Through service design to improve the HRQOL (Health-Related Quality of Life) in the treatment and rehabilitation of elderly women with breast cancer in Shanghai

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Breast cancer is the most common cancer among women in the world. As China enters the aging society, elderly breast cancer presents the characteristics of high incidence, late detection and long treatment time. This is related to the imperfect services that elderly women receive in the treatment and rehabilitation. Eventually, the HRQOL (health-related quality of life) in their later years has declined. By using service design tools, the authors conducted field research and in-depth interviews in Shanghai hospitals and developed service strategy to improve the Health-Related Quality of Life (HRQOL) in the treatment and rehabilitation of elderly women with breast cancer. The paper presents three design contents: (1) smart healthcare service system; (2) improvement of service scenarios in the hospital; (3) a life-long service that links communities, families, and individuals to transform breast cancer into “chronic disease”. In this paper, the authors also discuss the next step and prospects.

Keywords: aging society, breast cancer, service design, smart healthcare, health-related quality of life

Introduction

Breast cancer is the most common cancer among women in the world, with an incidence of 24.2% (Bray et al., 2018). In China, the incidence of breast cancer ranks first among female malignant neoplasms, and Shanghai has the highest incidence of breast cancer among all cities (Huang et al., 2012). Elderly women with breast cancer in the survival period, due to the decline of physical function brought by the loss of health, often accompanied by the decline of physiological, emotional, social functions (Hu & Huang, 2008). They need to bear huge pressure from family and society.

As China enters the aging society, elderly breast cancer presents the characteristics of high incidence and late detection and long treatment time. According to relevant predictions, the number of elderly people in China will reach 270 million in 2023 (Qiu, Tian, Zheng, Cheng & Qin, 2015). Studies have shown that women aged 60 to 79 are 13 times more likely to have breast cancer than women under 39 (Wu, 2013). With the increase in the elderly population, there will be more and more elderly breast cancer patients.

Developed countries, such as the United States and the United Kingdom have developed smart medical care, involving electronic medical records, doctor-patient communication, personalization, and continuous medical care (Qiu et al., 2015). Shanghai, as a representative city of medical treatment in China, has formulated a
blueprint for smart medical care covering medical security, public health, medical services and drug security (Gong, Sun, Lin & Gu, 2013).

The specificity of pathology of elderly women with breast cancer in Shanghai

In Shanghai, the elderly breast cancer presents the characteristics of high incidence, late detection, long treatment time and low survival rate.

Firstly, the elderly breast cancer presents the characteristics of high incidence and late detection. Elderly women have poor alertness to their own physical conditions, and do not have a strong sense of health examination (Wei, Qin, Yu, Tang & Pan, 2007). Many elderly people do not go to the doctor until they have serious physical symptoms, which leads to the late detection of elderly breast cancer patients. By analysing 99 elderly patients with breast cancer, Cai found that the average disease duration of elderly breast cancer patients before treatment was 2 years, and the clinical stage was mostly staged II and III (77.9%) (Cai, Shao, Gao & Hu, 2000).

Secondly, elderly women with breast cancer have longer treatment time than young patients. Many elderly women discover breast cancer in the late period which leads to their long treatment time. According to the statistics, 45% of elderly patients with breast cancer have a course of more than 6 months (Wei et al., 2007).

Furthermore, the rehabilitation of breast cancer in elderly women is difficult. Elderly breast cancer patients often coexist with chronic diseases such as cardiovascular disease, diabetes, chronic lung disease, hypertension, and cerebral infarction. The data of Qiu showed that the overall 10-year survival rate of elderly patients is 40.8%, lower than 50.8% of young patients (Qiu, Wu & Guo, 2019). Therefore, it is necessary to take into account the treatment of these comorbidities in the treatment of breast cancer, otherwise, it will affect the quality of life of patients.

Elderly women who live in first-tier cities, such as Shanghai, tend to have strong negative psychology and uncertainty about the disease at the psychological level. A psychological study of 58 elderly cancer patients found that the depression rate of elderly patients was 32.76%, much higher than that of young patients (Diao, Niu & Li, 2002). This is because the social role of the elderly has undergone a huge transformation, from the "caregiver" to "people who need to be cared for", which leads to a stronger sense of loneliness and dependence. Especially after suffering from cancer, elderly patients hope to get more intimate and lasting interpersonal relationships (Li, Shi, Shen & Shen, 2015). By analysing the data of 348 elderly women with breast cancer in the literature of the paper, the research team found that the scores were low in physiological status, social and family status, emotional status and additional attention (Li, Sun & Yan, 2015; Fang et al., 2010).

Service design for treatment and rehabilitation of breast cancer

Service design has been introduced into the medical and health fields in recent years. Mayo Clinic has achieved great success with the use of HealthKit service to share health data among patients, healthcare workers and medical institutions. Design schools and companies already have done some service research and service design on improving the treatment and rehabilitation of the elderly. They help breast cancer patients with treatment and rehabilitation from four aspects: (1) cognitive education, (2) patient care, (3) community support, (4) smart health care.

Service design in cognitive education

In 2013, the project “Staying the Course” from the Royal College of Art (RCA) aims to help breast cancer patients to take medication at home. The study revealed that education is the most important factor affecting compliance, also that smartphone technology is useful in people’s lifestyle and routines. They found that most patients learn about their medications only in one initial session with the cancer care nurse. This session covers the different drugs, when and how they need to be taken, as well as the side effects that may be experienced. The patients need to remember a lot of things which make them feel stressed and worried. The main research output is a smartphone app, developed to support patients during the education session with the nurse. This provides relevant information about their specific treatment, and patients can review the different elements of their treatment that are confusing or unclear (Riadigos, 2013).
**Service design in patient care**

National Breast Cancer Foundation (NBCF) develop HOPE Kits which are filled with thoughtful items: unscented lotion, fuzzy socks, tea, “Hope is Stronger than Fear” bracelet, hope journal, lip balm, education resources, etc. The patients would feel comforting and encouraging while undergoing breast cancer treatment after they receive this kit. Because NBCF is a public welfare organization, it offers five ways to get involved: (1) donate, sponsor a Hope kit for a woman with breast cancer; (2) send, send a HOPE Kit to a loved one facing breast cancer; (3) volunteer, pack or prepare contents for HOPE Kits; (4) fundraise, raise funds and deliver HOPE Kits locally; (5) partner, support HOPE Kits through gift-in-kind and sponsorship.

![Figure 1: HOPE Kit (Source: National Breast Cancer Foundation website)](image1)

**Service design in community support**

In 2018, North-eastern Illinois University presents a mobile application named My Guide to improve symptom burden and health-related quality of life among Hispanic women who have completed active treatment for breast cancer by increasing their health literacy (Iacobelli et al., 2018). They developed a community-supported approach to building the application, which involved eliciting feedback from community leaders, conducting a formal evaluation of design principles based on previous interaction design research and user responses and incorporating feedback from potential future users.

![Figure 2: My Guide (Source: Iacobelli et al., 2018)](image2)

In China, the application “Breast Cancer Home” has three main functions: the circle of patients, the establishment of a communication platform for breast cancer patients; anti-cancer knowledge, pushing the authority of anti-cancer knowledge; similar medical records, finding similar patients, and viewing the relevant treatment programs.
1. **Service design in smart health care**

Mayo Clinic Application has revolutionized the relationship between health applications and users in the past. In the past, the data provided by health applications were isolated and one-sided, so users could not get a comprehensive understanding of their health status. By using the research results of Mayo Clinic in patient education for many years, and using the application software of Healthkit, it provided patients with customized health management programs. In the hospital treatment scenario, each department will make the consultation seamless by the way of intelligent collaboration. In the course of breast cancer treatment, Mayo Clinic doctors will coordinate with the local doctors in the patient’s location, invite local doctors to provide chemotherapy and other medication to save patient time.

In China, there are some cases of smart medical care, such as the wisdom hospital of Beijing University People’s Hospital, the Shaoyifu Hospital of Zhejiang University, etc. The smart medical care mainly focuses on the internal management of the hospital and the electronification of the patient’s medical treatment process. All of these designs show that service design plays an important role in improving the treatment, rehabilitation and quality of life of the patients. In addition, a large number of studies have shown that the health-related quality of life of breast cancer patients can be improved through patient care psychological intervention and community support (Zhang & Tong, 2008; Peng, 2016).

**Research purpose**

Existing researches have proven that service design can improve the physical and psychological discomfort of elderly patients during treatment and rehabilitation. Therefore, in this research, the research team hopes to
combine the new technology and social trends through service design to enhance the health-related quality of life of elderly breast cancer patients in Shanghai during treatment and rehabilitation.

**Design Process and Methodology**

In 2018, the research team conducted field research on three hospitals and several neighboring residential communities in Shanghai. And then the research team conducted in-depth interviews and did records with 17 people from Shanghai, including 6 elderly women with breast cancer, 7 family members, and 4 breast surgeons.

Service design allows us to not only focus on the data, but also through in-depth interviews, insights, role-playing, and the establishment of empathy and other service design methods to understand the real needs and perspectives of patients. As Wendy Perchick from ZGF company said:

*Patients have the power of choice—they own this facility and design their own experience. A patient told me that he felt the healing intensified here because he felt so relaxed.* (Perchick, 2018)

**Research standard based on HRQOL system**

In this study, the research team adopted the standard system of Health-Related Quality of Life. Health-Related Quality of Life (HRQOL) refers to the assessment of health status and subjective satisfaction associated with personal life events under the influence of illness, accidental injury and medical intervention. Centers for Disease Control and Prevention defines HRQOL as:

*Health-related quality of life (HRQOL) is a multi-dimensional concept that includes domains related to physical, mental, emotional, and social functioning. It goes beyond direct measures of population health, life expectancy, and causes of death, and focuses on the impact health status has on quality of life. A related concept of HRQOL is well-being, which assesses the positive aspects of a person’s life, such as positive emotions and life satisfaction.* (Centers for Disease Control and Prevention)

HRQOL is an important refinement that plays to the needs of elderly people. Medical workers have generally accepted the view that "for cancer patients, survival or disease-free survival is an important evaluation index, and health-related quality of life is the basis". The evaluation of the health-related quality of life of cancer patients has become one of the endpoints of cancer clinical research (Zheng et al., 2007).

Through the analysis and refinement of HRQOL, we can conduct research and insight into service design from a medical point of view, and also provide direction for subsequent service output. Patients of different cultures and values have different experiences of their life goals, expectations and standards, and the state of life-related to the things they care about, including physical function, mental function, role function, social function, and overall feeling of health.

![Health-Related Quality of Life (HRQOL)](image)

*Figure 5: Health-related quality of life (Source: authors)*
1. Physical function refers to individual activity and physical strength. It mainly includes physical activity, self-care ability, and physical strength.

2. Psychological function mainly refers to emotional reactions (anxiety, depression, stress, etc.) and cognitive function (attention, memory, thinking ability, etc.). Both disease and environmental factors can bring psychological changes to patients.

3. Role function refers to the effect of disease on the work or study or housework of the patient.

4. Social function refers to the quality and quantity of an individual’s social network, such as the frequency of contact with family, friends and other intimate relationship.

5. The overall feeling of health status is self-evaluation by the patient’s satisfaction with his or her health status, reflecting the patient’s subjective feelings about his or her life.

Under the systematic standard of HRQOL, the research team members developed the research strategy: Through the observation and tracking of the behaviors of elderly breast cancer patients in different scenes to find their behaviors and processes. Afterwards, conducting in-depth interviews and guide narration with stakeholders such as elderly breast cancer patients, family members and medical staff to help them recall the problems (physical, psychological, social, role and overall feelings) in the process of treatment and rehabilitation. In this way, we can find insights about their explicit and implicit needs, and then determine the service design directions to improve patients’ health-related life quality, and the touchpoints to improve patients’ emotional experience, so as to provide a basis for the proposal of later service strategies.

Figure 6: Research strategy (Source: authors)

**Field observation**

According to the treatment and rehabilitation process of elderly patients, the research team divided the scene into three parts: medical service scenario in hospital, family care scenario, community mutual assistance scenario.

In 2018, the research team conducted field research on three hospitals and several neighboring residential communities in Shanghai. The research team members observed the three service scenarios and took pictures of relevant service scenarios. Then we corresponded the service scenarios photos with user behaviour and conducted in-depth interviews and follow-up observations with stakeholders (elderly breast cancer patients, family members, doctors, and nurses).

**Medical service scenario in hospital:**

The hospital's treatment scenario is the most important scenario for patient treatment. In the investigation of hospitals in Shanghai, the research team divided the hospital treatment scene into three parts: hospitalization, surgery and daytime chemotherapy.
After diagnosis, according to different levels of cancer, elderly patients need to undergo hospitalization, chemotherapy and surgery. Through field observation, the research team found that the phenomena in the hospitalization scenario: (1) The accompanying staff were mostly children or husbands, but they rarely chatted with each other, (2) The patient’s activities were limited to walking in the corridor, rarely going downstairs, (3) It’s difficult for patients to go to the bathroom when they were infused, and they need help from others, (4) The wards were two-person or three-person rooms, sometimes patients would be disturbed by others (lights, sounds), (5) Chemotherapy led to hair loss, loss of appetite, vomiting, sweating and other physical discomfort.

After the condition is stable, the patient would start daytime chemotherapy. In the service scenario of daytime chemotherapy, the research team found that: (1) The patient need to wait for 1-2 hours before infusion. The waiting time was long. (2) It took one day for patients to do daytime chemotherapy, but because of the limitation of hospital space, they can only sit. (3) It’s inconvenient for patients to check infusion progress.

Family care scenario:
In the nursing environment of the family, the degree of tension of the patient is low, and the mood tends to be gentle. Home nursing has an important influence on follow-up treatment, rehabilitation exercise and psychological recovery. The current phenomena were as follows :(1) the rehabilitation exercises were monotone and hard to insist on; (2) the elderly patients were retired people, who often stay at home and seldom communicate with others.

Community mutual assistance scenario:
At present, community mutual assistance is mainly divided into online community mutual assistance and offline real community mutual assistance. By investigating online communities (breast cancer homes, breast cancer control, and health-loving businesses), the research team found that few elderly women are active on online communication platforms.

Regarding the offline real community mutual assistance, the research team investigated the hospital-based patient support community. The members of the platform are breast cancer patients who have been treated in Shanghai hospital and volunteers from all walks of life. The platform regularly organizes activities and lectures to help doctors and patients, patients and patients communicate with each other. It is a targeted and efficient mutual help platform. The phenomena in this scene were: (1) the patient was willing to communicate with people who have the same condition and the same feelings. (2) Compared with the hospital scene, the offline community scene was warmer and the patient was more relaxed.
In-depth interviews

The research team conducted in-depth interviews and did records with 17 people from Shanghai, including 6 breast cancer patients, 7 family members, and 4 breast surgeons. We summarized the problems of HRQOL, interviewed elderly women patients, family members and doctors, and displayed pictures in detail to arouse their memory in the course of treatment and rehabilitation.

Elderly breast cancer patients: In terms of treatment, many patients said that they would consider choosing a hospital close to the community for treatment. The main reason was that it was convenient to arrive, but there was also the fear that “the big hospital was better than the community hospital”. During the treatment, the problems were mainly due to the lack of understanding of related technical terms and strong physical response during chemotherapy.

On the psychological side, most of the elderly had shown an optimistic attitude and actively cooperate with the treatment, but sometimes they still felt sad and anxious. Ms. Hu (62-year-old) said: "On the day before the operation, I told the patient who next to me, ‘After taking the shower today, I will not be complete tomorrow.’ I cried in the toilet for a long time that night."

When it comes to the problems of rehabilitation at home, many elderly people said that it was difficult to perform rehabilitation training at home, which caused arm edema. Most elderly patients expressed their willingness to chat and engage in activities with people who were similar to themselves. They thought that “they had the same illness, they felt the same way, and I was willing to listen to them.”

Family members: In the care of the treatment, most of the family members said that the feeling of accompanying the night was poor, mainly due to the limited space of the hospital and the need to check the patient’s situation at any time. At the stage of home rehabilitation, many family members said that sometimes they would be too nervous about the physical condition of the patients, and some families became full-time “free carer” because of their restlessness.

Breast doctors: In terms of treatment, doctors said that some patients or their families would frequently ask them about the patients’ situation because of fear, causing trouble in their normal work. Doctors also said that they were very willing to care about the patient’s physical condition and would do their best to help patients. About the rehabilitation, one doctor said that the patient would be told to do rehabilitation exercise every day, but due to the limited space, they cannot be carried out in the hospital.

Figure 9: In-depth interviews & guiding narrative & journey map (Source: photos taken by authors)

Journey map and stakeholder map

Through field observation, in-depth interviews and analysis, the research team came up with journey map and stakeholder map to clarify the impact at each stage in the service.

The journey map mainly describes three aspects: (1) the behaviours of elderly breast cancer patients during treatment (2) the corresponding scenes (3) mood curve.
The stakeholder map primarily illustrates existing and potential relationships of elderly breast cancer patients. The different distances on this map represent different relationships among them. The bigger the distance between them, the smaller the relationship, the smaller the distance, the bigger the relationship.
The main reasons for the decline in HRQOL in breast cancer patients during treatment and rehabilitation are as follows:

Physical function:
1. After the operation, the ability of self-care and activity is limited.
2. Patients need to endure cancer pain and chemotherapy radiotherapy. There will be physical discomfort such as vomiting, hair loss, constipation, sweating, numbness or stinging of hands and feet, skin changes, nausea, loss of appetite, tightness or difficulty breathing.
3. Elderly patients often have complications such as diabetes and high blood pressure.

Role function and social function:
1. Physical discomforts and some complications make elderly patients cannot carry out the normal living and social activities. These problems affect the role and social function of patients to a certain extent.
3. The ability of knowledge acceptance, understanding, and learning of elderly patients is weaker than that of young people. They may not understand the efficacy of drugs and the rehabilitation manual.
4. Nurses in hospitals often neglect the needs of patients’ spouses for disease knowledge and rehabilitation knowledge. Patients’ spouses sometimes don’t know how to communicate with patients.
5. Most breast cancer patients without special complications will choose to go home for rehabilitation. It takes half a year or more time for patients to recover. Patients and their families are plagued by “adaptation” and “care”.

Psychological function:
1. Elderly patients are more traditional in ideology, but they have to bear the tremendous pressure brought by physical changes, which cause them to have negative emotions such as anxiety, depression, pessimism, and inferiority.
6. Social roles changing make elderly patients more dependent on their families, which brings loneliness and frustration to the patients.

Through the collation and analysis, the research team got the corresponding direction of service design. In the physical function part, because mainly problems are caused by medical problems such as surgery, service design is difficult to directly intervene. As to role function, social function and psychological function, elderly women cannot live and socialize normally because of physical pain or change. They need to bear great psychological pressure. Service design can create a high-quality living environment for elderly women with breast cancer by introducing products, interaction, experience and other design.

Findings and Discussion
Through literature collation and analysis, research and co-creation, the research team carry out service design in the following aspects to help elderly women with breast cancer improve health-related quality of life.

**Internet +**

At present, the number of elderly Internet users in China has reached as high as 8.28 million, accounting for 20% of the elderly population (Tencent, 2018). That means, one in five elderly people use mobile phones to access the Internet. In the past five years, the speed of Internet access for the elderly is 1.6 times faster than the overall speed of mobile Internet popularization. The elderly people are embracing mobile Internet life with smart phones. Breast cancer treatment and rehabilitation is a long-term, dynamic and professional practice process. There are many nursing problems and needs of patients, including post-operative rehabilitation, symptoms management during chemotherapy. It is urgent to have long-term and timely guidance from professionals. Mobile medicine, which has sprung up in recent years, is the best way to meet this need.

In December 2013, American authors Jacqueline Lorene Bender jointly evaluated 295 mobile phone apps for cancer. The study found that most apps are about raising awareness of cancer (32% of the total number of apps), followed by information about cancer education (26%), and some apps to raise money (Bender, Yue, To, Deacken & Jadad, 2013). In the Internet + breast cancer related applications, the application of mobile intervention technology in the field of breast cancer care penetrates from the disease prevention stage to the disease rehabilitation stage. Comprehensive analysis of mobile applications, websites and WeChat public accounts at home and abroad found that their functions and characteristics are mainly distributed in four aspects: patient self-management, online consultation, patient community, and medical information.

**Smart health care for hospital service scenarios**

As the core component of traditional health care service industry, all kinds of institutions providing professional health care services (medical groups, large general hospitals, specialized hospitals, community hospitals, physical examination centres, etc.) are also using their own high-quality resources combined with Internet +.

Elderly women with breast cancer have strong needs in the treatment and rehabilitation of diseases and psychological state. The Mobile Medical Ecosystem Model designed by Meng fully mobilizes the enthusiasm of all stakeholders and realizes the transformation from doctor-led situational service to patient-centred continuous service (Meng, Hu, Qu & Li, 2013). This ecosystem emphasizes the interaction of various stakeholders, including the environment, individual attributes and social relations, cultural level, technology and medical resources that affect individual health. Through this ecosystem, patients can better manage their own health and make better decisions when diseases occur, thereby improving the health-related quality of life.

**Family and community care**

At present, there are 130,000 cancer patients in Shanghai. About 100,000 of them have returned to their families and lived in communities after completing clinical treatment and stabilizing their condition (Zheng et al., 2007). Cancer, unlike other diseases, is closely related to pain and death. Psychological problems of many patients may replace physiological problems and become the main problems faced by patients themselves, their families and community doctors.

In order to improve the curative effect and quality of life of elderly female breast cancer patients in their later years, it is necessary not only for the hospital to put forward a more individual diagnosis and treatment plan, but also for the cooperation of family, society and the overall environment. Through service design to build a life-long service system, focus on the whole life cycle, through community hospitals as the centre of health care services, to make it become chronic diseases.

The home care services should consist of three elements: (1) Homecare plan, (2) Patient homework execution form, (3) Returning visit and telephone consultation.

1. **Homecare plan**: After treatment, the smart platform will automatically generate evaluation results and suggestions. The analysis table of breast cancer patient evaluation and management was generated through the smart system platform, and the home care plan was developed by the medical staff and community nurses.
7. **Patient homework execution form**: The community nurses guide the patient to carry on the family rehabilitation training, so the patient can get better home rehabilitation with the help of family and community nurses.

8. **Returning visit and telephone consultation**: After every returning visit and telephone consultation, the community nurse fills in the relevant information of the questionnaire and summarize the assessment results. Then, feedback the information to the medical staff in time.

Community nurses provide one-to-one health education for breast cancer patients through information management of chronic diseases and home care services and record the health indicators of breast cancer patients into health records. Individualized rehabilitation training programs and health intervention programs were generated through information-based chronic disease management platform, which gave the feedback to breast cancer patients for the new plan.

**A life-long service system for elderly women with breast cancer**

In the life-long service system for elderly breast cancer patients, the researchers corresponded the functions of HRQOL to the main stakeholders: The elderly breast cancer patients are located in the centre, including their physical and psychological characteristics; the second level is the interpersonal relationship, including family members, friends and social workers who communicate with elderly breast cancer patients; the third level is organizational factors, including hospitals and professional organizations related to the diagnosis and treatment process of elderly breast cancer patients; the fourth level is community, representing the small size of elderly breast cancer patients. The scope of the environment, including community support agencies, community media and so on; the fifth level is related to elderly breast cancer policies and laws, including breast cancer screening policies.

With the cooperation of stakeholders (elderly breast cancer patients, patients' families, community personnel, attending physicians, nurses), under the new situation of family-hospital-community and smart healthcare, we design a system map to enhance patients' HRQOL by collecting data, cooperating with hospital and community. The details of a life-long service design system are as follows:

1. By creating a warm treatment environment to reduce the psychological pressure of patients during treatment.
2. Creating nursing services through Family, hospital and community linkage care to help patients with daily activities when they suffer from surgical wounds or pain. At the same time, enrich patients' social activities and establish certain social connections for patients.
3. By helping patients rebuild breast and other female characteristics to help patients improve self-identity, reduce psychological burden.
4. Through cognitive education, patients' awareness of the disease can be improved, and their panic caused by not understanding the disease can be alleviated. At the same time, it can also lay a foundation for the follow-up treatment of patients.
5. Reduce the psychological stress of patients by establishing contact with psychological experts.
6. Enhance patients' confidence in treatment and rehabilitation through mutual assistance and encouragement.
7. Enhance the patient's understanding of their situation through body data tracking.
Based on this service system and co-creation with stakeholders, the research team carried out the first step of touchpoints design. The research team created an emotional medical service scenario in a hospital in Shanghai, including wayfinding system for patient and family, corridors for families and patients to rest during treatment, and rest areas are designed to make doctors and patients communicate better.

Conclusions and Suggestions

This paper reviews the literature on the decline of HRQOL (health-related quality of life) in elderly patients with breast cancer during treatment and rehabilitation. Through field observation, user tracking, in-depth
interviews and co-creation, the research team summarized the treatment needs, information needs and emotional needs that can improve patients' physical functions, social functions, role functions, psychological functions and overall feelings during treatment and rehabilitation. Patients, medical staff and designers discuss the details of the service experience and draw the following conclusions:

Under the system standard of HRQOL, the research team developed the research strategy to study the special needs of elderly breast cancer patients. Through behavioural tracking, guiding narrative and other service design research methods, the research team found the physiological needs, role needs, social needs and psychological needs of elderly female breast cancer patients.

Based on the research, the authors build a life-long service system and design emotional hospital service scenarios to improve the health-related quality of life in the treatment and rehabilitation of elderly women with breast cancer in Shanghai:

1. Families, nurses, doctors and community workers cooperate with each other to help patients when they are unable to live a normal life.
2. By communicating with patients, family members and professionals, patients can enhance their enthusiasm and alleviate psychological pressure.
3. Community staff and nurses plan and guide patients' home-based rehabilitation, help patients correctly carry out rehabilitation training and follow-up treatment, reduce the possibility of complications caused by diseases, and make patients return to normal life faster.
4. Real-time interaction and connection with hospitals (doctors, nurses) and smart city medical services through data tracking of products such as smart wear can play the role of monitoring and treatment to the greatest extent, and enhance patients' sense of security and control of their own body.
5. Community is an important field of patients' daily life, and also a service place to learn scientific treatment concepts and correct treatment methods. It provides a platform for patients to learn and communicate daily.
The development of Internet technology, artificial intelligence and big data provides a technical foundation for building a life-long service. In the treatment and rehabilitation of breast cancer, surgery and chemotherapy are still the most important treatment methods. In the next step, the treatment and rehabilitation of elderly breast cancer patients need the joint efforts of multiple stakeholders (family members, nurses, attending physician, community workers), multiple departments (social insurance and government), and multiple services (social network communication and smart healthcare) in order to achieve good results and ensure the quality of life after treatment.

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