Assessment of the **Portuguese Hospitals Websites** using HSWAI

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Summary

Improvement of health sector electronic services has been on the European Commission Information Society policy agenda for more than fifteen years, from the eEurope initiative[1] to the i2010 Strategy[2] and most recently the EU2020 Strategy[3]. This demands health sector organizations to develop websites that enable patients to receive a high-level health service[4]. Hospitals do not only provide information to their clients but their websites are increasingly used to facilitate interaction and offer online services to national and international audiences. Their websites have evolved to service channels between health sector organizations, patients and other stakeholders. Evaluation research is necessary to monitor and further improve the quality of these websites.

Besides, the Sustainable Development Goals (SDG) urge for new solutions that promote Good health and well-being (SDG3) and Peace, justice and strong institutions (SDG16). Well-developed health institutions websites that are inclusive, have good usability, and promote institution transparency, amongst other characteristics, directly contribute to these goals.

The development of websites that better serve patients' needs is thus a key element in the evolution of hospital services provided through the Internet. To deliver the expected level of service, it is important to understand how users perceive and evaluate health sector web presence.

There are several studies related to evaluation on health-sector websites, each one assessing a variety of elements. However there is not yet an unequivocal definition of the essential health sector website characteristics, and thus, the discourse about health sector institutions' website presence evaluation remains open[5].

In an effort to close this gap, the Health Sector Website Assessment Index (HSWAI) is the result of the development of an instrument that compiles a set of indicators used to evaluate hospitals' websites. It offers hospital management aggregated and scientifically sound information to improve provided services, it offers clients the possibility to compare and select health service providers, and, finally, it assists health sector policymakers in monitoring and further developing eHealth policy.

Health sector website assessment is built on identifying relative evaluation dimensions and conceived measurements of health sector websites' services. This document presents a picture of the website presence of Portuguese hospitals by detailing the results of applying HSWAI to 135 public and private hospitals between July and August 2019.

Hospital selection was based on the list provided by the Entidade Reguladora da Saúde (ERS) on their website for National System for Health Evaluation[6] (SINAS)[7] from the list of 2017. The

[1] European Commission, eEurope, an Information Society for All, Communication on A Commission Initiative for the Special European Council of Lisbon, 23-24 March 2000, European Commission: COM(1999) 687 final, Brussels, 2000.

[2] European Commission, i2010 - A European Information Society for growth and employment: COM (2005) 229 final, Brussels, 2005.

[3] European Commission, Europe 2020. A European Strategy for smart, sustainable and inclusive growth. 2010, European Commission: COM(2010) 2020 final, Brussels. 2010.

[4] D. Kim, and H. Chang, Key functional characteristics in designing and operating health information websites for user satisfaction: An application of the extended technology acceptance model. International journal of medical informatics, 76(11), 2007, pp.790-800.

[5] J.M. Moreno, J.M. Del Castillo, C. Porcel, and E. Herrera-Viedma, A quality evaluation methodology for health-related websites based on a 2-tuple fuzzy linguistic approach, Soft Computing, 14(8), 2010, pp. 887-897.

[6] Sistema Nacional de Avaliação em Saúde

[7] https://apch2.ers.pt/pages/198

evaluation was performed by direct observation of each website, guided by a set of criteria and indicators.

Data collection method consisted on the aggregation of data from two different researchers, attributing to each sub-indicator value 0 or 1. Data was then manually compared, treated and analyzedResults were after calculated based on a weight system that attributed to each hospital website a final score between 0 and 1.

Results presented in this document follow different approaches. Besides the global ranking of websites according to the final score, ranking by criterion is also provided, namely: Criterion 1 – Content; Criterion 2 – Services; Criterion 3 - Community Interaction; and Criterion 4 - Technology Features. Also, segmented analysis by type of hospital (private and public), by population distribution (large, medium and small regions), geographical area (islands, coastal and interior) and by NUTS II[8] regions are also provided. Complementing data segmentation analysis is a results comparison with the SINAS assessment.

The results achieved rank in the first place the hospital IPO do Porto Francisco Gentil. Ranked in second place is Hospital CUF Torres Vedras and in third place Centro Hospitalar Universitário Lisboa Central.

Criterion 1 – Content, focuses on the presence of information relevant to the user and evaluates the quality, availability, relevance, completeness and concise representation of specific information that it is expected to be provided in a hospital website. Ranked in the first position is Centro Hospitalar de Leiria, followed by Hospital de Santa Maria Maior de Barcelos and Hospital do Espírito Santo de Évora in the second and third positions, respectively.

Criterion 2 – Services – is directed at the provision of personalized electronic services including electronic healthcare scheduling, prescription renewal or drug acquisition, automation of hospital's back-office procedures, forms availability on the website, electronic completion of administrative transactions and online appointments. In the first position ranked Hospital CUF Torres Vedras and Hospital CUF Cascais with the same classification. Ranked second is Centro Hospitalar Universitário Lisboa Central. Third rank is divided between Hospital CUF Infante Santo, Hospital CUF Descobertas, and Hospital CUF Santarém.

Criterion 3 – Community Interaction – is used to describe the interaction between hospital, patients and online communities on the web. Online communities often involve members to provide content to the website and contribute in some way. Examples of such interactions include forums, complaints forms, interaction with the media, and hospital's marketing activities. For this criterion, IPO do Porto Francisco Gentil ranked first, followed by Hospital Distrital da Figueira da Foz in second and Hospital de Vila Franca de Xira in third.

Lastly, Criterion 4 – Technology Features – encompasses mainly technical items related to easy navigation, website quality, visual appeal, functionality and reliability. The technology criterion is related to how the content and services are assembled and made available on a website. Ranking in the first position is Hospital de Braga. The second position is occupied by Hospital de Vila Franca de Xira and the third position by Hospital da Prelada.

The results of this study are intended to foster and promote good practices sharing and application benefiting hospitals and their clients. From the results it can be argued there is still a

[8] Classification available in the Portuguese law (Decree-Law n.º 46/89)

road ahead to be followed for Portuguese hospitals to improve their web presence. Although it requires great effort from hospital administration and technical staff to implement a website that is easily accessible for every user, the benefits of such endeavor will have major impact in hospital reputation and daily activity.

1. Introduction

This document reports the results of the first application of the Health Sector Website Assessment Index (HSWAI) to the Portuguese context, encompassing 135 hospitals. From these, three websites were down and impossible to access, bringing the total sample of evaluated hospitals' websites to 132. These are Casa de Repouso de Coimbra, Casa de Saúde de S. Lázaro, and Hospital CUF Porto.

The HSWAI was developed through a process of identification, selection, analysis and categorization of indicators, arriving at four main structural criteria (Table 1): Content, Services, Community Interaction and Technology Features. Each criterion has a set of associated indicators and corresponding sub-indicators.

Criteria	Number of Indicators
Content	5
Services	3
Community Interaction	3
Technology Features	5

Table 1 - Number of indicators associated with the evaluation grid criteria

Data collection was performed by direct observation of each hospital website and registered in an excel file that contained the evaluation grid. Each sub-indicator was attributed the value 0 or 1. Final results and scoring were calculated according to the weights defined for each indicator and criterion resulting in the final global ranking as well as other rankings also presented in this document, namely in the analysis by criterion or region.

The public nature of the results, as well as of the applied methodology, are relevant for the national hospital context and for the development of better websites and provision of more personalized services. These results may be the necessary boost for internal hospital management debate and best practices sharing.

This document is structured in ten chapters, describing the foundations, methodology, and results of applying the Health Sector Website Assessment Index to the Portuguese context.

The following chapter (chapter 2) describes HSWAI and briefly presents the assessment process phases.

Chapters 3 to 8 are concerned with the results of the study.

While chapter 3 focuses on the global ranking of the web presence of Portuguese hospitals, chapter 4 presents a more detailed analysis of each criterion that composes the evaluation grid. It is in this chapter that the rankings are presented according to the following criteria: Content, Services, Community Interaction, and Technology Features.

The health sector reality presents itself with two distinct administrative types: public (belonging to the state) and private. It is in chapter 5 that rankings, according to each type, are unfolded.

The following chapters are related to population and geographical distribution. Chapter 6 categorizes public hospitals in three classes: Class 1 – Large Region, Class 2 – Medium Region,

Class 3 – Small Region according to the resident population in their area of action. The geographical distribution is analyzed using two different classification schemes: the seven NUTS II regions (chapter 7), and the three main geographical areas – Islands, Coastal, and Inland – (chapter 8).

Chapter 9 provides a comparison between HSWAI results and SINAS (Sistema Nacional de Avaliação na Saúde). Conclusions are presented in chapter 10.

The complete list of selected hospitals and respective characterization can be found in Annex A and the global ranking of the evaluated hospital websites in Annex B. Annex C provides SINAS results and classification for every hospital website assessed.

2. HSWAI

This chapter briefly presents the steps taken to apply the instrument to the Portuguese hospitals' websites as well as a detailed view of the instrument's components. HSWAI is introduced in terms of its criteria and indicators, and corresponding weights that enable hospitals ranking according to their web presence, presenting the formulas used to classify and rank the hospitals.

2.1 Study Phases

The study took place in six main phases, as described in Figure 1. The first phase – Instrument development – involved the identification, analysis, and validation of indicators to be included in the instrument as well as the instrument validation with experts and users.

Figure 1 – Study phases

This phase was followed by data collection, which required organizing a list of Portuguese hospitals and corresponding websites, and consequently accessing each website for evaluation according to the assessment grid for each sub-indicator.

Data collected was then validated and treated to enable calculating final weights and classification for each hospital. These results were then analyzed and organized to produce the rankings presented in this report.

2.2 Evaluation Instrument

The final HSWAI instrument is composed of four criteria, each with a set of indicators and sub-indicators that allow hospital website evaluation. The indicators for each criterion are described in Table 2.

C1 Content	
C1.i1 Health institution information available on the website	Any institutional website provides static up-to-date information. In the case of hospitals, this usually includes the hospital designation, logo, general phone number for the hospital, e-mail address, a map or directions to the hospital, parking information, transportation information and a history of the institution, among other.
C1.i2 Quality Metrics	Public reporting of hospital quality data empowers patients, physicians, and purchasers of health care with the information needed to make informed decisions. It also encourages hospitals and physicians to participate in continuous performance improvement by creating a healthy and competitive environment. Quality elements include the waiting list, the number of available beds, the admissions number report, the nosocomial infection rate, the inpatient mortality rate and the surgical mortality rate.

C1.i3 Organisational Structure and Medical Information	Hospitals need to enhance proximity with users emphasizing on openness and accountability, providing information about staff, internal structure, available services, health-disease specific information, and relative treatment information.
C1.i4 Patient Information	Hospitals must provide information that is essential for patients and visitors to conform with while in the institution. A clear description of the patient's rights and obligations is essential as well as information that should be adequately transmitted related to indications for hospital admission and discharge.
C1.i5 Research and Teaching	Hospitals that have a teaching mission must include in their website information about graduate medical education in general and information for medical students and researchers.
C2 Services	
C2.i1 Administration Procedures	Health institutions should simplify and optimize administrative interaction with their customers. Hospital websites are expected to facilitate interaction between visitors and the hospital staff. To achieve cost savings and streamline the treatment, hospitals allow visitors to submit e-mail requests for general health information and/or enable interactive communication applications.
C2.i2 Appointments	Translating a visitor's interest in a hospital into action is one of the most important purposes of a hospital website. Online appointments and user membership registration are functions that should be included.
C2.i3 Patient Care	Allowing the patient to communicate and feel informed is one important aspect hospitals should consider while developing their websites. Some hospitals offer telemedicine services or real-time chat sessions between doctors and patients, and provide access to the patient's medical records system.
C3 Community Interaction	
C3.i1 Participation	Hospital websites aim principally to communicate with the community and with existing or prospective patients. Providing mechanisms of interaction is essential for such communication. Examples of these mechanisms can be polls or discussion forums.
C3.i2 Media	Many hospitals exploit the immediacy of the web to report current news about the institution, press releases and internal announcements. They must also provide information about the hospital public relations office and a virtual tour to the institution.
C3.i3 Advertising/Marketing	A hospital's website is one of its public faces. Some hospitals use their websites to promote their work and keep in touch with the different types of stakeholders. Social media can also be included in this category (Facebook, Twitter, LinkedIn etc.).
C4 Technology Features	
C4.i1 Navigability	Navigability examines the easiness for the user to find the required piece of information by moving through the website. Elements that are evaluated include effective use of hyperlinks and the degree to which the interface helps the user orient himself within the website.
C4.i2 Accessibility	Accessibility refers to the practice of removing barriers that prevent interaction with, or access to the website, by people with disabilities or limited computer literacy. Some elements that should be addressed include semantically meaningful HTML tags, textual equivalents provided for images, links named meaningfully, and text and images that are large or enlargeable.

C4.i3 Usability/Readability	Usability/Readability evaluates the ease of use of the website. Information should be presented concisely, without ambiguity and each item should be placed in the appropriate area. Some of the common aspects of usability are simplicity, consistency, familiarity, clarity and relevancy. Some essential features include website map, content in foreign languages, quick load time, and graphics that open conveniently.
C4.i4 Credibility	Credibility assesses elements that make the hospital more reliable and credible in the eyes of its users. Some elements that should be evaluated include author and date of the provided information and the text quality which should be grammatically and spelling correct. Interest conflict declaration, date of last website update, and HON (Health on the Net) foundation code certification.
C4.i5 Privacy/Security	Health sector website privacy holds profound implications since service delivery impacts human life, legality and social policy. Some elements included in this category are: privacy policy, issues regarding patient confidentiality, copyright notice and terms of use.

Table 2 – Criteria and indicators of the evaluation grid

Each of the criteria and indicators indicated in Table 2 are weighted with a specific value in the final calculation of HSWAI. Weight attribution followed a thorough process of validation that included using a panel of experts and a separate panel of users to ponder each indicator and criterion using the Analytic Hierarchy Process (AHP) method. Final results from the AHP analysis were then reviewed by an expert, leading to the final weights, as presented in Table 3.

Criteria	Weight of criteria	Indicator	Weight of indicator
C1 Content	20%	C1.i1. Health institution information available in the website	20%
		C1.i2. Quality Metrics	20%
		C1.i3. Organisational Structure and Medical Information	10%
		C1.i4. Patient Information	40%
		C1.i5. Research and Teaching	10%
		Total weight of C1 indicators	*100%*
C2 Services	50%	C2.i1. Administration Procedures	20%
		C2.i2. Appointments	40%
		C2.i3. Patient Care	40%
		Total weight of C2 indicators	*100%*
C3 Community Interaction	20%	C3.i1. Participation	70%
		C3.i2. Media	20%
		C3.i3. Advertising/Marketing	10%
		Total weight of C3 indicators	*100%*
C4 Technology Features	10%	C4.i1. Navigability	20%
		C4.i2. Accessibility	20%
		C4.i3. Usability/Readability	20%
		C4.i4. Credibility	20%
		C4.i5. Privacy/Security	20%
		Total weight of C4 indicators	*100%*
Total	*100%*		

Table 3 - Weights attributed to the criteria and indicators of the evaluation grid

The index i_{HSWAI} is a composite index calculated by the weighted sum of the four criteria (Content, Services, Community Interaction, and Technology Features) each of which is in turn the weighted sum of a set of indicators and sub-indicators considered relevant for that criterion.

The calculation of the i_{HSWAI} is obtained with the following formula:

$$i_{HSWAI} = 20\% \times C1 + 50\% \times C2 + 20\% \times C3 + 10\% \times C4$$

taking into account that,

$$C1 = 20\% \times C1i1 + 20\% \times C1i2 + 10\% \times C1i3 + 40\% \times C1i4 + 10\% \times C1i5$$

$$C2 = 20\% \times C2i1 + 40\% \times C2i2 + 40\% \times C2i3$$

$$C3 = 70\% \times C3i1 + 20\% \times C3i2 + 10\% \times C3i3$$

$$C4 = 20\% \times C4i1 + 20\% \times C4i2 + 20\% \times C4i3 + 20\% \times C4i4 + 20\% \times C4i5$$

and that the calculation of the value of each indicator is obtained by the formula:

$$\frac{\sum values\ of\ all\ the\ sub\_indicators}{number\ of\ sub\_indicators \neq \text{"not applicable"}/total\ number\ of\ sub\_indicators}$$

In the case where hospitals do not have "Research and Teaching" (*C1i5*) resources, calculation of criterion C1 follows the rule:

$$C1 = 22\% \times C1i1 + 22\% \times C1i2 + 11\% \times C1i3 + 45\% \times C1i4$$

In this case, the weight of *C1i5* (10%) is distributed in the right proportion by *C1i1, C1i2, C1i3*, and *C1i4.*

2.3 Data Collection, Validation and Treatment

Data collection was based on direct observation of the hospitals' websites conducted during July and August 2019. The first step in the data collection phase was to identify the hospital's website (the correct link to the hospital website). After having the correct link, the assessment started through direct observation of the set of criteria, indicators, and sub-indicators described. During the stage of data collection, value 1 was ascribed to the presence of the considered sub-indicator, value 0 to its absence, and NA if it was not applicable.

The assessors were instructed to assume, during the assessment, the logic and attitude that would typically be of an average client/user/patient when navigating the website. This means that the effort put in the search for the assessment of the sub-indicators should be similar to the one performed, on average, by a citizen while using the website, and not an exaggerated and extensive effort. Although it is possible to meticulously look for certain elements and find them on a website, this does not seem to be the best approach because it disregards the fact that the user needs to be able to find what he wants quickly and intuitively, assuring the website is useful and effectively used.

The task was performed by a team of two assessors, under the supervision of a third one (supervisor), who is an expert on the assessment process. This means that for each hospital

website there are two observations (one from each assessor) which were validated by the supervisor. In cases where the two assessors assigned different values to a specific sub-indicator, this was signaled to them in order to be reassessed more thoroughly. In case the assessment discrepancy remained, the supervisor decided which value was assigned to the sub-indicators.

Data was then treated to attribute one single value to each sub-indicator, eliminating discrepancies and avoiding misclassifications. Assessors' commentaries were construed to facilitate this task and regarded as complementary information.

2.4 Data Analysis

Complementing the global ranking obtained, other data analysis perspectives were undertaken:

- Analysis of the HSWAI results according to the four criteria: Content, Services, Community Interactions, and Technology Features;
- Segmented analysis by type of hospital: public or private;
- Segmented analysis by total of resident population;
- Segmented analysis by NUTs II region;
- Segmented analysis by location: islands, coastal or inland;
- Comparative analysis with SINAS.

The segmented analysis by total resident population categorized each hospital by population number in that NUTS III region. NUTS III classification divides the country in 25 sub-regions, 23 regions in the mainland and other two that correspond to the Autonomous Regions of Azores and Madeira, according to the Decree-Law n.º 46/89. The population number was obtained in PORDATA website consulting the resident population in each NUTS III region, referring to the latest available reference (2019). This information is responsibility of the National Statistics Institute (INE) according to whom the population number corresponds to the set of people that, independently of being present or absent of home at the moment of analysis, have lived in their current location for a continuous period of at least 12 months prior to the moment of analysis, or that have arrived at the current living location during the 12 months prior to the moment of analysis, intending to live there for at least one year.

As such, the resident population was divided into three classes:

- Class 1 – population over 1000.000 inhabitants (large)
- Class 2 – population over 200.000 inhabitants and less than 1000.000 inhabitants (medium)
- Class 3 – population less or equal to 200.000 inhabitants (small)

Segmentation by NUTs II regions is a classification available in the Portuguese law (Decree-Law n.º 46/89) considering seven units: five units in the continent and the other two correspond to the Autonomous Regions of Azores and Madeira. In this study, the continent regions (Alentejo, Algarve, Centro, Área Metropolitana de Lisboa, and Norte) have greater representation as only one hospital from the Autonomous Region of Madeira is present. The designations used are in conformity with the last change to the law as published in Decree-Law n.º 244/2002 and by Regulation (EU) Nº 868/2014 of the Comission, from August 8th 2014.

For the analysis by location, regions were classified as islands, coastal or inland. Coastal regions are assumed to be all NUTS III regions that include coastline in their territory.

A comparison with the SINAS evaluation seemed appropriate to provide insights on two sides of hospital operation. In site and online service provision should be regarded as complementary and the same level of service should be aimed at. This is the motivation behind this analysis.

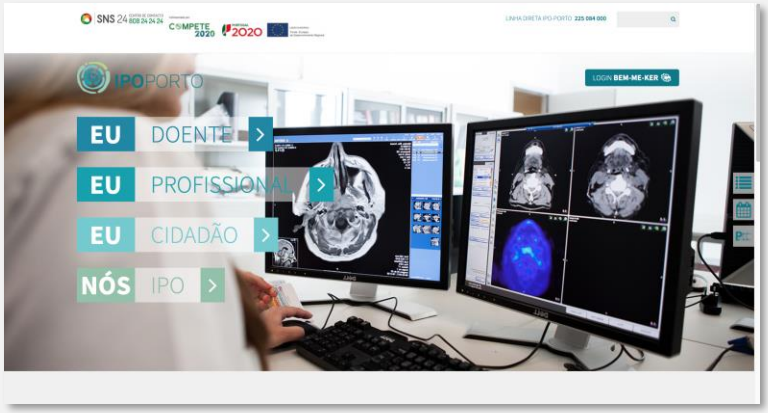
A more in-depth and detailed description of the methodology adopted in this study is available in the document entitled Health Sector Website Assessment Instrument – Notes on the Assessment Method.

3. Global Ranking of Portuguese Hospitals' Websites

The global ranking of Portuguese Hospitals' Websites presents the results according to the overall classification obtained by each website using the formula i_{HSWAI} presented in the previous chapter. At the end of this document, in Annex B, it is possible to view the full ranking.

For the present study the best ranked hospital website was IPO do Porto Francisco Gentil followed by Hospital CUF Torres Vedras in the second position and Centro Hospitalar Universitário de Lisboa Central in the third position.

The top 3 of this ranking includes one hospital from the north of Portugal, in Porto, and two from the central area, one in what is called the Oeste region and one in the metropolitan area of Lisbon.



IPO do Porto Francisco Gentil (1st classified in the global ranking)

Hospital CUF Torres Vedras (2nd classified in the global ranking)

Centro Hospitalar Universitário de Lisboa Central (3rd classified in the global ranking)

Figure 2 – Home page of the top 3 websites in the global ranking

Among the top 10 of the global ranking of Portuguese hospitals' websites, there is a private group occupying five positions. There is a clear dominant presence of private hospitals with three public hospitals and seven private hospitals in the top 10. The CUF (Companhia União Fabril) group occupies the 4th, 5th, 6th, and 7th positions with the Cascais, Santarém and Lisbon area hospitals. The 8th position is occupied by the Luz group with their Póvoa de Varzim hospital website, the 9th position is occupied by the Alto Minho public hospital and the 10th position belongs to the Luz group again, in Lisbon. Table 4 shows the first ten ranked hospitals indicating their type, NUTS II region and value in the i_{HSWAI} index.

Position	Name	Type	NUTS II region	i_{HSWAI} value
1	IPO do Porto Francisco Gentil	Public	North	0,624
2	Hospital CUF Torres Vedras	Private	Center	0,608
3	CH Universitário Lisboa Central, EPE	Public	Lisbon	0,603
4	Hospital CUF Cascais, AS	Private	Lisbon	0,602
5	Hospital CUF Santarém	Private	Alentejo	0,594
6	Hospital CUF Infante Santo	Private	Lisbon	0,588
7	Hospital CUF Descobertas	Private	Lisbon	0,581
8	Hospital da Luz, Póvoa de Varzim	Private	North	0,543
9	ULS Alto Minho, EPE	Public	North	0,541
10	Hospital da Luz, Lisboa	Private	Lisbon	0,536

Table 4 - Global ranking - best-classified hospitals

The average value of the i_{HSWAI} is 0,359. The number of hospitals with a value equal or above the average is 64, corresponding to 48%, meaning that 68 hospitals, corresponding to 52%, have a value below the average.

Regarding the highest and lowest values found in the Portuguese hospitals analyzed, the highest value belongs to IPO do Porto Francisco Gentil with 0,624. The lowest value is 0,048 and belongs to Hospital de Santa Isabel in Marco de Canaveses.

4. Rankings by criterion

The global ranking presented in the previous chapter offers a global vision of the positioning of each hospital, that is, taking in consideration the final index calculation including all the criteria and indicators that compose the evaluation grid.

In this chapter, each criterion is looked at more closely, presenting the best classified in each criterion considered in the study: Criterion 1 – Content; Criterion 2 – Services; Criterion 3 - Community Interaction; and Criterion 4 - Technology Features.

4.1 Criterion 1 – Content

The first criterion that is part of the evaluation grid used in this study is Content. This criterion focuses on the evaluation of the availability and completeness of information expected to be found in a hospital website. Five indicators are part of this criterion: Health institution information available on the website (C1.i1), Quality Metrics(C1.i2), Organisational Structure and Medical Information (C1.i3), Patient Information (C1.i4), and Research and Teaching (C1.i5).

Table 5 presents the first 10 positions in the criterion ranking. There is only one private hospital in the top 10 for the Content criterion and there is an even distribution between NUTS II regions of North, Center, Lisbon and Alentejo.

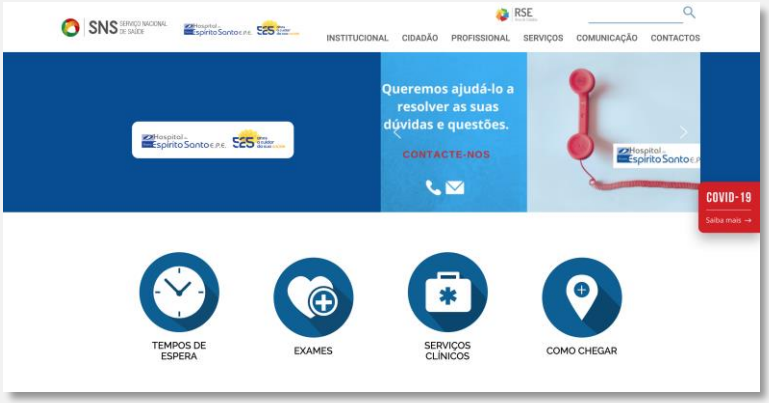
Position	Name	Type	NUTS II region	C1 value
1	CH Leiria, EPE	Public	Center	0,740
2	Hospital de Sta. Maria Maior - Barcelos	Public	North	0,705
3	Hospital do Espírito Santo de Évora	Public	Alentejo	0,694
4	CH S. João, EPE	Public	North	0,686
5	CH Lisboa Ocidental, EPE	Public	Lisbon	0,681
6	Hospital de Braga	Public	North	0,666
7	CH Universitário Cova da Beira, EPE	Public	Center	0,645
8	Hospital Beatriz Ângelo	Private	Lisbon	0,644
9	CH Lisboa Norte, EPE	Public	Lisbon	0,644
10	Hospital Distrital de Santarém	Public	Alentejo	0,643

Table 5 - Criterion 1 - Content: best-ranked hospitals

The first position belongs to Centro Hospitalar de Leiria, followed by Hospital de Santa Maria Maior em Barcelos and Hospital do Espírito Santo de Évora. Their websites home pages are presented in Figure 3.

Centro Hospitalar de Leiria (1st ranked in Criterion 1)

Hospital de Santa Maria Maior em Barcelos (2nd ranked in Criterion 1)



Hospital do Espírito Santo de Évora (3rd ranked in Criterion 1)

Figure 3 - Home page of the three best-ranked websites in Criterion 1

The average value of the classifications obtained for Criterion 1 – Content is 0,406. The number of hospitals classified with a value equal or greater to the average was 62 corresponding to 47% and the number of hospitals with a classification value for Criterion 1 below average is of 70, corresponding to 53% of the sample.

The highest value achieved was of 0,740 from Centro Hospitalar de Leiria, and the lowest value was 0,048 belonging to Hospital Arcebispo João Crisóstomo.

Within Criterion 1 – Content, a set of 5 indicators exists, and the average classification results for each can be consulted in Table 6 as well as the highest and lowest values achieved. Values for each indicator are between 0 and 1.

Indicator	Average value	Max value	Min value
C1.i1 - Health institution information available on the website	0,626	0,905	0,222
C1.i2 - Quality Metrics	0,123	0,533	0
C1.i3 - Organisational Structure and Medical Information	0,399	0,750	0
C1.i4 - Patient Information	0,442	0,933	0
C1.i5 - Research and Teaching	0,472	1	0

Table 6 - Values obtained by each indicator composing Criterion 1

Indicator C1.i5 was only assessed in hospitals found to have a connection with universities and consequently including research and teaching capacity. This information resulted from an online search performed by the researchers and, as such, might have resulted in incomplete information[9]. All the hospitals named Hospital, or *Centro Hospitalar*, *Universitário* were considered for this indicator as well as Hospital de Braga, Hospital da Senhora da Oliveira, and ULS Alto Minho.

As can be seen in Table 6, the indicator with the lowest average is C1.i2 – Quality Metrics which includes the evaluation of the presence of information regarding the waiting list, the number of available beds, the admissions number report, the nosocomial infection rate, the inpatient mortality rate and the surgical mortality rate, among others.

4.2 Criterion 2 – Services

The second criterion that composes the evaluation grid is Services. The growth of consumerism and the proliferation of Internet accessible sources of health-related information have modified the traditional roles of provider and patient. Personalized content can be provided during interactions with all clients and this might improve loyalty to a particular hospital.

This criterion includes electronic healthcare scheduling, prescription renewal or drug acquisition, automation of hospital's back-office procedures, forms availability on the website, electronic completion of administrative transactions and online appointments. "Services" criterion is assessed in three indicators: Administration Procedures (C2.i1), Appointments (C2.i2), and Patient Care (C2.i3).

Table 7 presents the first 10 positions in the criterion ranking. For this criterion, several hospitals classified with the same value. With the same classification in the first place there is the CUF group with two units: Hospital CUF Torres Vedras and Hospital CUF Cascais. The second position is occupied by Centro Hospitalar Universitário Lisboa Central and the third position belongs to the

[9] The information was requested to the ministry of education by email without success.

CUF group once again with three other units: Hospital CUF Infante Santo, Hospital CUF Descobertas, and Hospital CUF Santarém.

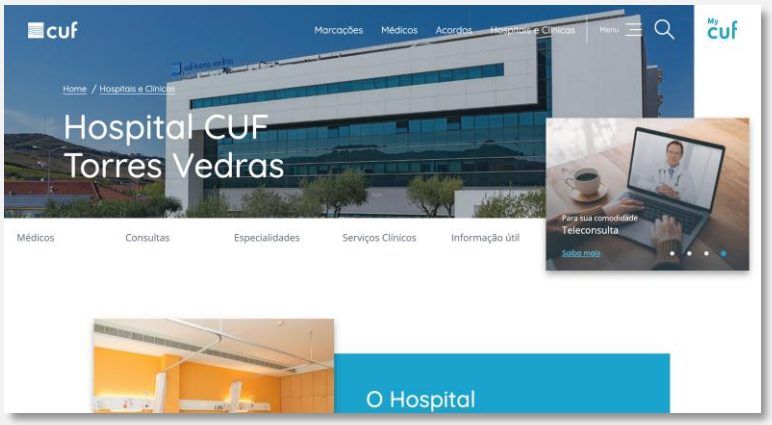
The four largest private hospital groups are ranked in the top 10 for Criterion 2 – Services. Even so, there is a strong presence of public hospitals in the best classified for Criterion 2.

Position	Name	Type	NUTS II region	C2 value
1	Hospital CUF Torres Vedras	Private	Center	0,722
1	Hospital CUF Cascais, AS	Private	Lisbon	0,722
2	CH Universitário Lisboa Central, EPE	Public	Lisbon	0,683
3	Hospital CUF Infante Santo	Private	Lisbon	0,672
3	Hospital CUF Descobertas	Private	Lisbon	0,672
3	Hospital CUF Santarém	Private	Alentejo	0,672
4	IPO do Porto Francisco Gentil	Public	North	0,638
5	Hospital da Luz – all the 11 units	Private	---	0,544
5	ULS Alto Minho, EPE	Public	North	0,544
5	ULS Guarda, EPE	Public	Center	0,544
5	Hospital da Misericórdia de Évora	Private	Alentejo	0,544
5	CH Tâmega e Sousa, EPE	Public	North	0,544
5	CH Setúbal, EPE	Public	Lisbon	0,544
5	Hospital Dr. Francisco Zagalo - Ovar	Public	Center	0,544
5	Hospital de S. José - Sta. Casa da Misericórdia de Fafe	Private	North	0,544
6	Clínica Europa	Private	Lisbon	0,500
7	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Public	Alentejo	0,494
7	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Public	Center	0,494
7	ULS Nordeste, EPE	Public	North	0,494
7	ULS Norte Alentejano, EPE	Public	Alentejo	0,494
7	ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Public	Alentejo	0,494
7	ULS Matosinhos, EPE - Hospital Pedro Hispano	Public	North	0,494
7	CH Tondela - Viseu, EPE	Public	Center	0,494

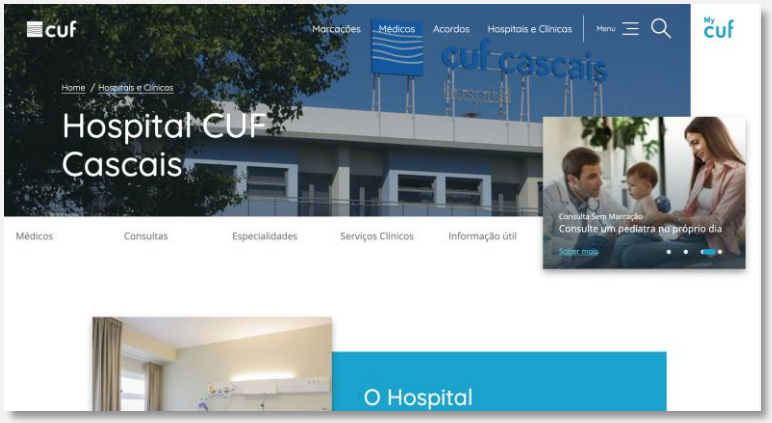
8	Hospital Lusíadas Group with 3 units -Albufeira, Lisboa and Porto	Private	---	0,450
8	Clínica Sto. António	Private	North	0,450
9	Hospital CUF Viseu	Private	Center	0,411
9	Hospital CUF Coimbra	Private	Center	0,411
9	CH Baixo Vouga, EPE	Public	Center	0,411
10	Trofa Saúde Group with its 13 units	Private	---	0,405
10	Hospital dos SAMS	Private	Lisbon	0,405

Table 7 - Criterion 2 - Services: best-ranked hospitals

Following, in Figure 4 are the home pages of the top 3 hospitals.

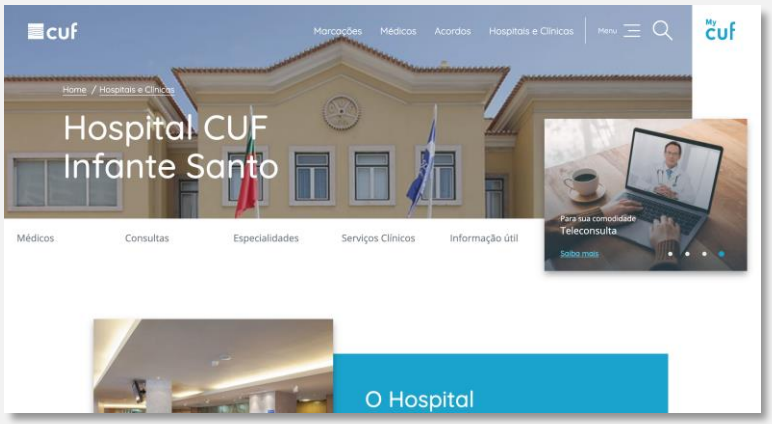


Hospital CUF Torres Vedras (1st ranked in Criterion 2)

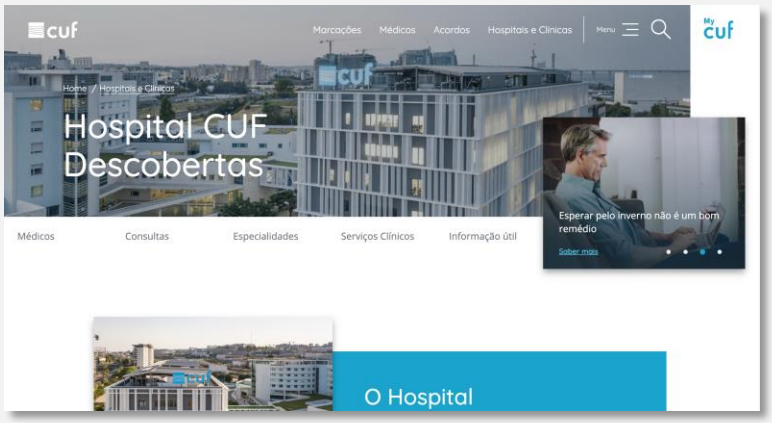


Hospital CUF Cascais (1st ranked in Criterion 2)

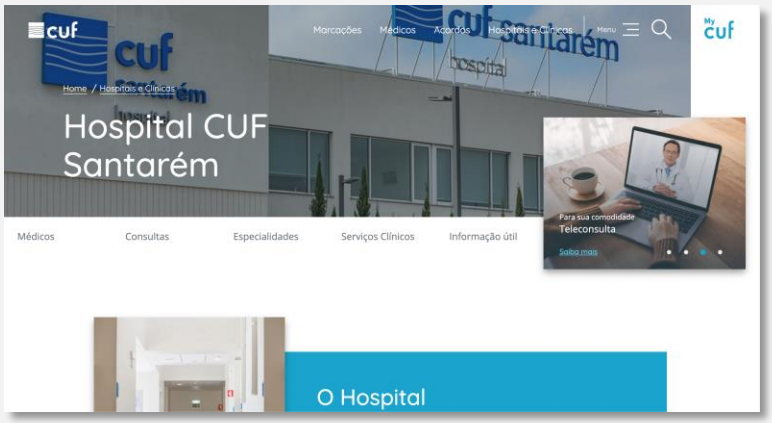
Centro Hospitalar Universitário Lisboa Central (2nd ranked in Criterion 2)



Hospital CUF Infante Santo (3rd ranked in Criterion 2)



Hospital CUF Descobertas (3rd ranked in Criterion 2)



Hospital CUF Santarém (3rd ranked in Criterion 2)

Figure 4 - Home page of the three best-ranked websites in Criterion 2

The average value obtained for Criterion 2 – Sevices was 0,314. There are 82 hospitals with equal or above average classification corresponding to 62% of the sample. Below average classification was achieved by 50 hospitals corresponding to 38% of the assessed hospitals.

Looking at the end values, the highest classification was attributed to Hospital CUF Torres Vedras and Hospital CUF Cascais with a value of 0,722. The lowest value achieved was 0 and attributed to 7 hospitals, namely: Centro Hospitalar Universitário do Porto, Centro Hospitalar Universitário de Coimbra, Hospital de Cascais, Hospital Garcia da Orta, Centro Hospitalar Oeste, Hospital de Avelar, and Hospital de Santa Isabel de Marco de Canaveses.

For the three indicators that compose the Services criterion, as can be validated in Table 8, all had 0 as minimum value obtained. Indicator C2.i2 – Appointments was the only indicator where a maximum value of 1 was achieved.

Indicator	Average value	Max value	Min value
C2.i1 - Administration Procedures	0,292	0,750	0
C2.i2 - Appointments	0,457	1	0
C2.i3 - Patient Care	0,183	0,667	0

Table 8 - Values obtained by each indicator composing Criterion 2

Considering this is the Criterion that weighs the most in the index calculation formula, average values achieved are not very high, suggesting more attention should be put into these elements.

4.3 Criterion 3 – Community Interaction

The third criterion that is part of the evaluation grid used in this study is Community Interaction. This criterion describes the interaction between hospital, patients and online communities on the web. Examples of such include forums, complaints forms, interaction with the media and hospital's marketing activities. Hospital sites can host patient support groups, interact with community organizations and become a portal for physician organizations and private medical offices. The Community Interaction criterion includes three indicators: Participation (C3.i1), Media (C3.i2), and Advertising/Marketing (C3.i3).

As can be seen in Table 9, the first three positions are occupied by IPO do Porto Francisco Gentil, Hospital Distrital da Figueira da Foz and Hospital de Vila Franca de Xira, respectively. The 5th position is occupied by both Centro Hospitalar Universitário de Lisboa Central and Centro Hospitalar de Leiria. The same happens for the 10th position which is occupied by both Centro Hospitalar Lisboa Central and Centro Hospitalar do Porto.

Position	Name	Type	NUTS II region	C3 value
1	IPO do Porto Francisco Gentil	Public	North	0,659
2	Hospital Distrital da Figueira da Foz	Public	Center	0,609

3	Hospital de Vila Franca de Xira	Public	Lisbon	0,589
4	CH Lisboa Norte, EPE	Public	Lisbon	0,570
5	CH Universitário Lisboa Central, EPE	Public	Lisbon	0,559
5	CH Leiria, EPE	Public	Center	0,559
6	CH Universitário Cova da Beira, EPE	Public	Center	0,553
7	Hospital da Sr.ª da Oliveira Guimarães	Public	North	0,550
8	CH Tâmega e Sousa, EPE	Public	North	0,525
9	IPO de Lisboa Francisco Gentil	Public	Lisbon	0,500
10	CH Lisboa Ocidental, EPE	Public	Lisbon	0,497
10	CH Universitário do Porto, EPE	Public	North	0,497

Table 9 - Criterion 3 - Community Interaction: best-ranked hospitals

All the hospitals present in the top 10 for Criterion 3 – Community Interaction are public hospitals. The Lisbon region has five hospitals in the best positions of this ranking, followed by the North region with four and the Center region with three.

The following image shows the home web pages of the top 3 hospitals.

IPO do Porto Francisco Gentil (1st ranked in Criterion 3)

Hospital Distrital da Figueira da Foz (2nd ranked in Criterion 3)

Hospital de Vila Franca de Xira (3rd ranked in Criterion 3)

Figure 5 - Home page of the three best-ranked websites in Criterion 3

The average value obtained for Criterion 3 – Community Interaction was 0,335. There are 70 hospitals with equal or above average classification corresponding to 53% of the sample. Below average classification was achieved by 62 hospitals corresponding to 47% of the assessed hospitals.

The highest classification for this criterion was attributed to IPO do Porto Francisco Gentil with a value of 0,659. The lowest value achieved was 0,070 by Hospital de Avelar.

Indicator	Average value	Max value	Min value
C3.i1 - Participation	0,325	0,700	0,100
C3.i2 - Media	0,374	0,889	0
C3.i3 – Publicity/Marketing	0,337	0,704	0

Table 10 - Values obtained by each indicator composing Criterion 3

For the three indicators that compose the Community Interaction criterion, both Media and Publicity/Marketing had 0 as minimum value obtained as seen in Table 10. Indicator C3.i2 – Media achieved the highest value and the highest average.

4.4 Criterion 4 – Technology Features

The final criterion that composes the evaluation grid is dedicated to technological aspects of the websites. This criterion encompasses mainly technical items related to easy navigation, website quality, visual appeal, functionality and reliability. The technology criterion is related to how the content and services are assembled and made available on a website. "Technology Features" criterion includes five indicators: Navigability (C4.i1), Accessibility (C4.i2), Usability/Readability (C4.i3), Credibility (C4.i4), and Privacy/Security (C4.i5).

In Table 11, the top 10 ranking for Criterion 4 – Technology features is presented. Private hospitals have a stronger presence in this criterion. The North and Lisbon regions are again more represented, and the Alentejo region keeps up with the Center region.

Position	Name	Type	NUTS II region	C4 value
1	Hospital de Braga	Public	North	0,668
2	Hospital de Vila Franca de Xira	Public	Lisbon	0,648
3	Hospital da Prelada	Private	North	0,640
4	Trofa Saúde Hospital Loures	Private	Lisbon	0,637
5	ULS Nordeste, EPE	Public	North	0,634
5	ULS Norte Alentejano, EPE	Public	Alentejo	0,634
5	ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Public	Alentejo	0,634
5	CH S. João, EPE	Public	North	0,634
6	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Public	Alentejo	0,628
6	Hospital Beatriz Ângelo	Private	Lisbon	0,628
7	Hospital de Sta. Maria - Porto	Private	North	0,622
7	Clínica Europa	Private	Lisbon	0,622
7	Trofa Saúde Group with 8 units	Private	---	0,622
7	Hospital Particular de Barcelos	Private	North	0,622
7	Hospital Particular de Viana do Castelo	Private	North	0,622
8	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Public	Center	0,614
9	CH Lisboa Norte, EPE	Public	Lisbon	0,608
9	Hospital CUF Torres Vedras	Private	Center	0,608
9	Hospital CUF Cascais, AS	Private	Lisbon	0,608
9	Hospital da Luz Group with 9 units	Private	---	0,608
9	Hospital da Misericórdia de Évora	Private	Alentejo	0,608
9	Hospital CUF Viseu	Private	Center	0,608
9	Hospital CUF Coimbra	Private	Center	0,608
10	Trofa Saúde Group with 4 units	Private	---	0,602

Table 11 - Criterion 4 - Technology Features: best-ranked hospitals

For this criterion, the top 3 ranked hospitals are Hospital de Braga, Hospital de Vila Franca de Xira and Hospital da Prelada. Figure 6 shows the home pages of each.

Hospital de Braga (1st ranked in Criterion 4)

Hospital de Vila Franca de Xira (2nd ranked in Criterion 4)

Hospital da Prelada (3rd ranked in Criterion 4)

Figure 6 - Home page of the three best-ranked websites in Criterion 4

The average value obtained for Criterion 4 – Technology Features was 0,533. There are 80 hospitals with equal or above average classification corresponding to 61% of the sample. Below average classification was achieved by 52 hospitals corresponding to 39% of the assessed hospitals.

The highest classification for this criterion was attributed to Hospital de Braga with a value of 0,668. The lowest value achieved was 0,180 by Hospital de Avelar.

Indicator	Average value	Max value	Min value
C4.i1 - Navigability	0,646	0,857	0,143

C4.i2 - Accessibility	0,393	0,700	0,100
C4.i3 – Usability/Readability	0,533	0,786	0
C4.i4 - Credibility	0,516	0,714	0,286
C4.i5 – Privacy/Security	0,581	0,857	0

Table 12 - Values obtained by each indicator composing Criterion 4

For the five indicators that compose the Community Interaction criterion represented in Table 12, both Usability/Readability and Privacy/Security had 0 as minimum value obtained. The highest average was attained in indicator C4.i1 – Navigability as well as the maximum value, tied with C4.i5 – Privacy/Security.

5. Analysis by Type of Hospital – Public or Private

The Portuguese reality presents a diverse typology of hospital management and health provision services. From the 132 hospital websites evaluated, 44 are public hospitals and 88 are from privately managed institutions. This means the vast majority of hospitals are from the private sector.

In Portugal there are 4 major private groups that own 34 of the 88 private hospitals. These groups are CUF with 7 hospital units, Hospital da Luz with 11 hospital units, Hospital Lusíadas with 3 hospital units and Trofa Saúde with 13 hospital units.

From a website construction perspective, it would be expected to find the same structure, type of content and navigability among the websites within the same group. That is not always the case, because hospitals belonging to the same group do not always score on indicators in a uniform way.

In public sector, websites have some baseline guidance and structure for website construction. Even so, it is in the public sector that stronger values variation occurs.

5.1 Public Hospitals

From the universe of 132 analysed websites 33% are from the public sphere. This means these hospitals are under the indirect management of the Health Ministry or under the Entrepreneurial Public Sector management, depending on the type of hospital.

Table 13 presents the five best classified hospitals in the global ranking. IPO do Porto Francisco Gentil is the best classified, ranking in first place for public hospitals as well as in the global ranking. Following are Centro Hospitalar Universitário Lisboa Central, Unidade Local de Saúde Alto Minho, Unidade Local de Saúde Guarda e Centro Hospitalar Tâmega e Sousa. The North region occupies three of the five best places.

Position	Name	NUTS II region	i_{HSWAI} value
1	IPO do Porto Francisco Gentil	North	0,624
2	CH Universitário Lisboa Central, EPE	Lisbon	0,603
3	ULS Alto Minho, EPE	North	0,540
4	ULS Guarda, EPE	Center	0,526
5	CH Tâmega e Sousa, EPE	North	0,524

Table 13 - Public hospitals with the best positioning in the global ranking

The following tables present the positioning of the best-ranked public hospitals for every criterion.

As can be seen in Table 14, the best ranked hospital for Criterion 1 – Content was Centro Hospitalar de Leiria, followed in the second position by Hospital de Santa Maria Maior in Barcelos. In the third, fourth and fifth positions are Hospital do Espírito Santo de Évora, Centro Hospitalar de S. João and Centro Hospitalar Lisboa Central.

Position	Name	NUTS II region	C1 value
1	CH Leiria, EPE	Center	0,740
2	Hospital de Sta. Maria Maior - Barcelos	North	0,705
3	Hospital do Espírito Santo de Évora	Alentejo	0,694
4	CH S. João, EPE	North	0,686
5	CH Lisboa Ocidental, EPE	Lisbon	0,681

Table 14 - Public hospitals with the best positioning in Criterion 1

Table 15 depicts the results for Criterion 2 – Services. Ranking in the first place is Centro Hospitalar Lisboa Central followed by IPO do Porto Francisco Gentil. Both the third and fourth places are occupied by several hospitals and in fifth place there is Centro Hospitalar Baixo Vouga.

Position	Name	NUTS II region	C2 value
1	CH Universitário Lisboa Central, EPE	Lisbon	0,683
2	IPO do Porto Francisco Gentil	North	0,638
3	ULS Alto Minho, EPE	North	0,544
3	CH Setúbal, EPE	Lisbon	0,544
3	ULS Guarda, EPE	Center	0,544
3	CH Tâmega e Sousa, EPE	North	0,544
3	Hospital Dr. Francisco Zagalo - Ovar	Center	0,544
4	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Alentejo	0,494
4	ULS Norte Alentejano, EPE	Alentejo	0,494
4	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Center	0,494
4	ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Alentejo	0,494
4	ULS Nordeste, EPE	North	0,494
4	ULS Matosinhos, EPE - Hospital Pedro Hispano	North	0,494
4	CH Tondela - Viseu, EPE	Center	0,494
5	CH Baixo Vouga, EPE	Center	0,411

Table 15 - Public hospitals with the best positioning in Criterion 2

For Criterion 3 – Community Interaction (Table 16), the first place is occupied by IPO do Porto Francisco Gentil. The second place is occupied by Hospital Distrital da Figueira da Foz followed

by Hospital de Vila Franca de Xira and Centro Hospitalar Lisboa Norte. Centro Hospitalar Universitário Lisboa Central and Centro Hospitalar de Leiria are ranked in the fifth position with the same classification.

Position	Name	NUTS II region	C3 value
1	IPO do Porto Francisco Gentil	North	0,659
2	Hospital Distrital da Figueira da Foz	Center	0,609
3	Hospital de Vila Franca de Xira	Lisbon	0,589
4	CH Lisboa Norte, EPE	Lisbon	0,570
5	CH Universitário Lisboa Central, EPE	Lisbon	0,559
5	CH Leiria, EPE	Center	0,559

Table 16 - Public hospitals with the best positioning in Criterion 3

The last table (Table 17) shows the results for Criterion 4 – Technology Features. Hospital de Braga is ranked first followed by Hospital de Vila Franca de Xira in the second position. The third position comprehends ULS Nordeste, ULS Litoral Alentejano, ULS Norte Alentejano and Centro Hospitalar S. João. The fourth place is occupied by ULS Baixo Alentejo and the fifth position by ULS Castelo Branco.

Position	Name	NUTS II region	C4 value
1	Hospital de Braga	North	0,668
2	Hospital de Vila Franca de Xira	Lisbon	0,648
3	ULS Nordeste, EPE	North	0,634
3	ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Alentejo	0,634
3	ULS Norte Alentejano, EPE	Alentejo	0,634
3	CH S. João, EPE	North	0,634
4	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Alentejo	0,628
5	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Center	0,614

Table 17 - Public hospitals with the best positioning in Criterion 4

5.2 Private Hospitals

Privately managed hospitals represent 67% of the analyzed hospital websites. Private hospitals, unlike public hospitals, do not have a general website guideline to follow. For that reason, privately managed hospitals can design, structure and implement websites' information and functionalities as they see best. With this freedom at hands, it was expected that private hospitals

would have more efficient and effective websites trying to satisfy their customers needs and increase their market share.

Table 18 presents the best-ranked private hospitals websites in the global ranking. All five positions are occupied by the CUF group but curiously enough, with different classifications.

Position	Name	NUTS II region	i_{HSWAI} value
1	Hospital CUF Torres Vedras	Center	0,608
2	Hospital CUF Cascais, AS	Lisbon	0,602
3	Hospital CUF Santarém	Alentejo	0,594
4	Hospital CUF Infante Santo	Lisbon	0,588
5	Hospital CUF Descobertas	Lisbon	0,581

Table 18 - Private hospitals with the best positioning in the global ranking

The following tables present the positioning of the top five hospitals for each criterion.

As can be seen in Table 19, the best-ranked hospital for Criterion 1 – Content was Hospital Beatriz Ângelo. The following places are all occupied by Hospital da Luz Group with various classifications. In positions four and five, the same classification is given to two hospitals.

Position	Name	NUTS II region	C1 value
1	Hospital Beatriz Ângelo	Lisbon	0,644
2	Hospital da Luz, Lisboa	Lisbon	0,600
3	Hospital da Luz, Arrábida	Lisbon	0,581
4	Hospital da Luz, Guimarães	North	0,575
4	Hospital da Luz, Oeiras	Lisbon	0,575
5	Hospital da Luz, Póvoa de Varzim	North	0,564
5	Hospital da Luz, Aveiro	Center	0,564

Table 19 - Private hospitals with the best positioning in Criterion 1

Table 20 depicts the results for Criterion 2 – Services. Ranking in the first place are two CUF group hospitals – Torres Vedras and Cascais. For second position there are other three CUF hospitals with the same classification – Infante Santo, Descobertas and Santarém. Hospital da Luz has all its eleven units on the third position as well as Hospital da Misericórdia de Évora and Hospital de S. José – Sta. Casa da Misericórdia de Fafe. Clínica Europa is in the fourth position and finally, the fifth position is occupied by the three Lusíadas group hospitals – Albufeira, Lisboa, and Porto alongside with Clínica Sto. António.

There is a clear standout for three of the big hospital groups in the services criterion. Considering that this criterion weights the most on the final index calculation, it is visible that particular attention is put on this criterion, in website development, by the private groups.

Position	Name	NUTS II region	C2 value
1	Hospital CUF Torres Vedras	Center	0,722
1	Hospital CUF Cascais, AS	Lisbon	0,722
2	Hospital CUF Infante Santo	Lisbon	0,672
2	Hospital CUF Descobertas	Lisbon	0,672
2	Hospital CUF Santarém	Alentejo	0,672
3	Hospital da Luz, Lisboa	Lisbon	0,544
3	Hospital da Luz, Arrábida	Lisbon	0,544
3	Hospital da Luz, Guimarães	North	0,544
3	Hospital da Luz, Oeiras	Lisbon	0,544
3	Hospital da Luz, Póvoa de Varzim	North	0,544
3	Hospital da Luz, Aveiro	Center	0,544
3	Hospital da Luz, Funchal	Madeira	0,544
3	Hospital da Luz, Vila Real	North	0,544
3	Hospital da Luz, Setúbal	Lisbon	0,544
3	Hospital da Misericórdia de Évora	Alentejo	0,544
3	Hospital da Luz Torres de Lisboa	Lisbon	0,544
3	Hospital da Luz, Coimbra	Center	0,544
3	Hospital de S. José - Sta. Casa da Misericórdia de Fafe	North	0,544
4	Clínica Europa	Lisbon	0,500
5	Hospital Lusíadas Albufeira	Algarve	0,450
5	Hospital Lusíadas Lisboa	Lisbon	0,450
5	Hospital Lusíadas Porto	North	0,450
5	Clínica Sto. António	North	0,450

Table 20 - Private hospitals with the best positioning in Criterion 2

For Criterion 3 – Community Interaction, rankings can be consulted in Table 21. The first place in this ranking is shared by Hospital CUF Santarém and Hospital da Luz, Póvoa de Varzim. The second place is occupied by Hospital Garcia da Orta. With the same classification ranking in the

third position are several hospitals: CUF group – Descobertas, Viseu and Coimbra; Hospital da Luz group – Lisboa, Arrábida, Guimarães, Oeiras, Aveiro, Funchal, Vila Real, Setúbal, Torres de Lisboa, and Coimbra; Hospital da Misericórdia de Évora; and Trofa Saúde Hospital Loures. The fourth position is occupied by the CUF group – Torres Vedras, Cascais, and Infante Santo, and the Trofa Saúde Group – Guimarães, S. João da Madeira, Senhor do Bonfim, and Vila Real. Trofa Saúde Group also occupies the fifth position with four units: Braga Centro, Gaia, Famalicão, and Gaia.

Position	Name	NUTS II region	C3 value
1	Hospital CUF Santarém	Alentejo	0,485
1	Hospital da Luz, Póvoa de Varzim	North	0,485
2	Hospital Garcia de Orta	Lisbon	0,483
3	Hospital CUF Descobertas	Lisbon	0,415
3	Hospital da Luz, Lisboa	Lisbon	0,415
3	Hospital da Luz, Arrábida	Lisbon	0,415
3	Hospital da Luz, Guimarães	North	0,415
3	Hospital da Luz, Oeiras	Lisbon	0,415
3	Hospital da Luz, Aveiro	Center	0,415
3	Hospital da Luz, Funchal	Madeira	0,415
3	Hospital da Luz, Vila Real	North	0,415
3	Hospital da Luz, Setúbal	Lisbon	0,415
3	Hospital da Misericórdia de Évora	Alentejo	0,415
3	Hospital da Luz Torres de Lisboa	Lisbon	0,415
3	Hospital da Luz, Coimbra	Center	0,415
3	Hospital CUF Viseu	Center	0,415
3	Hospital CUF Coimbra	Center	0,415
3	Trofa Saúde Hospital Loures	Lisbon	0,415
4	Hospital CUF Torres Vedras	Center	0,410
4	Hospital CUF Cascais, AS	Lisbon	0,410
4	Hospital CUF Infante Santo	Lisbon	0,410
4	Trofa Saúde Hospital Guimarães	North	0,410
4	Trofa Saúde Hospital S. João da Madeira	North	0,410
4	Trofa Saúde Hospital Senhor do Bonfim	North	0,410
4	Trofa Saúde Hospital Vila Real	North	0,410

5	Trofa Saúde Hospital Braga Centro	North	0,404
5	Trofa Saúde Hospital Gaia	North	0,404
5	Trofa Saúde Hospital Famalicão	North	0,404
5	Trofa Saúde Hospital Maia	North	0,404

Table 21 - Private hospitals with the best positioning in Criterion 3

The last table (Table 22) shows the results for Criterion 4 – Technology Features. Hospital da Prelada is ranked first followed by Trofa Saúde Hospital Loures in the second position and Hospital Beatriz Ângelo in the third position. Several hospitals have the same classification ranking fourth: Hospital de Sta. Maria Porto, Trofa Saúde group with 8 units – Guimarães, S. João da Madeira, Senhor do Bonfim, Vila Real, Braga Centro, Gaia, Famalicão, and Maia, Hospital Particular de Barcelos, Clínica Europa, and Hospital Particular de Viana do Castelo. The fifth position is occupied by the Hospital da Luz group with 9 units (Póvoa de Varzim, Lisboa, Arrábida, Guimarães, Oeiras, Aveiro, Funchal, Vila Real, Setúbal), Hospital da Misericórdia de Évora, and the CUF group with 4 units (Viseu, Coimbra, Torres Vedras, Cascais).

Position	Name	NUTS II region	C4 value
1	Hospital da Prelada	North	0,640
2	Trofa Saúde Hospital Loures	Lisbon	0,637
3	Hospital Beatriz Ângelo	Lisbon	0,628
4	Hospital de Sta. Maria - Porto	North	0,622
4	Trofa Saúde Hospital Guimarães	North	0,622
4	Trofa Saúde Hospital S. João da Madeira	North	0,622
4	Trofa Saúde Hospital Senhor do Bonfim	North	0,622
4	Trofa Saúde Hospital Vila Real	North	0,622
4	Trofa Saúde Hospital Braga Centro	North	0,622
4	Trofa Saúde Hospital Gaia	North	0,622
4	Trofa Saúde Hospital Famalicão	North	0,622
4	Trofa Saúde Hospital Maia	North	0,622
4	Hospital Particular de Barcelos	North	0,622
4	Clínica Europa	Lisbon	0,622
4	Hospital Particular de Viana do Castelo	North	0,622
5	Hospital da Luz, Póvoa de Varzim	North	0,608
5	Hospital da Luz, Lisboa	Lisbon	0,608
5	Hospital da Luz, Arrábida	Lisbon	0,608

5	Hospital da Luz, Guimarães	North	0,608
5	Hospital da Luz, Oeiras	Lisbon	0,608
5	Hospital da Luz, Aveiro	Center	0,608
5	Hospital da Luz, Funchal	Madeira	0,608
5	Hospital da Luz, Vila Real	North	0,608
5	Hospital da Luz, Setúbal	Lisbon	0,608
5	Hospital da Misericórdia de Évora	Alentejo	0,608
5	Hospital CUF Viseu	Center	0,608
5	Hospital CUF Coimbra	Center	0,608
5	Hospital CUF Torres Vedras	Center	0,608
5	Hospital CUF Cascais, AS	Lisbon	0,608

Table 22 - Private hospitals with the best positioning in Criterion 4

6. Analysis by Population Distribution

Public hospitals serve the population of a certain city, area or region while private hospitals can serve anyone living anywhere. For this reason, this analysis will only take in consideration public hospitals due to their location-based characteristic.

The hospital region by NUTS III was considered to be aligned with statistics presented at Pordata[10] website from 2019. The resident population is considered to identify the population size and categorize the hospital in one of the three classes:

- Class 1 – population over 1.000.000 inhabitants (large)
- Class 2 – population over 200.000 inhabitants and less than 1.000.000 inhabitants (medium)
- Class 3 – population less or equal to 200.000 inhabitants (small)

This chapter presents the results of this segmented analysis for each of the mentioned classes.

6.1 Class 1 – Hospitals in Large Regions

From the 132 evaluated hospitals, only 44 are public hospitals, and from these, having in consideration the population for each NUTS III region, 18 are classified in "Class 1 – Large Regions". This corresponds to 41% of public hospitals.

As shown in Table 23, the hospital in this class that obtained the best classification was IPO do Porto Francisco Gentil. Following, come Centro Hospitalar Universitário Lisboa Central, Centro Hospitalar de Setúbal, ULS de Matosinhos, and Centro Hospitalar Lisboa Ocidental.

Position	Name	District	NUTS III region	i_{HSWAI} value
1	IPO do Porto Francisco Gentil	Porto	Área Metropolitana do Porto	0,624
2	CH Universitário Lisboa Central, EPE	Lisboa	Área Metropolitana de Lisboa	0,603
3	CH Setúbal, EPE	Setúbal	Área Metropolitana de Lisboa	0,502
4	ULS Matosinhos, EPE - Hospital Pedro Hispano	Porto	Área Metropolitana do Porto	0,455
5	CH Lisboa Ocidental, EPE	Lisboa	Área Metropolitana de Lisboa	0,389

Table 23 - Hospitals from Class 1 - Large Region with best positioning in the global ranking

The following tables present the results for hospitals in Class 1 according to each specified criterion from the index.

Table 24 shows the results for Criterion 1 – Content, ranking Centro Hospitalar S. João in first place. The second-best classified is Centro Hospitalar Lisboa Ocidental, followed by Centro

[10] pordata.pt/Municipios/População+residente+total+e+por+grandes+grupos+etários-390

Hospitalar Lisboa Norte, Centro Hospitalar Barreiro Montijo and Hospital de Vila Franca de Xira in third, fourth and fifth positions, respectively.

Position	Name	District	NUTS III region	C1 value
1	CH S. João, EPE	Porto	Área Metropolitana do Porto	0,686
2	CH Lisboa Ocidental, EPE	Lisboa	Área Metropolitana de Lisboa	0,681
3	CH Lisboa Norte, EPE	Lisboa	Área Metropolitana de Lisboa	0,644
4	CH Barreiro Montijo, EPE	Setúbal	Área Metropolitana de Lisboa	0,592
5	Hospital de Vila Franca de Xira	Lisboa	Área Metropolitana de Lisboa	0,577

Table 24 - Hospitals from Class 1 - Large Region with best positioning in Criterion 1

Results for Criterion 2 – Services are presented in Table 25. Centro Hospitalar Universitário Lisboa Central is the best classified. IPO do Porto Francisco Gentil occupies the second position, Centro Hospitalar de Setúbal ranked third, and ULS Matosinhos is in fourth. The fifth position belongs to Centro Hospitalar Barreiro Montijo.

Position	Name	District	NUTS III region	C2 value
1	CH Universitário Lisboa Central, EPE	Lisboa	Área Metropolitana de Lisboa	0,683
2	IPO do Porto Francisco Gentil	Porto	Área Metropolitana do Porto	0,638
3	CH Setúbal, EPE	Setúbal	Área Metropolitana de Lisboa	0,544
4	ULS Matosinhos, EPE - Hospital Pedro Hispano	Porto	Área Metropolitana do Porto	0,494
5	CH Barreiro Montijo, EPE	Setúbal	Área Metropolitana de Lisboa	0,233

Table 25 - Hospitals from Class 1 - Large Region with best positioning in Criterion 2

IPO do Porto Francisco Gentil ranked once again in the first position, this time for Criterion 3 – Community Interaction among Class 1 – Large Regions public hospitals, as can be verified in Table 26. Following are Hospital de Vila Franca de Xira, Centro Hospitalar Lisboa Norte, Centro Hospitalar Universitário Lisboa Central and IPO de Lisboa Francisco Gentil for the first five positions in this ranking.

Position	Name	District	NUTS III region	C3 value
1	IPO do Porto Francisco Gentil	Porto	Área Metropolitana do Porto	0,659
2	Hospital de Vila Franca de Xira	Lisboa	Área Metropolitana de Lisboa	0,589
3	CH Lisboa Norte, EPE	Lisboa	Área Metropolitana de Lisboa	0,570

4	CH Universitário Lisboa Central, EPE	Lisboa	Área Metropolitana de Lisboa	0,559
5	IPO de Lisboa Francisco Gentil	Lisboa	Área Metropolitana de Lisboa	0,500

Table 26 - Hospitals from Class 1 - Large Region with best positioning in Criterion 3

Lastly, Criterion 4 – Technology Features' results are presented in Table 27. Hospital de Vila Franca de Xira occupies the first position and Centro Hospitalar S. João the second. The third position is occupied by Centro Hospitalar Lisboa Norte, the fourth by ULS Matosinhos and the fifth by Centro Hospitalar PSiquiátrico de Lisboa.

Position	Name	District	NUTS III region	C4 value
1	Hospital de Vila Franca de Xira	Lisboa	Área Metropolitana de Lisboa	0,648
2	CH S. João, EPE	Porto	Área Metropolitana do Porto	0,634
3	CH Lisboa Norte, EPE	Lisboa	Área Metropolitana de Lisboa	0,608
4	ULS Matosinhos, EPE - Hospital Pedro Hispano	Porto	Área Metropolitana do Porto	0,594
4	CH Psiquiátrico de Lisboa	Lisboa	Área Metropolitana de Lisboa	0,594
5	IPO do Porto Francisco Gentil	Porto	Área Metropolitana do Porto	0,580

Table 27 - Hospitals from Class 1 - Large Region with best positioning in Criterion 4

6.2 Class 2 – Hospitals in Medium Regions

According to the number of inhabitants by NUTS III regions, this category counts with 19 public hospitals making it 43% of the sample.

As can be seen in Table 28, ULS Alto Minho is the best ranked globally for Class 2. ULS Guarda finds itself in the second position closely followed by Centro Hospitalar Tâmega e Sousa. The fourth and fifth positions are occupied by Hospital de Ovar and Centro Hospitalar Universitário Cova da Beira.

Position	Name	District	NUTS III region	i_{HSWAI} value
1	ULS Alto Minho, EPE	Viana do Castelo	Alto Minho	0,540
2	ULS Guarda, EPE	Guarda	Beiras e Serra da Estrela	0,526
3	CH Tâmega e Sousa, EPE	Porto	Tâmega e Sousa	0,524
4	Hospital Dr. Francisco Zagalo - Ovar	Aveiro	Região de Aveiro	0,472
5	CH Universitário Cova da Beira, EPE	Castelo Branco	Beiras e Serra da Estrela	0,465

Table 28 - Hospitals from Class 2 - Medium Region with best positioning in the global ranking

For Criterion 1 – Content, Centro Hospitalar de Leira ranked in the first position. The other Class 2 hospitals ranking in the best positions are, in order, Hospital de Sta. Maria Maior Barcelos, Hospital de Braga, Centro Hospitalar Universitário Cova da Beira, and Hospital Distrital de Santarém. This classification can be consulted in Table 29.

Position	Name	District	NUTS III region	C1 value
1	CH Leiria, EPE	Leiria	Região de Leiria	0,740
2	Hospital de Sta. Maria Maior - Barcelos	Braga	Cávado	0,705
3	Hospital de Braga	Braga	Cávado	0,666
4	CH Universitário Cova da Beira, EPE	Castelo Branco	Beiras e Serra da Estrela	0,645
5	Hospital Distrital de Santarém	Santarém	Lezíria do Tejo	0,643

Table 29 - Hospitals from Class 2 - Medium Region with best positioning in Criterion 1

Table 30 presents the results for Criterion 2 – Services, with ULS Guarda, ULS Alto Minho, Hospital de Ovar, and Centro Hospitalar Tâmega e Sousa ranking in the first position with the same classification. The following positions are occupied by Centro Hospitalar Tondela – Viseu (second position), Centro Hospitalar Baixo Vouga (third position), Centro Hospitalar Universitário Cova da Beira (fourth position), and Centro Hospitalar Médio Tejo (fifth position).

Position	Name	District	NUTS III region	C2 value
1	ULS Guarda, EPE	Guarda	Beiras e Serra da Estrela	0,544
1	ULS Alto Minho, EPE	Viana do Castelo	Alto Minho	0,544
1	Hospital Dr. Francisco Zagalo - Ovar	Aveiro	Região de Aveiro	0,544
1	CH Tâmega e Sousa, EPE	Porto	Tâmega e Sousa	0,544
2	CH Tondela - Viseu, EPE	Viseu	Viseu Dão Lafões	0,494
3	CH Baixo Vouga, EPE	Aveiro	Região de Aveiro	0,411
4	CH Universitário Cova da Beira, EPE	Castelo Branco	Beiras e Serra da Estrela	0,361
5	CH Médio Tejo, EPE	Santarém	Médio Tejo	0,355

Table 30 - Hospitals from Class 2 - Medium Region with best positioning in Criterion 2

Table 31 shows the highest positions for Criterion 3 – Community Interaction. The leader in this criterion is Hospital Distrital Figueira da Foz, followed by Centro Hospitalar Leiria, Centro

Hospitalar Universitário Cova da Beira, Hospital da Srª da Oliveira Guimarães, and finally, Centro Hospitalar Tâmega e Sousa.

Position	Name	District	NUTS III region	C3 value
1	Hospital Distrital da Figueira da Foz	Coimbra	Região de Coimbra	0,609
2	CH Leiria, EPE	Leiria	Região de Leiria	0,559
3	CH Universitário Cova da Beira, EPE	Castelo Branco	Beiras e Serra da Estrela	0,553
4	Hospital da Sr.ª da Oliveira Guimarães	Braga	Ave	0,550
5	CH Tâmega e Sousa, EPE	Porto	Tâmega e Sousa	0,525

Table 31 - Hospitals from Class 2 - Medium Region with best positioning in Criterion 3

The fourth criterion, Criterion 4 – Technology Features is headed by Hospital de Braga as presented in Table 32. ULS Guarda and ULS Alto Minho are both ranked second with the same classification. IPO de Coimbra Francisco Gentil comes in the third position and the two final positions are occupied by Centro Hospitalar Tondela – Viseu and Centro Hospitalar Médio Tejo.

Position	Name	District	NUTS III region	C4 value
1	Hospital de Braga	Braga	Cávado	0,668
2	ULS Guarda, EPE	Guarda	Beiras e Serra da Estrela	0,594
2	ULS Alto Minho, EPE	Viana do Castelo	Alto Minho	0,594
3	IPO de Coimbra Francisco Gentil	Coimbra	Região de Coimbra	0,551
4	CH Tondela - Viseu, EPE	Viseu	Viseu Dão Lafões	0,534
5	CH Médio Tejo, EPE	Santarém	Médio Tejo	0,528

Table 32 - Hospitals from Class 2 - Medium Region with best positioning in Criterion 4

6.3 Class 3 – Hospitals in Small Regions

This is the class with the smallest number of hospitals. Only 7 public hospitals are classified in Class 3 corresponding to 16% of the total.

As can be seen in Table 33, Hospital José Joaquim Fernandes is the best ranked hospital in this class, followed by Hospital Amato Lusitano. The last 3 positions have very close index values and are occupied by ULS Nordeste, ULS Norte Alentejano and Hospital do Litoral Alentejano.

Position	Name	District	NUTS III region	i_{HSWAI} value

1	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Beja	Baixo Alentejo	0,508
2	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Castelo Branco	Beira Baixa	0,501
3	ULS Nordeste, EPE	Bragança	Terras de Trás-os-Montes	0,469
4	ULS Norte Alentejano, EPE	Portalegre	Alto Alentejo	0,467
5	ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Setúbal	Alentejo Litoral	0,466

Table 33 - Hospitals from Class 3 - Small Region with best positioning in the global ranking

For Criterion 1 – Content, Table 34 shows the five best classified hospitals beginning with Hospital do Espírito Santo de Évora. The ranking continues with Hospital José Joaquim Fernandes, ULS Norte Alentejano, Hospital Amato Lusitano, and Centro Hospitalar Trás-os-Montes e Alto Douro.

Position	Name	District	NUTS III region	C1 value
1	Hospital do Espírito Santo de Évora	Évora	Alentejo Central	0,694
2	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Beja	Baixo Alentejo	0,589
3	ULS Norte Alentejano, EPE	Portalegre	Alto Alentejo	0,568
4	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Castelo Branco	Beira Baixa	0,506
5	CH Trás-os-Montes e Alto Douro, EPE	Vila Real/Viseu	Douro	0,495

Table 34 - Hospitals from Class 3 - Small Region with best positioning in Criterion 1

Class 3 – Small Regions' best ranked hospitals for Criterion 2 – Services are presented in Table 35. In the first position with the same classification we can find five hospitals: ULS Norte Alentejano, ULS Nordeste, Hospital José Joaquim Fernandes, Hospital Amato Lusitano, and Hospital do Litoral Alentejano. The following positions are occupied by Centro Hospitalar Trás-os-Montes e Alto Douro and Hospital do Espírito Santo de Évora.

Position	Name	District	NUTS III region	C2 value
1	ULS Norte Alentejano, EPE	Portalegre	Alto Alentejo	0,494
1	ULS Nordeste, EPE	Bragança	Terras de Trás-os-Montes	0,494
1	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Beja	Baixo Alentejo	0,494

1	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Castelo Branco	Beira Baixa	0,494
1	ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Setúbal	Alentejo Litoral	0,494
2	CH Trás-os-Montes e Alto Douro, EPE	Vila Real/Viseu	Douro	0,100
3	Hospital do Espírito Santo de Évora	Évora	Alentejo Central	0,088

Table 35 - Hospitals from Class 3 - Small Region with best positioning in Criterion 2

Criterion 3 – Community Interaction in the Small Regions class has its results in Table 36. Hospital Amato Lusitano and Centro Hospitalar Trás-os-Montes e Alto Douro occupy the first two positions. Hospital José Joaquim Fernandes ranks third, and ULS Nordeste and Hospital do Litoral Alentejano rank fourth and fifth, respectively.

Position	Name	District	NUTS III region	C3 value
1	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Castelo Branco	Beira Baixa	0,455
2	CH Trás-os-Montes e Alto Douro, EPE	Vila Real/Viseu	Douro	0,425
3	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Beja	Baixo Alentejo	0,404
4	ULS Nordeste, EPE	Bragança	Terras de Trás-os-Montes	0,376
5	ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Setúbal	Alentejo Litoral	0,334

Table 36 - Hospitals from Class 3 - Small Region with best positioning in Criterion 3

The last criteria, Criterion 4 – Technology Features has ULS Norte Alentejano, ULS Nordeste, and Hospital do Litoral Alentejano in the first position with the same classification, has can be seen in Table 37. Hospital José Joaquim Fernandes ranks second followed by Hospital Amato Lusitano in third, Hospital do Espírito Santo de Évora in fourth, and lastly, ranking fifth, Centro Hospitalar de Trás-os-Montes e Alto Douro.

Position	Name	District	NUTS III region	C4 value
1	ULS Norte Alentejano, EPE	Portalegre	Alto Alentejo	0,634
1	ULS Nordeste, EPE	Bragança	Terras de Trás-os-Montes	0,634
1	ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Setúbal	Alentejo Litoral	0,634

2	ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Beja	Baixo Alentejo	0,628
3	ULS Castelo Branco, EPE - Hospital Amato Lusitano	Castelo Branco	Beira Baixa	0,614
4	Hospital do Espírito Santo de Évora	Évora	Alentejo Central	0,517
5	CH Trás-os-Montes e Alto Douro, EPE	Vila Real/Viseu	Douro	0,442

Table 37 - Hospitals from Class 3 - Small Region with best positioning in Criterion 4

7. Analysis by NUTs II Regions Distribution

In this section, the segmented results by each NUTs II region are presented. NUTs II is a designation based on the definition of territorial units for statistical purposes (Nomenclatura das Unidades Territoriais para Fins Estatísticos) which was approved by law (Decreto-Lei nº 244/2002 from November 5th) dividing the country into seven regions: Alentejo, Algarve, Center, Metropolitan Lisbon Area (here designated as Lisbon), North, Azores Autonomous Region (here designated as Azores), and Madeira Autonomous Region (here designated as Madeira). The regions can be seen in Figure 7.

Figure 7 - NUTS II regions

The number of hospitals per region is presented in Figure 8. The Azores region has no hospitals in the evaluated sample and the Madeira region has only one hospital. The North has the largest number of hospitals, followed by the Center region and Lisbon. This is in line with population density.

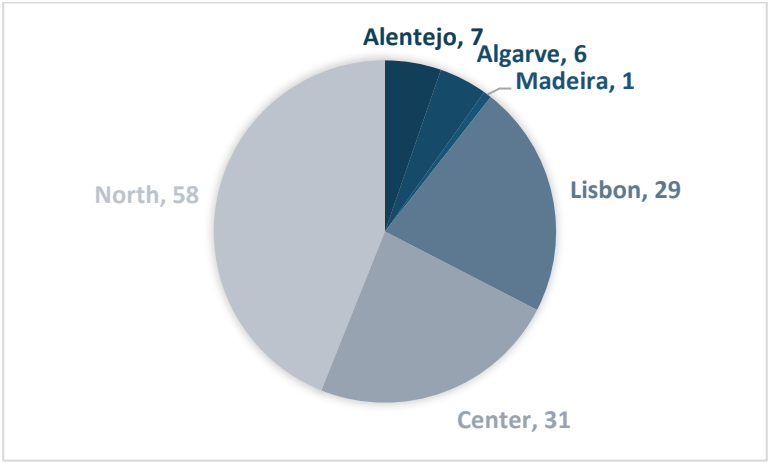


Figure 8 - Hospitals distribution per NUTS II regions

The average values achieved in each region are presented in Figure 9. The black line represents the average value achieved for all hospitals representing 0,359.

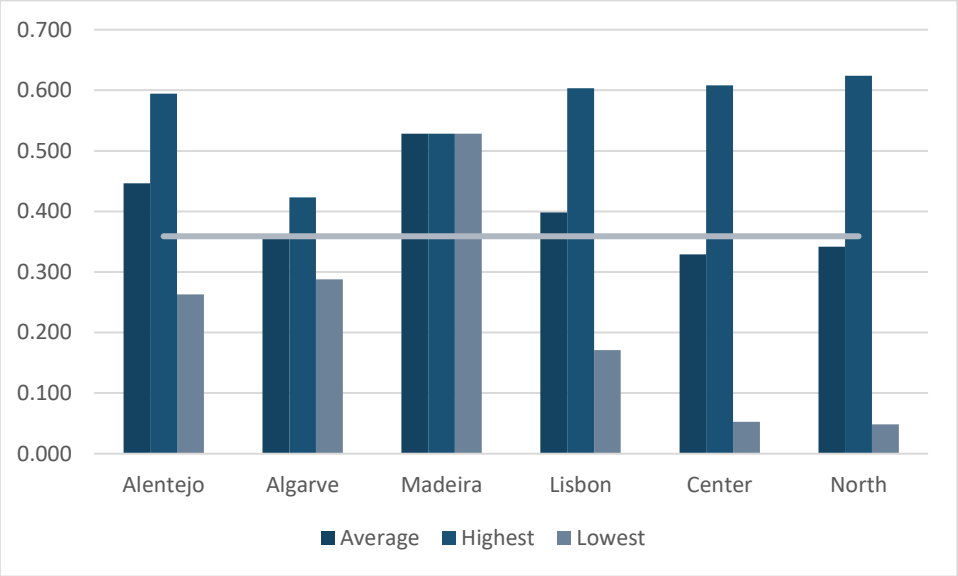


Figure 9 - Global average values achieved by hospitals in each NUTS II region

Only Algarve, Madeira and Lisbon regions have average values above the global average.

8. Analysis by Islands-Coastal-Inland Distribution

For the following analysis, the NUTS III regions to which each hospital belongs were classified in the three mentioned categories. Following this division, the three main areas are distributed as follows:

- Islands: 1 hospital
- Coastal: 100 hospitals
- Inland: 31 hospitals

Once again, keeping up with population distribution, there is a clear aggregation of health services provision in the coastal line.

Since the Islands only have one hospital representing the region, it was left out from Figure 10 representing the average values, highest and lowest classifications scored for coastal and inland situated hospitals. The line represents the global average with value 0,359.

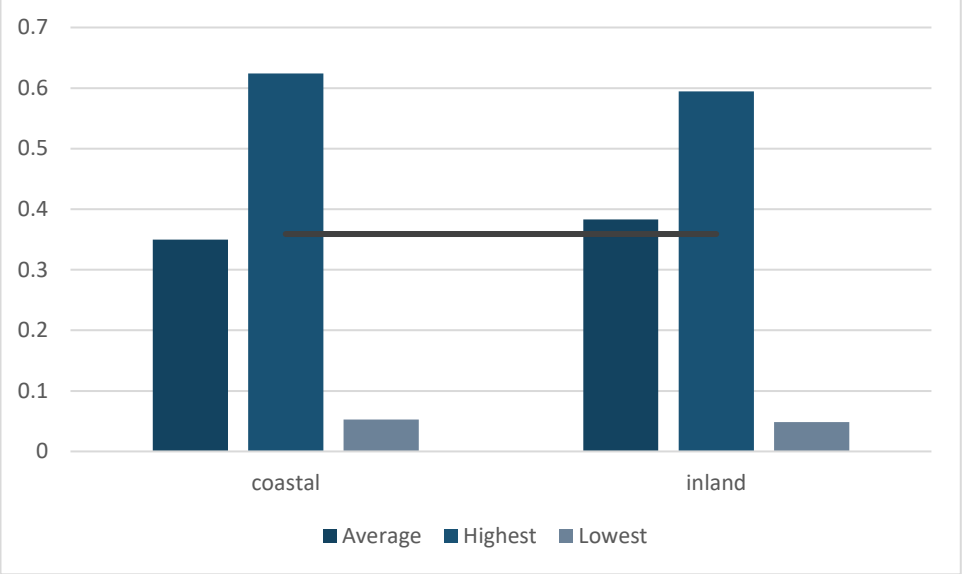


Figure 10 - Global average values achieved by hospitals in coastal and interior regions

Although coastal hospitals have the best ranked hospitals, inland hospitals have an average value above the global average.

9. Comparative analysis with SINAS

The National System for Health Evaluation (SINAS) is an assessment system that rates the overall quality of health providers in Portugal considering services provided on site. It is developed by the Regulatory Health Entity and its most recent results concern the year of 2019.

SINAS comprises 5 dimensions (Clinical Excellence, Patient Security, Facilities Comfort and Adequacy, Client Focus, and User Satisfaction) each including a set of indicators. The results of the evaluation are attributed on the basis of a star system, ranging from 1 to 3 stars for each indicator.

To facilitate a comparison between SINAS results and HSWAI results, it was necessary to transform SINAS classification into a numeric system. To do so, the number of stars given to a certain hospital was divided by the number of possible stars, that is, the maximum each hospital could obtain. This was done only reaching the second level of indicators. As an example, Table 38 shows a fictional case of conversion for a hospital.

Dimension	Nbr of possible stars	Obtained stars	SINAS value
Clinical Excellence (evaluated in 3 out of 16 areas possible)	9	5	0,722
Patient Security	3	3	
Facilities Comfort and Adequacy	3	3	
Client Focus	3	2	
Total	18	13	

Table 38 - Example of SINAS conversion

Each hospital receives a value between 0 and 1 corresponding to the conversion to this numeric system. The complete list of results and calculations can be consulted in Annex C.

For each dimension, the following assumptions were made for conversion of the star system to the numeric system:

SINAS Classification	Procedure
Red star	The number of stars in the dimension are summed
Grey star	Attribute value 0 to the dimension
Evaluation declined	Attribute value 0 to the dimension
Under investigation	The number of stars in the dimension are summed

Table 39 - Assumptions for SINAS conversion

The dimension User Satisfaction was not considered for the conversion since the majority of cases presented it as still in progress.

Not all hospitals evaluated in SINAS are present in HSWAI and vice-versa.

To facilitate comparison, both SINAS and HSWAI values were converted to a qualitative class, according to the ranges presented in Table 40.

SINAS and HSWAI Values	Class
0 to 0,250	Very low
0,251 to 0,500	Low
0,501 to 0,750	High
0,751 to 1	Very high

Table 40 - SINAS and HSWAI class ranges

Table 41 presents the top-rated hospitals in the HSWAI assessment and their corresponding SINAS classification, as well as the classes attributed to each.

Position	Name	i_{HSWAI} value	HSWAI class	SINAS value	SINAS class
1	IPO do Porto Francisco Gentil	0,624	High	0,867	Very high
2	Hospital CUF Torres Vedras	0,608	High	0,762	Very high
3	CH Universitário Lisboa Central, EPE - Hospital de Santa Marta	0,603	High	0,667	High
3	CH Universitário Lisboa Central, EPE - Hospital Dona Estefânia	0,603	High	0,667	High
3	CH Universitário Lisboa Central, EPE - Maternidade Dr. Alfredo da Costa	0,603	High	0,667	High
3	CH Universitário Lisboa Central, EPE - Hospital Curry Cabral	0,603	High	0,381	Low
3	CH Universitário Lisboa Central, EPE - Hospital de Santo António dos Capuchos	0,603	High	0,333	Low
3	CH Universitário Lisboa Central, EPE - Hospital de São José	0,603	High	0,333	Low
4	Hospital CUF Cascais, AS	0,602	High	0,714	High
5	Hospital CUF Santarém	0,594	High	0,800	Very high
6	Hospital CUF Infante Santo	0,588	High	0,718	High
7	Hospital CUF Descobertas	0,581	High	0,769	Very high
8	Hospital da Luz, Póvoa de Varzim	0,543	High	0,524	High
9	ULS Alto Minho, EPE - Hospital Conde de Bertiandos - Ponte de Lima	0,541	High	0,778	Very high

9	ULS Alto Minho, EPE - Hospital de Santa Luzia	0,541	High	0,750	High
10	Hospital da Luz, Lisboa	0,536	High	0,756	Very high

Table 41 - Top-ranked hospitals in HSWAI and their comparison to SINAS

Table 42 presents hospitals by classification considering both SINAS and HSWAI results. There is a concentration of hospitals classified as High in SINAS and Low in HSWAI which points towards improvement space in what concerns hospitals' online presence.

HSWAI assessment \ SINAS assessment	Very high	High	Low	Very low
Very high	---	---	---	---
High	• CH Tâmega e Sousa, EPE - Hospital de Amarante • CH Tâmega e Sousa, EPE - Hospital Padre Américo • Hospital CUF Descobertas • Hospital CUF Santarém • Hospital CUF Torres Vedras • Hospital da Luz Torres de Lisboa • Hospital da Luz, Lisboa • Hospital da Luz, Setúbal • IPO do Porto Francisco Gentil • ULS Alto Minho, EPE - Hospital Conde de Bertiandos - Ponte de Lima	• CH Universitário Lisboa Central, EPE - Hospital de Santa Marta • CH Universitário Lisboa Central, EPE - Hospital Dona Estefânia • CH Universitário Lisboa Central, EPE - Maternidade Dr. Alfredo da Costa • Hospital CUF Cascais, AS • Hospital CUF Infante Santo • Hospital da Luz, Arrábida • Hospital da Luz, Aveiro • Hospital da Luz, Guimarães • Hospital da Luz, Póvoa de Varzim • Hospital da Misericórdia de Évora • ULS Alto Minho, EPE - Hospital de Santa Luzia • ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes • ULS Castelo Branco, EPE - Hospital Amato Lusitano • ULS Guarda, EPE - Hospital de Nossa Senhora da Assunção • ULS Guarda, EPE - Hospital Sousa Martins	• CH Setúbal, EPE - Hospital Ortopédico de Sant'iago do Outão • CH Universitário Lisboa Central, EPE - Hospital Curry Cabral • CH Universitário Lisboa Central, EPE - Hospital de Santo António dos Capuchos • CH Universitário Lisboa Central, EPE - Hospital de São José	• CH Setúbal, EPE - Hospital de São Bernardo

Low	• CH Leiria, EPE - Hospital Bernardino Lopes de Oliveira - Alcobaça • CH Médio Tejo, EPE - Hospital de Nossa Senhora da Graça - Tomar • CH Médio Tejo, EPE - Hospital Rainha Santa Isabel - Torres Novas • CH Trás-os-Montes e Alto Douro, EPE - Unidade Hospitalar de Lamego • CH Universitário do Porto, EPE - Centro Materno Infantil do Norte • CH V.N. Gaia/Espinho, EPE - Hospital de Nossa Senhora da Ajuda - Espinho • CH V.N. Gaia/Espinho, EPE - Hospital Distrital de Vila Nova de Gaia • Hospital Beatriz Ângelo • Hospital da Misericórdia de Vila Verde • Hospital da Prelada • Hospital de Braga • Hospital de S. José - Sta. Casa da Misericórdia de Fafe • Hospital de Vila Franca de Xira • Hospital Lusíadas Porto • Hospital Narciso Ferreira - Riba de Ave • Hospital Particular do Algarve, SA - Unidade de Gambelas • Hospital Terra Quente • IPO de Coimbra Francisco Gentil ● ULS Matosinhos, EPE - Hospital Pedro Hispano	• CH Baixo Vouga, EPE - Hospital Infante D. Pedro • CH Barreiro Montijo, EPE - Hospital de Nossa Senhora do Rosário • CH Barreiro Montijo, EPE - Hospital Distrital do Montijo • CH Leiria, EPE - Hospital de Santo André - Leiria • CH Leiria, EPE - Hospital Distrital de Pombal • CH Lisboa Norte, EPE - Hospital Pulido Valente • CH Lisboa Ocidental, EPE - Hospital Egas Moniz • CH Médio Tejo, EPE - Hospital Dr. Manoel Constâncio - Abrantes • CH Tondela - Viseu, EPE - Hospital Cândido de Figueiredo - Tondela • CH Tondela - Viseu, EPE - Hospital de São Teotónio • CH Trás-os-Montes e Alto Douro, EPE - Hospital de São Pedro de Vila Real • CH Trás-os-Montes e Alto Douro, EPE - Unidade Hospitalar de Chaves • CH Universitário Cova da Beira, EPE - Hospital do Fundão • CH Universitário do Algarve, EPE - Hospital de Faro • CH Universitário do Algarve, EPE - Hospital Distrital de Lagos • CH Universitário do Porto, EPE - Hospital de Santo António • CH V.N. Gaia/Espinho, EPE - Hospital Eduardo Santos Silva • Hospital António Lopes • Hospital CUF Viseu • Hospital da Sr.ª da Oliveira Guimarães • Hospital de Sta. Maria Maior - Barcelos • Hospital Distrital da Figueira da Foz • Hospital Distrital de Santarém • Hospital Dr. Francisco Zagalo - Ovar • Hospital Lusíadas Albufeira • Hospital Lusíadas Lisboa • Hospital Particular de Barcelos • Hospital Particular de Viana do Castelo • Hospital Prof. Doutor Fernando Fonseca • IPO de Lisboa Francisco Gentil • ULS Nordeste, EPE - Unidade Hospitalar de Bragança • ULS Nordeste, EPE - Unidade Hospitalar de Macedo de Cavaleiros ● ULS Nordeste, EPE - Unidade Hospitalar de Mirandela	• Centro Cirúrgico de Coimbra • CH Baixo Vouga, EPE - Hospital Distrital de Águeda • CH Baixo Vouga, EPE - Hospital Visconde Salreu de Estarreja • CH Entre Douro e Vouga, EPE - Hospital de São Sebastião • CH Lisboa Norte, EPE - Hospital de Santa Maria • CH Lisboa Ocidental, EPE - Hospital de Santa Cruz • CH Lisboa Ocidental, EPE - Hospital de São Francisco Xavier • CH S. Francisco, SA - Unidade de Leiria • CH S. João, EPE - Hospital Nossa Senhora da Conceição de Valongo • CH Universitário Cova da Beira, EPE - Hospital Pêro da Covilhã • CH Universitário do Algarve, EPE - Unidade Hospitalar de Portimão • Clinigrande - Clínica da Marinha Grande, Lda. • Hospital Agostinho Ribeiro • Hospital da Misericórdia da Mealhada • Hospital de Sant'Ana • Hospital do Espírito Santo de Évora • Hospital dos SAMS • Hospital Escola da Universidade Fernando Pessoa • Hospital Particular de Paredes • Hospital Particular do Algarve, SA - Unidade de Alvor • Sanfil - Casa de Saúde de Sta. Filomena, AS • Trofa Saúde Hospital Braga Centro • Trofa Saúde Hospital Braga Sul • Trofa Saúde Hospital Matosinhos • ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano ● Venerável Irmandade de N.ª Sra. da Lapa	---
Very low	• CH Póvoa de Varzim/Vila do Conde, EPE - Unidade Hospitalar de Vila do Conde • Hospital de Cascais • Hospital José Luciano de Castro-Misericórdia de Anadia	• CH Médio Ave, EPE - Unidade Hospitalar de Famalicão • CH Póvoa de Varzim/Vila do Conde, EPE - Unidade Hospitalar da Póvoa de Varzim • Hospital da Sta. Casa da Misericórdia de Vila do Conde • Hospital de Sta. Isabel - Marco de Canaveses ● Venerável Ordem Terceira de S. Francisco do Porto	• CH Médio Ave, EPE - Unidade Hospitalar de Santo Tirso • CH Universitário de Coimbra, EPE - Hospitais da Universidade de Coimbra • CH Universitário de Coimbra, EPE - Hospital Geral • CH Universitário de Coimbra, EPE - Hospital Pediátrico de Coimbra • CH Universitário de Coimbra, EPE - Maternidade Bissaya Barreto • CH Universitário de Coimbra, EPE - Maternidade Dr. Daniel de Matos	---

Table 42 - SINAS and HSWAI classifications matrix

10. Conclusions

This document reports the results obtained after applying the instrument of the Health Sector Website Assessment Index to evaluate Portuguese hospitals' websites. The instrument was developed by United Nations University – Operating Unit on Policy Driven Electronic Governance (UNU-EGOV).

The process of development and validation of the instrument followed several steps that culminated in the final version of the instrument to be applied[11]. The instrument is in constant adaptation to accompany websites evolution and assessment directives. It is composed of four main criteria: Criterion 1 – Content; Criterion 2 – Services; Criterion 3 – Community Interaction; Criterion 4 – Technology Features. More details on the indicators and sub-indicators that constitute each criterion was presented in chapter 2 of this document.

For i_{HSWAI}, that is, the index of Hospitals' websites, the average value for this assessment is 0,359 and the percentage of hospitals with classification equal or above this value is 48%. The highest classification achieved was 0,624.

Hospitals assessment counts with two separate groups: public hospitals and private hospitals. The Health Ministry has recently made available a template webpage that most public hospitals use and adapt to. Private hospitals have more freedom in websites design and features making the expectation of clearer, usable, easier, and more appealing websites a reality. Nonetheless, criteria, indicators and sub-indicators included in the HSWAI Instrument should be considered by both private and public hospitals with the intention of providing better services and making user-friendly environments with the technology available.

Considering the analysis by criterion, the first one, Content, focuses on the presence of information relevant to the user and evaluates the quality, availability, relevance, completeness and concise representation of specific information that it is expected to be provided in a hospital website. It includes five indicators concerned with hospitals general information, quality metrics available, medical information and organizational structuring, general information for patients and information related to research and teaching.

Information seeking is one of the activities users do more frequently when searching for a website and thus the relevance of such criterion. With an average value of 0,406, this criterion shows significant variation of values. This criterion achieves the highest value of the four criteria but also one of the lowest (Most of the hospitals show the best performance in this criterion, but there are few cases that show the worst performance among the 4 criteria). Information disclosure on website should be considered as a mandatory practice.

The second criterion, Services, is the heaviest weight criterion on the final calculation of the index. This criterion is directed at the provision of personalized electronic services including electronic healthcare scheduling, prescription renewal or drug acquisition, automation of hospital's back-office procedures, forms availability on the website, electronic completion of administrative

[11] Demetrios Sarantis, Delfina Soares, and Joana Carvalho. 2020. HSWAI: a health sector website assessment instrument. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020). Association for Computing Machinery, New York, NY, USA, 359–368. DOI:https://doi.org/10.1145/3428502.3428551

transactions and online appointments. It includes three indicators: administrative procedures, scheduling and patient care.

This criterion obtained an average value of 0,314 and is the only one where a 0 mark was allocated. This is the criterion where private hospitals lead by making available more features of patient services online. For its relevance in user interaction, it is the criterion where more investment should be put into.

Criterion 3 – Community Interaction is used to describe the interaction between hospital, patients and online communities on the web. Online communities often involve members that provide content to the website and contribute in some way. Examples of such include forums, complaints forms, interaction with the media and hospital's marketing activities. It includes three indicators concerning participation, media, and publicity or marketing.

The average value for the criterion is 0,335 and its top 10 is composed of only public hospitals.

The last and final criterion is Criterion 4 – Technology Features which encompasses mainly technical items related to easy navigation, website quality, visual appeal, functionality and reliability. The technology criterion is related to how the content and services are assembled and made available on a website. It includes five indicators associated with navigability, accessibility, usability, credibility, and privacy and security.

The average value for this criterion was 0,533 which was the highest average value achieved among the four criteria. Once again, the top-ranked hospitals in the criterion are public hospitals.

Annex A – Characterization of the assessed hospitals

This annex contains data regarding each of the 135 selected hospitals to be evaluated. It includes information considered as relevant for the segmented analysis presented in this document namely: the type of hospital, whether it is of private or public administration; NUTS II regions; NUTS III regions; the region size which classifies in large, medium, or small each NUTS III region according to the resident population; Location in Coastal, Inland, or Islands categories, and the website used to perform the assessment of each hospital.

Hospital	Type	NUTS II	NUTS III	Region size	Location	Website
Hospital da Luz Torres de Lisboa	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.hospitaldaluz.pt/torreslisboa/pt/
Casa de Repouso de Coimbra	Private	Center	Região de Coimbra	Medium	coastal	https://www.crc-csc.pt/
Casa de Saúde da Boavista	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.csaudeboavista.com/
Casa de Saúde de Amares	Private	North	Cávado	Medium	coastal	https://www.csamares.pt/
Casa de Saúde de S. Lázaro	Private	North	Cávado	Medium	coastal	http://www.csslazaro.com.pt/
Hospital Casa de Saúde	Private	Center	Viseu Dão Lafões	Medium	inland	https://casadesaude.pt/
CH Universitário do Algarve, EPE	Public	Algarve	Algarve	Medium	coastal	www.chalgarve.min-saude.pt
CH Baixo Vouga, EPE	Public	Center	Região de Aveiro	Medium	coastal	http://www.chbv.min-saude.pt/
CH Barreiro Montijo, EPE	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.chbm.min-saude.pt
CH Universitário Cova da Beira, EPE	Public	Center	Beiras e Serra da Estrela	Medium	inland	www.chcbeira.pt
CH Entre Douro e Vouga, EPE	Public	North	Área Metropolitana do Porto	Large	coastal	http://www.chedv.min-saude.pt
CH Leiria, EPE	Public	Center	Região de Leiria	Medium	coastal	www.chleiria.pt
CH Universitário Lisboa Central, EPE	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.chlc.min-saude.pt
CH Lisboa Norte, EPE	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.chln.min-saude.pt
CH Lisboa Ocidental, EPE	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.chlo.min-saude.pt
CH Médio Ave, EPE	Public	North	Ave	Medium	inland	http://www.chma.pt
CH Médio Tejo, EPE	Public	Center	Médio Tejo	Medium	inland	www.chmt.min-saude.pt
CH Oeste	Public	Center	Oeste	Medium	coastal	http://www.choeste.min-saude.pt
CH Universitário do Porto, EPE	Public	North	Área Metropolitana do Porto	Large	coastal	http://www.chporto.pt/
CH Póvoa de Varzim/Vila do Conde, EPE	Public	North	Área Metropolitana do Porto	Large	coastal	https://www.chpvvc.pt/
CH S. Francisco, SA - Unidade de Leiria	Private	Center	Região de Leiria	Medium	coastal	https://www.sanfil.pt/
CH S. João, EPE	Public	North	Área Metropolitana do Porto	Large	coastal	www.chsj.pt
CH Setúbal, EPE	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	www.chs.min-saude.pt
CH Tâmega e Sousa, EPE	Public	North	Tâmega e Sousa	Medium	inland	www.chts.min-saude.pt
CH Tondela - Viseu, EPE	Public	Center	Viseu Dão Lafões	Medium	inland	www.hstviseu.min-saude.pt
CH Trás-os-Montes e Alto Douro, EPE	Public	North	Douro	Small	inland	http://chtmad.com/
CH Universitário de Coimbra, EPE	Public	Center	Região de Coimbra	Medium	coastal	http://www.chuc.min-saude.pt/

CH V.N. Gaia/Espinho, EPE	Public	North	Área Metropolitana do Porto	Large	coastal	http://www.chvng.pt/
Hospital CUF Cascais, AS	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.saudecuf.pt/unidades/cascais
Hospital CUF Torres Vedras	Private	Center	Oeste	Medium	coastal	https://www.saudecuf.pt/unidades/torres-vedras
Clínica de Montes Claros, Lda	Private	Center	Região de Coimbra	Medium	coastal	https://www.clinicademontesclaros.pt/
Clínica Europa	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.jcs.pt/pt/unidades_de_saude/unidades/22
Clínica de Santa Tecla	Private	North	Cávado	Medium	coastal	http://clinicasantatecla.pt/
Hospital Particular de Barcelos	Private	North	Cávado	Medium	coastal	https://www.hospitaldebarcelos.com/
Clinigrande - Clínica da Marinha Grande, Lda.	Private	Center	Região de Leiria	Medium	coastal	http://www.clinigrande.pt/
Hospital da Luz, Póvoa de Varzim	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.hospitaldaluz.pt/povoa/pt/
Hospital da Luz, Aveiro	Private	Center	Região de Aveiro	Medium	coastal	https://www.hospitaldaluz.pt/aveiro/pt/
Clínica Sto. António	Private	North	Cávado	Medium	coastal	https://www.lusiadas.pt/pt/unidades/clisa/Paginas/home.aspx
COGE - Clínica da Santa Casa, Espinho	Private	North	Área Metropolitana do Porto	Large	coastal	http://www.coge.pt/
Hospital Agostinho Ribeiro	Private	North	Tâmega e Sousa	Medium	inland	http://www.hospitalagostinhoribeiro.com/har
Hospital António Lopes	Private	North	Ave	Medium	inland	https://hospitalantoniolopes.pt/
Hospital Arcebispo João Crisóstomo	Private	Center	Região de Coimbra	Medium	coastal	http://www.hdcantanhede.min-saude.pt/
Hospital Beatriz Ângelo	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.hbeatrizangelo.pt/pt/
Hospital CUF Descobertas	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.saudecuf.pt/unidades/descobertas
Hospital CUF Infante Santo	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.saudecuf.pt/unidades/infante-santo
Hospital CUF Porto	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.saudecuf.pt/unidades/porto
Hospital CUF Santarém	Private	Alentejo	Lezíria do Tejo	Medium	inland	https://www.saudecuf.pt/unidades/santarem
Hospital da Luz, Arrábida	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.hospitaldaluz.pt/arrabida/pt/
Hospital da Confraria de N.ª Sra. da Nazaré	Private	Center	Oeste	Medium	coastal	http://hospital.cnsn.pt/
Hospital da Cruz Vermelha Portuguesa	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.hospitalcruzvermelha.pt/
Hospital da Misericórdia da Mealhada	Private	Center	Região de Coimbra	Medium	coastal	http://www.hmmealhada.com/
Hospital da Misericórdia de Vila Verde	Private	North	Cávado	Medium	coastal	http://www.hospitalvilaverde.pt/
Hospital da Ordem Terceira Chiado	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://hotc.pt/
Hospital da Prelada	Private	North	Área Metropolitana do Porto	Large	coastal	https://portaldasaude.scmp.pt/pt-pt/hospital-da-prelada/areas-clinicas
Hospital da Sr.ª da Oliveira Guimarães	Public	North	Ave	Medium	inland	http://www.hospitaldeguimaraes.min-saude.pt/
Hospital da Sta. Casa da Misericórdia de Lousada	Private	North	Tâmega e Sousa	Medium	inland	https://www.scmlousada.pt/
Hospital da Sta. Casa da Misericórdia de Vila do Conde	Private	North	Área Metropolitana do Porto	Large	coastal	http://www.scmvc.pt/

Hospital da Sta. Casa da Misericórdia do Entroncamento - Hospital de S. João Baptista	Private	Center	Médio Tejo	Medium	inland	http://scment.org/
Hospital da Ordem da Trindade	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.ordemtrindade.pt/pt-pt
Hospital de Avelar	Private	Center	Região de Leiria	Medium	coastal	http://www.fnsg-avelar.com/
Hospital de Braga	Public	North	Cávado	Medium	coastal	https://www.hospitaldebraga.pt/
Hospital de Cascais	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.hospitaldecascais.pt
Hospital de Fão - Sta. Casa da Misericórdia de Fão	Private	North	Cávado	Medium	coastal	http://www.hospitaldefao.pt/
Hospital de Jesus	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.hospitaldejesus.pt/
Hospital de S. José - Sta. Casa da Misericórdia de Fafe	Private	North	Ave	Medium	inland	http://hsj.scmfafe.pt/
Hospital de S. Louis	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.hslouis.pt/
Hospital de S. Martinho	Private	North	Área Metropolitana do Porto	Large	coastal	http://www.hsmartinho.pt/home.php
Hospital de Sta. Isabel - Marco de Canaveses	Private	North	Tâmega e Sousa	Medium	inland	https://scmmarco.com/
Hospital de Sta. Maria - Porto	Private	North	Área Metropolitana do Porto	Large	coastal	http://www.hsmporto.pt/#
Hospital de Sta. Maria Maior - Barcelos	Public	North	Cávado	Medium	coastal	http://www.hbarcelos.min-saude.pt/
Hospital de Vila Franca de Xira	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.hospitalvilafrancadexira.pt/
Hospital Distrital da Figueira da Foz	Public	Center	Região de Coimbra	Medium	coastal	http://www.hdfigueira.min-saude.pt/
Hospital Distrital de Santarém	Public	Alentejo	Lezíria do Tejo	Medium	inland	http://www.hds.min-saude.pt/
Hospital do Espírito Santo de Évora	Public	Alentejo	Alentejo Central	Small	inland	http://www.hevora.min-saude.pt/
Hospital Dom Manuel de Aguiar	Private	Center	Região de Leiria	Medium	coastal	http://www.misericordiadeleiria.pt/servico.asp?t=paginas&pid=82
Hospital dos SAMS	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://pics.sams.pt/Paginas/default.aspx
Hospital Dr. Francisco Zagalo - Ovar	Public	Center	Região de Aveiro	Medium	coastal	http://www.hovar.min-saude.pt/
Hospital Escola da Universidade Fernando Pessoa	Private	North	Área Metropolitana do Porto	Large	coastal	https://he.ufp.pt/
Hospital Garcia de Orta	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.hgo.pt/
Hospital José Luciano de Castro-Misericórdia de Anadia	Private	Center	Região de Aveiro	Medium	coastal	https://www.hospitalanadia.pt/
Hospital Lusíadas Albufeira	Private	Algarve	Algarve	Medium	coastal	https://www.lusiadas.pt/pt/unidades/HospitalAlbufeira/Paginas/home.aspx
Hospital Lusíadas Lisboa	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.lusiadas.pt/pt/unidades/HospitalLisboa/Paginas/home.aspx
Hospital Lusíadas Porto	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.lusiadas.pt/pt/unidades/HospitalPorto/Paginas/home.aspx
Hospital Narciso Ferreira - Riba de Ave	Private	North	Ave	Medium	inland	https://www.scmribadeave.pt/Hospital-Narciso-Ferreira

Hospital de Sant'Ana	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.hospitaldesantana.pt/
Hospital Particular de Paredes	Private	North	Área Metropolitana do Porto	Large	coastal	https://hpp.pt/
Hospital Particular de Viana do Castelo	Private	North	Alto Minho	Medium	coastal	https://www.hospitaldeviana.com/
Hospital Particular do Algarve, SA - Unidade de Alvor	Private	Algarve	Algarve	Medium	coastal	https://www.grupohpa.com/pt/unidades/algarve/hospitais/hospital-particular-do-algarve-alvor/
Hospital Particular do Algarve, SA - Unidade de Gambelas	Private	Algarve	Algarve	Medium	coastal	https://www.grupohpa.com/pt/unidades/algarve/hospitais/hospital-particular-do-algarve-gambelas/
Trofa Saúde Hospital Trofa	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.hospitaldatrofa.pt/
Hospital Prof. Doutor Fernando Fonseca	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.hff.min-saude.pt/
Hospital S. Gonçalo de Lagos	Private	Algarve	Algarve	Medium	coastal	https://www.grupohpa.com/pt/unidades/algarve/hospitais/hospital-sao-goncalo-lagos/
Hospital Terra Quente	Private	North	Terras de Trás-os-Montes	Small	inland	http://htq.pt/
Trofa Saúde Hospital Alfena	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.hpalfena.pt/
Trofa Saúde Hospital Braga Sul	Private	North	Cávado	Medium	coastal	https://www.hospitalprivadodebraga.pt/
Trofa Saúde Hospital Matosinhos	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.hpbn.pt/
Hospital da Luz, Coimbra	Private	Center	Região de Coimbra	Medium	coastal	http://hospitaldaluz.coimbra.idealmed.pt/pt/Home/Index
Centro Cirúrgico de Coimbra	Private	Center	Região de Coimbra	Medium	coastal	http://ccci.pt/
IPO de Coimbra Francisco Gentil	Public	Center	Região de Coimbra	Medium	coastal	https://ipocoimbra.pt/
IPO de Lisboa Francisco Gentil	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.ipolisboa.min-saude.pt/
IPO do Porto Francisco Gentil	Public	North	Área Metropolitana do Porto	Large	coastal	http://www.ipoporto.pt/
Montepio Rainha Dona Leonor - Associação Mutualista	Private	Center	Oeste	Medium	coastal	http://www.montepio-rdl.pt/
Sanfil - Casa de Saúde de Sta. Filomena, AS	Private	Center	Região de Coimbra	Medium	coastal	https://www.sanfil.pt/casa-saude-santa-filomena/
ULS Alto Minho, EPE	Public	North	Alto Minho	Medium	coastal	http://www.ulsam.min-saude.pt
ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	Public	Alentejo	Baixo Alentejo	Small	inland	http://www.ulsba.min-saude.pt/
ULS Castelo Branco, EPE - Hospital Amato Lusitano	Public	Center	Beira Baixa	Small	inland	http://www.ulscb.min-saude.pt
ULS Guarda, EPE	Public	Center	Beiras e Serra da Estrela	Medium	inland	http://www.ulsguarda.min-saude.pt
ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	Public	Alentejo	Alentejo Litoral	Small	coastal	http://www.ulsla.min-saude.pt
ULS Matosinhos, EPE - Hospital Pedro Hispano	Public	North	Área Metropolitana do Porto	Large	coastal	http://www.ulsm.min-saude.pt
ULS Nordeste, EPE	Public	North	Terras de Trás-os-Montes	Small	inland	http://www.ulsne.min-saude.pt
ULS Norte Alentejano, EPE	Public	Alentejo	Alto Alentejo	Small	inland	http://www.ulsna.min-saude.pt
Venerável Irmandade de N.ª Sra. da Lapa	Private	North	Área Metropolitana do Porto	Large	coastal	http://www.irmandadedalapa.pt/hospital-cp49

Venerável Irmandade de N.ª Sra. do Terço e Caridade	Private	North	Área Metropolitana do Porto	Large	coastal	http://www.hospitaldoterco.pt/hospital
Venerável Ordem Terceira de S. Francisco do Porto	Private	North	Área Metropolitana do Porto	Large	coastal	http://ordemsaofrancisco.pt/hospital/
CH Psiquiátrico de Lisboa	Public	Lisbon	Área Metropolitana de Lisboa	Large	coastal	http://www.chpl.pt/
Hospital de Magalhães Lemos	Public	North	Área Metropolitana do Porto	Large	coastal	http://www.hmlemos.min-saude.pt
Hospital CUF Viseu	Private	Center	Viseu Dão Lafões	Medium	inland	https://www.saudecuf.pt/unidades/viseu
Hospital da Luz, Lisboa	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.hospitaldaluz.pt/lisboa/pt/
Hospital da Luz, Setúbal	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.hospitaldaluz.pt/setubal/pt/
Hospital da Misericórdia de Évora	Private	Alentejo	Alentejo Central	Small	inland	https://www.hmevora.pt/pt/
Trofa Saúde Hospital Braga Centro	Private	North	Cávado	Medium	coastal	https://www.trofasaude.pt/bragacentro/
Trofa Saúde Hospital Gaia	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.hospitalprivadodegaia.com/
Hospital da Luz, Funchal	Private	Madeira	Região Autónoma da Madeira	Small	islands	https://www.hospitaldaluz.pt/funchal/pt/
Hospital da Luz, Guimarães	Private	North	Ave	Medium	inland	https://www.hospitaldaluz.pt/guimaraes/pt/
Hospital da Luz, Oeiras	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.hospitaldaluz.pt/oeiras/pt/
Hospital da Luz, Vila Real	Private	North	Douro	Small	inland	https://www.hospitaldaluz.pt/vilareal/pt/
Hospital CUF Coimbra	Private	Center	Região de Coimbra	Medium	coastal	https://www.saudecuf.pt/unidades/coimbra
Hospital de São Camilo - Portimão	Private	Algarve	Algarve	Medium	coastal	https://www.grupohpa.com/pt/unidades/algarve/hospitais/hospital-sao-camilo-portimao/
Trofa Saúde Hospital Famalicão	Private	North	Ave	Medium	inland	https://www.trofasaude.pt/famalicao/
Trofa Saúde Hospital Guimarães	Private	North	Ave	Medium	inland	https://www.trofasaude.pt/guimaraes/
Trofa Saúde Hospital Loures	Private	Lisbon	Área Metropolitana de Lisboa	Large	coastal	https://www.trofasaude.pt/loures/
Trofa Saúde Hospital Maia	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.trofasaude.pt/maia/
Trofa Saúde Hospital S. João da Madeira	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.trofasaude.pt/sjmadeira/
Trofa Saúde Hospital Senhor do Bonfim	Private	North	Área Metropolitana do Porto	Large	coastal	https://www.trofasaude.pt/senhordobonfim/
Trofa Saúde Hospital Vila Real	Private	North	Douro	Small	inland	https://www.trofasaude.pt/vilareal/

Annex B – Rankings of Portuguese hospitals web presence

This annex presents the list of 132 assessed hospitals organized by ranking in the i_{HSWAI} index. It contains the ranking and the global classification obtained but also the classification obtained in each of the four criteria that comprehend the evaluation grid.

Hospital	Rank	i_{HSWAI}	C1 Content	C2 Services	C3 Community Interaction	C4 Technology Features
IPO do Porto Francisco Gentil	1	0,624	0,574	0,639	0,660	0,580
Hospital CUF Torres Vedras	2	0,608	0,521	0,722	0,410	0,609
CH Universitário Lisboa Central, EPE	3	0,604	0,491	0,683	0,560	0,517
Hospital CUF Cascais, AS	4	0,602	0,491	0,722	0,410	0,609
Hospital CUF Santarém	5	0,594	0,516	0,672	0,486	0,580
Hospital CUF Infante Santo	6	0,589	0,563	0,672	0,410	0,580
Hospital CUF Descobertas	7	0,581	0,521	0,672	0,416	0,580
Hospital da Luz, Póvoa de Varzim	8	0,543	0,564	0,544	0,486	0,609
ULS Alto Minho, EPE	9	0,541	0,577	0,544	0,469	0,594
Hospital da Luz, Lisboa	10	0,536	0,601	0,544	0,416	0,609
Hospital da Luz, Arrábida	11	0,533	0,581	0,544	0,416	0,609
Hospital da Luz, Guimarães	12	0,531	0,575	0,544	0,416	0,609
Hospital da Luz, Oeiras	12	0,531	0,575	0,544	0,416	0,609
Hospital da Luz, Aveiro	13	0,529	0,564	0,544	0,416	0,609
Hospital da Luz, Funchal	14	0,528	0,561	0,544	0,416	0,609
Hospital da Luz, Vila Real	14	0,528	0,561	0,544	0,416	0,609
Hospital da Luz, Setúbal	14	0,528	0,558	0,544	0,416	0,609
ULS Guarda, EPE	15	0,527	0,500	0,544	0,475	0,594
Hospital da Misericórdia de Évora	16	0,525	0,544	0,544	0,416	0,609
CH Tâmega e Sousa, EPE	16	0,525	0,476	0,544	0,526	0,523
Hospital da Luz Torres de Lisboa	17	0,517	0,520	0,544	0,416	0,580
Hospital da Luz, Coimbra	18	0,513	0,516	0,544	0,416	0,546
ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	19	0,509	0,590	0,494	0,405	0,629
CH Setúbal, EPE	20	0,502	0,527	0,544	0,376	0,494
ULS Castelo Branco, EPE - Hospital Amato Lusitano	21	0,501	0,506	0,494	0,456	0,614
Hospital Dr. Francisco Zagalo - Ovar	22	0,473	0,352	0,544	0,386	0,529
ULS Nordeste, EPE	23	0,469	0,418	0,494	0,376	0,634
ULS Norte Alentejano, EPE	24	0,468	0,569	0,494	0,218	0,634
ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	25	0,467	0,446	0,494	0,335	0,634
CH Universitário Cova da Beira, EPE	26	0,466	0,646	0,361	0,554	0,451
Hospital de S. José - Sta. Casa da Misericórdia de Fafe	27	0,458	0,368	0,544	0,312	0,494
ULS Matosinhos, EPE - Hospital Pedro Hispano	28	0,456	0,341	0,494	0,405	0,594
Hospital CUF Viseu	29	0,447	0,488	0,411	0,416	0,609
Hospital CUF Coimbra	29	0,447	0,488	0,411	0,416	0,609
CH Médio Tejo, EPE	30	0,433	0,630	0,356	0,384	0,529
Clínica Europa	31	0,426	0,225	0,500	0,346	0,623
Trofa Saúde Hospital Loures	32	0,425	0,378	0,406	0,416	0,637
Trofa Saúde Hospital Braga Centro	33	0,424	0,392	0,406	0,405	0,623

Hospital Lusíadas Albufeira	34	0,423	0,389	0,450	0,312	0,580
Trofa Saúde Hospital Guimarães	34	0,423	0,378	0,406	0,410	0,623
Trofa Saúde Hospital S. João da Madeira	34	0,423	0,378	0,406	0,410	0,623
Trofa Saúde Hospital Senhor do Bonfim	34	0,423	0,378	0,406	0,410	0,623
Trofa Saúde Hospital Vila Real	34	0,423	0,378	0,406	0,410	0,623
Hospital Lusíadas Lisboa	35	0,422	0,389	0,450	0,312	0,566
Hospital Lusíadas Porto	35	0,422	0,389	0,450	0,312	0,566
Trofa Saúde Hospital Gaia	35	0,422	0,378	0,406	0,405	0,623
Trofa Saúde Hospital Famalicão	35	0,422	0,378	0,406	0,405	0,623
Trofa Saúde Hospital Maia	35	0,422	0,378	0,406	0,405	0,623
CH Tondela - Viseu, EPE	36	0,415	0,297	0,494	0,272	0,534
Trofa Saúde Hospital Alfena	37	0,414	0,378	0,406	0,376	0,603
Trofa Saúde Hospital Braga Sul	37	0,414	0,378	0,406	0,376	0,603
Trofa Saúde Hospital Matosinhos	37	0,414	0,378	0,406	0,376	0,603
Trofa Saúde Hospital Trofa	38	0,411	0,392	0,406	0,348	0,603
Hospital dos SAMS	39	0,407	0,432	0,406	0,301	0,580
Clínica Sto. António	39	0,407	0,383	0,450	0,236	0,580
CH Baixo Vouga, EPE	40	0,391	0,281	0,411	0,405	0,480
CH Lisboa Ocidental, EPE	41	0,389	0,681	0,228	0,498	0,394
Hospital Narciso Ferreira - Riba de Ave	42	0,388	0,497	0,361	0,265	0,551
Hospital Particular do Algarve, SA - Unidade de Alvor	43	0,364	0,441	0,361	0,206	0,537
Hospital Particular do Algarve, SA - Unidade de Gambelas	43	0,364	0,441	0,361	0,206	0,537
Hospital S. Gonçalo de Lagos	44	0,362	0,433	0,361	0,206	0,537
CH Barreiro Montijo, EPE	45	0,361	0,592	0,233	0,382	0,494
Hospital Particular de Barcelos	45	0,361	0,301	0,317	0,399	0,623
Hospital de São Camilo - Portimão	46	0,359	0,419	0,361	0,206	0,537
CH Leiria, EPE	46	0,359	0,740	0,094	0,560	0,517
Hospital de Sta. Maria - Porto	47	0,358	0,348	0,317	0,340	0,623
CH Lisboa Norte, EPE	48	0,351	0,644	0,094	0,571	0,609
Hospital Particular de Viana do Castelo	49	0,336	0,290	0,317	0,286	0,623
Hospital Particular de Paredes	50	0,334	0,390	0,317	0,250	0,480
Hospital Distrital da Figueira da Foz	51	0,326	0,532	0,094	0,609	0,503
Hospital de Vila Franca de Xira	52	0,323	0,577	0,050	0,590	0,649
Hospital Escola da Universidade Fernando Pessoa	53	0,322	0,196	0,361	0,238	0,551
Venerável Irmandade de N.ª Sra. do Terço e Caridade	54	0,321	0,310	0,317	0,308	0,394
Montepio Rainha Dona Leonor - Associação Mutualista	54	0,321	0,231	0,367	0,250	0,417
CH S. João, EPE	55	0,319	0,687	0,050	0,467	0,634
CH V.N. Gaia/Espinho, EPE	56	0,316	0,500	0,178	0,461	0,346
Hospital da Ordem Terceira Chiado	57	0,315	0,336	0,317	0,168	0,560
Hospital António Lopes	58	0,314	0,198	0,317	0,289	0,586
IPO de Coimbra Francisco Gentil	59	0,312	0,621	0,100	0,414	0,551
IPO de Lisboa Francisco Gentil	59	0,312	0,534	0,100	0,501	0,551
Hospital de Sta. Maria Maior - Barcelos	60	0,311	0,705	0,094	0,353	0,523
Hospital de Sant'Ana	61	0,309	0,286	0,317	0,189	0,560
Hospital da Sr.ª da Oliveira Guimarães	61	0,309	0,609	0,050	0,550	0,517
Hospital da Cruz Vermelha Portuguesa	62	0,308	0,263	0,317	0,189	0,594
Hospital de Braga	63	0,307	0,666	0,050	0,408	0,669

Centro Cirúrgico de Coimbra	64	0,304	0,200	0,317	0,247	0,566
Hospital do Espírito Santo de Évora	65	0,298	0,695	0,089	0,316	0,517
Hospital Beatriz Ângelo	66	0,297	0,645	0,050	0,399	0,629
Sanfil - Casa de Saúde de Sta. Filomena, AS	67	0,293	0,227	0,317	0,168	0,560
Clinigrande - Clínica da Marinha Grande, Lda.	67	0,293	0,201	0,317	0,238	0,471
CH S. Francisco, SA - Unidade de Leiria	68	0,288	0,202	0,317	0,168	0,560
Hospital Agostinho Ribeiro	68	0,288	0,223	0,317	0,180	0,494
CH Universitário do Algarve, EPE	68	0,288	0,446	0,189	0,265	0,514
Casa de Saúde da Boavista	69	0,284	0,480	0,183	0,247	0,466
Hospital de S. Louis	70	0,281	0,288	0,317	0,110	0,431
Hospital Terra Quente	71	0,280	0,245	0,317	0,127	0,474
CH Psiquiátrico de Lisboa	71	0,280	0,522	0,094	0,342	0,594
CH Trás-os-Montes e Alto Douro, EPE	72	0,279	0,496	0,100	0,425	0,443
CH Entre Douro e Vouga, EPE	73	0,271	0,552	0,044	0,443	0,494
Hospital da Misericórdia de Vila Verde	74	0,270	0,359	0,183	0,278	0,509
Hospital da Sta. Casa da Misericórdia de Lousada	75	0,269	0,227	0,317	0,146	0,360
Hospital de S. Martinho	75	0,269	0,253	0,317	0,127	0,346
Venerável Irmandade de N.ª Sra. da Lapa	76	0,265	0,310	0,183	0,283	0,546
Hospital Distrital de Santarém	77	0,263	0,644	0,050	0,386	0,320
Hospital da Prelada	78	0,258	0,299	0,183	0,211	0,640
CH Universitário do Porto, EPE	79	0,257	0,521	0,000	0,498	0,537
Hospital de Fão - Sta. Casa da Misericórdia de Fão	80	0,256	0,396	0,183	0,202	0,446
Hospital Prof. Doutor Fernando Fonseca	81	0,255	0,377	0,100	0,416	0,460
COGE - Clínica da Santa Casa, Espinho	82	0,254	0,225	0,183	0,329	0,517
Hospital da Misericórdia da Mealhada	83	0,252	0,211	0,317	0,081	0,351
Hospital José Luciano de Castro-Misericórdia de Anadia	84	0,246	0,184	0,183	0,297	0,580
Venerável Ordem Terceira de S. Francisco do Porto	85	0,245	0,180	0,183	0,317	0,537
Clínica de Montes Claros, Lda	86	0,229	0,204	0,183	0,244	0,474
Hospital Dom Manuel de Aguiar	87	0,222	0,181	0,183	0,259	0,423
CH Póvoa de Varzim/Vila do Conde, EPE	88	0,205	0,387	0,044	0,306	0,437
CH Universitário de Coimbra, EPE	89	0,200	0,469	0,000	0,329	0,403
Hospital de Cascais	90	0,197	0,459	0,000	0,259	0,531
Hospital Garcia de Orta	91	0,195	0,253	0,000	0,484	0,474
Clínica de Santa Tecla	92	0,189	0,119	0,183	0,210	0,317
CH Oeste	93	0,182	0,393	0,000	0,306	0,417
CH Médio Ave, EPE	94	0,179	0,280	0,133	0,104	0,351
Hospital da Sta. Casa da Misericórdia de Vila do Conde	95	0,172	0,206	0,050	0,301	0,460
Hospital de Magalhães Lemos	96	0,171	0,292	0,050	0,174	0,531
Hospital de Jesus	96	0,171	0,201	0,050	0,238	0,580
Hospital da Ordem da Trindade	97	0,167	0,217	0,050	0,216	0,557
Hospital da Sta. Casa da Misericórdia do Entroncamento - Hospital de S. João Baptista	98	0,166	0,197	0,050	0,236	0,546
Hospital da Confraria de N.ª Sra. da Nazaré	99	0,157	0,126	0,183	0,076	0,246
Hospital Casa de Saúde	100	0,130	0,204	0,050	0,104	0,431
Hospital Arcebispo João Crisóstomo	101	0,121	0,049	0,094	0,081	0,477
Casa de Saúde de Amares	102	0,118	0,147	0,050	0,098	0,437

Hospital de Avelar	103	0,053	0,104	0,000	0,070	0,180
Hospital de Sta. Isabel - Marco de Canaveses	104	0,048	0,065	0,000	0,076	0,203

Annex C – SINAS calculation, classes, and comparison to HSWAI

This annex presents the list of hospitals assessed in SINAS in alphabetical order. It contains the values used to transform SINAS results into a numeric scale, the class each hospital belongs to, and the final HSWAI value and class.

Hospital	SINAS										HSWAI	
	Dimensions						Total obtained	Total possible	Final Value	SINAS class	HSWAI class	HSWAI value
	Clinical Excellence			Patient Security	Facilities comfort and adequacy	User Focus						
	Nbr of evaluated areas	Total of stars	Max stars possible									
Casa de Saúde da Boavista	4	0	12	0	0	0	0	21	0,000	Very low	Low	0,284
Casa de Saúde de Amares	8	0	24	0	0	0	0	33	0,000	Very low	Very low	0,118
Centro Cirúrgico de Coimbra	3	2	9	0	3	2	7	18	0,389	Low	Low	0,304
CH Baixo Vouga, EPE - Hospital Distrital de Águeda	0	-	0	2	0	1	3	9	0,333	Low	Low	0,391
CH Baixo Vouga, EPE - Hospital Infante D. Pedro	6	12	18	3	0	1	16	27	0,593	High	Low	0,391
CH Baixo Vouga, EPE - Hospital Visconde Salreu de Estarreja	0	-	0	1	0	2	3	9	0,333	Low	Low	0,391
CH Barreiro Montijo, EPE - Hospital de Nossa Senhora do Rosário	2	0	6	3	3	3	9	15	0,600	High	Low	0,361
CH Barreiro Montijo, EPE - Hospital Distrital do Montijo	1	2	3	0	3	3	8	12	0,667	High	Low	0,361
CH Entre Douro e Vouga, EPE - Hospital de São João da Madeira	1	0	3	2	1	0	3	12	0,250	Very low	Low	0,271
CH Entre Douro e Vouga, EPE - Hospital de São Miguel	0	-	0	1	0	0	1	9	0,111	Very low	Low	0,271
CH Entre Douro e Vouga, EPE - Hospital de São Sebastião	9	14	27	3	0	0	17	36	0,472	Low	Low	0,271
CH Leiria, EPE - Hospital Bernardino Lopes de Oliveira - Alcobaça	0	-	0	3	2	2	7	9	0,778	Very high	Low	0,359
CH Leiria, EPE - Hospital de Santo André - Leiria	11	20	33	3	3	3	29	42	0,690	High	Low	0,359
CH Leiria, EPE - Hospital Distrital de Pombal	0	-	0	2	2	2	6	9	0,667	High	Low	0,359
CH Lisboa Norte, EPE - Hospital de Santa Maria	14	17	42	3	3	0	23	51	0,451	Low	Low	0,351
CH Lisboa Norte, EPE - Hospital Pulido Valente	0	-	0	3	3	0	6	9	0,667	High	Low	0,351
CH Lisboa Ocidental, EPE - Hospital de Santa Cruz	3	6	9	0	0	2	8	18	0,444	Low	Low	0,389
CH Lisboa Ocidental, EPE - Hospital de São Francisco Xavier	10	12	30	2	1	2	17	39	0,436	Low	Low	0,389
CH Lisboa Ocidental, EPE - Hospital Egas Moniz	4	7	12	2	1	2	12	21	0,571	High	Low	0,389

CH Médio Ave, EPE - Unidade Hospitalar de Famalicão	7	11	21	0	3	3	17	30	0,567	High	Very low	0,179
CH Médio Ave, EPE - Unidade Hospitalar de Santo Tirso	5	4	15	3	2	3	12	24	0,500	Low	Very low	0,179
CH Médio Tejo, EPE - Hospital de Nossa Senhora da Graça - Tomar	2	4	6	3	3	2	12	15	0,800	Very high	Low	0,433
CH Médio Tejo, EPE - Hospital Dr. Manoel Constâncio - Abrantes	8	15	24	3	0	2	20	33	0,606	High	Low	0,433
CH Médio Tejo, EPE - Hospital Rainha Santa Isabel - Torres Novas	1	2	3	3	3	2	10	12	0,833	Very high	Low	0,433
CH Oeste - Hospital Distrital Caldas da Rainha	1	2	3	0	0	0	2	12	0,167	Very low	Very low	0,182
CH Oeste - Hospital Distrital Torres Vedras	0	-	0	0	0	0	0	9	0,000	Very low	Very low	0,182
CH Oeste - Hospital São Pedro Gonçalves Telmo - Peniche	0	-	0	0	0	0	0	9	0,000	Very low	Very low	0,182
CH Póvoa de Varzim/Vila do Conde, EPE - Unidade Hospitalar da Póvoa de Varzim	6	13	18	2	2	3	20	27	0,741	High	Very low	0,205
CH Póvoa de Varzim/Vila do Conde, EPE - Unidade Hospitalar de Vila do Conde	1	3	3	2	2	3	10	12	0,833	Very high	Very low	0,205
CH S. Francisco, SA - Unidade de Leiria	3	3	9	2	0	2	7	18	0,389	Low	Low	0,288
CH S. João, EPE - Hospital de São João	9	0	27	0	3	3	6	36	0,167	Very low	Low	0,319
CH S. João, EPE - Hospital Nossa Senhora da Conceição de Valongo	0	-	0	0	0	3	3	9	0,333	Low	Low	0,319
CH Setúbal, EPE - Hospital de São Bernardo	9	0	27	0	3	0	3	36	0,083	Very low	High	0,502
CH Setúbal, EPE - Hospital Ortopédico de Sant'iago do Outão	2	0	6	3	0	2	5	15	0,333	Low	High	0,502
CH Tâmega e Sousa, EPE - Hospital de Amarante	0	-	0	3	3	3	9	9	1,000	Very high	High	0,525
CH Tâmega e Sousa, EPE - Hospital Padre Américo	1	1	3	3	3	3	10	12	0,833	Very high	High	0,525
CH Tondela - Viseu, EPE - Hospital Cândido de Figueiredo - Tondela	1	2	3	0	2	3	7	12	0,583	High	Low	0,415
CH Tondela - Viseu, EPE - Hospital de São Teotónio	13	30	39	0	3	0	33	48	0,688	High	Low	0,415
CH Trás-os-Montes e Alto Douro, EPE - Hospital de São Pedro de Vila Real	12	24	36	3	3	3	33	45	0,733	High	Low	0,279
CH Trás-os-Montes e Alto Douro, EPE - Unidade Hospitalar de Chaves	3	5	9	3	3	2	13	18	0,722	High	Low	0,279
CH Trás-os-Montes e Alto Douro, EPE - Unidade Hospitalar de Lamego	1	3	3	2	3	2	10	12	0,833	Very high	Low	0,279
CH Universitário Cova da Beira, EPE - Hospital do Fundão	0	-	0	1	2	3	6	9	0,667	High	Low	0,466

CH Universitário Cova da Beira, EPE - Hospital Pêro da Covilhã	12	14	36	3	0	3	20	45	0,444	Low	Low	0,466
CH Universitário de Coimbra, EPE - Hospitais da Universidade de Coimbra	4	3	12	0	3	2	8	21	0,381	Low	Very low	0,200
CH Universitário de Coimbra, EPE - Hospital Geral	1	2	3	0	2	2	6	12	0,500	Low	Very low	0,200
CH Universitário de Coimbra, EPE - Hospital Pediátrico de Coimbra	1	0	3	0	3	3	6	12	0,500	Low	Very low	0,200
CH Universitário de Coimbra, EPE - Maternidade Bissaya Barreto	1	2	3	0	2	0	4	12	0,333	Low	Very low	0,200
CH Universitário de Coimbra, EPE - Maternidade Dr. Daniel de Matos	1	2	3	0	3	0	5	12	0,417	Low	Very low	0,200
CH Universitário do Algarve, EPE - Hospital de Faro	10	22	30	0	0	3	25	39	0,641	High	Low	0,288
CH Universitário do Algarve, EPE - Hospital Distrital de Lagos	0	-	0	1	2	2	5	9	0,556	High	Low	0,288
CH Universitário do Algarve, EPE - Unidade Hospitalar de Portimão	3	4	9	2	0	2	8	18	0,444	Low	Low	0,288
CH Universitário do Porto, EPE - Centro Materno Infantil do Norte	4	7	12	3	3	3	16	21	0,762	Very high	Low	0,257
CH Universitário do Porto, EPE - Hospital de Santo António	9	14	27	3	3	3	23	36	0,639	High	Low	0,257
CH Universitário Lisboa Central, EPE - Hospital Curry Cabral	4	3	12	3	2	0	8	21	0,381	Low	High	0,604
CH Universitário Lisboa Central, EPE - Hospital de Santa Marta	4	8	12	3	3	0	14	21	0,667	High	High	0,604
CH Universitário Lisboa Central, EPE - Hospital de Santo António dos Capuchos	2	0	6	3	2	0	5	15	0,333	Low	High	0,604
CH Universitário Lisboa Central, EPE - Hospital de São José	3	0	9	3	3	0	6	18	0,333	Low	High	0,604
CH Universitário Lisboa Central, EPE - Hospital Dona Estefânia	2	4	6	3	3	0	10	15	0,667	High	High	0,604
CH Universitário Lisboa Central, EPE - Maternidade Dr. Alfredo da Costa	3	6	9	3	3	0	12	18	0,667	High	High	0,604
CH V.N. Gaia/Espinho, EPE - Hospital de Nossa Senhora da Ajuda - Espinho	0	-	0	3	2	3	8	9	0,889	Very high	Low	0,316
CH V.N. Gaia/Espinho, EPE - Hospital Distrital de Vila Nova de Gaia	0	-	0	3	2	3	8	9	0,889	Very high	Low	0,316
CH V.N. Gaia/Espinho, EPE - Hospital Eduardo Santos Silva	16	32	48	3	3	3	41	57	0,719	High	Low	0,316
Clínica de Montes Claros, Lda	0	-	0	0	0	0	0	9	0,000	Very low	Very low	0,229
Clínica Europa	0	-	0	0	0	1	1	9	0,111	Very low	Low	0,426

Clinigrande - Clínica da Marinha Grande, Lda.	3	4	9	2	0	2	8	18	0,444	Low	Low	0,293
COGE - Clínica da Santa Casa, Espinho	0	-	0	0	0	0	0	9	0,000	Very low	Low	0,254
Hospital Agostinho Ribeiro	1	2	3	0	0	3	5	12	0,417	Low	Low	0,288
Hospital António Lopes	2	5	6	0	2	3	10	15	0,667	High	Low	0,314
Hospital Beatriz Ângelo	6	14	18	3	3	3	23	27	0,852	Very high	Low	0,297
Hospital CUF Cascais, AS	4	7	12	3	3	2	15	21	0,714	High	High	0,602
Hospital CUF Descobertas	10	21	30	3	3	3	30	39	0,769	Very high	High	0,581
Hospital CUF Infante Santo	10	19	30	3	3	3	28	39	0,718	High	High	0,589
Hospital CUF Santarém	2	3	6	3	3	3	12	15	0,800	Very high	High	0,594
Hospital CUF Torres Vedras	4	7	12	3	3	3	16	21	0,762	Very high	High	0,608
Hospital CUF Viseu	3	3	9	3	3	3	12	18	0,667	High	Low	0,447
Hospital da Confraria de N.ª Sra. da Nazaré	0	-	0	0	0	0	0	9	0,000	Very low	Very low	0,157
Hospital da Cruz Vermelha Portuguesa	0	-	0	0	0	0	0	9	0,000	Very low	Low	0,308
Hospital da Luz Torres de Lisboa	0	-	0	3	3	2	8	9	0,889	Very high	High	0,517
Hospital da Luz, Arrábida	7	14	21	0	3	3	20	30	0,667	High	High	0,533
Hospital da Luz, Aveiro	2	3	6	0	3	2	8	15	0,533	High	High	0,529
Hospital da Luz, Guimarães	0	-	0	0	3	2	5	9	0,556	High	High	0,531
Hospital da Luz, Lisboa	12	25	36	3	3	3	34	45	0,756	Very high	High	0,536
Hospital da Luz, Póvoa de Varzim	4	8	12	0	3	0	11	21	0,524	High	High	0,543
Hospital da Luz, Setúbal	1	3	3	3	3	3	12	12	1,000	Very high	High	0,528
Hospital da Misericórdia da Mealhada	2	0	6	0	3	3	6	15	0,400	Low	Low	0,252
Hospital da Misericórdia de Évora	0	-	0	0	2	3	5	9	0,556	High	High	0,525
Hospital da Misericórdia de Vila Verde	3	8	9	0	3	3	14	18	0,778	Very high	Low	0,270
Hospital da Ordem da Trindade	0	-	0	0	0	0	0	9	0,000	Very low	Very low	0,167
Hospital da Prelada	4	11	12	3	3	3	20	21	0,952	Very high	Low	0,258
Hospital da Sr.ª da Oliveira Guimarães	14	30	42	0	0	0	30	51	0,588	High	Low	0,309
Hospital da Sta. Casa da Misericórdia de Lousada	0	-	0	0	0	0	0	9	0,000	Very low	Low	0,269
Hospital da Sta. Casa da Misericórdia de Vila do Conde	3	7	9	3	0	2	12	18	0,667	High	Very low	0,172
Hospital da Sta. Casa da Misericórdia do Entroncamento - Hospital de S. João Baptista	2	2	6	0	0	0	2	15	0,133	Very low	Very low	0,166
Hospital de Braga	14	32	42	3	3	3	41	51	0,804	Very high	Low	0,307
Hospital de Cascais	11	26	33	3	3	3	35	42	0,833	Very high	Very low	0,197
Hospital de Fão - Sta. Casa da Misericórdia de Fão	5	5	15	0	0	0	5	24	0,208	Very low	Low	0,256

Hospital de Jesus	2	1	6	0	0	0	1	15	0,067	Very low	Very low	0,171
Hospital de S. José - Sta. Casa da Misericórdia de Fafe	1	3	3	3	2	2	10	12	0,833	Very high	Low	0,458
Hospital de S. Louis	2	0	6	0	0	3	3	15	0,200	Very low	Low	0,281
Hospital de Sant'Ana	2	5	6	0	0	2	7	15	0,467	Low	Low	0,309
Hospital de Sta. Isabel - Marco de Canaveses	1	2	3	2	2	2	8	12	0,667	High	Very low	0,048
Hospital de Sta. Maria - Porto	0	-	0	0	0	2	2	9	0,222	Very low	Low	0,358
Hospital de Sta. Maria Maior - Barcelos	4	7	12	1	0	3	11	21	0,524	High	Low	0,311
Hospital de Vila Franca de Xira	13	32	39	3	3	3	41	48	0,854	Very high	Low	0,323
Hospital Distrital da Figueira da Foz	7	10	21	3	2	3	18	30	0,600	High	Low	0,326
Hospital Distrital de Santarém	6	12	18	3	0	3	18	27	0,667	High	Low	0,263
Hospital do Espírito Santo de Évora	9	6	27	3	3	3	15	36	0,417	Low	Low	0,298
Hospital Dom Manuel de Aguiar	0	-	0	0	0	0	0	9	0,000	Very low	Very low	0,222
Hospital dos SAMS	3	0	9	3	3	2	8	18	0,444	Low	Low	0,407
Hospital Dr. Francisco Zagalo - Ovar	2	5	6	0	0	3	8	15	0,533	High	Low	0,473
Hospital Escola da Universidade Fernando Pessoa	6	4	18	3	3	3	13	27	0,481	Low	Low	0,322
Hospital Garcia de Orta	11	0	33	3	3	3	9	42	0,214	Very low	Very low	0,195
Hospital José Luciano de Castro-Misericórdia de Anadia	1	3	3	3	2	2	10	12	0,833	Very high	Very low	0,246
Hospital Lusíadas Albufeira	2	2	6	2	2	2	8	15	0,533	High	Low	0,423
Hospital Lusíadas Lisboa	7	10	21	3	3	3	19	30	0,633	High	Low	0,422
Hospital Lusíadas Porto	4	8	12	3	3	3	17	21	0,810	Very high	Low	0,422
Hospital Narciso Ferreira - Riba de Ave	2	4	6	3	3	2	12	15	0,800	Very high	Low	0,388
Hospital Particular de Barcelos	0	-	0	0	3	3	6	9	0,667	High	Low	0,361
Hospital Particular de Paredes	0	-	0	1	1	1	3	9	0,333	Low	Low	0,334
Hospital Particular de Viana do Castelo	1	2	3	0	3	3	8	12	0,667	High	Low	0,336
Hospital Particular do Algarve, SA - Unidade de Alvor	5	2	15	3	3	3	11	24	0,458	Low	Low	0,364
Hospital Particular do Algarve, SA - Unidade de Gambelas	1	2	3	3	3	3	11	12	0,917	Very high	Low	0,364
Hospital Prof. Doutor Fernando Fonseca	5	9	15	3	3	3	18	24	0,750	High	Low	0,255
Hospital S. Gonçalo de Lagos	0	-	0	0	0	0	0	9	0,000	Very low	Low	0,362
Hospital Terra Quente	0	-	0	3	2	3	8	9	0,889	Very high	Low	0,280
IPO de Coimbra Francisco Gentil	0	-	0	3	3	3	9	9	1,000	Very high	Low	0,312
IPO de Lisboa Francisco Gentil	0	-	0	0	3	3	6	9	0,667	High	Low	0,312
IPO do Porto Francisco Gentil	2	4	6	3	3	3	13	15	0,867	Very high	High	0,624

Montepio Rainha Dona Leonor - Associação Mutualista	3	0	9	0	0	0	0	18	0,000	Very low	Low	0,321
Sanfil - Casa de Saúde de Sta. Filomena, AS	3	5	9	0	2	2	9	18	0,500	Low	Low	0,293
Trofa Saúde Hospital Alfena	8	2	24	0	2	2	6	33	0,182	Very low	Low	0,414
Trofa Saúde Hospital Braga Centro	0	-	0	0	3	0	3	9	0,333	Low	Low	0,424
Trofa Saúde Hospital Braga Sul	8	4	24	2	2	3	11	33	0,333	Low	Low	0,414
Trofa Saúde Hospital Gaia	0	-	0	0	0	2	2	9	0,222	Very low	Low	0,422
Trofa Saúde Hospital Matosinhos	8	4	24	2	3	2	11	33	0,333	Low	Low	0,414
Trofa Saúde Hospital Trofa	8	3	24	0	3	1	7	33	0,212	Very low	Low	0,411
ULS Alto Minho, EPE - Hospital Conde de Bertiandos - Ponte de Lima	3	6	9	2	3	3	14	18	0,778	Very high	High	0,541
ULS Alto Minho, EPE - Hospital de Santa Luzia	13	27	39	3	3	3	36	48	0,750	High	High	0,541
ULS Baixo Alentejo, EPE - Hospital José Joaquim Fernandes	8	15	24	0	2	0	17	33	0,515	High	High	0,509
ULS Castelo Branco, EPE - Hospital Amato Lusitano	12	22	36	2	3	3	30	45	0,667	High	High	0,501
ULS Guarda, EPE - Hospital de Nossa Senhora da Assunção	1	3	3	3	1	0	7	12	0,583	High	High	0,527
ULS Guarda, EPE - Hospital Sousa Martins	9	15	27	3	1	0	19	36	0,528	High	High	0,527
ULS Litoral Alentejano, EPE - Hospital do Litoral Alentejano	4	4	12	1	2	1	8	21	0,381	Low	Low	0,467
ULS Matosinhos, EPE - Hospital Pedro Hispano	13	28	39	3	3	3	37	48	0,771	Very high	Low	0,456
ULS Nordeste, EPE - Unidade Hospitalar de Bragança	11	15	33	3	3	3	24	42	0,571	High	Low	0,469
ULS Nordeste, EPE - Unidade Hospitalar de Macedo de Cavaleiros	5	9	15	3	3	3	18	24	0,750	High	Low	0,469
ULS Nordeste, EPE - Unidade Hospitalar de Mirandela	6	8	18	3	3	3	17	27	0,630	High	Low	0,469
ULS Norte Alentejano, EPE - Hospital de Santa Luzia de Elvas	3	0	9	0	0	0	0	18	0,000	Very low	Low	0,468
ULS Norte Alentejano, EPE - Hospital Dr. José Maria Grande - Portalegre	6	0	18	0	0	0	0	27	0,000	Very low	Low	0,468
Venerável Irmandade de N.ª Sra. da Lapa	1	2	3	0	0	2	4	12	0,333	Low	Low	0,265
Venerável Ordem Terceira de S. Francisco do Porto	0	-	0	2	2	2	6	9	0,667	High	Very low	0,245

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