

Research on the Design of Telemedicine Interface for the Elderly based on the Double Diamond Model

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Abstract: It has become an inevitable trend for China to enter an aging society. The rapid growth of the elderly population has placed a huge burden on the existing medical system. Existing telemedicine APPs do not take into account the characteristics and preferences of the elderly. In order to help the elderly better accept and use the telemedicine system and improve user satisfaction. It is proposed to optimize the telemedicine interface design based on the double diamond model, and the design process around the four stages of exploration, definition, development and interaction is explained in detail. Through semi-structured interviews with the elderly and designers, the user needs of the elderly for telemedicine and the design elements, tools and methods of the telemedicine interface for the elderly were obtained. Draw a user experience journey map and conduct telemedicine interface design practice for the elderly. Improve the elderly's experience of using telemedicine, improve the comfort performance of products, and promote the development of the elderly health industry.

Keywords: The Elderly; Telemedicine; Double Diamond Model; Semi-structured Interview; Interface Design.

1. Introduction

The number of elderly people has increased sharply, and aging will accelerate between 2021 and 2050 [1], the issue of aging will become an important issue facing society in the future [2]. The rapid aging of the population has made the existing medical problems of the elderly more prominent, including low medical resources, medical inefficiency, and insufficient medical personnel. As age increases, the elderly's physical functions gradually deteriorate, their cognitive and memory abilities decline, and their visual perception and acuity deteriorate [3], the lack of companionship leads to emergencies that cannot be solved in time, causing the elderly to encounter more obstacles and difficulties in their daily lives. This not only leads to a series of usability problems, but also to usefulness issues reflected in the comparison of costs and benefits for older adults [4]. Many hospitals now use operating systems such as online registration, online consultation, and online payment. However, they do not take into account the needs, preferences, and characteristics of the elderly. In addition, the elderly lack experience in using the Internet and are slow to learn new technologies. Some telemedicine service systems are not suitable for the elderly.

Most of the current research on telemedicine focuses on the Technology Acceptance Model (TAM) and the UTAUT model, analyzing the influencing factors of users' acceptance or adoption of telemedicine. Such as perceived usefulness, perceived ease of use, economic factors, social influence [5], support from family and friends, self-satisfaction [5,6], perceived incentives [4,6], perceived value [4], information quality, medical service satisfaction [7] and other factors will affect the elderly's willingness to use telemedicine. This article combines the two perspectives of the elderly and professional designers, focusing on summarizing the functional needs and design practices of the elderly for telemedicine services. Semi-structured interviews elderly

people and designers [8], understanding the methods, tools, strategies and suggestions for the design of telemedicine interfaces for the elderly, and providing guidance for later design practice.

2. Application of Double Diamond Model in Telemedicine for the Elderly

The Double Diamond model was proposed by the British Design Council in 2005 to improve effective design process management and planning through a standardized methodological process. It is mainly divided into four phases: discovery, definition, development and delivery [9]. When applied to specific fields and projects, research content and expression forms can be enriched according to their characteristics in order to manage the design process more effectively. As a theoretical method, the double diamond model plays an important role in obtaining user needs [10]. The research process of telemedicine interface design for the elderly based on the double diamond model is shown in Figure 1.

First, in the exploration phase, existing problems and user needs of telemedicine are collected through literature research, market research and user interviews. After conducting user interviews with 20 elderly people, it was found that existing problems mainly revolve around three aspects: users, technology, and market. The user level includes: lack of proficiency in use, the elderly have relatively little understanding of digital technology and the Internet, and are not familiar with smartphones. It is difficult to successfully complete telemedicine operation services; it is difficult to communicate and understand. Due to the audio-visual impairment and cognitive degradation of the elderly, it is difficult to communicate effectively with doctors in terms of text, voice and video; the telemedicine system is complex to

operate and difficult to learn; Do not trust telemedicine, believe there is false information, and are afraid of being deceived. Technology aspects include: unstable network connections, some elderly people live in remote areas, unstable network signal quality, affecting the quality of video calls between doctors and patients; privacy and security issues, telemedicine involves uploading health files and filling in personal health information, and the elderly have low security awareness of digital technology and are easily exposed to the threat of personal privacy leakage. The market level includes: lack of popularization and promotion, telemedicine

technology is not popular among elderly user groups, and even during the interview, it was learned that some elderly people have not yet learned of the existence of telemedicine services, resulting in them being unable to enjoy the convenience of telemedicine; economic restrictions include the lack of market supervision and regulation of telemedicine registration and consultation service fees, resulting in high costs. Moreover, some telemedicine requires the purchase of related equipment, which may affect the elderly's willingness to use telemedicine.

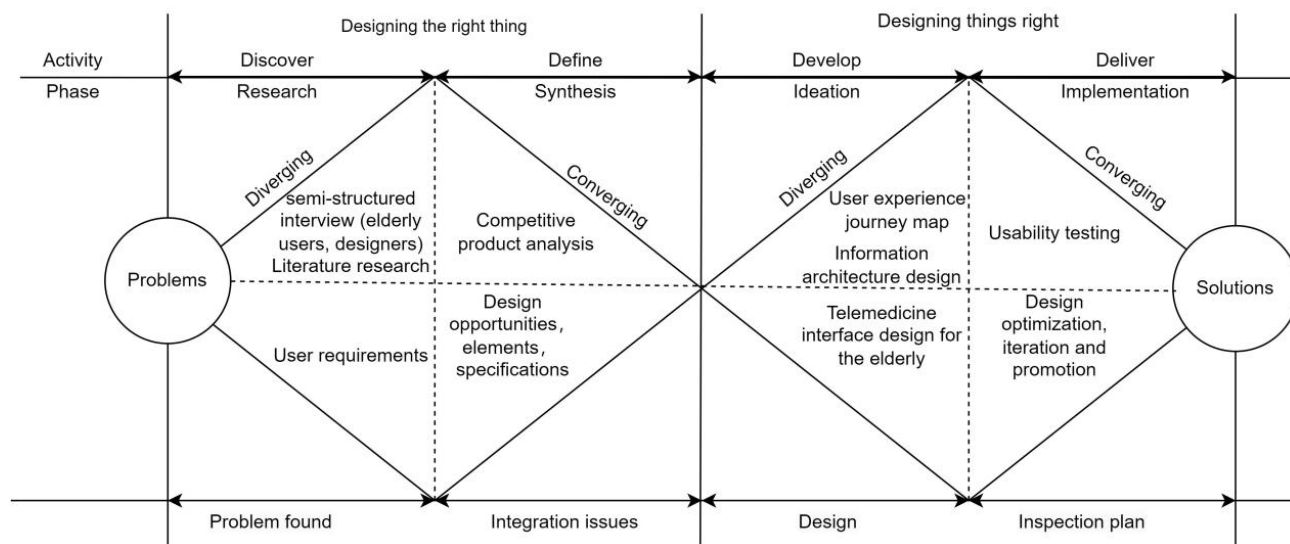


Fig 1. Research process of telemedicine interface design for the elderly based on the double diamond model

In addition, this study also conducted semi-structured interviews with 10 designers [8], understand the difficulties and challenges designers may encounter when designing telemedicine interfaces for the elderly, as well as interface design tools, elements and suggestions. In terms of design methods, it is recommended that the design process should be centered on the elderly and that the elderly should be involved in the design process; in terms of visual design, refer to existing interface design products for the elderly, combine ergonomics, and rationally plan icon text sizes, interface layout, interaction logic; in terms of technical design, artificial intelligence and voice interaction are combined to simplify the operation tasks of the elderly as much as possible, focusing on interface navigation.

In the definition stage, the research problem is refined and user needs are analyzed. Understand the market development status of telemedicine through competitive product analysis. The survey found that there are currently few telemedicine service platforms specifically for the elderly. Some medical applications have "elder mode" or "care version", such as WeDoctor and Haodafu Online, JD Health, but it is still very immature. It is in the stage of reducing functions and enlarging fonts, without truly designing the interface based on the characteristics, preferences and user needs of the elderly. Existing telemedicine service platforms can be divided into focus areas such as online consultation, medical e-commerce, content platforms, Internet hospitals, and health management. This study positions the telemedicine service system for the elderly as medical consultation services. Selecting WeDoctor, Chunyu Doctor, Dingxiang Doctor, JD Health, Ping An Good Doctor, Good Doctor Online, etc. for competitive product analysis, it was found that most medical APPs are not user-

friendly for the elderly, especially in terms of simplified icon images, which makes the elderly It is difficult for people to understand; the main way to purchase medicines online is express delivery, which is very slow; advertisements and interface recharges make the elderly less favorable to the medical platform. The results of competitive product analysis are shown in Figure 2.

In response to the above issues, three competitive product analysis strategies are proposed: the concrete expression of icons, the combination of drug purchase and takeout economy, the coordinated development of online services with community hospitals and local hospitals, and the setting up of parent-child portals for remote assistance. Classify the functional requirements and determine the first-level requirements of the telemedicine service system as appointment registration, online consultation, remote assistance, voice guidance, condition tracking, health management, independent testing, online drug purchase, health community, etc., focusing on function, interaction, and vision are three aspects, and the functions are prioritized based on the preliminary research results for subsequent interface visual design.

Again, in the ideation stage, solutions are proposed. Convert user needs into design needs through the user experience journey map, extract key factors of telemedicine interface design, propose design strategies, and design telemedicine interface for the elderly. In the design practice stage, first, organize the design requirements, design the information architecture, classify the functions, display the most important functions in the most prominent position on the homepage, and hide the secondary functions. Secondly, rationally layout and plan the functions to complete the

interactive prototype design. Finally, according to the cognition, preferences and user habits of the elderly, adjust the size and color of fonts, icons, font sizes, etc., and set the interaction logic reasonably [10], carry out interface visual

design and improve design works. The user experience journey diagram is shown in Figure 3, the information architecture design is shown in Figure 4, and the interface design is shown in Figure 5.









	Product positioning	Product features	Product Advantages:	Product disadvantages
 JD Health	A health management enterprise with the supply chain of pharmaceutical and health products as the core, medical services as the starting point, and digitally driven by the whole life cycle and all scenarios of users	Jingdong Family Doctor, Famous Doctor Consultation, Newcomer Gift Package, Second Health, Seeking Doctor and Medicine, Health Mall, Health Tools and Health Services	Provide symptom self-diagnosis function, provide a variety of forms of consulting services, including graphics, telephone, video, private doctors, etc., stable supply, fast logistics	The APP has a wide range of functions and services, and the elderly may find the interface complicated and unfriendly to the user experience of the elderly
 Dr. Chunyu	Adopt the light consultation mode, use the consultation platform to provide services for patients, and realize "consultation + self-diagnosis"	Quick Consultation, Doctor Search, Medication Shopping at Home, Health Courses, Specialty Services, Family Doctor, Chronic Disease Management	Patient-centered, rapid consultation, simplified consultation process, nurses come to the door, free disease self-diagnosis; Focus on pre-diagnosis consultation, and the users' willingness to retain is high	It does not provide the functions of online drug purchase and appointment registration, the interface is complex, the text and buttons are small, and the popular science function is monotonous; The business mode is single, the revenue growth is slow, the online and offline linkage is insufficient, the encouragement of doctors is single, and the growth of doctor resources is stagnant
 WeDoctor	It allows users to enjoy a full range of medical services such as appointment registration, online diagnosis and treatment, electronic prescription, and online dispensing.	Appointment registration, online consultation, health self-diagnosis, electronic prescription, online dispensing, member-style health management, etc	It can provide the function of accurate appointment and online surgery, intelligent triage, the elderly can make appointments according to their own time, place, hospital and other conditions, the page is relatively simple, and the user stickiness is low	There is no function of online drug purchase and appointment registration, and there is a version for the elderly but it is not perfect, and it is more complicated to use
 Doctor deer	We are committed to providing fair, inclusive and accessible medical and health services for 1 billion people. Female user group is the owner.	Professional Internet medical and health services such as online consultation, health search, vaccine appointment, community mutual aid and exchange, live science popularization, registration and drug delivery.	Strong resources, strong technical strength, strong team of doctors, large traffic, 2 million monthly active apps, abundant drugs and fast delivery	The user experience is poor, the functional design is not perfect, the design details are lacking, the online consultation method is few, the rapid drug delivery mechanism is not perfect, and the medical insurance payment covers few cities
 Hao df.com	We are committed to rationally allocating medical resources and helping patients find good doctors.	Online consultation, free free consultation, appointment registration, online drug purchase, popular science function, health management, private doctor	With the accumulation in the early stage, Good Doctor Online has a large number of high-quality doctor resources, and the overall user experience is good. It can meet the user's medical experience throughout the process.	The online mode is single and easy to be copied, the target group and the scope of services are limited, and the caring version only has telephone consultations
 Dr. Lilac	We are committed to providing "trusted" medical and health information and services	Online consultation, popular science function, health inquiry, online drug purchase	The brand image has been initially established, and the image of authority, professionalism, reliability and integrity is deeply rooted in the hearts of the people. And the number of fans is huge. The funds are sufficient, and the products have a formal WeChat sharing channel	Relying on the online Internet medical model, it is impossible to achieve a comprehensive diagnosis. There are fewer head doctors in the platform. The product has not yet formed an online and offline integrated medical and health information service network.
 Health people	Relying on the expert resources of the country's top three hospitals, it realizes the functions of "big experts talk about popular science", "live broadcast interaction of famous doctors" and "doctor-patient interaction and health circle", and at the same time provides all-round and full-cycle health management services.	Online consultation, live science popularization, patient communication, health records, disease self-testing	The team of doctors is strong and the content of popular science is authoritative	In user feedback, there are many cases of forced download and learning, and there are fewer cases of real need; The functional design is imperfect and lacks design details
 Health pingan	With doctor resources as the core, it provides users with one-stop health consultation and health management services	Family Doctor, Famous Doctor Consultation, Healthy Community, Health Mall, Health Assessment, Health Habits, Health Records, AI Consultation	Strong capital strength, strong marketing ability, strong technical strength, high user activity, cross-selling strategy	The page layout is scattered, there are too many ads, too much information content, and not enough user loyalty

Fig 2. Competitive product analysis of telemedicine APP

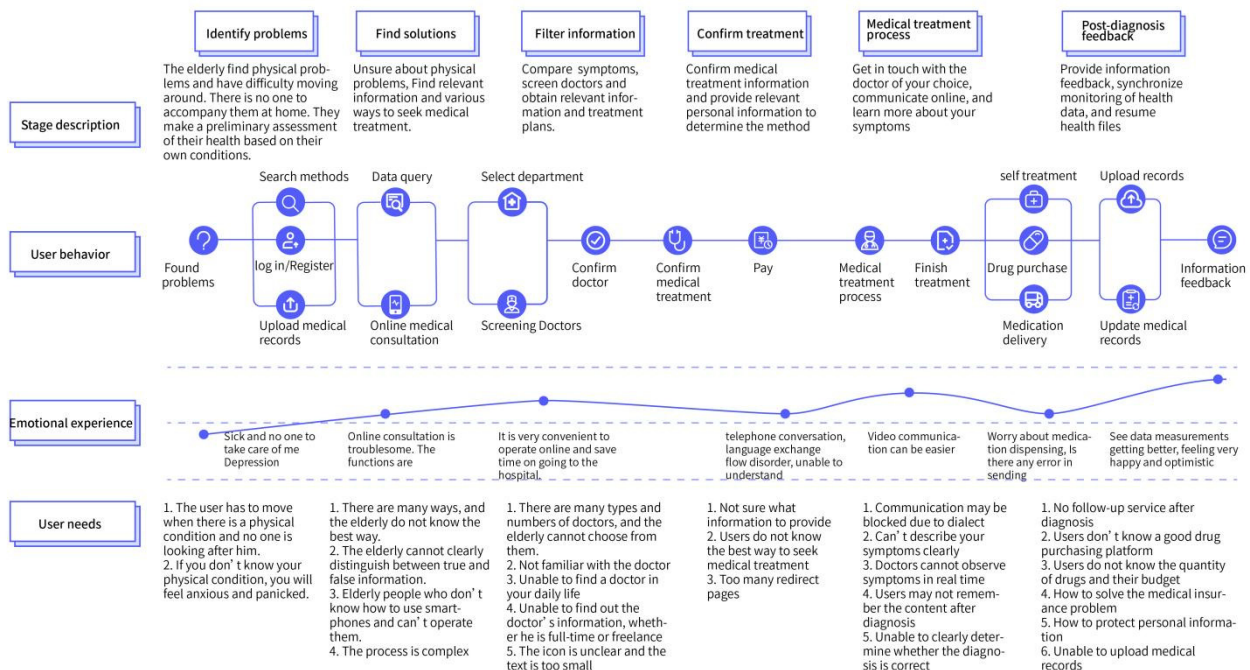


Fig 3. User experience journey map

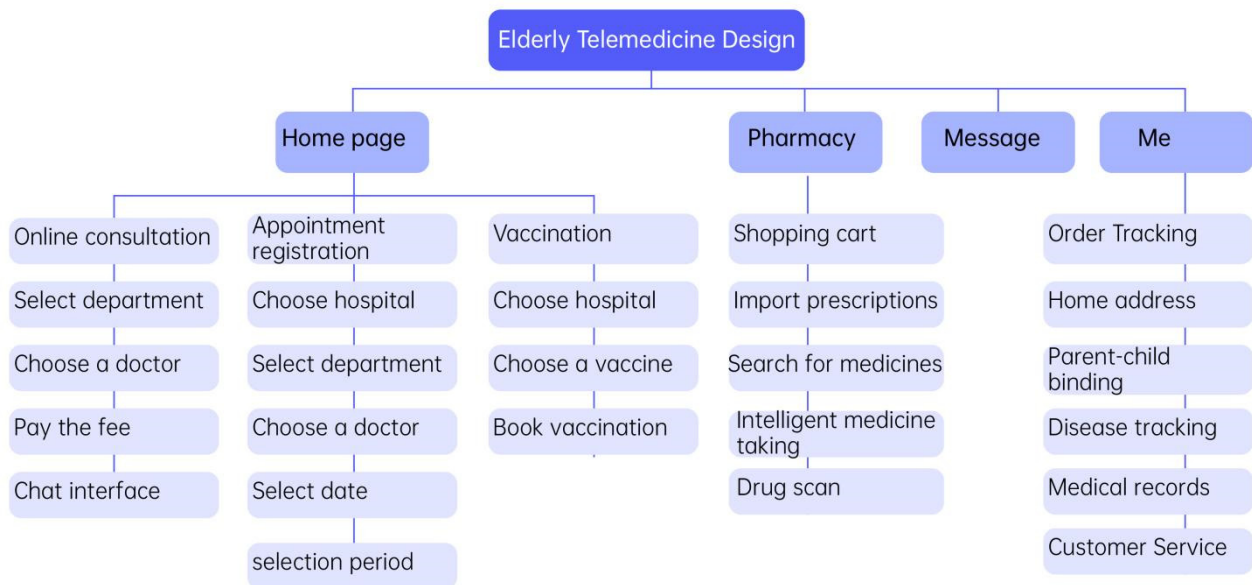


Fig 4. Information architecture design

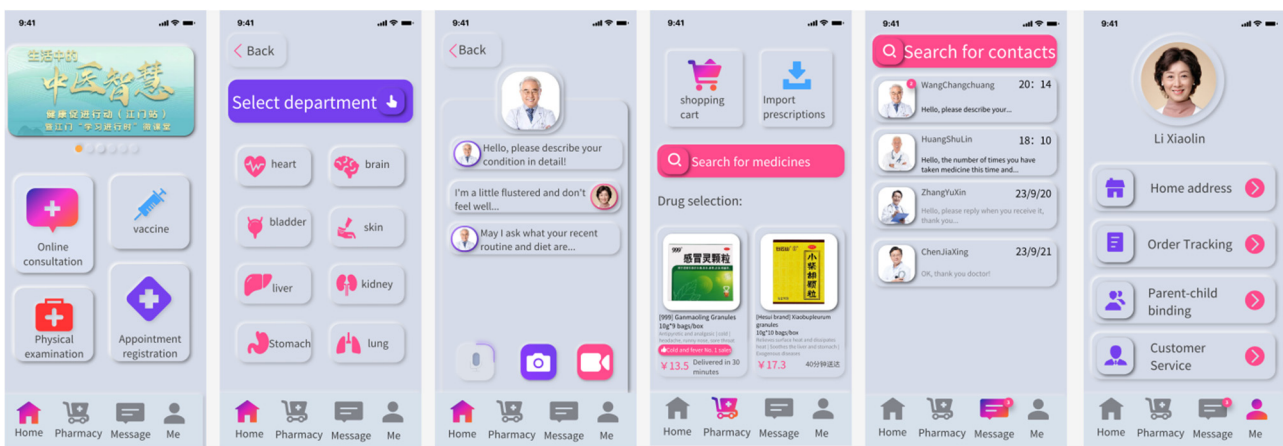


Fig 5. Visual design of telemedicine interface for the elderly

Finally, in the delivery phase, non-working components are eliminated or improved, and options are evaluated and finalized. Conduct usability testing on the elderly telemedicine interface design system to improve and determine the final design plan. The study adopted the SUS scale test, and the usability test results were good. The limitation of this study is that the interview subjects are mainly elderly people and designers from Guangdong Province, China, and there is a lack of in-depth research on the actual application of telemedicine in the north. In the follow-up, telemedicine products in different regions can be compared and studied, and quantitative research methods can also be used to conduct in-depth discussions on telemedicine for the elderly.

3. Conclusion

This article first discusses the feasibility of the double diamond model in the field of telemedicine application from the perspective of literature research. Secondly, from the perspective of qualitative analysis, an improved double diamond model is proposed as the core contribution of In this study, this model is applied to the practice of telemedicine interface design for the elderly. Through the analysis of system functions and behavioral actions, it provides valuable reference for telemedicine interface design. In order to

effectively apply the double diamond model, we conduct usability testing on the design practice results to facilitate subsequent product iterations and updates. Finally, the innovation and limitations of this study are summarized. The test results show that the telemedicine interface design for the elderly under the double-diamond model thinking is more reasonable and Humanize. The theoretical model proposed in this study can provide solutions and references for future aging-friendly design-related fields.

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