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NEW MODELS OF HEALTH SERVICES PROVISION IN PORTUGUESE HEALTH INSTITUTIONS: A PERFORMANCE AND QUALITY INDICATORS REVIEW & ANALYSIS

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Abstract:
Background: The expansion of health professionals' mobility can have effects on planning, regulation and maldistribution of HRH, being associated with a higher professional *turn-over*, with effects on the performance of the organization. **Objective:** In this study we aimed to 1) analyse the level to which health organizations in an European country, Portugal, recur to external health professionals and health services provision, as a reflection of the mobility of health professionals between institutions, at local or regional levels, and 2) how that affects health care organizations performance, on dimensions like safety, quality and productivity. **Study Design and Setting:** Observational, cross-sectional, quantitative study, using secondary data analysis (indicators) from Health Units registered at the Central Health Administration Authority. Multivariate analysis of quantitative data correlation and multiple regression) was performed. **Results:** Significant Pearson's correlation was found for costs indicator (percentage of costs), productivity indicator (waiting time for elective surgery), access indicator (waiting time for first consultation), and performance indicator (percentage of day surgery), however no significant correlations for the selected variables were found. **Conclusions:** Results suggested that there are no changes at performance level, for health institutions due to recurring to external health services and health professionals' provision and health outcomes. At national level, this practice represents a relevant percentage of the health costs budget, justifying further studies and research on this theme, to allow comparison (benchmarking) with other European countries.

Keywords: mobility, health, services, costs, outcomes, professionals, Europe, performance

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1. Background

The growing health professional's mobility, and provision of health services by free - circulating professionals, in the EU regions is now well established as a relevant segment of health labour market [1, 2]. The European Union Directive 2011/24/EU [3] assures and incentives the cooperation in health care services and provision of cross-border health care, at local and regional level, promoting the elimination of main barriers to cooperation between health care providers, including professional flows, in "*cross- border regions, implementation of recommendations and guidelines for good practices, continuous qualification and development of health professionals, and observation of safety and quality standards and requirements*" [4, 5, 6].

Health professionals mobility can change the pool (composition) of health human resources [7] for the source and for destination countries, and raises questions concerning safety and quality of health care provided, differences of skills, practices and training, and at competences, regulation, language and cultural levels [7, 8, 9, 10]. On the other end, the increase in flows of health professionals can also have effects on planning, regulation and distribution of HRH, with potential aggravation of maldistribution of services and HRH, skills mismatch, and lack of information on health workers flows [10, 11, 12]. Mobility of health workers is associated with higher *turn-over* of professionals, resulting in higher recruitment, selection, and training of new professionals costs (tangible costs), a potential reduction on overall effectiveness of an organization (intangible costs) affecting the organization culture, with loss of social and human capital, and consequently on the performance of the organization [13, 14, 15, 16].

Some authors defend the notion of turn-over being non-detrimental to organisation performance [17, 18] suggesting a more complex relationship between performance and turn-over, and sustaining that moderate turn-over and mobility "*is positive for national economies*", where "*workers move across jobs to meet their expectations*" [17, 18]. Voluntary turn-over is then considered as beneficial for the worker, attracted by better career opportunities, experiencing different cultures or higher incomes [16, 17, 18]. Several publications [18, 19, 20] studied the effects of turn-over on the effectiveness and performance of the organization, from a proximal (workforce related) perspective.

One study found that the replacement of absent workers by temporary workers or outside contractors is 15% to 19% more expensive, whereas when overtime was used, it costs 33% to 44% of the regular rate of pay [23]. Although there are more than one perspective on the relationship between "turn-over" (voluntary) and work performance [24, 25, 26] there is consensus that turn-over increases costs and is negatively related to organizational performance [25, 27]. From the organization side, "turn-over" could bring new skills and ideas, allowing the replacement of lower performers [16, 17, 18, 19].

Other determinants of the turn-over relationship with organizational performance were found, like employment systems, size of the organization [28] and region or location. Location was found as a relevant factor for turn-over/performance relation, depending on "*with a predominant collectivist or individualist organizational culture*" with a higher or

lower tolerance to turn-over effects" [25]. Economies types (liberal or controlled), differences in cultures and structure between nations also may affect turn-over/performance relation [25, 26, 27, 29]. Healthcare organizations, being more dependent on human capital and professionals' roles for organizational performance, by their nature, comparing with other industries, are therefore more vulnerable to human capital losses and high "turn-over rates" [25].

1.1 Objective

In this study we aimed to analyse the level to which health organizations recur to external health professionals and health services provision, as a reflection of the mobility of health professionals between institutions, at local or regional level, in an European country, Portugal (EU), and how that model of health services provision affects health care organizations performance, comparing 1) the level of recurring to external health professionals and health services provision, and 2) their possible effects on health care organizations/ institutions performance outcomes, through health performance indicators analysis.

2. Methods

2.1 Study Design and Setting

For that purpose, we conducted a multivariate analysis [30, 31] of health performance indicators (secondary data), obtained, with permission, from the Central Health Administration Authority –ACSS [32], for the year of 2017. An observational, cross-sectional study, was conducted, including all Health Units, registered at the Central Health Administration Authority –ACSS [32] (universal sample). We looked for variables associations and correlations, and multiple regression analysis was performed using the SPSS 25 software.

2.2 Main Outcome Measures

2.2.1 Description of Indicators (variables)

Data were collected per Health Units/Institution, (hospitals) as a universal sample, where all Units (Hospitals) were included, as long as registered in the Health Services Central Administration [32] data base. The selection of indicators was made according to criteria of relevance for health outcomes, correct measurement of results, validity, reliability and comparability [33,34,35].

As **independent variables**, the following indicators were selected:

- **Structure Indicators**: number of professionals, professional category (nurses, doctors) type of link to the institution (cadre, liberal status, with or without a permanent link to the institution, agency temporary recruitment), nationality (national European or non-European).
- **Outcomes Indicators:**
  Access (Waiting time for first consultation);

Productivity (Waiting time for elective surgery);
Performance Indicators (Percentage of day surgery;
Percentage of hip fracture operated in 48h).

- **Quality& Safety Indicators**
  Quality Indicators (DVT prophylaxis);
  Complications and Adverse Effects Indicators;
  (Pressure Ulcers, Post –Surgical Sepsis /EP/ DVT).

As **dependent variable**, an indirect cost indicator was selected, reflecting the costs (in percentage, per health unit) of health professionals (staff), from health services externally provided, (e.g., services provided by professionals working for external recruitment agencies).

- **Costs Indicator:** costs with health professionals due to externally provided health services, in percentage, and per health unit.

2.3 Source of Data

All data were collected, with permission, from the Health Services Central Administration [32] database and reports, for the year of 2017 (values per month, middle year, time of data collection –October 2017).

Table 1: Variables codification

Variables name	Description
Costs	Costs with health professionals due to externally provided health services, in percentage, and per health unit.
Access	Waiting time for first consultation
Productivity	Waiting time for elective surgery
Performance I	Percentage of day surgery
Performance II	Percentage of hip fracture operated in 48h
Quality	DVT prophylaxis
Complications & Adverse effects I	Pressure ulcers
Complications & Adverse effects II	Postsurgical Sepsis /EP/ DVT

Although information regarding structure indicators is available, with detailed information on the number of professionals, professional category (nurses, doctors) type of link to the institution (cadre, liberal status, with or without a permanent link to the institution) nationality, country of origin), data concerning health professionals without a permanent link to the institution (and no longer in training positions), like health professionals recruited by recruitment agencies for temporary or seasonal appointments, or data on health professionals that, having a link to one health institution, have a regular or long term collaboration with another health institution, was not found.

For that reason, it was not possible to compare institutions with higher rates or lower rates of recurring to external health professionals and health services provision. Structure indicators, although available, were not included in the analysis to avoid redundant information and possible bias.

In the absence of detailed data regarding direct measure of recourse to external services and professionals, by health units, an indirect measure, a financial indicator of costs, "*the percentage of costs with health professionals from external health services provision*", was used. Indicators for patient satisfaction were not available for the year of the study (2017), so it is not possible to be included in the analysis.

3. Results

Indicators selected for the study, obtained at central data bases (Health Administration Central Authority), include outcomes indicators (productivity indicators: waiting time for elective surgery, waiting time for first consultation), quality indicators **(**DVT prophylaxis), safety indicators (adverse effects indicators: pressure ulcers, sepsis, postsurgical sepsis /EP/ DVT) and financial indicators (Costs with health professionals due to externally provided health services, in percentage, per health unit/institution). All the indicators obtained refer to all health institutions at National level, per institution or health organization.

3.1 Statistical Analysis

3.1.1 Statistical Methods

Regarding descriptive statistics, central location and dispersion measures results are presented. Data distribution analysis was performed, with Kolmogorov-Smirnov (KS) and Shapiro-Wilk tests, as well as missing values and outlier analysis (Little's MCAR test, distance measures – Cook's and Leverage).

Inferential statistical analysis was performed to establish possible variables associations or correlations. Variables were compared with calculation of confidence intervals and significance tests for proportions and media. Pearson´s test of correlation was applied to test for correlation of variables. A multiple regression analysis was performed for a deeper analysis of variables correlations.

3.1.2 Descriptive Statistics

Data distribution was analysed with normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) for the dependent variable. The original data set presents a dependent variable "costs percentage" with a non-normal distribution, with a mean value of 4,60%, a (*p25*: 1, 73%; *p 75*: 7,03%), and an *outlier* value for one observation. Missing values for all data set were below 5% (4,1%). The descriptive statistics for all variables included in this study are presented in Table 2.

Table 2: Descriptive Statistics

Variables name	N	Minimum	Maximum	Mean	Std. Deviation
Costs	31	0.5%	15.5%	4.6%	3.2%
Access	42	48.0%	99.7%	73.9%	13.1%
Productivity	42	0.217	1.909	0.847	0.378
Performance I	42	0.2%	100.0%	68.9%	20.5%

Performance II	39	0.0%	93.3%	48.3%	21.2%
Quality	42	0.000	286.650	90.0	97.4
Complications & Adverse effects I	42	0.000	0.011	0.00084	0.00204
Complications & Adverse effects II	42	0.000	2288.330	342.8	443.0

3.1.3 Inference Statistics

In a first stage, Pearson's correlation was tested for all variables. A significant Pearson's correlation was found between the dependent variable Costs (percentage of costs) and the indicators Access (waiting time for first consultation, p=0,007), Performance I (percentage of day – surgery, p=0,018), Productivity (waiting time for elective surgery, p=0,005) and Complications & Adverse effects II (postsurgical Sepsis /EP/ DVT, p=0,055). Independent variables were not correlated among each other, with only one exception. The significant correlations tables are presented in Table 3.

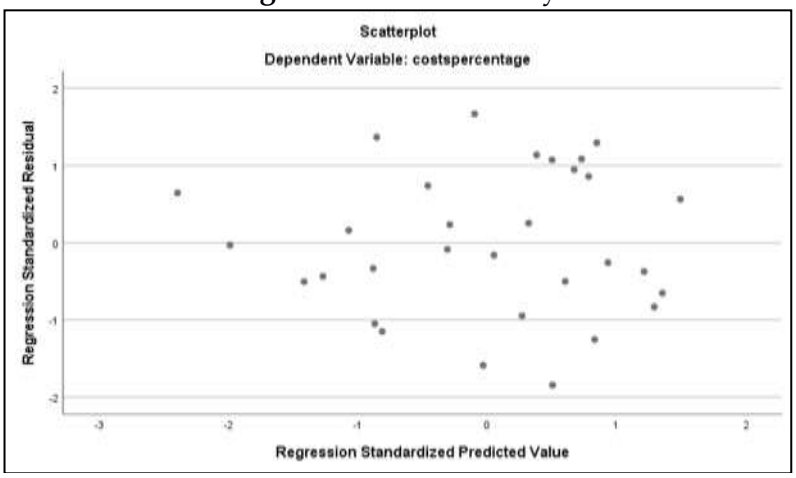
Table 3: Correlations

Variables (N=31) **r = Pearson correlation**		**Access**	**Performance**	**Productivity**	**Complications & Adverse effects II**
Costs	r	-0.440	0.379	-0.452	0.310
	p	** 0.007	* 0.018	** 0.005	* 0.045
Access	r	1.000			
	p				
Performance I	r	-0.225	1.000		
	p	0.112			
Productivity	r	0.366	-0.017	1.000	
	p	* 0.021	0.464		
Complications &	r	-0.111	0.209	-0.224	1.000
Adverse effects II	p	0.277	0.130	0.113	

3.1.4 Multiple Regression Analysis

Regression analysis was performed for the independent variables significantly correlated with the dependent variable (costs). Because the analysis of the original dataset presented an outlier value, this value was corrected, replacing the outlier value for the dependent variable - the outlier value was 15.5 - by the mean value for the dependent variable Y (4,6%). The regression included the correlated independent variables, and a good model fit was obtained, explaining 40,8% of the independent variable dispersion ($r=0.639$, $r^2=0.408$), and by the ANOVA test ($F_{4,26}=4.485$, $p=0.007$) indicating that the model is fit for the data. The multiple linear regression model assumptions were verified: to analyse the homoscedasticity, the P-P plot for standardized residual and the scatterplot of standardized residuals against standardized predicted values are presented in Figure 1, were there are no differences in the dispersion of standardized residuals for the range of standardized predicted values, so we can conclude that the homoscedasticity is verified;

Figure 1: Homocedascity



the independence or absence of self-correlation among independent variable was then analysed based on the Durbin –Watson test, with a value of 2.099, compared with the values of dL=1.160 and dU=1.735 from the Savin-White tables for a model with 31 observations and four independent variables, and since the Durbin-Watson test value is higher than dU, the null hypothesis of null self-correlation cannot be rejected, so the independence assumption is also verified; the linearity assumption is verified by the ANOVA test, already presented, indicating that there is a linear relation in the global model; the normality was verified using the P-P plot, also in Figure 1, showing that there are no relevant deviations of residuals from the normal distribution, and specially the Kolmogorov-Smirnov (K-S) test for the normal distribution, since its results (KS_{31}=0,140, p=0,128) indicate that the null hypothesis of normal distribution cannot be rejected; and finally the multicolinearity was analysed by the Variance Inflation Factor (VIF), for which values higher than two indicate the assumption violation, and since the values presented in Table 4 for VIF are all much smaller than the reference value (at least lower than 1.3), we can conclude that the assumption of multicolinearity is also verified. So, globally, all assumptions are verified and the model results can be used for inference.

Although the model was fit for the data, as shown by the ANOVA test, and significant Pearson´s correlations were found for some of the variables, multiple regression did not show significant correlation for the selected variables, as shown in Table 4, using a reference value of 5% for the significance.

Table 4: Regression Model Results

Coefficients						
Variables	**b**	**Std. Error**	**95% CI**	**t**	**p**	**VIF**
Constant	7.052	2.720	[1.460, 12.644]	2.592	0.015	
Access	-4.258	2.964	[-10.349, 1.834]	-1.437	0.163	1.223
Performance I	0.033	0.018	[-0.004, 0.069]	1.816	0.081	1.107
Productivity	-2.079	1.063	[-4.264, 0.107]	-1.955	0.061	1.218
Complications & Adverse effects II	0.002	0.002	[-0.002, 0.005]	.949	0.351	1.102

The variables analysed by this model indicate that: the increase in Productivity is related to a mean decrease in the Costs (b=-2.079, [-4.264, 0.107]), but the relation is not statistically significant (p=0.061), although it is very close to the reference value, so very close to be significant; the increase in Performance is related to a mean increase in the Costs (b=0.033, [-0.004, 0.069]), but the relation is also not statistically significant (p=0.083), although it is close to the reference value, so close to be significant; the increase in Access is related to a mean decrease in the Costs (b=-4.258, [-10.349, 1.834]), but the relation is not statistically significant (p=0.163); the increase in Complications & Adverse effects II is related to a mean increase in the Costs (b=0.002, [-0.002, 0.005]), but the relation is not statistically significant (p=0.351).

4. Conclusion

In this study we aimed to analyse the level to which health organizations recur to external health professionals and health services provision, as a reflection of the mobility of health professionals between institutions, at local or regional level, in a European country, Portugal (EU), and how that model of services provision affects health care organizations performance. For that purpose we conduct a secondary data analysis, of health outcomes indicators obtained and authorized for the study, regarding access, productivity, quality, safety indicators and costs indicators, concerning all Health Units registered and under the authority of the Health services Central Administration and National Health Service,.

Data showed that, at national level, the mean value for the percentage of costs with health professionals for external health services provided is 4, 6% of the total costs with personal (percentage of the costs from the total costs with health professionals) [36]. At national level, in Portugal, the budget for human resources is estimated in 3,6 billion per year (euros) [36], where 4,6% (approximately 165 million per year) corresponds to the percentage of costs health institutions have with health professionals and health services externally provided, by recruitment agencies or other sources.

Health professionals and health services externally provided may be either national professionals or foreign professionals that migrate from other EU countries, on permanent or short-term contracts, and may include some crossing border professionals.

So far, we could not find any paper or study that provides information on the level to which hospitals at European level recur to external health services providers, or the level of costs incurred. There is a lack of information on quantitative data and benchmarking on costs with external health services providers, in Portugal and perhaps concerning the EU region. Also, health professionals may have a link with one health institution, like a permanent individual contract, and also work for recruitment agencies providing health services to one or more health institution, on an occasional or regular basis, which adds to the difficult task of getting accurate information on which level health organizations recur to external health services providers. Currently there is no accurate or complete data on this type of health services provision, which mobilizes an unknown number of health professionals, either at national level and throughout Europe.

Consequently, it is not possible to establish a comparison or benchmarking at national level or at countries level, in Europe. Our results suggested that external health services provision is correlated (Pearson's correlation) with productivity indicator, "waiting time for elective surgery", and "waiting time for the first consultation", with the performance indicator "percentage of ambulatory surgery" and with the complication & adverse effects indicator "post-surgical sepsis and infection". However, multiple regression analysis did not find statistically significant correlations among variables. As a conclusion, no relation was established between health organisations performance, indicators and external health services provision indicators, suggesting that there is no significant relation, and consequently no significant changes, between health services outcomes and performance and external health services and health professionals provision.

Although only a few works were found on this matter, data shows that at national level, recurring to external health professionals and services providers represents a relevant percentage of health costs budget, with a 165 million revenue (per year), justifying further studies and research on this theme, gathering information to allow benchmarking and data comparison among countries in European Union.

Conflict of Interests

No conflict of interests is declared.

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