



Research on the Application of Service Design in Maternal Extended Care

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Abstract. Aimed to improve maternal care, this study applied service design principles to address discontinuous and unsystematic care issues. Using a double drill model with 207 samples, high demand for psychological, nutrition, and exercise advice was found, varying by age, gestation, and parity. Knowledge, status, and support seeking correlated with service expectations. The service design approach integrates resources, meets personalized needs, and offers insights for future smart medical care.

Keywords: maternal nursing; Extended nursing; Service design; Individual demand; User experience

1 Introduction

In 2021, the National Health Commission issued a notice on the issuance of the "Maternal and Infant Safety Action Improvement Plan (2021-2025)", highlighting the importance of maternal and infant safety for health and health. According to the chronological order of women after conception, the whole pregnancy of women can be divided into the first trimester, the second trimester, the third trimester, pregnancy, several major periods, each period of women face different risks during pregnancy, and some diseases can be early intervention to improve the safety of pregnant women throughout pregnancy and childbirth.

Due to the long-term nature of the whole pregnancy and childbirth period and the different needs of each stage, the transformation of the environment that pregnant women need to experience, from the workplace to the family environment, from the family environment to the hospital environment, but the scenes of each environment are different, the personnel are different, and the different nursing care of pregnant women in each period is not taken into account, and it is often easy to ignore the real needs of pregnant women in each period, and the implementation of continuous care for pregnant women in the whole cycle can increase the continuity and integrity of the entire maternal cycle. Avoid some irreversible losses and injuries caused by the lack of basic medical knowledge and unscientific knowledge of pregnancy and childbirth, improve the safety and satisfaction of pregnant women throughout pregnancy and childbirth, and reduce maternal anxiety^[1].

2 Research Background

2.1 Status Quo of Extended Nursing Services for Pregnant and Pregnant Women

In the context of promoting the long-term and balanced development of population, China's official implementation of the policy of allowing a couple to have three children, the cancellation of restrictive measures such as social maintenance fees, the cleaning up and abolition of relevant penalties, and the implementation of positive fertility support measures, the Decision of The State Council on Optimizing the fertility Policy to Promote the long-term and balanced development of Population (2021)^[2] points out that: A sound maternal and child health service system is the carrier and foundation to meet high-quality maternal and child safety services. It can coordinate all kinds of medical institutions and form a scientific and reasonable service pattern, which is an important guarantee for promoting maternal and child safety. A perfect maternal and child health care service system not only includes pre-pregnancy, pregnancy, postpartum and other medical services, but also includes psychological support, health popularization and other humanized services. This perfect maternal and child health care system integrates social service resources and medical resources, and theoretically supports the maternal and child health care system to develop into a new path integrating comprehensive, systematic and timely advantages. Although the current maternal and child health care system has been greatly improved compared with the early 21st century, at present, there is still room for optimization in the service design of maternal and child services in terms of optimizing the service process, improving the systematic knowledge of maternal and child, taking into account stakeholders and other aspects. The service design based on the concept of continuous care provides new innovative ideas for solving the problems of pregnancy and childbirth in pregnant women.

2.2 Development Status of Extended Care at Home and Abroad

Transitional Care, as defined by the American Geriatric Society, involves designing care activities to ensure coordination and continuity of health services as patients move between different health care settings. Haggerty et al. identified three core elements of continuum of care: continuity of information, continuity of relationships, and continuity of treatment and nursing. These elements ensure that patients receive accurate information during referrals, maintain good doctor-patient relationships, and continue to receive necessary care across different medical institutions. In countries like the United States^[3], Japan, and the United Kingdom, continuous care has become a key part of health services, supported by models such as discharge planning, case management, and advanced practice nurse-led care^[4]. These models focus on comprehensive assessment, health education, follow-up care, and collaboration between medical institutions, communities, and families. In China^[5], continuity of care is still in its early stages, facing challenges such as scarce medical resources, varying professional levels, and a lack of a dedicated service team to ensure post-discharge care^[6].

2.3 Precise Service Needs of Pregnant and Pregnant Women

Periodic examination and treatment are needed in the process of pregnancy and reproduction, and the demand for nursing services of pregnant and pregnant women has shifted from the scene of hospitals to mobile nursing places and the combination of family nursing. Although pregnant and pregnant women will receive comprehensive maternity care and newborn knowledge guidance in hospitals, due to a series of reasons such as short hospital stay and shortage of medical resources, Limiting the continuity of guidance, which will greatly reduce the recovery of pregnant women.

This series of activities, from a sociological point of view, is accompanied by the female gender, women will be given the role of mother because of this series of activities. During pregnancy and childbirth, the physiological risk index of pregnant women is different in different age stages, but most of them will experience a series of high-risk and painful processes such as pregnancy reverse, pregnancy-induced hypertension, pregnancy-induced diabetes, pelvic floor muscle dysfunction, and some pregnant women have basic diseases, which increases the risk of pregnancy; Psychologically, although pregnancy and childbirth is a psychological need of women, it is also a psychological stress factor for women. Due to the sudden change of social roles and personal physical changes, it is easy to cause women's anxiety, fear, physical state and other negative emotions, resulting in increased loneliness and extreme emotions such as delusion of victimization, thus endangering the physical and mental health of pregnant women. It will affect the development of infants and young children and their emotional, intellectual and behavioral development At present, China's extended nursing service has not been designed for the special physical and psychological state of pregnant women, and lacks the design and accurate service for female maternity care.

2.4 Service Design Involves in Medical Services for Pregnant Women

Maternal service design across countries has common ground in terms of personalized care, cross-professional teamwork, information technology support, patient education and engagement, a coherent care pathway and patient-centered care philosophy. However, there are some subtle differences according to the basic situation of different countries. For example, the UK NHS has comprehensively optimized the design of maternity services. The UK NHS has comprehensively optimized maternity care through the "Better Births" program^[7]. Including optimising care pathways, introducing personalised care plans, forming inter-professional teams, introducing an electronic health record (EHR) system, and providing comprehensive pre - and post-natal education. These measures have significantly increased maternal satisfaction, reduced complications and enhanced maternal self-management capabilities. Kaiser Permanente in the United States used integrated care platforms and remote health monitoring to reduce complications, and the "BabyFriendly" program in the Netherlands increased breastfeeding rates and offered home care programs, Denmark's Pregnancy+ app enhances self-management and provides personalized health information, and Australia's Continuity of Midwifery Care program ensures continuity and personalization of care while providing midwifery with continuous care by the same team^[8]. These cases are supported by

the literature and demonstrate the critical role of service design in improving the quality and experience of maternal care^[9].

2.5 Research Methods

Based on the above analysis, this study will introduce service design methods and thinking tools, integrating the characteristics of the current healthcare system, to explore a new model for maternal extended care service design. The research process is guided by the Double Diamond Design Process proposed by the British Design Council^[10], which consists of two main stages: identifying the right problem and finding the right solution. This process is further divided into four stages: (1) Identifying the problem – through literature review and field research, the key issues in maternal healthcare during pregnancy and childbirth are explored; (2) Defining the problem – user research, including interviews and questionnaires, is conducted to clearly define the user groups; (3) Developing solutions – user pain points, challenges, and opportunities are analyzed, and solutions are formulated; (4) Delivering the solution – the most appropriate solution is selected and implemented in design practice.

The research methods for each stage are illustrated in Figure 1. Initially, through literature research and case analysis, this study explores the development of maternal extended care services both domestically and internationally, summarizes potential directions for future development, and determines the research focus on stakeholder groups and users. User research is then carried out, utilizing tools such as user journey maps to identify service pain points, goals, and needs. Based on this analysis, the service system architecture is established, and the functions and forms of the product are defined. Ultimately, a more efficient and convenient continuous care service system will be developed, aiming to support the physical and mental health of pregnant women and enhance daily family care^[11].

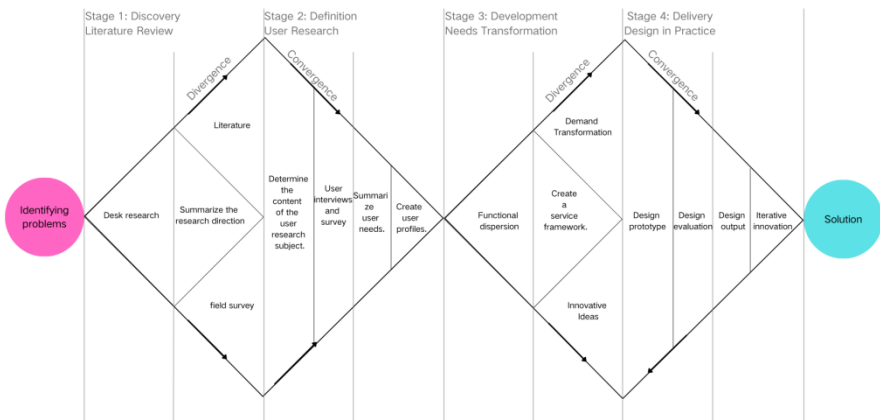


Fig. 1. Double drill model of maternal extended care service design

3 The Service Design Introduces the Process and Methods of Continuous Maternal Care

Taking pregnant women as an example, this study aims to discuss the methods of intervening in maternal and infant safety through service design focusing on women's physical and mental health during the reproductive cycle. After having a certain understanding of the macro situation, the author followed up and tracked 9 pregnant women and 3 groups of pregnant women's families, and conducted field investigations in three hospitals. And carried out collaborative design with doctors, nurses, pregnant women and their families, and explored the true thoughts of pregnant women on extended care and collected their needs through user interviews. A total of 30 items were formed based on the collected information from five dimensions: basic personal information, knowledge understanding of pregnancy and childbirth, physical and psychological conditions during pregnancy, help and support needed during pregnancy and the expectation of extended nursing service, and the initial questionnaire was formed by Likert five-point attitude scale. A total of 220 questionnaires were sent out for pregnant women, of which 207 were effectively collected. According to the results of reliability and validity analysis, Klonbach Alpha coefficient was 0.862, Table 1 shows the data in detail indicating high reliability; KMO and Bartlett test results showed that KMO value was 0.852, and passed the significance test, indicating high validity, relatively high reliability and validity, indicating good data reliability Table 2 shows the data in detail.

Table 1. Reliability analysis of the questionnaire

Klonbach Alpha	Number of terms
0.862	24

Table 2. Questionnaire validity analysis

KMO and Bartlett tests		
KMO measure of suitability for sampling.		0.852
Bartlett sphericity test	<i>Approximate Chi-square</i>	1673.139
	<i>Degrees of Freedom</i>	276
	<i>significance</i>	0.000

According to the results of general data description analysis, among 207 subjects, 30-35 years old accounted for 41.5%, followed by 22-29 years old, accounting for 33.8%; In terms of the number of births, the first time was the majority, accounting for 65.2%, followed by the second time, accounting for 27.1%; In the stage of pregnancy, 1-12 weeks, 13-27 weeks and postpartum were the most, accounting for more than 20%, and hospital waiting for childbirth was the least, only 5.8%; In the hope of extended nursing services, the majority of nutrition guidance, psychological counseling, exercise advice, accounting for more than 77%, slightly less expert consultation, accounting for 58.5%; In the main channels to obtain maternity knowledge, the Internet was the most, accounting for 76.8%, followed by doctors, accounting for 66.2%, books and family

members accounted for about 50%; In terms of the types of suggestions according to the stage of pregnancy, the majority were nutrition advice, accounting for 83.6%, and the proportions of exercise advice, psychological adjustment and medical examination reminder were close. Table 3 shows the data in detail.

Table 3. Difference analysis of the number of births

	The number of births			F	p
	The first time	The second time	Third time and beyond		
<i>Knowledge Understanding</i>	2.219±0.645	2.054±0.537	2.525±1.009	3.451	0.034
<i>Physical and mental condition</i>	2.368±0.487	2.497±0.465	2.625±0.922	2.472	0.087
<i>Help and support</i>	2.03±0.66	2.012±0.664	2.333±1.174	1.405	0.248
<i>Continuation of the expectation of care services</i>	1.902±0.507	1.934±0.502	2.156±0.949	1.524	0.22

According to the results of different stages of pregnancy, there were significant differences in physical and psychological status ($F=6.411$, $p < 0.05$) in different stages of pregnancy, with the highest postpartum scores and the lowest scores from 1 to 12 weeks. Table 4 shows the data in detail.

Table 4. Analysis of differences in pregnancy stage

	In Pregnancy Stages					F	p
	1-12 weeks	13-27 weeks	28-40 weeks	Admission to hospital for delivery	Postpartum		
<i>Knowledge understanding</i>	2.169±0.728	2.054±0.524	2.211±0.658	2.433±0.697	2.298±0.693	1.367	0.247
<i>Physical and mental condition</i>	2.268±0.561	2.247±0.406	2.5±0.482	2.444±0.604	2.67±0.523	6.411	0.000
<i>Help and support</i>	2.105±0.694	2.019±0.569	2.01±0.725	2.111±0.557	2.035±0.87	0.153	0.962
<i>Continuation of the expectation of care services</i>	1.906±0.507	1.867±0.44	1.88±0.531	1.95±0.608	2.037±0.674	0.798	0.528

According to the results of correlation analysis, expectation and knowledge of extended care service ($r=0.514$, $p < 0.05$), physical and psychological status ($r=0.474$, $p < 0.05$), help and support ($r=0.538$, $p < 0.05$) were significantly positively correlated, and the correlation was moderate. Table 5 shows the data in detail.

Table 5. Correlation analysis

	Knowledge Understanding	Physical and mental condition	Help and support	Continuation of the expectation of care services
<i>Knowledge Understanding</i>	1			
<i>Physical and mental condition</i>	0.515 **	1		
<i>Help and support</i>	0.327 **	0.337 **	1	
<i>Continuation of nursing service expectations</i>	0.514 **	0.474 **	0.538 **	1

Regression analysis was conducted with expectation of extended care service as the dependent variable and knowledge understanding, physical and psychological status, help and support, and age as the independent variables. According to the results, $R^2=0.448$, indicating that the independent variable could explain 44.8% of the change of the dependent variable, $F=40.950$, $p < 0.05$, the model passed the significance test. Finally, the variables included were knowledge understanding ($B=0.255$, $p < 0.05$), physical and psychological status ($B=0.203$, $p < 0.05$), and help and support ($B=0.297$, $p < 0.05$), all of which could significantly positively affect the expectation of continuation care service. Table 6 shows the data in detail.

Table 6. Regression analysis

	Unnormalized coefficients		Standardized coefficient	t	Salience	95.0% confidence interval for B	
	B	Standard error	Beta			Lower limit	Upper limit
<i>(Constant)</i>	0.168	0.197		0.854	0.394	-0.22	0.557
<i>Age</i>	0.037	0.037	0.055	0.99	0.323	-0.036	0.109
<i>Knowledge understanding</i>	0.255	0.054	0.306	4.728	0.000	0.149	0.362
<i>Physical and mental condition</i>	0.203	0.065	0.195	3.124	0.002	0.075	0.332
<i>Help and support</i>	0.297	0.044	0.383	6.739	0.000	0.21	0.384
<i>R²</i>	0.448						
<i>F</i>	40.950 **						

In the future smart medical scenario, the integration application of continued services for women's fertility cycle pays attention to the nursing needs of pregnant women and the user experience in a variety of scenarios, and provides certain reference significance for pregnant women to effectively create a continuous and comprehensive nursing service system.

4 Service Design for the Continuation of Maternal Care

During pregnancy and perinatal life, women's care needs vary at different stages. To improve the experience, expectations of extended care services are treated as dependent variables, with knowledge understanding, physical and psychological condition, help and support, and age being independent variables^[12]. Regression analysis showed that knowledge comprehension ($B=0.255$, $p<0.05$), physical and mental state ($B=0.203$, $p<0.05$) and support ($B=0.297$, $p<0.05$) were significant. Based on these needs, APP should be used as the carrier to design an intelligent extended care service system covering pre-pregnancy, pregnancy and postpartum for pregnant women, as shown in Figure 2

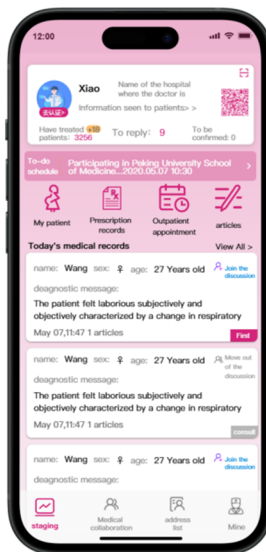
To understand the knowledge, the app allows pregnant women to track the timing of their pregnancy and receive targeted information at different stages. The app analyzes user behavior and provides customized content based on the number of clicks and time spent, ensuring regular pushes of essential knowledge to expand understanding. In addition, online and offline pregnancy education sessions were organized to promote scientific knowledge, as shown in Figure 2b.

Regarding physical and mental conditions, the app enables pregnant women to record daily health data, including weight, mood, blood pressure, and more. Big data analytics detect potential risks and share reports with community hospital physicians for review. If the symptoms persist for more than three days, the app will alert the user to seek medical attention. Integration with wearables helps collect data and synchronize it with the app for comprehensive health monitoring, see Figure 2a.

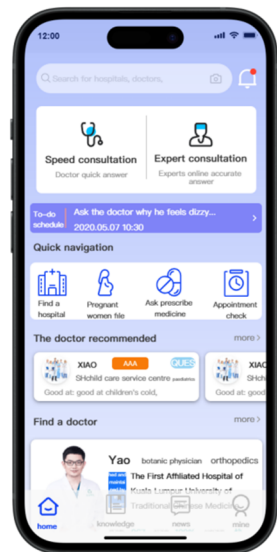
To help and support, the system also includes an app for family members to track the health of pregnant women and provide support. It helps prevent misunderstandings by educating families about pregnancy and tracking mood changes. The maternity community in the app provides a platform for pregnant women to connect, share experiences, and ask for help. If needed, a doctor or peer provides support and keyword filtering to ensure a positive, anxiety-reducing environment. Regular follow-up by staff or volunteers further strengthens care and helps women make a smooth transition to pregnancy and postpartum, as shown in Figure 2c.



a. Pregnant Woman Interface



b. Doctor's End User Interface



c. Family End User Interface

Fig. 2. Mobile phone terminal interface design

5 Conclusion

Through the study, it is found that Chinese pregnant women are not only facing the simple education and care during pregnancy, but also the physical changes and the constant adjustment and adaptation of psychological pressure. The service demand and emotional guidance of pregnant women need to be reflected in the service design, in

order to actively improve the pressure of child-rearing, physical change and social pressure faced by pregnant women. Such an outcome requires not only the efforts of the pregnant women themselves, but also the joint efforts of the stakeholders (family members, doctors, nurses, community workers) and multiple service providers (social insurance, enterprises, government, etc.). With the development of Internet technology, artificial intelligence and big data, it provides a solid technical foundation for the realization of maternal extended care service design. The development of "Internet + medical" also makes the establishment of a hospital-family-community extended care service system with maternity as the center has more possibilities.

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