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User Experience Design of Mobile Medical Applications

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Abstract:

With the advancement of technology and the widespread adoption of smartphones, mobile health applications have emerged as a significant tool for enhancing the quality and accessibility of healthcare services. These applications enable users to conveniently access health information, monitor their health status, and interact with healthcare professionals. However, alongside their rapid development, these applications face a series of challenges, including privacy protection, the rationality of user interface design, and integration with existing medical systems. This paper first outlines the fundamental principles of mobile health application design and discusses the current state of their development. It further explores the notable advantages in improving healthcare efficiency, convenience, and personalization, while also highlighting the inflexibilities and issues related to collaboration with hospitals. Ultimately, this study summarizes the comprehensive discussion, and aims to contribute to the advancement and development of mobile health technologies, thereby more effectively addressing public health needs.

Keywords: User experience design; medical applications; advantages; solutions

1. Introduction

Since ancient times, medical treatment has been closely related to human production and life. It can be said that since the birth of human beings, human medical history has also been written, from the ancient, scattered knowledge of herbs to the gradual system of medical books, from the still ignorant treatment methods to the modern medical technology.

In recent years, with the development of Internet and technology, more and more industries have begun to go digital, as a result, mobile apps are gushing out. Especially during the COVID-19 pandemic, when everyone is quarantined at home, most industries rely on the Internet and are gradually developing online services with the launch of many new mobile apps. This situation did not retreat until after the epidemic, and the online industry and apps have become more prosperous. In 2022, non-gaming app users will spend $23.7 billion, up 4.3% from the previous quarter. The development of apps in the medical field is also good, and the market size in China increased by 14.1% year-on-year. At present, medical treatment in many places can not be separated from the assistance

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of mobile apps, from appointment registration to payment, every step of offline medical treatment may be operated by mobile apps, patients can even see a doctor online [1].

What kind of experience these apps bring to users is the category of user experience design (UX design). UX design is as important to medical app as water is to fish, and medical treatment is an indispensable part of public life, so the UX design of medical app has more or less impact on everyone. A good medical app should bring about the optimisation of services, should facilitate users, make medical care more accessible to the people, and improve medical efficiency. This requires UX design staff to simulate the use process, investigate user feedback, find problems and provide solutions. In the future, digital health will become more widespread, and perhaps new service features will be developed, so UX design will have a wider application. However, data describing the overall state of affairs in this area is scarce. As a result, what is the status quo, how are the advantages and disadvantages of app in real world case, what are the problems at this stage, and how might designers solve these problems are the contents of this article.

2. What is UX Design?

UX design focuses on enhancing the emotional experience of users, aiming for higher satisfaction across various industries, including mobile medical apps. In essence, user experience is defined as encompassing all aspects of users, products, systems, and interactions, covering a range of emotions and experiences related to human emotions, perceptions, preferences, reflections, feelings, and psychological changes [1]. In this context, UX design prioritizes understanding users' real needs and feelings, ensuring ease of use for first-time users. Mobile medical apps require innovative service design to meet personalized user needs, such as tailored health management plans, real-time monitoring, and interactive communication with healthcare providers. Effective interface and functional design should be informed by user needs analysis, which can involve user interviews and questionnaires to gather quantitative data. Creating persona models and storytelling scenarios helps identify and optimize poor user experiences.

Accessible design is crucial, ensuring that all users, regardless of age or abilities, can access key functions. This approach enhances usability and demonstrates respect for diverse user groups. Finally, the design of mobile medical apps should embrace trends like socialization, intelligence, miniaturization, mobility, wearability, and interactivity. By integrating various communication and networking technologies, a comprehensive "medical health cloud" platform can be created, improving service efficiency and economic benefits for medical institutions.

2.1 The Work of Medical UX Design

The core of UX design lies in predicting and shaping user experience, understanding and meeting the real needs of users, and finding a balance between user expectations and actual functions. Products should be easy to understand and operate to improve the user experience [2].

Predicting user experience requires designers to deeply understand user behavior patterns and psychological models. This usually involves observing, interviewing, and surveying users, as well as analyzing how users interact with similar products. In the field of mobile medical care, this may mean considering user scenarios in emergency situations or daily interactions when managing long-term health conditions. Understanding user expectations is a key step in the design process. This involves identifying user needs, pain points, and motivations. For example, a mobile medical app may need to provide patients with an easy-to-use interface to track their symptoms and medication intake, while also providing doctors with a system that can quickly access patient health data. In terms of correcting and improving functions, designers need to continuously optimize the app based on user feedback. This may include improving the layout of the user interface to make it more intuitive and user-friendly, or adding new features to enhance the user experience. Based on user feedback, designers may find the need to add a medication reminder feature or improve the data input process to make it more smooth.

Mobile medical apps need to provide a consistent experience across various devices and platforms. This may mean considering the screen sizes of different devices, operating system characteristics, and user habits. Emotional experience is another key element in the design of mobile medical apps. Designers need to create an experience that resonates emotionally with users, which can be achieved through the use of warm language, friendly interactions, and attractive visual design. This emotional connection can help users better connect with the app, thereby increasing its usage frequency and satisfaction [3].

In the design of mobile medical apps, innovation is key to driving industry development. This may involve developing new features, such as using artificial intelligence for health data analysis, or using augmented reality technology to provide more intuitive medical information. Innovation can not only enhance the user experience but also provide new possibilities for medical services.

2.2 Application of UX Design

For mobile application UX design, the specific process in-

cludes creating a sitemap based on research information, which serves as a simple overall flowchart, followed by adding possible features and details, refining them into sketches, and conducting tests with target users. Next, designers modify the sketches into wireframes based on feedback and conduct further user testing before designing a high-fidelity prototype, which is the final user interface. After completion, it undergoes additional testing [4]. According to data, prototypes that have gone through multiple iterations often see significant improvements in user satisfaction and usage rates.

The nature of UX design and UI design can be divided into two categories. The former focuses more on user research, responsible for designing service processes that create better user experiences through the study of user behaviors, needs, and motivations. In contrast, the latter concentrates on interface design, aiming to provide users with a more comfortable experience through visual design. UI designers pay attention to the selection and layout of elements such as colors, fonts, and icons. In terms of workflow, UX design is usually completed first, followed by UI design. For example, when Dropbox designed its file-sharing interface, it first conducted user research to clarify the users' usage scenarios before moving on to visual design, ensuring that the interface was both aesthetically pleasing and practical.

3. Advantage of Mobile Medical Apps

The fig. 1 is a user experience map of seeing a doctor in an offline hospital. This part will analyze the advantages of the current mobile medical app in service design according to its pain points [5].

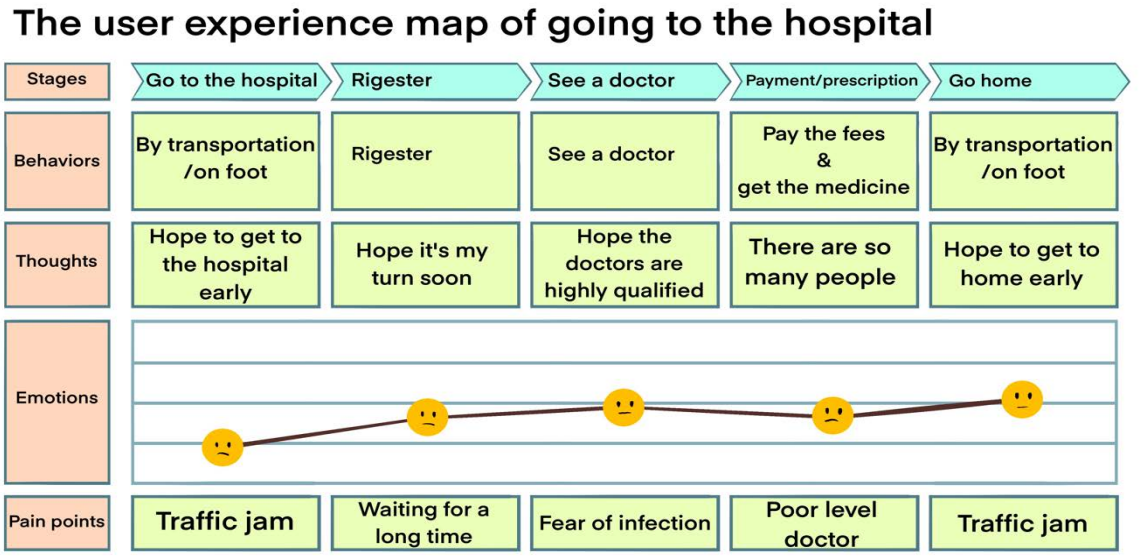

Fig.1. A user experience map of seeing a doctor in an offline hospital(Photo/Picture credit : Original).

3.1 Time Savings and Efficiency Improvement

It is well established that physical healthcare institutions are typically located in urban center areas, resulting in a concentrated distribution of medical resources within cities. Traveling from one's residence or workplace to a hospital invariably requires a certain amount of travel time, particularly during peak hours or periods of road maintenance, when traffic congestion can significantly extend travel durations. However, by utilizing online applications, patients can access remote diagnosis and treatment without needing to visit the hospital in person. For the majority of the general population, this travel time may not present a substantial issue; however, for individuals who are busy with work or encounter unforeseen circumstances (such as needing to catch a flight), saving one to two hours can be particularly valuable. From a user experience perspective, this addresses the existing "lateness" pain point for these groups, thereby significantly enhancing their overall experience.

For patients with non-urgent needs, although the time savings may not be the most pronounced advantage, reducing the need for travel itself avoids numerous potential inconveniences, which represents a noteworthy improvement from the user's perspective. Additionally, mobile applications can interact with physical healthcare institutions to provide convenient services at various points in the process. For instance, users can complete appointment

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bookings and payments through the application, while still being required to visit the physical hospital for in-person consultations. Given that hospitals have a limited number of appointment slots available each day, failure to secure an appointment in a timely manner can result in wasted trips. Mobile applications can display real-time availability of appointments for the current and upcoming days, allowing users to select appropriate times for their bookings, thus simplifying the entire process.

l Case

In early August 2018, a volunteer initiative at a local hospital assisted patients with the appointment booking process. Around 10:30 AM, all available slots for the dermatology department had been fully booked, compelling patients to schedule appointments for the following day or later, resulting in futile trips during the sweltering heat. Many of these patients were elderly, making their unnecessary journeys indicative of a poor service experience. Subsequently, in 2020, the hospital launched a mobile application and initiated a volunteer program aimed at teaching elderly individuals how to use this application. Feedback from classmates indicated that the implementation of this initiative was successful. Later visits to the hospital revealed that instances of wasted trips had nearly vanished, according to front desk staff.

3.2 Assisting in Emergency Response

In the medical field, the ability to respond swiftly to emergencies is crucial. Not all health issues are chronic; some conditions may arise abruptly, such as acute abdominal pain or appendicitis, requiring immediate action. During these critical moments, people often feel at a loss, especially when lacking medical knowledge. While mobile medical applications may not be able to provide on-site treatment, they can guide patients to take preliminary alleviation measures, such as pain relief methods, while waiting for an ambulance to arrive or heading to the hospital.

Furthermore, patients can consult with online doctors in real-time through the application, which may help resolve issues without the need to go to the hospital. Even if the symptoms cannot be immediately relieved, the application can also provide steps that should be taken when going to the hospital, thereby reducing the user's anxiety.

l Case

Mr. Zhang, a 48-year-old male, suddenly felt severe upper abdominal pain, accompanied by nausea and the urge to defecate [6]. He used a medical APP called "Spring Rain Doctor" and contacted an online doctor through the app's consultation feature. After understanding Mr. Zhang's symptoms, the doctor preliminarily diagnosed it as acute appendicitis and guided him to take some relief measures, such as resting, avoiding food, and advised him to seek medical attention immediately. Following the doctor's advice, Mr. Zhang went straight to the hospital. While waiting for the ambulance, he used the pain relief methods in the APP, such as deep breathing and gentle pressure on the painful area. Upon arrival at the hospital, the doctor confirmed that Mr. Zhang had a perforated acute appendicitis and required immediate surgery. Before the surgery, Mr. Zhang also learned about the general steps of the surgery and postoperative care through the APP, which to some extent alleviated his anxiety.

This case demonstrates how medical APPs can provide immediate medical consultation and guidance for patients in emergencies, as well as assist patients in health management during treatment and recovery. In this way, medical APPs not only improve the efficiency of patients seeking medical treatment but also help to reduce the anxiety of patients facing sudden health problems.

3.3 Balancing Resources for Better Medical Services

Despite the rapid development of society, not all regions have reached the same level of advancement, and the development gap between different areas continues to widen. The medical conditions in remote areas are obviously not comparable to those in developed regions, where the disparity between the less developed and the developed is increasingly pronounced. In some mountainous areas, a single doctor may serve several villages and has to travel extensively. However, the internet is not limited by geography and is accessible wherever there is a signal. Therefore, mobile medical applications can, in theory, help almost anyone in the world. An increasing number of hospitals and doctors are joining medical apps, providing even relatively disadvantaged areas with the opportunity to receive diagnoses and treatment from top-tier physicians. This, to some extent, compensates for the insufficiencies caused by regional development disparities, allowing a broader range of users to enjoy relatively better services. This has a positive impact on the stable development of society and also brings better lives to people.

l Case

Lishui City, located in the southwestern part of Zhejiang Province, is characterized by its mountainous and hilly terrain, with many remote and sparsely populated villages. To address the difficulty of accessing medical services in these areas, Lishui City has launched the "Smart Mobile Hospital" project. This project brings medical services directly to the villagers' doorsteps through mobile clinics equipped with necessary medical equipment, such as ultrasound machines and ECG machines, which can perform

routine examinations and diagnostic services. In addition, these vehicles are equipped with 5G networks, enabling medical insurance card swiping and settlement, allowing villagers to enjoy outpatient services of county-level hospitals right at their doorstep. This model effectively solves the problems of difficulty and high cost of seeking medical treatment in mountainous areas and enhances the efficiency and quality of medical services through digital means.

3.4 Minimizing In-Person Contact to Reduce Infection Risks

Throughout human history, there have been numerous outbreaks of widespread infectious diseases, with the 2019 novel coronavirus pandemic being the most recent and far-reaching example, causing immense loss and continuing to cast a shadow over our lives. During the pandemic, there was a widespread fear of interacting with others for the risk of viral infection. Even though containment measures have been lifted, the potential for COVID-19 infection remains a concern. Beyond COVID-19, numerous other contagious viruses are prevalent, and hospitals are known to be hotspots for bacterial growth, which is a primary reason many people dread visiting them. Opting for online medical services eliminates the need for physical contact with others, allowing patients to consult with doctors face-to-face through electronic devices, effectively addressing the concern of "catching an illness by going to the hospital." This represents a significant enhancement in user experience.

l Case

In the context of managing infectious disease outbreaks and mitigating the risks of infection, mobile medical applications and online health services have played a significant role. For instance, during the COVID-19 pandemic, Wuhan Tongji Hospital rapidly adopted an "Internet Plus Healthcare" model, establishing an online fever clinic specifically for COVID-19. This initiative offered video consultations and pharmaceutical delivery services, which reduced the need for in-person contact between patients and healthcare workers, effectively lowering the risk of infection. Concurrently, Beijing Friendship Hospital developed an in-house pre-examination screening system for COVID-19, utilizing a WeChat mini-program for electronic pre-examination registration. This innovation significantly diminished patient congregation and waiting times at hospital entrances, further reducing the potential for hospital-acquired infections. Additionally, the Yi Lu APP, launched by Alibaba Health, provides a suite of professional internet medical health services, including online consultations, health information searches, and vaccine appointment scheduling. Particularly during the pandemic, the online consultation feature of the app decreased the necessity for patients to visit hospitals, thereby reducing the risks of cross-infection. These case studies illustrate that mobile medical applications and online health services not only enhance the efficiency and quality of healthcare delivery but also provide a safe and convenient medical experience for patients while minimizing in-person interactions.

4. Shortcomings and Possible Fixes

4.1 Non-Manual Processing, Not Flexible Enough

While machines are more efficient than humans in handling tasks with established workflows, they are constrained by fixed procedures and may struggle to handle special situations as flexibly as a human would. In reality, occurrences may not follow predictable patterns and can be random, and given the multitude of diseases, machines might provide unreasonable solutions, potentially worsening a patient's condition. This would be a significant failure in service provision, leading to a poor user experience.

l Possible Solutions

To enhance the flexibility of mobile health applications in managing emergency situations, a combined approach of advanced AI and human intervention can be adopted. One strategy involves integrating sophisticated AI algorithms capable of recognizing anomalies and automatically redirecting such requests to customer service representatives or emergency response teams. Additionally, a dedicated "emergency assistance" button within the app could allow users to instantly connect with knowledgeable customer service representatives for immediate support and guidance. Furthermore, by continuously collecting and analyzing user feedback data, the algorithm can be refined to better adapt to complex medical environments, thereby improving its capability to handle unexpected events.

4.2 Cooperation with Offline Hospitals Needs Improvement

Currently, a substantial number of hospitals operate in a hybrid online-offline mode, which is appropriate for the present situation and generally results in a positive experience for both service providers and recipients. However, there is still room for optimization. For instance, during an August visit, a patient found themselves as the 310th registrant in the morning, yet the app indicated that there were still available slots. In reality, only 273 patients were seen in the morning, with the rest having to wait until the

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afternoon. This could mean that afternoon patients might have to wait until the next day, or doctors might rush to provide rapid diagnoses and treatments, inevitably compromising the quality of consultations. In either scenario, the patient's experience would be negative. This reflects a miscalculation of the efficiency of hospital visits and a flaw in service design. Foreign user experience design focuses on data analysis and hidden user experience, while domestic user experience design is relatively less, so it is necessary to strengthen the ability and research in this area [4].

l Possible Solutions

To improve collaboration with offline hospitals, mobile health applications should take several steps to enhance user experience. Firstly, they should strengthen information sharing with hospitals to ensure that the online booking system accurately reflects the hospital's capacity and operational status in real-time. Secondly, the application can leverage big data analytics to predict daily demand for medical services and dynamically adjust the number of available appointments accordingly. For example, implementing a quota system for reservations that adjusts based on the hospital's actual capacity, and promptly informing patients of their updated appointment schedules via SMS or in-app notifications, can be beneficial. Additionally, establishing a feedback mechanism for patients to report issues encountered during the booking process can assist hospitals and service providers in continually refining their processes and services.

5. Conclusion

This paper briefly discusses the current status of mobile medical app service design, making it suitable for those seeking a general understanding of this area, while also providing reference value for individuals interested in researching it further. The paper begins by introducing the topic of UX design in medical apps, followed by a definition of relevant concepts. It then analyzes the current advantages and challenges, offering possible solutions, and concludes with a summary. Public service self-service and facilitation is the inevitable trend of the development of science and technology society. Currently, mobile medical apps perform well, not only providing users with a positive experience in terms of medical efficiency but also offering multiple channels for obtaining medical support, thereby delivering relatively high-quality services in various aspects. Medical apps are a product of the times. Thanks to effective user experience design, users can save time and have greater opportunities to access better medical conditions and support from home. Even when regional development disparities lead to insufficient medical resources, mobile apps can partially alleviate this issue, enhancing the experience for users in more areas.

However, the user experience design of mobile medical apps still requires improvement. The lack of flexibility in machines renders them somewhat inadequate in handling unexpected situations, which increases user confusion. Additionally, misjudgments regarding real-world circumstances can lead to sporadic online and offline services from hospitals, resulting in negative experiences. Therefore, the application needs more human intervention and should continuously evaluate the actual situation to make necessary adjustments, ensuring an enhancement in user experience.

References

[1] Wang Tianxiong. Research on mobile interactive interface design for the elderly based on user experience. Industrial engineering design2023, (03),99-108.

[2] Zhang Runnan, Wang Shuyi, Wu Zhenhai, Zhong Qingsen, Su Haiyun, Li Wenqi & He Dongdong.Research on the design of intelligent interactive hearing aid products for the elderly based on user experience.Science and technology communication, 2024,(15), 20-26.

[3] Li Ziyang, Research on the Design of Public Health Information Service Platform based on UCD Master's Thesis, Xi 'a University of Technology,2023

[4] Jiang Peiyi,.Research on Medical APP and UI Design Based on User Experience (Master's Thesis, Nanchang University, 2023

[5] Zhang Jianan Wang Jiayi, .Research on smart medical terminal service design based on user experience.Industrial design. 2021, (08),104-107.

[6] Yuan Xiuqun, Hu Jiale, Ni Jiaqi, et al. The Application Progress of Mobile Apps in Self-Management of Chronic Pain Patients. Chinese Nursing Management, 2018, 18(12): 3.