

RESEARCH ARTICLE (ORIGINAL) 8

Cost analysis of the first wave of the COVID-19 pandemic on human resource management in a Portuguese hospital

Análise de custos da primeira vaga da pandemia COVID-19 na gestão de recursos humanos num hospital português

Análisis del coste de la primera ola de la pandemia de COVID-19 en la gestión de los recursos humanos de un hospital portugués

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Abstract

Background: The COVID-19 pandemic has brought healthcare systems to the brink of collapse worldwide, imposing relevant economic challenges.

Objective: To analyze the costs related to the impact of the first wave of the COVID-19 pandemic on human resource management in a Portuguese hospital.

Methodology: Economic, retrospective, and single-center study. This study analyzed the costs of absenteeism, hiring new staff, and overtime work by health professionals (nurses, physicians, operational assistants, and diagnostic and therapeutic technicians) and compared data from March 1 to May 31, 2020 to the same period in 2019 to determine differences in costs.

Results: Data from 6,994 health professionals were included. Compared to 2019, an additional 8,817,199.84€ were spent on staff in this trimester (absenteeism: €6,842,284.64; hiring new staff: €363,540.03; overtime work: €1,611,375.17).

Conclusion: In the first trimester of the COVID-19 pandemic, the overall costs with health professionals almost tripled, representing almost €9 million more than in the same period in 2019.

Keywords: coronavirus infections; costs and cost analysis; personnel management; health personnel

Resumo

Enquadramento: A pandemia de coronavírus de 2019 (COVID-19) levou os sistemas de saúde à beira da rotura em todo o mundo, impondo desafios económicos relevantes.

Objetivo: Analisar os custos da primeira vaga da pandemia COVID-19 na gestão de recursos humanos num hospital português.

Metodologia: Estudo económico, retrospectivo e unicêntrico. Foram analisados os custos associados ao absentismo, com novas contratações e trabalho suplementar com profissionais de saúde (enfermeiros, médicos, assistentes operacionais e técnicos de diagnóstico e terapêutica). Determinaram-se as diferenças de custos entre 1 de março e 31 de maio de 2020 e o período homólogo de 2019.

Resultados: Foram incluídos dados referentes a 6994 profissionais de saúde. Comparado com 2019, neste trimestre gastaram-se mais 8 817 199,84€ com pessoal (absentismo: 6 842 284,64€; novas contratações: 363 540,03€; trabalho suplementar: 1 611 375,17€).

Conclusão: O primeiro trimestre da pandemia COVID-19 levou à quase triplicação de custos globais com profissionais de saúde, representando quase 9 milhões de euros gastos a mais do que no período homólogo de 2019.

Palavras-chave: infeções por coronavírus; custos e análise de custo; administração de recursos humanos; pessoal de saúde

Resumen

Marcos contextual: La pandemia de coronavirus de 2019 (COVID-19) ha puesto a los sistemas sanitarios al borde del colapso en todo el mundo y ha planteado importantes retos económicos.

Objetivo: Analizar los costes de la primera ola de la pandemia de COVID-19 en la gestión de los recursos humanos en un hospital portugués.

Metodología: Estudio económico, retrospectivo y monocéntrico. Se analizaron los costes asociados al absentismo, las nuevas contrataciones y el trabajo adicional de los profesionales sanitarios (enfermeros, médicos, auxiliares y técnicos de diagnóstico y terapia). Se determinaron diferencias de costes entre el 1 de marzo y el 31 de mayo de 2020 y el mismo periodo de 2019.

Resultados: Se incluyeron los datos de 6994 profesionales sanitarios. En comparación con 2019, en este trimestre se gastaron 8 817 199,84 euros más en personal (absentismo: 6 842 284,64 €; nuevas contrataciones: 363 540,03 €; trabajo adicional: 1 611 375,17 €).

Conclusión: El primer trimestre de la pandemia de COVID-19 hizo que casi se triplicaran los costes globales relacionados con los profesionales sanitarios, lo que supuso un gasto de casi 9 millones de euros más que en el mismo periodo de 2019.

Palabras clave: infecciones por coronavirus; costos y análisis de costo; administración de personal; personal de salud



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Introduction

The 2019 coronavirus pandemic (COVID-19) has brought health systems to the brink of rupture worldwide (Huang et al., 2020; Lu et al., 2020; World Health Organization, 2020a), imposing an overwhelming workload and stress on health professionals (Lai et al., 2020; Li et al., 2020; Xiao et al., 2020).

The pandemic has posed several challenges to health systems that had to adapt their circuits and reorganize their institutions, among other things, to provide an adequate response while having to deal with the shortage of health professionals (because demand has constrained supply), personal protective equipment (PPE), and hospital equipment.

Despite the increase in the number of dedicated services and the prevention and preparation efforts, the exponential increase in the number of patients in the second and third waves tested once again the capacity of the national health system, particularly of its professionals (Kaye et al., 2020). The number of confirmed cases continues to increase worldwide, with over 102.1 million reported cases and over 2.2 million deaths since February 2, 2021 (World Health Organization, 2020b).

Human resource management in health institutions has faced unprecedented trials, requiring substitution of workers due to infection/disease and subsequent periods of absenteeism, the creation of new services, mobility, recruitment of health workers, overtime work, among other adjustments (American Hospital Association, 2020; Kaye et al., 2020; Santos et al., 2020). All these dynamics have important implications for human resource management and represent major economic challenges.

As evidence in this area remains scarce, this study aimed to analyze the costs related to human resource management during the first wave of the COVID-19 pandemic (between March 1 and May 31, 2020) in a university hospital.

Background

Health institutions worldwide face unprecedented economic challenges due to the COVID-19 pandemic (American Hospital Association, 2020; Kaye et al., 2020; Pak et al., 2020). For example, a report on the economic impact of COVID-19 from March to June 2020 estimated an impact of \$202.6 billion in losses for America's hospitals and health systems, or an average of \$50.7 billion per month (American Hospital Association, 2020). In the case of low- and middle-income countries, the costs are estimated to reach \$52 billion (equivalent to \$8.60 per person) every four weeks to provide an effective healthcare response to COVID-19 (American Hospital Association, 2020).

From a global economic standpoint, the World Bank projects a nearly 8% decline in global growth, with poorer countries feeling most of the impact. The United Nations projects that 2020 will cost the global economy around \$2 trillion (Kaye et al., 2020).

Several factors contribute to these numbers. First, there have been steep reductions in revenue for hospitals and health systems due to the COVID-19 pandemic, namely due to the cancellation of non-essential activity (American Hospital Association, 2020). Second, these losses in revenue were aggravated by a sharp increase in hospital costs, associated with an increase in the number of COVID-19-related hospitalizations in general wards or dedicated intensive care services, whose high treatment costs (American Hospital Association, 2020) receive less funding than expenditure (Shin et al., 2021). Third, the costs of supporting professionals have also increased exponentially, including the costs with COVID-19 materials, screening, and testing, among others. Finally, the lack of preparation and the increased need for specific materials for health professionals, such as PPE and other hospital equipment, have exposed several deficiencies of health systems worldwide, calling for new essential plans for pandemic preparedness (Higginson et al., 2020; Kaye et al., 2020; Shukla et al., 2020).

Research question

What were the costs of human resource management during the first wave of the COVID-19 pandemic in a Portuguese hospital?

Methodology

A descriptive, single-center, retrospective study was conducted. Data for the period from March 1 to May 31, 2020 were analyzed in comparison with the same period in 2019 to determine any differences. Demographic and cost specificities were considered, using different complementary data sources provided by the human resource management department.

The population consisted of all health professionals from the following professional groups: operational assistants, nurses, physicians, and diagnostic and therapeutic technicians. The remaining professionals were excluded mainly to reduce the complexity of the analysis, but also because the selected professional groups are the largest groups involved in direct care and those most affected by the disease. The study was carried out in a tertiary and university hospital located in the central region of Portugal, with more than 1,700 beds and over 8,000 health professionals. It consists of a network of hospital units (two general adult hospitals, two maternity hospitals, a pediatric hospital, and a psychiatric hospital) with well-structured and integrated services and technologies to provide society with a humanized, comprehensive, reliable, and transparent service. Continuous variables (mean and standard deviation) and categorical variables (frequencies and percentages) were used for the health professionals' demographic characterization (Marôco, 2014).

The cost analysis study was carried out in three areas: i) costs of absenteeism with paid absences and productivity loss, ii) costs of hiring new staff, and (iii) costs of over-

time. The difference between 2020 and 2019 (March, April, and May) was determined for each area. Concerning absenteeism, all reasons were considered, except for vacations, official absences, unpaid leave, temporary assignment, worker-student statutes, union activities, and participation in exams/tenders. The costs of the amount of work paid but not performed due to absenteeism were obtained through the following formula: Absenteeism costs = Number of working days of absence per professional group * Average daily wage of the professional (obtained through the hourly wage of each professional group). Due to financial implications, sub-analyses were carried out based on the health professionals' employment contract: individual employment contracts (*contratos individuais de trabalho*, CIT) or public service employment contracts (*contratos de trabalho em funções públicas*, CTFP). Concerning the costs of hiring new staff, the entry-level salary was considered for each professional group. The following formula was applied: Costs with new contracts = Number of professionals hired * Monthly entry-level salary per professional group (Salary + contribution to Social Security). The costs of overtime work represent the costs paid in accordance with the legislation in force, adjusted by professional group. Thus, the impact of the costs on the hospital corresponds to the difference in

the costs with absenteeism per CTFP worker attributed to the corresponding loss of productivity + difference in the costs with new contracts and overtime. The salaries paid to absent CIT workers were not considered because they were supported by Social Security rather than the hospital center.

Data were exported to several Microsoft Excel 2016 spreadsheets to perform the dynamic calculations mentioned above, and additional analyses were performed using IBM SPSS Statistics software, version 23.0.

The Ethics Committee of the Coimbra Hospital and University Center (CHUC-058-20) approved the study. Although imperfectly given the hybrid nature of this analysis, this study followed the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement (Husereau et al., 2013).

Results

Data from 6,994 health professionals of the selected hospital center were included. Administrators, managers, pharmacists, senior technicians, computer technicians, and technical assistants were excluded. Table 1 shows the demographic characteristics of the population.

Table 1

Demographic characteristics of the 6,994 health professionals

Characteristic	n (%)
Age, mean (SD), years	45.6 (16.6)
Gender	
Men	1,827 (26.1)
Women	5,167 (73.9)
Professional group and contract	
Physicians	1,712 (24.5)
CTFP	1,246 (72.8)
CIT	466 (27.2)
Nurses	2,999 (42.9)
CTFP	1,613 (53.8)
CIT	1,386 (46.2)
Operational assistants	1,782 (25.5)
CTFP	863 (48.4)
CIT	919 (51.6)
Diagnostic and Therapeutic Technicians	501 (7.1)
CTFP	315 (62.9)
CIT	186 (37.1)

Note. SD = standard deviation; CTFP = Public Service Employment Contract; CIT = Individual Employment Contract.

Nurses represented 42.9% of the total population, followed by operational assistants (25.5%), physicians (24.5%), and, finally, diagnostic and therapeutic technicians (7.1%). The sample is predominantly female (73.9%). The type of contract CTFP was more prevalent in physicians (72.8%), but less in diagnostic and therapeutic

technicians (62.9%), and even less in nurses (53.8%) and operational assistants (48.4%).

Table 2 shows the financial impact of the first wave of the COVID-19 pandemic on human resource management over the three months under analysis.

Table 2*Economic impact of the first wave of the COVID-19 pandemic on human resource management costs*

	1 March - 31 May, 2019		1 March - 31 May, 2020		Difference
	<i>n</i>	Costs in €	<i>n</i>	Costs in €	
Work paid but not performed (<i>n</i> = working days of absence)	40,858	3,854,600.64	102,448	10,696,885.28	6,842,284.64
Nurses	16,157	1,574,338.08	31,276	3,047,533.44	1,473,195.36
Total CTFP	5,757	560,962.08	12,415	1,209,717.60	648,755.52
Total CIT	10,400	1,013,376.00	18,861	1,837,815.84	824,439.84
Operational assistants	14,350	623,364.00	33,358	1,449,071.52	825,707.52
Total CTFP	8,948	388,701.12	20,077	872,144.88	483,443.76
Total CIT	5,402	234,662.88	13,281	576,926.64	342,263.76
Physicians	7,844	1,448,316.16	30,108	5,559,141.12	4,110,824.96
Total CTFP	5,191	958,466.24	20,165	3,723,265.60	2,764,799.36
Total CIT	2,653	489,849.92	9,943	1,835,875.52	1,346,025.60
TDTs	2,507	208,582.40	7,706	641,139.20	432,556.80
Total CTFP	1,371	114,067.20	4,404	366,412.80	252,345.60
Total CIT	1,136	94,515.20	3,302	274,726.40	180,211.20
New contracts	49	185,954.52	160	549,494.55	363,540.03
Nurses	33	147,637.36	80	357,908.76	210,271.40
Operational assistants	16	38,317.16	80	191,585.79	153,268.63
Physicians	0	0	0	0	0
TDTs	0	0	0	0	0
Overtime		5,407,950.40		7,019,325.57	1,611,375.17
Nurses		1,069,585.99		1,576,469.40	506,883.41
Operational assistants	-	175,293.60	-	444,332.90	269,039.30
Physicians		3,862,846.55		4,621,982.38	759,135.83
TDTs		300,224.26		376,540.89	76,316.63
Total	-	9,448,505.56	-	18,265,705.40	8,817,199.84

Note. TDTs = Diagnostic and Therapeutic Technicians; CTFP = Public Service Employment Contract; CIT = Individual Employment Contract.

Regarding the amount of work paid but not performed due to absenteeism during these three months of 2020 compared to the same period in 2019, physicians had the largest cost difference (€4,110,824.96), followed by nurses (€1,473,195.36), operational assistants (€825,707.52), and diagnostic and therapeutic technicians (€432,556.80). Overall, the economic impact of absenteeism amounted to more than €6.5 million (€6,842,284.64). Nurses were the only professional group whose absenteeism costs were higher in CIT workers than in CTFP workers (€824,439.84 and €648,755.52, respectively). The professional group with the highest absenteeism rate was the group of operational assistants, with 33,358 working days of absence. Forty-seven nurses and 64 operational assistants were

hired compared to the same period in 2019, resulting in a cost difference of €363,540.03.

In relation to the costs with overtime work, physicians were the professional group with the largest cost differences (€759,135.83), followed by nurses (€506,883.41), operational assistants (€269,039.30), and diagnostic and therapeutic technicians (€76,316.63). The total cost increase with overtime work was more than €1.5 million (€1,611,375.17).

Finally, the impact on the hospital center of the work paid to but not performed by CTFP workers with the corresponding loss of productivity was €6,124,259.44, which, together with the costs of new contracts and overtime work, has an overall cost impact of nearly €9 million (€8,819.84).

Discussion

This study was the first one in Portugal and one of the few studies worldwide to analyze the costs related to the impact of the first wave of the COVID-19 pandemic on human resource management, reporting the specific reality of a university hospital center.

In the first three months of the pandemic, there was an overall increase of almost €9 million (€8,817,199.84) when compared to the same period in 2019 due to the costs with paid work but not performed due to absenteeism, hiring new staff, and overtime in four groups of health professionals.

This study found that the costs with absenteeism and overtime were higher among physicians than among other health professionals, which is explained by their higher hourly wage. Nurses were the only professional group whose costs with absenteeism were higher in CIT workers than in CTFP workers. This information is relevant because CIT workers' absences are paid for by Social Security rather than the hospital, as in the case of CTFP workers. This situation allows limiting the costs of the hospital center from a microeconomic standpoint. In this period, only new nurses and operational assistants were hired, but, later on, other professional groups were also hired.

The United Nations estimated that the economic crisis triggered by the COVID-19 pandemic would hurt economies, regardless of the countries' income level, as seasonally adjusted industrial production index data pointed out that both lower- and upper-middle-income countries would be significantly affected by COVID-19 (22% and 24%), with high-income countries having an average loss of 18% (United Nations, 2020).

Therefore, interventions must be implemented to help mitigate the impact of COVID-19 on health systems (Shaaban et al., 2020). There is an urgent need to develop financial support policies, increase the likelihood of attracting potential financial opportunities, reorganize hospital care models and public health priorities and, finally, prepare contingency plans for future waves of COVID-19 and/or other pandemic responses (Ehrenberg et al., 2021; Shaaban et al., 2020).

Our results should be interpreted taking into account some limitations. First, cost estimates were only based on the costs of absenteeism, hiring of new staff, and overtime work, without considering the impact of the loss of revenue associated with paid work but not performed. In other words, this study focused on the costs rather than on the economic impact as a whole. Although hospital funds continue to be paid in "twelfths" and contract adjustments have been made, there must have been at least a relevant impact on surgery vouchers (called *cheques-cirurgia*) and additional compensatory production costs that do not fit our objectives. Nevertheless, our analysis provides a realistic financial perspective, even if *attenuated* by the effects of not including these data. Secondly, the single-center nature does not allow for the generalization of the results, although it reflects what may have been the experience of many Portuguese hospitals. Finally, this study included

only four professional groups in the health area (physicians, nurses, hospital assistants, and diagnostic and therapeutic technicians). Although they do not represent the hospital population as a whole, these groups are the most prevalent ones (in our case, they represent 87% of the total population) that have a direct influence on care delivery and, consequently, a much higher probability of absenteeism due to infection with SARS-CoV-2 and its consequences.

Conclusion

The management of the first wave of the COVID-19 pandemic suffered a major financial impact. The costs with staff almost tripled, leading to an increase of almost €9 million in the first three months of the crisis. As the COVID-19 pandemic continues to spread globally, in addition to the increasing number of cases and deaths, the virus is expected to have an insidious effect on the world economy, especially in the health sector.

This situation will have relevant implications for clinical practice because hospitals and health professionals are negatively influenced, which can lead to future damage to the health system. For this reason, there is a need to promote financial support policies, reorganize hospital care models, and prepare contingency plans for future waves of COVID-19 or other pandemic responses.

Given the scarcity of studies on this topic, further cost analysis studies should be conducted to compare data.

Author contributions

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References

- American Hospital Association. (2020). *Hospitals and health systems face unprecedented financial pressures due to COVID-19*. www.aha.org
- Ehrenberg, J. P., Utzinger, J., Fontes, G., da Rocha, E. M., Ehrenberg, N., Zhou, X.-N., & Steinmann, P. (2021). Efforts to mitigate the economic impact of the COVID-19 pandemic: Potential entry points for neglected tropical diseases. *Infectious Diseases of Poverty*, 10(1), 2-10. <https://doi.org/10.1186/s40249-020-00790-4>



- Higginson, S., Milovanovic, K., Gillespie, J., Matthews, A., Williams, C., Wall, L., Moy, N., Hinwood, M., Melia, A., & Paolucci, F. (2020). COVID-19: The need for an Australian economic pandemic response plan. *Health Policy and Technology*, 9(4), 488-502. <https://doi.org/10.1016/j.hlpt.2020.08.017>
- Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., Xiao, Y., Gao, H., Guo, L., Xie, J., Wang, G., Jiang, R., Gao, Z., Jin, Q., Wang, J., & Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*, 395(10223), 497-506. [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5)
- Husereau, D., Drummond, M., Petrou, S., Carswell, C., Moher, D., Greenberg, D., Augustovski, F., Briggs, A. H., Mauskopf, J., & Loder, E. (2013). Consolidated health economic evaluation reporting standards (CHEERS) statement. *European Journal Health Economics*, 14(3), 367-372. <https://doi.org/10.1007/s10198-013-0471-6>
- Kaye, A. D., Okeagu, C. N., Pham, A. D., Silva, R. A., Hurley, J. J., Arron, B. L., Sarfraz, N., Lee, H., Ghali, G. E., Gamble, J., Liu, H., Urman, R., & Cornett, E. M. (2020). Economic impact of COVID-19 pandemic on healthcare facilities and systems: International perspectives. *Best Practice & Research Clinical Anaesthesiology*. <https://doi.org/10.1016/j.bpa.2020.11.009>
- Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., Hu, J., Du, H., Chen, T., Li, R., Tan, H., Kang, L., Yao, L., Huang, M., Wang, G., Wang, H., Liu, Z., & Hu, S. (2020). Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Network Open*, 3(3), e203976-e203976. <https://doi:10.1001/jamanetworkopen.2020.3976>
- Li, Z., Ge, J., Yang, M., Feng, J., Qiao, M., Jiang, R., Jiangjiang, B., Zhan, G., Xu, X., Wang, L., Zhou, Q., Zhou, C., Pan, Y., Liu, S., Zhang, H., Yang, J., Zhu, B., Hu, Y., Hashimoto, K., Yang, C. (2020). Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. *Brain Behavior and Immunity*, 88, 916-919. <https://doi.org/10.1016/j.bbi.2020.03.007>
- Lu, H., Stratton, C. W., & Tang, Y. W. (2020). Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *Journal Medicine Virology*, 92(4), 401-402. doi.org/10.1002/jmv.25678
- Marôco, J. (2014). *Análise estatística com o SPSS statistics*. Report Number.
- Pak, A., Adegboye, O. A., Adekunle, A. I., Rahman, K. M., McBryde, E. S., & Eisen, D. P. (2020). Economic consequences of the COVID-19 outbreak: The need for epidemic preparedness. *Frontiers in Public Health*, 8(241), 1-4. <https://doi.org/10.3389/fpubh.2020.00241>
- Santos, E. J., Ferreira, R. J., Batista, R., Pinheiro, V., Marques, A. A., Antunes, I., & Marques, A. (2020). Health care workers not in the frontline are more frequently carriers of coronavirus disease 2019: The experience of a tertiary Portuguese hospital. *Infection Prevention in Practice*, 2(4), 100099. <https://doi.org/10.1016/j.infpip.2020.100099>
- Shaaban, A. N., Peleteiro, B., & Martins, M. R. (2020). COVID-19: What is next for Portugal? *Frontiers in Public Health*, 8, 392-400. <https://doi.org/10.3389/fpubh.2020.00392>
- Shin, J.-h., Takada, D., Morishita, T., Lin, H., Bun, S., Teraoka, E., Okuno, T., Itoshima, H., Nagano, H., Kishimoto, K., Segawa, H., Asami, Y., Higuchi, T., Minato, K., Kunisawa, S., & Imanaka, Y. (2021). Economic impact of the first wave of the COVID-19 pandemic on acute care hospitals in Japan. *PLoS One*, 15(12), e0244852. <https://doi.org/10.1371/journal.pone.0244852>
- Shukla, D., Pradhan, A., & Malik, P. (2020). Economic impact of COVID-19 on the Indian healthcare sector: An overview. *International Journal Of Community Medicine And Public Health*, 8(1), 489-494. <http://dx.doi.org/10.18203/2394-6040.ijcm-ph20205741>
- United Nations. (2020). *Coronavirus: The economic impact: 10 July 2020: A health pandemic or a pandemic for the economy?* <https://www.unido.org/stories/coronavirus-economic-impact-10-july-2020>
- World Health Organization. (2020a). *WHO Director-General's remarks at the media briefing on 2019-nCoV on 11 February 2020*.
- Xiao, H., Zhang, Y., Kong, D., Li, S., & Yang, N. (2020). The effects of social support on sleep quality of medical staff treating patients with coronavirus disease 2019 (COVID-19) in January and February 2020 in China. *Medical Science Monitor*, 5(26), e923549. <https://doi.org/10.12659/MSM.923549>