

Building Cancer Hospitals' Reputed Brands through Health Education and Mobile Apps

Running head: Building Cancer Hospitals' Reputed Brands

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ABSTRACT

Cancer hospitals implement communication initiatives to promote their brands, such as websites, patient portals, social media platforms, or mobile applications. However, they face different challenges: legal frameworks, patients' requirements, and global competition. This paper analyzes how hospitals manage mobile applications to implement health education initiatives, allowing them to reinforce their relations with stakeholders and promote their brands. We conducted a literature review about cancer hospitals' brands (health communication, branding, health education, mobile applications), and then we carried out a quantitative analysis of how the 250 best cancer hospitals in the world managed their mobile applications for health education and branding purposes. We found that most cancer hospitals used websites (99,6%) and social media platforms (90,4%), but only a few of them managed general mobile applications for patients (52,8%) and mobile applications for cancer patients (7,6%). We concluded that most cancer hospitals mainly use applications for administration tasks and only focus on patients, constituting a reputational risk for these organizations.

1. Branding Hospitals: Communication Challenges

Building a reputed brand collectively and with all stakeholders constitutes the most critical responsibility of all experts in corporate communication working in these organizations. Cancer hospitals' corporate communication departments implement different initiatives to achieve this goal, such as publishing corporate magazines, organizing internal events, establishing relationships with media companies, or managing online patient communities. However, these organizations face different challenges that make their branding initiatives more difficult: strict legal frameworks, patients' requirements, limited communication budgets, and the difficulty of disseminating cancer-related content. On the other hand, these institutions face different crises, such as those provoked by medical mistakes made by health professionals or those related to internal and external problems (legal issues, fake health news). Finally, cancer hospitals deal with new international hospital groups that have recently opened branches in different countries, implemented new business models, and invested

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significant amounts in marketing campaigns. In this context, many cancer hospitals have decided to focus on mobile applications as a health education and branding tool.

This paper aims to understand better how cancer hospitals manage mobile applications to implement health education initiatives, allowing them to enhance their relations with stakeholders and reinforce their corporate brand. In other words, this paper analyzes how mobile applications help cancer hospitals make their branding initiatives more dynamic and establish more meaningful relationships with their stakeholders, especially their patients. Some researchers have analyzed mobile applications in hospital settings from a technical perspective: medical protocols, patients' perceptions, and economic costs. However, not many papers examine the impact of mobile applications on hospitals' health education campaigns launched for branding purposes. This paper addresses this issue since it will determine these organizations' corporate communication strategies in the coming years. To better understand this topic, we conducted a literature review of cancer hospitals' brands: health communication, branding, health education, and mobile applications. Then, we quantitatively analyzed how the 250 best cancer hospitals managed their mobile applications for health education and branding purposes. To do that, we resorted to the World's Best Specialized Hospitals 2024 in oncology, a ranking published by *Newsweek* and *Statista*, and we used 27 indicators to analyze each hospital and gather quantitative results. Finally, based on this analysis, we proposed different conclusions and practical recommendations for cancer hospitals.

2. Literature Review

2.1 From Health Communication to Branding

Oncologists' skills in interpersonal communication influence patients' behaviors and perceptions (Peterson et al., 2016). When doctors communicate professionally, patients ask more questions and follow their advice (Brand, Fasciano, 2017). Which is why many cancer hospitals are implementing training sessions to help oncologists communicate risk information more professionally (Janz et al., 2016), focus on facts rather than personal opinions (Moore et al., 2018), and regulate their emotions -stress, alexithymia- as well as those of patients -sadness, anxiety- more efficiently (De Vries et al., 2018). These sessions allow cancer hospitals to change internal processes and implement patient-centered communication models (Epstein, Duberstein, Fenton, 2017).

Besides interpersonal communication, cancer hospitals manage internal and external communication initiatives addressed to stakeholders such as employees, media companies, or public authorities (Medina Aguerrebere, Gonzalez-Pacanowski, Medina, 2020). These organizations face ten main corporate communication challenges that affect their internal and external communication initiatives. First, helping oncologists understand that they must consider social issues (human rights, cultural elements) when communicating with patients (Salmon, Bridget, 2017). Second, training doctors and patients in controlling their emotions to communicate more efficiently (De Vries et al., 2018). Third, integrating cancer patients into collective decision-making processes allowing them to ask questions, share information, and empower their rights (Peterson et al., 2016). Fourth, using social media platforms as health education tools to disseminate meaningful content that helps patients protect their rights (Yeob et al., 2017). Fifth, integrating social media into the hospital's internal protocols and evaluating doctors' performance in this area (Kotsenas et al., 2018). Sixth, finding synergies between social media platforms, mobile health, and artificial intelligence to improve medical treatments and enhance patients' perceptions of the hospital (Prochaska, Coughlin, Lyons, 2017). Seventh, conducting professional research about patients' attitudes

and expectations before implementing corporate communication initiatives to make this area more professional (Mazor et al., 2016). Eighth, promoting online communities where patients can share experiences and medical information (Falisi et al., 2017). Ninth, implementing personal branding programs to help some employees become brand ambassadors able to promote the hospital's image (Trepanier, Gooch, 2014). And tenth, disseminating meaningful content on different media to help the hospital build a reputed brand (Kotsenas et al., 2018).

To efficiently face these corporate communication challenges, cancer hospitals must reinforce their brands (Medina Aguerrebere, Gonzalez-Pacanowski, Medina, 2020). These organizations should understand the brand from an integrative perspective (Lithopoulos et al., 2021), which means that before implementing any branding initiatives, they must consider patients' and doctors' perceptions from a medical, social, and human perspective (Li, Xu, 2020). On the other hand, a hospital's brand is determined by four dimensions: brand elements, tangible assets, medical personnel quality, and critical services (Odoom, Narteh, Odoom, 2019). To efficiently manage these four dimensions, hospitals need to integrate employees into the organization's branding initiatives (Mheidly, Fares, 2020) and disseminate meaningful content that influences stakeholders' perceptions about the organization, its brand, its employees, and its medical services (Lithopoulos et al., 2021; Merminod, Benaroyo, 2021).

Hospitals must innovate and implement state-of-the-art marketing activities, including mobile applications for management and marketing purposes (Chandra, Nadjib, 2023). These applications help these organizations manage their relationships with patients more efficiently and improve their competitiveness in international markets (Sulaiman et al., 2024). From a medical perspective, the use of mobile applications is beneficial for patients suffering from chronic diseases, such as cancer: the promotion of health benefits of self-care through mobile applications should be part of hospitals' marketing strategies since it reduces patients' chronic pain and depressive symptoms, leading to better treatments and prevention. (Huntsman, Bulaj, 2023). From a branding perspective, using mobile applications where patients and doctors produce and share content positively influences the hospital's brand equity, especially its brand associations, perceived quality, brand reputation, and brand loyalty (Abuhmeidan, 2023). For this reason, hospitals need to recruit experts who create engaging content for mobile applications that improve patients' and doctors' quality of life (Al-Hasan, 2024).

2.2 Branding Strategies Based on Health Education

Hospitals, Schools of Medicine, and Public Health Authorities work together to implement health education initiatives that allow citizens to reinforce their health knowledge (Schulz et al., 2020). These initiatives should focus on citizens' needs rather than the technical aspects of treatments and diseases (Tomokawa et al., 2021). Besides, they should promote a multidisciplinary approach to health (Fittipaldi, O'Dwyer, Henriques, 2021). Finally, these initiatives should be creative and innovative, which means that these organizations must resort to visual information -videos, pictures, and information graphics- (Siregar et al., 2021) and storytelling strategies based on patients' experiences, perceptions, and attitudes (Breton, 2020). When hospitals and other health organizations promote health education in this way, they efficiently help citizens protect their rights (Rooney et al., 2021).

More and more cancer hospitals resort to health education initiatives to efficiently satisfy their patients' needs regarding information and emotional support (Lavdaniti, 2020). Moreover, these initiatives positively influence cancer hospitals' brands. First, thanks to health education, hospitals integrate knowledge from other fields -anthropology and

sociology- which helps these organizations better understand their stakeholders and improve their relations with them (Shi et al., 2021). Second, health education initiatives allow doctors to evolve from a paternalistic model to a patient-centered paradigm where these last ones feel more comfortable (Morsa, 2021). Third, implementing a health education approach improves hospitals' internal protocols and makes them more performant institutions (Driever, Stiggelbout, Brand, 2019). Fourth, thanks to these initiatives, hospitals reinforce their scientific credibility in different medical fields (Leemans, Van den Broucke, Philippe, 2021). Fifth, health education allows hospitals to become social institutions that support patients from a medical, emotional, and social perspective (Hammoud et al., 2020).

Building a brand based on health education helps cancer hospitals become more reputable institutions and accelerate their digital transformation (Moore et al., 2018). Cancer hospitals, Schools of Medicine, and technology providers collaborate to implement digital education initiatives addressed to patients, such as online consultations with doctors through mobile applications and patient portals (Turkdogan et al., 2021). Besides, these hospitals use artificial intelligence to make their health education initiatives more professional: post-surgical instructions, medication reminders, health-associated evaluations, surveys, and appointment follow-ups (Fareed, Alrebish, 2021). On the other hand, hospitals merge websites, social media platforms, and mobile applications to launch online communities where patients share medical data, interact with doctors, and manage appointments at the hospital (Johansson et al., 2021). Finally, these organizations resort to different software to fix problems some patients face, such as those related to linguistics or health literacy (Callery et al., 2021).

2.3 Branding and Health Education through Mobile Applications

The use of mobile technologies to improve hospital services will be increasingly important in the following years (Tassone et al., 2020). On the one hand, these devices enhance hospitals' information systems and change how healthcare knowledge is disseminated (Mateus-Coelho, Avila, 2021). On the other hand, using mobile applications leads hospital's employees to change their mentalities and develop more integrated medical services (Yu et al., 2021). The most important functional categories of mobile applications are four: a) supporting clinical diagnosis and decision-making processes; b) improving clinical outcomes from established treatment pathways through enhancement of patient adherence with treatment; c) acting as standalone digital therapeutics; and d) delivering disease-related education (Rowland et al., 2020). Mobile applications are becoming so crucial that many hospitals are training their employees in this area (Palacios-Gálvez et al., 2021), and some of them have even integrated these applications with other platforms (video games, patient portals) to develop unique health education initiatives (Machado, Turrini, Sousa, 2020).

Mobile applications play a key role in cancer hospitals' health education initiatives. According to Lavdaniti (2020), five main principles guide these initiatives: a) assessing patients' physical and emotional well-being; b) evaluating patients' ability to comprehend their diseases and treatments; c) possessing some understanding of patients' family environment; d) ensuring that patients have enough time to ask questions; and e) maintaining documentation of patients' education activities through the period of care. To efficiently implement these principles, cancer hospitals can resort to mobile applications (Prochaska, Coughlin, Lyons, 2017) because these tools allow oncologists to communicate with patients more frequently (Peterson et al., 2016) and manage patients' needs more efficiently, especially when patients face chronic cancer or surgery (Machado, Turrini, Sousa, 2020). In the field of oncology, digital patient education is a relatively new area and lacks an organized

strategy (Turkdogan et al., 2021). For this reason, cancer hospitals must integrate mobile applications as the main health education tool and change patients' attitudes and behaviors (Steves, Scafide, 2021).

When cancer hospitals promote health education initiatives through mobile applications, they become more reputable brands and influence stakeholders' perceptions (Medina Aguerrebere, Gonzalez-Pacanowski, Medina, 2020). Using mobile applications as a corporate communication and health education tool allows hospitals to associate their brands with positive values, such as scientific credibility (Crossley et al., 2020), social engagement (Piculell et al., 2021), passion for innovation (Butow, Hoque, 2020), respect of patients' rights (Mackert et al., 2020), and promotion of health professionals' engagement with the hospital's digital transformation (Chamberlain et al., 2021). Finally, the hospital's online presence in mobile applications determines its reputation, which is why these organizations must professionalize the use of these applications from a health education and branding perspective (Triemstra, Poepelman, Arora, 2018).

3. Methodology

Cancer hospitals implement health education initiatives to associate their brands with positive values, such as scientific credibility, social engagement, or patients' rights. To do that, many of them manage mobile applications. To better understand how cancer hospitals integrate health education and mobile applications into their branding initiatives, we resorted to the World's Best Specialized Hospitals 2024 in Oncology, a ranking published by *Newsweek* and *Statista*. This ranking is based on a global survey conducted by companies to over 40.000 health professionals from 27 countries (doctors, health care professionals, and hospital managers). In this survey, these professionals recommended hospitals based on their expertise in different medical fields. Subsequently, these recommendations were weighted by two factors: a) type of respondent by profession, and b) assigned ranking position for each hospital. Based on this information, a preliminary reputation score (0-100%) was calculated for every hospital. Finally, these results were validated by an external Expert Board, including doctors from the United States, Israel, Switzerland, Germany, and France.¹

Thanks to this ranking, we identified the 250 best cancer hospitals in the world.² For each hospital, we analyzed whether they had a corporate website, patient portal, social media platforms, and mobile applications. Then, we evaluated in more detail how these hospitals managed mobile applications for health education and branding purposes. We considered these four platforms because corporate websites play a key role in hospitals' branding initiatives (Team et al., 2020), patient portals help these organizations to reinforce patients' skills in health education (Driever, Stiggelbout, Brand), and social media contribute to making hospitals' branding and health education initiatives more dynamic and efficient (Medina Aguerrebere, Gonzalez-Pacanowski, Medina, 2020). Finally, we focused on mobile applications because thanks to these tools, hospitals enhance their medical services (Mateus-Coelho, Avila, 2021), reinforce their relationships with patients (Yu et al., 2021) and build more reputed brands (Ardisonne, 2020).

We conducted a quantitative analysis from 12th November 2024 to 23rd December 2024 that helped us better understand how the 250 best cancer hospitals in the world managed mobile

¹ Information retrieved on 3rd November 2024 from: <https://d.newsweek.com/en/file/467977/worlds-best-specialized-hospitals-2024-methodology.pdf>

² Complete list available on: <https://www.newsweek.com/rankings/worlds-best-specialized-hospitals-2024/oncology>. Document retrieved on 3rd November 2024.

applications for health education and branding purposes. We downloaded each hospital's mobile application and analyzed their websites, patient portals, and social media platforms. Based on this previous screening, we identified 27 indicators that we grouped into four main categories: a) online integration, b) general application for patients, c) mobile applications for other stakeholders, and d) mobile application for cancer patients (see *Table 1*). We evaluated each hospital's website, patient portal, social media platforms, and mobile applications based on these indicators. We resorted to a quantitative analysis system to assess whether each hospital respected the 27 criteria. Concerning mobile applications, we only evaluated the official ones developed by each hospital and those designed by external providers and adapted to the hospital's medical system.³ We mainly considered mobile applications addressed to patients. Finally, all indicators were analyzed according to the binary system, except one that was evaluated as an absolute number: online integration (*5. Number of mobile apps*).

Table 1. Indicators

Online integration	General application for patients	Mobile application for other stakeholders	Mobile application for cancer patients
1. Corporate website 2. Patient portal 3. Social media platforms 4. Mobile applications 5. Number of mobile applications	1. Review test results 2. Upload personal data 3. Access family's health data 4. Communicate with doctors 5. Manage appointments 6. Request prescriptions 7. Video consultations 8. Find physicians 9. Billing	1. Patients facing particular diseases 2. Employees 3. Suppliers 4. Media companies	1. Health education information 2. Track medical metrics 3. Contact doctors 4. Online consultations 5. Request prescriptions 6. Review test results 7. Upload personal data 8. Manage appointments 9. Find physicians

Source: Authors' elaboration

4. Results

Most cancer hospitals managed social media platforms, corporate websites, patient portals, and mobile applications to implement health education initiatives addressed to patients. However, many organizations can still enhance these practices and use these platforms more professionally. To justify this statement, we presented our quantitative results, which are grouped into four main categories: 1) online integration of websites, portal patients, social media, and mobile applications; 2) general mobile applications for patients; 3) mobile applications for other stakeholders; and 4) mobile applications for cancer patients.

Online integration of websites, portal patients, social media, and mobile applications. According to our results, most hospitals displayed these tools: corporate websites (99,6%), patient portals (58,4%), social media platforms (90,4%), and mobile applications (52,8%). On average, hospitals having mobile applications showcased 2,7 mobile apps addressed to different stakeholders. However, some hospitals did not develop their mobile applications

³ Some hospitals resorted to mobile applications developed by external providers that they then adapted to the hospital's system: My Chart (*Epic*), Follow my Health (*Allscripts*), and Health Buddy (*SignHealth Group*).

and resorted to external companies – *Epic, Allscripts, Sign Health Group*- to design platforms that they adapted to the hospital's internal system.⁴ Finally, as to the number of mobile applications, the best hospital was *Cleveland Clinic* -United States- (see Table 2).

Table 2. Best hospitals by number of mobile apps

Hospital	Number of mobile apps
<i>Cleveland Clinic</i> (United States)	14
<i>All India Institute of Medical Sciences - Delhi</i> (India)	12
<i>UCLA Health – Ronald Reagan Medical Center</i> (United States)	11
<i>The Johns Hopkins Hospital</i> (United States) (1)	9
<i>Johns Hopkins Bayview Medical Center</i> (United States) (1)	9
<i>MedStar Georgetown University Hospital</i> (United States)	8
<i>Massachusetts General Hospital</i> (United States)	7
<i>Vanderbilt University Medical Center</i> (United States)	7

(1) *Johns Hopkins Medicine* (United States) and *Johns Hopkins Bayview Medical Center* (United States) share the same apps.

Source: authors' elaboration

General mobile application for patients. Most hospitals (78,80%) had a general mobile application that patients could use for different purposes: review test results and medical records (96,2%), upload personal health data (96,2%), manage appointments (93,3%), communicate with doctors (92,3%), find physicians (61,5%), pay bills (55,8%), request prescriptions (47,10%), conduct video consultations with doctors (25%) and access family's health information (23,10%). *Baylor University Medical Center* (United States) and *University of Colorado Hospital* -United States were the hospitals that fulfilled the nine indicators (see Table 3). Concerning the other hospitals, 78,8% of them respected between 5 and 7 criteria.

⁴ List of hospitals resorting to external companies to develop their mobile applications:

a) My Chart (*EPIC*): *MD Anderson Cancer Center* (United States), *The Princess Margaret Cancer Centre* (Canada), *UCSF Medical Center* (United States), *UCLA Health – Santa Monica Medical Center* (United States), *Addenbrooke's* (United Kingdom), *University of Chicago Medical Center* (United States), *Jefferson Health - Thomas Jefferson University Hospitals* (United States), *Barnes-Jewish Hospital* (United States), *University of Wisconsin Hospitals* (United States), *OHSU Hospital* (United States), *Children's Hospital of Philadelphia* (United States), *St. Michael's Hospital* (Canada), *University of North Carolina Hospitals* (United States), *Hospital for Sick Children* (Canada), *University of Iowa Hospitals and Clinics* (United States), *University of Kentucky - Albert B. Chandler Hospital* (United States), *Virginia Mason Medical Center* (United States) and *Central State Medical Center* (United States).

b) Follow my Health (*Allscripts*): *Community Memorial Hospital San Buenaventura* (United States).

c) Health Buddy (*SignHealth Group*): *Changi General Hospital* (Singapore) and *National Cancer Centre Singapore* (Singapore).

Table 3. Best general applications by number of services

Mobile application and hospital	Number of services (out of 9)
My BSW Health App (<i>Baylor University Medical Center</i> , United States)	9
UC Health App (<i>University of Colorado Hospital</i> , United States)	9
My Mount Sinai App (<i>The Mount Sinai Hospital</i> , United States) (1)	8
My Mount Sinai App (<i>Mount Sinai Beth Israel</i> , United States) (1)	8
My UofM Health App (<i>University of Michigan Hospitals - Michigan Medicine</i> , United States)	8
My UC Davis Health App (<i>University of California - Davis Medical Center</i> , United States)	8
Ask Apollo App (<i>Apollo Speciality Cancer Hospital</i> , India) (2)	8
Ask Apollo App (<i>Apollo Hospital – Chennai</i> , India) (2)	8

- (1) *Mount Sinai Hospital* (United States) and *Mount Sinai Beth Israel* (United States) shared the same applications.
 (2) *Apollo Speciality Cancer Hospital* (India) and *Apollo Hospital - Chennai* (India) shared the same applications.

Source: authors' elaboration

Mobile applications for other stakeholders. Our results proved that most hospitals did not propose a mobile application for some stakeholders. No hospital had an application addressed to the hospital's suppliers (0%), and only 1,5% proposed an application for media companies. However, many hospitals had mobile applications for their employees (34,8%) and patients facing diabetes, cancer, and depression (37,8%). On the other hand, no hospital proposed at least a mobile application for the four stakeholders (employees, patients suffering particular diseases, media companies, suppliers), and only one hospital displayed an application for 3 of them: *Cleveland Clinic* (United States) had mobile application for employees (*Bariatric Surgery Calculator App*), media companies (*Cleveland Clinic CME App*) and patients facing particular diseases (*Sleep by Cleveland Clinic App*).

Mobile application for cancer patients. Only 7,60% of hospitals had a mobile application addressed to cancer patients. These applications allowed cancer patients to conduct different activities, such as accessing health education information (100%), contacting doctors (90%), finding physicians (80%), managing appointments (80%), uploading personal health data (70%), tracking different metrics related to their diseases (50%), reviewing test results and medical records (40%), conducting online consultations with doctors (10%) and requesting prescriptions (10%). Considering the number of services proposed by each application, the best was the one developed by *Instituto do Cancer do Estado de Sao Paulo* in Brazil (see Table 4).

Table 4. Best applications for cancer patients

Mobile application and hospital	Number of services (out of 9)
Instituto do Câncer - Icesp App (<i>Instituto do Cancer do Estado de Sao Paulo, Brazil</i>)	8
Cancer Distress Coach (<i>Memorial Sloan Kettering Cancer Center, United States</i>)	7
UM Skin Check App (<i>University of Michigan Hospitals - Michigan Medicine, United States</i>)	7
Electronic Symptom Management App (<i>Dana-Farber Cancer Institute, United States</i>)	5
UCSF Fetal Treatment Center (<i>UCSF Medical Center, United States</i>)	5
UPMC Hillman Trials Finder (<i>UPMC Presbyterian & Shadyside, United States</i>)	5
Monitoramento Remoto App (<i>A.C. Camargo Cancer Center, Brazil</i>)	5
PM Cancer Journey App (<i>The Princess Margaret Cancer Centre, Canada</i>)	5

Source: authors' elaboration

5. Discussion

Enabling people to increase control over their health is at the core of health promotion (Van den Broucke, 2020), so more and more hospitals implement new technological initiatives that reinforce patients' empowerment (Abbas et al., 2020). In this framework, many hospitals resort to social media platforms and mobile applications to improve patients' medical outcomes, enhance medical education initiatives, and transform the hospital's internal processes (Farsi, 2021; Yu et al., 2021). According to our results, cancer hospitals follow this logic, which is why most of them had corporate websites (99,6%), social media platforms (90,4%), patient portals (58,4), and mobile applications (52,8%). However, only 7,60% of them proposed a mobile application for cancer patients, which constitutes a risk for them because they need regular support from their doctors and nurses to fulfill their information and emotional needs. Hospitals should conduct business analysis to understand better the impact of each disease on the organization's financial plan and, based on that, update their corporate communication plans, which includes integrating mobile applications to improve doctors-patients relationships.

Hospitals' communication initiatives face several challenges, including technical issues, human needs, and social values (Li, Xu, 2020). These organizations should prioritize a human approach where values such as knowledge, emotional support, or empathy are more important than key performance indicators (Reza, Ansari, Mahjob, 2022). When hospitals respect these values and adapt their communication initiatives to different stakeholders' information needs, they become more credible institutions (Merminod, Benaroyo, 2021). This credibility is essential because people need a clear correlation between the hospital and its original roots to perceive these institutions as authentic (Rindell, Santos, 2021). Despite these facts, most hospitals considered in this research only used general mobile applications to disseminate administrative information. Most of them did not use these platforms to share more elaborated content that helps patients emotionally. In fact, most of these organizations' general mobile apps allowed patients to review medical records and upload personal health data (96,2%). Still, only 25% of hospitals proposed to patients applications that allowed them to conduct online consultations with doctors and nurses. Cancer hospitals should evolve from this administrative approach to a more human paradigm based on disseminating meaningful

content for patients from a medical, social, and emotional perspective. To achieve this goal, the hospital's corporate communication department should recruit experts in humanities, such as sociology, anthropology, or philosophy, who integrate human values into each communication initiative implemented by the organization.

The brand value lies in the emotional connections between consumers and the brand (Zhang, Zhang, Li, 2021), which is why hospitals need to link their identity with captivating initiatives addressed to different stakeholders (Govers, 2020). To do that, these organizations should base these initiatives on meaningful content that helps other stakeholders better understand health-related issues (Ren, Ma, 2021). When hospitals follow this approach, they build their brand in a collective way along with these stakeholders and become credible institutions (Medina Aguerrebere, Gonzalez-Pacanowski, Medina, 2020). Cancer hospitals should do the same and implement different communication initiatives addressed to stakeholders such as patients, employees, public health authorities, media companies, or social leaders. However, our results demonstrated that most hospitals did not display mobile applications for particular stakeholders. No hospital proposed a mobile application for the hospital's suppliers, and only 1,5% had an application addressed to media companies. Finally, 34,80% of hospitals showcased an application for employees, which means that most cancer hospitals did not consider their employees as a main target for collective branding processes. To avoid this fragmentation, hospitals' corporate communication departments should collaborate with the organization's CEO and Board of Trustees to define more balanced communication plans that integrate all stakeholders and contribute to achieving the hospital's business goals.

This paper proved that cancer hospitals can still enhance their branding and health education initiatives based on mobile applications. Despite this interesting fact, we must highlight some limitations affecting this research. First, we could not check the legal framework in all countries considered in this study, which directly determines hospitals' investments in technology. Second, we did not contact each hospital's corporate communication department to understand better these applications' role in their corporate communication strategies, which prevented us from accurately describing these institutions' branding plans. Third, we did not find any other paper focused on the same area and using the same methodology, so we could not compare our results and propose more accurate conclusions. Even if this paper contributes to a better understanding of cancer hospitals' branding and health education initiatives based on mobile application, we recommend researchers interested in this area focus on three main topics in the coming years: 1) the use of artificial intelligence to revisit cancer hospitals' mobile applications, 2) the integration of mobile application on cancer hospitals' internal protocols to improve patients' perceptions about the organizations, and 3) the development of training sessions allowing health professionals to use mobile application for medical and branding purposes.

6. Conclusion

Building a brand collectively with stakeholders constitutes a priority for cancer hospitals interested in becoming credible institutions that influence society. However, these organizations face different challenges, such as strict legal frameworks, patients' requirements, and difficulty disseminating scientific content related to cancer. Many cancer hospitals resort to technological tools such as websites, patient portals, social media, and mobile applications to overcome these challenges. This paper aimed to understand better how cancer hospitals managed mobile applications to implement health education initiatives that allow them to enhance their relationships with stakeholders and, this way, reinforce their

corporate brands. Our literature review and quantitative results allowed us to conclude this paper with three main ideas. First, most cancer hospitals used general mobile applications for administration purposes (review test results -96,2%-, manage appointments -93,3%) and not to reinforce their relationships with patients: 75% of hospitals did not allow patients to use these general applications to conduct online consultations with doctors. This functional approach is not appropriate for hospitals interested in establishing long-term relationships with patients. Second, most cancer hospitals developed mobile applications for patients but not for other stakeholders such as media companies (1,5%) or suppliers (0%), which constitutes a risk because these organizations need to build their brands collectively with all stakeholders. Third, 92,4% of cancer hospitals did not propose an application for patients suffering from this disease, which constitutes a public health risk and a corporate mistake that affects these organizations' reputation because it prevents them from becoming a reference in scientific information and emotional support.

Based on these conclusions, we recommend that cancer hospitals approve three managerial decisions. First, these institutions should establish multidisciplinary teams integrated by medical, communication, public health, and engineering experts to develop mobile application that fulfill hospitals' requirements, stakeholders' needs, and public health authorities' recommendations. Once these organizations have developed their mobile applications, the hospital's corporate communication department should implement training sessions for healthcare professionals, patients, and other stakeholders to help them use this technology professionally. The same department needs to develop monitoring systems to evaluate stakeholders' perceptions about the mobile applications and propose initiatives to improve them from a medical, emotional, and branding perspective. This way, mobile applications will become useful corporate communication tools that will allow cancer hospitals to build their brands collectively with all stakeholders and become more credible institutions.

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