-of-fit indexes (Table 8). This model showed nomological validity ($x^{2/df}$ 2.802 and RMSEA .054), convergent validity (t-values of loadings between 28.67 and 68.08, $p < .01$) and reliability.

Table 8- Goodness-of-fit indices for the global model (CFA)

Model	χ2/df	RMSEA	GFI	AGFI	PGFI	CFI
Global Leadership Model	**2.802**	**.054**	**.89**	**.85**	**.67**	**.99**

$x^{2/df}$ = Chi-square/degrees of freedom; **RMSEA** = Root mean square error of approximation; **GFI** = Goodness of Fit Index; **AGFI** = Adjusted Goodness of Fit Index; **PGFI** = Parsimonious Goodness of Fit Index; **CFI** = Comparative Fit Index.
Global Model- Global Leadership Model. Acceptable or good values of goodness of fit (**bold**)

DISCUSSION

This study aimed to confirm the CFV presented through the leadership roles questionnaire proposed by Quinn (1988). We used a version which was translated and both linguistically and culturally adapted to Portuguese health services by Parreira et al. (2006).

Data were collected in two samples. The first sample was composed of 249 Portuguese health professionals, and an EFA in components was performed. Overall, from the analysis of the two-tailed correlation of each item with the factors, we observed that each item was more strongly correlated with its respective factor (>0.73) than with other factors, confirming its validity (Anastasi, 1990). The scores of internal consistency of the theoretical factors (mostly >0.80) were closer to the ones found by the author of the original scale. The EFA proved to be interpretable, accounting for 65.46% of the variance. It also showed satisfactory psychometric values.

The results collected through the same instrument, which were obtained in a second sample of 687 physicians and nurses (from 50 surgical units of 33 Portuguese hospitals) were subjected to a CFA using LISREL 8.80. The results obtained on the eight leadership roles (1-Facilitator; 2-Mentor; 3-Innovator; 4-Broker; 5-Producer; 6-Director; 7-Coordinator; and 8-Monitor) showed nomological validity, with goodness-of-fit scores between "good" and "acceptable", with convergent validity.

As for the **Innovator** and **Director** roles, nomological validity was questioned, as scores were higher than the acceptable scores (although in the limit). The scores in the **Innovator** role were not considered adequate. In the **Director** role, the values were close to the limit.

The analysis of the models per quadrant (1-*Human Relations*; 2-*Open Systems*; 3-*Rational Goal*; and 4-*Internal Process*) showed the same structure of the theoretical construct with the same number of indicators referred to in the literature. The one exception is the *Open Systems*, which showed more adequate goodness-of-fit indices with one less index. These four latent constructs showed nomological validity for all quadrants, as well as convergent validity. Thus, we observed that the analysis of the competing values framework proposed by Quinn (1988) obtained a better fit per quadrant than when analyzed per leadership role performed.

The solution generated from the analysis of the global leadership model (which includes the four latent constructs) did not prove acceptable. After testing models with fewer indicators but with the same structure as the theoretical construct of Quinn's leadership (1988), the global leadership model composed of its four constructs showed nomological validity, convergent validity, and reliability.

Given the opportunity to confirm the adequacy of Quinn´s competing values framework to the health care area based on the large diversity and extension provided by a large number of different hospitals (N = 33) with different dimensions, levels of complexity and management models, we created a possibility to conduct studies on leadership in the health domain.

Research limitations and perspectives of future research

One of the limitations may be related to the final sample used in this study as it was conditioned by the acceptance of the boards of administration and surgical units to participate in this study, which we considered to be a major obstacle to sample representativeness. However, we observed that, despite not being randomized, this sample showed no significant differences according to the geographical regions, the legal management model (SA/SPA) and the level of complexity (three levels). We also observed that the sample proved adequate to the use of structural equation models.

We recommend conducting studies with 360-degree evaluations, including subordinates, peers and hierarchical superiors, comprising both differences and similarities in the assessment of the gaps at the three levels. This 360-degree methodology would make it possible to assess the leader's ability to adjust the performance of the roles according to the subordinates' needs. We also suggest that the study be replicated by assessing the performance of the eight leadership roles integrated within the models of behavioral complexity, thus emphasizing the differentiation in action and the adequacy of the roles to the situation, as argued by Hooijberg, Hunt, and Dodge (1997). Finally, we suggest that longitudinal studies be conducted to assess the leadership behavior during different periods

of time, as well as similar studies with other samples and populations so as to contribute to the validation of the results of this study.

CONCLUSIONS AND IMPLICATIONS

Quinn's leadership questionnaire (1988), in its Portuguese version adapted to health care settings, showed adequate psychometric properties. The CFAs showed an overall fit of the date to the mode in the roles, the quadrants and the global model. However, some adjustments should be made, depending on whether we use each of the eight roles, the four quadrants or the model as a whole.

This research study is especially important nowadays given the restructuring of health care services in Portugal, and it may add value to the Hospitals' management model. The assumption of leadership as a key factor may be important to assess the effectiveness and efficiency of the skills of managers and hospital administrators.

The health care services, because of their dimension and cultural diversity, with different professions and specializations, have a highly complex type of management. It is thus necessary to use valid and reliable tools adapted to the Portuguese reality that consistently contribute to diagnose and discriminate effective leadership profiles This instrument is also relevant and useful as it assesses the leadership skills through its roles, rather than management skills. According to Bennis and Nanus (1985), the organizations are usually "over-managed" and "under-led", so it is essential to assess the leaders, as they have a strong capacity to influence the behavior of their subordinates.

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