

A Comparison of Websites from Spanish, American and British Hospitals

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Summary

Objective: To evaluate and compare the user-orientation of Spanish, American and British hospital websites.

Methods: A descriptive study of 32 hospital portals (12 Spanish, 10 American and 10 British) was carried out in which the following were analyzed: website readability according to the Flesch Index, websites accessibility using the Web Accessibility Test, and the quality of information provided using the "e-Information Scale of Health Care Centers".

Results: Fifty percent of the user-oriented information quality attributes are met. Readability indices tend to be below 60 (standard readability), and only 10 of the 32 websites meet the accessibility criteria.

Conclusions: Most portals exhibit accessibility problems that favor computer illiteracy. There is a wide variability in terms of website readability and in terms of user-oriented content.

Keywords

Internet, hospital websites, quality, readability, accessibility

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Introduction

The still emergent use of information and communication technologies in the field of health [1, 2] is opening up new possibilities in the clinical arena [3-5], for the continuing education of health professionals [6, 7], and is increasing citizens' access to all kinds of information [8, 9].

A recent study conducted by the Health On the Net Foundation [10] revealed that approximately 75% of American and European patients and healthcare professionals prefer to obtain health-related information from hospital-sponsored websites. The Internet has become a key platform for any organization to make itself known. At the same time, Internet users have learned that it is possible to obtain much necessary information from these websites.

Hospital web designers are well aware of this situation. In fact, the last years have witnessed an increased concern regarding their design and the quality of the content [11]. However, there are few papers in which they are evaluated.

Norum assessed the information provided by Norwegian hospital websites to cancer patients [12]. The assessment included topics such as: general information, contact addresses, presence of a browser, information about waiting lists, date of the page's last update or existence of an English version. Only 40% of acute care hospitals in California [13] indicated how to get to the center or included links to other health-related web pages. Gaps on the websites of American children's hospitals have also been identified [14]. In 2003 we compared the contents of 84 American and European hospital portals [15]. In this study American hospitals stood out because of their accessi-

bility (73%) and because they offered further information regarding the effectiveness of the interventions carried out in them (28%).

Objectives

The study objective was to explore the quality of web-based information aimed at citizens (or patients), its readability and the accessibility of websites pertaining to Spanish, American and British hospitals. Analyzing and comparing the websites of hospitals from different countries might help to promote international learning and development on this issue.

Methods

A descriptive study of web pages of Spanish, American and British hospital portals was carried out. The following items were analyzed: 1) user-orientation (friendliness) of the website; 2) analysis of the website content readability; and 3) assessment of website accessibility.

A total of 32 portals were analyzed, of which 10 pertain to American hospitals, 12 to Spanish hospitals, and 10 to British hospitals. The country selection might analyze a mainly private model (theoretically patient-oriented) versus public hospital webs, with dissimilar numbers of Internet connections [10]. In all cases, the hospitals selected had received praise in their respective countries by some of the comparison systems implemented in order to assess hospital center quality. Those that featured the best

results a priori were chosen, and these were then randomly selected for review.

The Spanish hospitals selected belong to the program “Hospitales Top 20 2004” [16]. This initiative relies on the voluntary participation of 155 public and private centers. The public hospitals are, in turn, classified into five levels according to criteria regarding size, teaching role, technological equipment and complexity of cases attended. According to the results of this ranking and by random sampling, two centers from each level were selected. The same criteria were applied to the selection of the two private centers.

Since we expected that American hospitals included in the “Top Hospitals 2003” [17] would be consulted often, we decided to pay special attention to their websites. Hospitals were split into five groups according to the following classification: teaching hospitals (25); major teaching hospitals (15); and large (20), medium (20) and small (20) community hospitals. Two centers from each level were selected by random sampling.

The British hospitals were chosen from the National Health Service (NHS) portal [18]. By selecting the “Hospitals” and “Map Search” options on this page, a map shows England divided into four regions, and all the hospitals in each region are assessed under the NHS accreditation system and awarded from zero to three stars depending on quality of service provided. The selection criteria for this study were firstly that the hospital had a web page and secondly that it had been awarded the top three star rating. Out of those that complied with these two criteria, a series of centers from each region was randomly selected: three from London, three from the Midlands and the East of England, two from the North of England and two from the South of England.

Assessment Scale

In order to assess the information and user-orientation of hospital websites, the Health Center e-Information Quality Scale was used (see Appendix). This scale was developed in a previous study in order to identify those elements that increase a web page's

quality [19], achieving an appropriate consistency between observer and content validity sufficient to generalize its use. The scale comprises 66 items or attributes grouped in 11 categories (see Table 2). The websites were assessed for the presence (1 point) or absence (2 points) of each item or attribute, as well as the percentage of total compliance.

Readability

In order to determine the readability of the hospital web pages, equivalent texts were selected from them all for comparison (similar topics regarding the hospital's history, welcome, and location of the center or information on patient care). A readability analysis of the refereed texts, which were approximately 200 words long, was conducted using the Flesch index. The text analysis was carried out using the tools provided by the Microsoft Word for Windows software.

The Flesch readability index (FI) relates text difficulty to word and phrase length. This index features a range of scores, for texts written in English, that ranges from 0 (minimum readability) to 100 (maximum readability). Indices higher than 60 are considered to have an adequate readability.

In the case of texts written in Spanish, as they use words and phrases longer than their English counterparts do, the adaptation of the Flesch formula by Fernández Huerta was used [20, 21] (AFI). In this case, indices higher than 60 are also considered to be adequately readable.

Accessibility

In order to assess the accessibility of each selected hospital web page, the Web Accessibility Test (TAW.exe version 3) [22] was used. To that end, a level-1 analysis was carried out, covering all the center websites following their domain links, i.e., the homepage and every page linked to it and featuring the same domain. TAW uses internationally accepted criteria [23, 24] to assess the websites' degree of accessibility. For TAW to consider a page accessible, it has to ex-

hibit no priority 1 problems (regarding accessibility to handicapped users).

The procedure used to assess the selected web pages' quality was the following. First of all, one and the same trained visitor accessed the pages of each hospital included in the study and applied the Health Center e-Information Quality Scale, and assigned either 1 point (present in the web) or 2 points (absent) to each item in the survey. One of the researchers conducted the whole assessment, given his experience from a previous study, where he demonstrated high agreement and reliability [19]. Then page readability and accessibility were analyzed by means of the aforementioned tools.

The data obtained was analyzed with the SPSS 13.0 statistics software, using univariate statistics (mean, frequency, typical deviation, etc.) and bivariate statistics (chi square, ANOVA, post-hoc tests by means of the Scheffe test) once the application assumptions prerequisites for each test were confirmed in each case. In order to determine the existence of statistically significant differences, a value of $p < 0.05$ was considered for two tails.

Results

The outcome of the application of the Health Center e-Information Quality Scale to the web pages of the selected hospitals (Table 1) shows a wide variability regarding frequencies. In the case of the Spanish hospitals, the range of scores is 29-68%, with a mean score of almost 47%. Approximately 6% of the website quality attributes are absent in all the Spanish web pages visited, whereas 9% of the referred attributes are present in all of them. Regarding American hospitals, scores range from 42% to 61%, with a mean score of 50%. Approximately 12% of the website quality attributes are absent in all the American web pages visited, whereas 20% of those attributes are present in all of them. Lastly, the scores for British hospitals range from 39% to 70%, with a mean score of 54%. Eleven percent of the attributes are absent in all of the visited English websites, whereas 17% are present in all of them. When the mean scores of the hos-

Table 1 Frequencies observed in the e-Information Scale (only items with significant statistical differences)

ATTRIBUTE	Frequency (%) Spanish hospitals	Frequency (%) American hospitals	Frequency (%) British hospitals	Significant differences
2 – Hospital logo in the header	100.0	90.0	0.0	($\chi^2 = 27.135$, $p < 0.0001$)
9 – Explanations activated by the mouse pointer	25.0	80.0	80.0	($\chi^2 = 9.112$, $p = 0.011$)
31 – Supplementary services: press, etc.	41.7	100.0	80.0	($\chi^2 = 9.355$, $p = 0.009$)
34 – Service department: telephone and/or fax	50.0	30.0	100.0	($\chi^2 = 10.517$, $p = 0.005$)
37 – Information via the internet/e-mail	0.0	50.0	50.0	($\chi^2 = 8.455$, $p = 0.015$)
45 – Hospitalization guidelines: discharge	33.3	20.0	80.0	($\chi^2 = 7.906$, $p = 0.019$)
56 – Medical news	25.0	80.0	60.0	($\chi^2 = 6.686$, $p = 0.035$)
59 – Hospital publications	83.3	20.0	50.0	($\chi^2 = 8.567$, $p = 0.014$)
61 – Hospital job opportunities	8.3	100.0	100.0	($\chi^2 = 27.063$, $p < 0.0001$)
Total (66 items)	46.7	50.3	53.9	

Table 2 Differences in the mean scores for the e-Information Scale categories

CATEGORY	Mean Spanish hospitals	Mean American hospitals	Mean British hospitals	Significant differences
1 – Address/contact (items 1-5)	4.08	3.90	3.10	($F = 7.783$, $p = 0.02$)**
2 – Page features (items 6, 7, 17, 62)	1.17	1.90	1.90	Ns*
3 – Page layout (items 8-12)	3.67	4.30	4.10	Ns*
4 – Page update (items 13-15)	0.25	0.00	0.20	Ns*
5 – General information, setting, access ways (items 18-23)	3.42	2.40	3.40	($F = 3.663$, $p = 0.038$)**
6 – Services (items 24-31, 16)	4.17	4.70	4.80	Ns*
7 – Patient services (items 32-42)	2.92	3.20	3.90	Ns*
8 – Patient information (items 43-49)	2.50	2.60	3.60	Ns*
9 – Research and teaching (items 50-56)	2.17	2.90	2.50	Ns*
10 – The hospital and the media (items 57-61)	2.33	3.30	4.10	($F = 8.411$, $p = 0.01$)**
11 – Technical features of the page (items 63-66)	3.92	4.00	4.00	Ns*

*Ns = Non-significant

**Significant values with p-value < 0.05

pitals from the three countries were compared, no significant differences were observed ($F = 1.578$, $p = 0.224$). However, breaking down the scale items, significant differences were observed in nine of the quality attributes (Table 1).

Regarding the scale categories (Table 2) it is worth mentioning that significant differences were observed in three of the 11 applied: “address/contact” ($F = 7.783$, $p = 0.02$), “general information, setting, access ways” ($F = 3.663$, $p = 0.038$) and “the hospital and the media” ($F = 8.411$, $p = 0.01$). Post hoc observed differences highlight the fact

that in the “address/contact” category British hospitals differ from their peers, given that they achieve a lower mean score (3.10 vs. 3.99). Regarding “general information, setting and access ways” category Spanish hospitals feature a higher mean score than the British and American hospitals (3.42 vs. 2.90). And, lastly, in the “hospital and the media” category, the best score corresponds to the British hospitals, compared to the mean Spanish score (4.10 vs. 2.33).

The scores obtained by Spanish hospitals on readability revealed that six of the 12 Spanish hospitals visited (50%) achieve an

AFI between 60 and 70 (standard readability). Three of them (25%), in turn, achieve scores below 60 (readability a bit difficult) and the other three (25%) achieve scores above 70 (readability a bit easy). The mean score for all the Spanish hospitals is 66 (standard readability).

Regarding FI scores for American hospitals, we can observe that the ten web pages analyzed (100%) feature scores lower than 60, so that they do not achieve the standard readability level. To be precise, five of them (50%) feature a very difficult readability level (scores below 30), whereas the other

five feature a difficult level (scores between 30 and 50). The mean score for all the American hospitals is 29, which translates as a very difficult readability level.

In the case of the British hospitals, their FI scores reveal a varying readability level. Three hospitals (30%) feature scores above 60 (standard readability level); two (20%) feature scores between 50 and 60 (a bit difficult readability level); four (40%) achieved scores between 30 and 50 (difficult readability level) and one (10%) a score between 0 and 30 (very difficult readability level). The mean score for all the British hospital web sites is 47, which translates as a difficult readability level.

A comparison of the results reveals significant differences in the readability indices for the three countries ($F = 30.919$, $p = 0.0001$).

Regarding accessibility difficulties detected after the TAW run, it should be pointed out that only ten out of 32 pages visited (5 from British hospitals, 4 from Spanish hospitals and 1 from an American center) met the Web Accessibility Initiative (WAI) [25] requirements. Table 3 presents the accessibility-related difficulties detected for each analyzed page, specifying, in each case, the priority level involved. For each difficulty column, there are, in turn, two subcolumns. The first features the number of difficulties automatically detected by the system, and the second those difficulties that had to be verified manually.

No differences were observed among the three countries in terms of accessibility problems, as these were the same in all three. When we performed the accessibility difficulty calculations, we discovered that the most common difficulty in the three countries was the page layout. The second most common difficulty was the lack of equivalent texts to accompany. And the third most common difficulty was that the information conveyed by colors was not always available in a non-color format.

Discussion and Conclusions

The outcomes of the application of the Health Center e-Information Quality Scale to the web pages of the different countries

Table 3 Accessibility problems observed (TAW test)

	Accessible	Priority level 1		Priority level 2		Priority level 3	
		autom.	manu.	autom.	manu.	autom.	manu.
SPANISH HOSPITALS							
1	NO	2	31	97	34	3	15
2	NO	1	15	18	18	3	15
3	YES	0	9	6	10	1	9
4	YES	0	17	16	12	1	11
5	YES	0	9	4	10	0	9
6	YES	0	13	14	15	1	11
7	NO	2	5	6	10	1	9
8	NO	2	5	11	10	1	9
9	NO	12	92	122	80	17	30
10	NO	2	12	22	19	1	13
11	NO	2	395	406	236	28	152
12	NO	1	5	7	9	1	9
	Accessible	Priority level 1		Priority level 2		Priority level 3	
		autom.	manu.	autom.	manu.	autom.	manu.
AMERICAN HOSPITALS							
1	NO	1	112	335	84	20	43
2	NO	23	86	157	98	16	37
3	NO	16	65	163	72	10	28
4	NO	8	51	294	77	13	24
5	NO	16	62	284	57	24	52
6	YES	0	226	253	164	19	46
7	NO	118	472	571	322	32	57
8	NO	2	49	90	43	4	20
9	NO	6	20	80	36	9	20
10	NO	12	86	361	41	7	24
	Accessible	Priority level 1		Priority level 2		Priority level 3	
		autom.	manu.	autom.	manu.	autom.	manu.
BRITISH HOSPITALS							
1	NO	30	132	363	165	46	94
2	YES	0	208	316	148	30	62
3	YES	0	31	20	38	0	15
4	YES	0	76	18	35	0	13
5	NO	2	5	7	11	1	9
6	YES	0	47	308	68	4	33
7	NO	5	86	276	19	3	17
8	YES	0	77	0	58	0	16
9	NO	24	80	101	77	10	40
10	NO	4	113	17	58	4	25

autom. = automatically detected by the TAW software
manu. = detected by the TAW software, but needing manual verification

suggests that several web pages' aspects should be improved. Namely, virtually none of the analyzed portals included either the date of creation of the page or the update data. Nor did they feature quality-related data (accreditation, satisfaction survey results, quality commitment to patients, etc.), with the WAI only recognizing a third of them as accessible.

None of the Spanish hospitals allowed visitors to request information via the Internet or e-mail. The same happened in the American hospitals regarding ease of communication with the centers or departments via e-mail, as well as the ability to make a virtual hospital tour. Finally, none of the British hospitals visited allowed for outside visit scheduling via the Internet.

In turn, American hospitals presented more information on medical news, supplementary services (e.g. cafeterias, press or TV), internal job opportunities and explanations activated by the mouse pointer, and they also allowed visitors to request information via the Internet or e-mail. British hospitals coincided with American hospitals in the last three aspects. They also included more frequently information about their customer service phone and/or fax number and a hospital discharge guide.

When we compared our results with those from the scarce papers published on this topic, we were able to identify some coincidences and differences. For example, the mean frequency with which assessed hospitals included the date of the last update in the web pages (12.2%) was very similar to that determined by Kind et al. [14] when they assessed the websites of the 26 best American children's hospitals (10%). Sanz Arrufat et al. [26] reported similar results (9,6%) when they assessed 52 Spanish hospital pharmacy department websites. However, Norwegian hospitals achieved superior results (40%) [12]. In spite of this, these centers' pages offer visitors a search engine with a frequency that is very similar to our own findings (20% and 22.7% respectively).

By evaluating 959 pages dealing with acne using an automatic indicator detection tool (AIDT), Wang and Liu [27] found that 28.7% featured a website map, a number somewhat lower than that obtained by us

(41.1%). Less than 1% of the pages indicated their date of creation, a result which is very similar to that of British and American hospitals (0%). Very few of the centers visited for this paper have an e-mail address available.

The results obtained by applying readability tests to the websites analyzed show differences among countries and languages. The texts from Spanish hospitals' pages were easier to understand compared to the American and British texts. Berland et al. [28] used another tool to assess readability (Fry Readability Graph method), and also concluded that health-related web pages written in English were harder to read than those written in Spanish ($p < 0.03$). Most of the visited Spanish portals (9) feature adequate readability levels, whereas none of the American hospitals and very few of the British hospitals (3) meet these requirements. After using DISCERN [29] to evaluate 114 American websites dealing with pediatric neuro-oncology, Hargrave and Bouffet [30] calculated the readability index for the best-rated 25 and determined that the mean score was 27.7, which is almost identical to that achieved by American hospitals in our study (29). Another recent paper on cancer web pages in English [31] achieved somewhat higher results (45.3). Readability is an important aspect of a page's quality, as it determines the extent to which subjects understand the information provided. Therefore, centers should make an effort in order to help a person of basic education to understand the information provided on their websites.

Regarding accessibility, half of the British hospitals and a third of the Spanish hospitals comply with the WAI requirements to be considered accessible, whereas only one American center complies with these criteria. O'Grady [32] evaluated 49 Canadian health-related web pages and verified that only 40% were free of priority 1 errors according to the WCAG guidelines. This finding coincides with the results that we obtained for the first two countries (50% and 33%). Chiang and Starren's [33] conclusions (27% of sites were accessible) after the assessment of 30 popular health-related websites using these same guidelines are even closer to the accessibility

data from Spanish hospitals. Our results are similar to those published by Zeng and Parmanto [34] who visited 108 websites (most of them American) and none complied with the WCAG priority 1 criteria. All of these countries' national regulatory agencies are making great efforts to ensure that all the information provided complies with the referred requirements. Center managers should follow suit and ensure page accessibility, particularly because this problem can be easily resolved if the page design complies with the basic rules aimed at making access by handicapped persons easier.

Analyzing the quality requirements assessed in each country thoroughly, we can observe that in the three countries only half of the scale attributes are fulfilled. The aim of these pages ought to be clearly user-oriented by providing useful information about the center, ensuring readability and accessibility and somehow arousing the subject's interest.

Additionally, it should be noted that a series of limitations came across when we carried out the study. Among them, one of the most evident is the fact that the Internet is an information medium that changes over time, so that not only page contents but also pages themselves are modified. In fact, it is probable that during this study some pages may have been redirected or modified. This naturally might change the results of the conducted quality analysis. The criteria used to establish the 11 scale categories should be considered as well. Even though the categories have proved to be valid, criteria might have been grouped according to different conditions. Another potential study limitation is the fact that only one rater conducted the assessment. While this fact may introduce potential bias in the findings, the researcher has expertise in this assessment because of prior work in the area.

Lastly, another difficulty that we have encountered is the difference between FI and AFI scores. The literature indicates that both indices are the same but it might be interesting to use additional tools in future studies that take into account other aspects besides phrases' length and word count.

Given the Internet's unstoppable progress, hospital web pages have become an instrument with a great potential for making centers known and for citizen and patient education purposes. Our paper provides for the first time a comparison of web pages from Spanish hospitals with those from

other countries and languages, suggesting potential areas of improvement that might be helpful for Internet users to choose a hospital or to be better informed about the center. All of this will ultimately increase confidence in health institutions, their services and professionals.

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Appendix

Health Center e-Information Quality Scale

- | | |
|---|--|
| 1. Hospital name on the page header | 34. Patient care service or unit: telephone and/or fax |
| 2. Hospital logo on the page header | 35. Suggestions form available via the internet or e-mail |
| 3. Contact information: hospital address | 36. Compliants form available via the internet or e-mail |
| 4. Contact information: telephone and/or fax | 37. Information request form available via the internet or e-mail |
| 5. Contact information: e-mail | 38. The web includes information related to patients rights and obligations |
| 6. Website map | 39. Hospital 's strategic plan: strategies and action lines in order to achieve proposed goals |
| 7. Website search engine | 40. Information about the hospital 's EFQM and ISO assessments, EFQM reports |
| 8. Presence of images(pictures or photographs) that make the page design look nicer | 41. Quality commitment to patient care is specified / Letter to the patients |
| 9. Explanations activated when the mouse pointer passes over photographs, subsections, etc. | 42. Presentation of patient satisfaction survey results |
| 10. Letter or font type that makes reading easier | 43. Hospitalization guidelines: information and regulations to be followed during admission |
| 11. Letter or font size that makes reading easier (size 10 or higher) | 44. Hospitalization guidelines: information and regulations to be followed during the hospitalization itself |
| 12. Letter or font color and contrast with background that make reading easier | 45. Hospitalization guidelines: information and regulations to be followed at the time of discharge |
| 13. Date of page creation | 46. Hospitalization guidelines: information and regulations to be followed by visitors |
| 14. Date of last page update | 47. Information necessary for visiting outpatient consulting rooms: business hours, telephone, etc. |
| 15. Webpage updated during the last two months | 48. Schedule visits to outpatient consulting rooms via the internet or e-mail |
| 16. Access to the webpage in the official languages of the territory | 49. Information necessary for visits to the emergency department: business hours, telephone, etc. |
| 17. The webpage features accessibility for disabled persons certification (WAI-A, -AA, or -AAA) | 50. Research: scientific studies fostered by the hospital or in which the hospital participates ... |
| 18. Welcome to the hospital message | 51. Teaching: graduate, postgraduate courses, etc., given at the hospital |
| 19. Hospital history | 52. Library: address |
| 20. Hospital location | 53. Library: business hours |
| 21. Area covered by the hospital (population served) | 54. Library: publications catalog |
| 22. How to get to the hospital: by car, by public transportation ... | 55. Library: services available, such as reading, loans, copies ... |
| 23. Virtual visit to the hospital | 56. Section devoted to national or international medical news |
| 24. Directory of department locations by floor | 57. Hospital news: new techniques used by the center specialists, infrastructure improvement ... |
| 25. Services directory: name and position of the staff | 58. Guide to the activities carried out in the hospital for each day: courses, workshops, conferences ... |
| 26. Services directory: telephone and/or fax for each department | 59. Publications by the hospital itself |
| 27. Services directory: e-mail for each department | 60. The hospital in the media: features news that appeared in press, radio, TV |
| 28. Hospital organization chart: medical management, nursing management ... | 61. Information about job opportunities at the hospital |
| 29. Listing of services available at the hospital | 62. Links to other websites of interest: hospitals, scientific societies, institutions ... |
| 30. Access to the hospital annual report for the previous year | 63. All of the pages ' links function |
| 31. Supplementary services: press, cafeterias, television ... | 64. The links lead to the specified files |
| 32. Patient care service or unit: location | 65. Page load time is less than 10 seconds |
| 33. Patient care service or unit: business hours | 66. The page can be printed without difficulties |

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