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Florence Nightingale and the inheritance and development of modern holistic care concepts

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Abstract
This study adopts the methodology of historical research to systematically examine the revolutionary practices of Florence Nightingale during the mid-19th century and the historical process of nursing institutionalization, aiming to clarify the ideological origin of modern holistic care and its evolutionary path. The research finds that Nightingale's three core innovations—environmental intervention, humanistic care, and data-driven decision-making—not only reversed the chaotic state of medical care in the Crimean War era but also laid the foundation for the transformation of nursing from an "unskilled labor" to a professional discipline. The institutionalization of nursing, driven by the establishment of standardized education systems and professional norms, together with the rise of women's roles in the medical field, promoted the transformation of hospitals from "cold treatment factories" to "warm healing communities." In the context of modern healthcare, Nightingale's concepts have been inherited and developed in aspects such as environmental design of medical institutions, psychological care integration, health data visualization, and full-cycle health management. This study reveals that the core of Nightingale's legacy lies in the integration of scientific rationality and humanistic care, which provides important enlightenment for addressing the challenges of technological alienation in contemporary holistic care and promoting the equitable and humanized development of healthcare.

Keywords: Florence Nightingale, holistic care, institutionalized nursing, medical history, health management

Introduction

The mid-19th century marked a critical turning point in the history of Western medical care. Prior to this period, the medical field was trapped in a state of "pre-scientific obscurity": hospitals lacked basic sanitation conditions, nursing work was dominated by unskilled laborers, and the concept of "care for the whole person" was completely absent (Hutchinson, 1989) [6]. The Crimean War (1853-1856) exposed the inherent flaws of this medical system—at the Scutari Hospital on the shores of Lake Scutari, the mortality rate of British wounded soldiers soared to 42%, with most deaths caused by infections and diseases rather than battlefield injuries (Nightingale, 1858) [11]. It was against this backdrop that Florence Nightingale launched a silent revolution in nursing and medical care, which not only saved countless lives but also reshaped the cognitive framework of human healthcare. From the perspective of medical history and the history of health thought, Nightingale's innovations are not merely isolated technical improvements but a comprehensive reconstruction of the healthcare system. Her emphasis on "the hospital's primary obligation to do no harm" (Nightingale, 1859) [12] transcended the limited understanding of "treatment-centered" medicine at that time and implicitly contained the embryonic form of modern holistic care (holistic care). However, existing studies often focus on Nightingale's role as the "founder of modern nursing" while neglecting the historical connection between her ideological connotations and the development of contemporary holistic care. In addition, the process of nursing institutionalization and the rise of women's roles in medicine, as important extensions of Nightingale's ideas, have not been sufficiently analyzed in the context of the history of health thought.

This study fills these research gaps by systematically sorting out Nightingale's practical innovations in the Crimean War, the historical process of nursing institutionalization in the late 19th and early 20th centuries, and the impact of women's participation in medicine on the transformation of healthcare concepts. It further explores the inheritance and development of Nightingale's ideas in modern holistic care practices, with the aim of providing a historical reference for the current reform of healthcare models and the promotion of humanized medical services.

Nightingale's Care Innovations in the Crimean War (1854-1856)

Against the backdrop of the dismal medical conditions of the Crimean War, Nightingale, leading a team of 38 nurses, implemented a series of innovative measures centered on environmental management, humanistic care, and data-driven practice. These measures not only achieved a significant reduction in the mortality rate at Scutari Hospital (from 42% to 2.2% within one year) but also established three core pillars for modern healthcare (Nightingale, 1858) [11]. In the mid-19th century, the dominant medical theory was the "miasma theory," which held that diseases were caused by "bad air" (Bynum, 1994) [4]. Although Nightingale did not completely break away from this theoretical framework, her practical interventions went beyond the limitations of the theory and formed a systematic environmental management strategy.

First, she launched a comprehensive sanitation revolution (sanitation revolution). Upon arriving at Scutari Hospital, Nightingale found that the wards were filled with filth, and medical supplies and sewage were mixed together. She immediately led nurses to clean every corner of the wards with soapy water and bleach, established a strict disinfection system (e.g., boiling bandages before use, disinfecting medical instruments with alcohol), and set up specialized waste disposal areas to separate clean and contaminated zones (Nightingale, 1858) [11]. This practice was far ahead of the medical community at that time—until the 1860s, when

Louis Pasteur proposed the germ theory (germ theory), the medical community generally ignored the role of environmental sanitation in disease prevention (Porter, 1997) [14]. Second, she emphasized the importance of ventilation (ventilation) and lighting (lighting). Nightingale ordered the opening of all windows in the wards and designed a simple ventilation system to promote air circulation. She even personally measured air flow to ensure that each ward had sufficient fresh air. Later microbiological studies confirmed that this measure could effectively reduce the concentration of pathogens in the air and lower the risk of cross-infection (Loudon, 2000) [9]. In terms of lighting, Nightingale rearranged the beds to ensure that each patient could be exposed to sunlight; at night, she increased the brightness of oil lamps during ward rounds to make patients feel cared for. This attention to light was nearly half a century earlier than the formal proposal of modern phototherapy (phototherapy) (Dossey, 2000) [5].

Nightingale's environmental intervention was not a random set of measures but a systematic practice based on the understanding of "the environment's impact on rehabilitation." She pointed out that a clean, well-ventilated, and well-lit environment was not only a prerequisite for preventing infections but also a key factor in promoting patients' physical and mental recovery (Nightingale, 1859) [12]. This idea laid the foundation for the concept of "therapeutic environment" in modern medical architecture design. In the 19th-century medical system, patients were often treated as "carriers of diseases" rather than individuals with emotional and psychological needs. Nightingale challenged this cold medical model by integrating humanistic care into daily nursing practice, creating a "care model centered on the patient's overall needs" (Dossey, 2000) [5].

Her humanistic care practices were mainly reflected in three aspects: First, the "lamp-light comfort" (lamp-light comfort) during ward rounds. Every night, Nightingale would make rounds with an oil lamp, gently touching the foreheads of feverish soldiers and comforting those in pain in a low voice. Many survivors later recalled that the sight of the lamp gave them a sense of security, making them feel "not abandoned" (Nightingale, 1858) [11]. This practice transformed ward rounds from a mere "check-up procedure" to a means of emotional communication, establishing a trusting relationship between nurses and patients. Second, acting as an "emotional bridge" (emotional bridge) through letter-writing. Recognizing that most soldiers were illiterate, Nightingale spent two hours every day helping them write letters to their families. She not only recorded the soldiers' messages but also carefully observed their emotional states and added words of warmth and hope to the letters. For soldiers who were dying, she would record their last words to ensure they could be conveyed to their families (Nightingale, 1859) [12]. This practice addressed the soldiers' longing for their families and alleviated their anxiety and fear in a war environment. Third, providing "individualized care" (individualized care) based on personal preferences. Nightingale kept records of each soldier's hobbies: for those who liked listening to stories, she found books to read to them; for those who missed the taste of their hometown, she tried her best to find corresponding food (Nightingale, 1858) [11]. In an era when soldiers were often treated as "numbers," this individualized care emphasized the uniqueness of each patient, which was a revolutionary breakthrough in the medical concept of the time.

Nightingale was not only a practitioner of care but also a pioneer of evidence-based medicine (evidence-based medicine). She realized that without data support, healthcare reforms could not be sustained or promoted. Therefore, she designed a set of systematic data collection and visualization methods, which later became an important tool for promoting medical reform. First, she established a "systematic recording system" (systematic recording system). Nightingale designed detailed statistical forms to record the number of deaths, causes of death, and environmental conditions (e.g., temperature, humidity, ventilation) of each ward on a daily basis. These records formed the most comprehensive medical statistical data at that time, providing a factual basis for analyzing the relationship between environmental factors and patient outcomes (Nightingale, 1858) [11]. Second, she invented the "Nightingale Rose Diagram" (Nightingale Rose Diagram) for data visualization. In 1858, Nightingale published Notes on Matters Affecting the Health, Efficiency, and Hospital Administration of the British Army, in which she designed a circular statistical chart. The chart used fan-shaped areas of different colors to represent the number of deaths from different causes (blue for deaths from wound infections, red for deaths from infectious diseases such as cholera and typhoid, and black for deaths from other causes) on a monthly basis (Nightingale, 1858) [11]. The diagram clearly showed that before Nightingale's arrival (December 1854), the monthly number of deaths exceeded 1,000, with 80% caused by infectious diseases; after May 1855, with the improvement of the environment, the number of deaths from infectious diseases dropped to less than 100 per month. This visualization method was far more persuasive than boring numbers. When the British Parliament saw the diagram, it immediately approved the "Military Hospital Reform Act" proposed by Nightingale, which required all military hospitals to be equipped with ventilation systems and cleaning staff and to integrate nursing into the medical system (Hutchinson, 1989) [6]. The Nightingale Rose Diagram also became a pioneer of modern health data visualization; today, tools such as "mortality trend charts" and "disease distribution heat maps" commonly used in health management continue Nightingale's idea of "using data to verify the effect of health interventions" (Spiegelhalter, 2012) [16].

The Institutionalization of Nursing (Late 19th to Mid-20th Century)

Nightingale's most far-reaching contribution was not limited to her temporary reforms during the Crimean War but to promoting the institutionalization of nursing, transforming it from a "low-level labor" into a professional discipline integrated into the medical system. This process involved the establishment of standardized education systems, the formulation of professional norms, and the construction of career development paths, laying the foundation for the development of modern nursing (Kalisch & Kalisch, 2004) [8]. Before the 1850s, nursing education was non-existent—nurses were mostly poor women, laundresses, or ex-convicts, with no formal medical training (Kalisch & Kalisch, 2004) [8]. To change this situation, Nightingale founded the "Nightingale Training School for Nurses" at St. Thomas' Hospital in London in 1860, which

was the world's first formal nursing school. The school's curriculum design reflected a brand-new educational philosophy, marking the beginning of standardized nursing education.

First, the curriculum emphasized the "seamless integration of theory and practice" (seamless integration of theory and practice). The courses included three core modules: (1) Basic medical knowledge, such as anatomy and physiology, to help students understand the human body's structure and functional mechanisms; (2) Nursing operational skills, such as wound disinfection, temperature measurement, and drug distribution, to ensure students could perform basic nursing operations proficiently; (3) Humanistic care concepts, such as how to communicate with patients and provide psychological support, to cultivate students' empathy and care awareness (Nightingale, 1859) [12]. In terms of teaching methods, the school adopted a "case management" approach: students spent two days a week interning in hospitals, directly participating in patient care, and recording details such as patients' food intake, defecation status, and emotional changes. This method helped students develop a "holistic care thinking" that integrated physical and psychological care (Dossey, 2000) [5]. Second, the school established a "strict quality assurance system" (strict quality assurance system). Students had to pass three types of assessments to graduate: theoretical exams (testing basic medical and nursing knowledge), operational assessments (evaluating proficiency in nursing skills), and internship evaluations (assessing performance in patient care and compliance with ethical norms). In addition, the school formulated a code of professional ethics, requiring students to protect patient privacy, respect patient wishes, and not accept gifts, incorporating ethics into the core curriculum of nursing (Kalisch & Kalisch, 2004) [8]. This system ensured the quality of nursing graduates and laid the foundation for the professionalization of nursing.

The Nightingale model of nursing education was quickly replicated worldwide. In 1873, three nursing schools were established almost simultaneously in Boston, New York, and Philadelphia in the United States, all adopting the curriculum and teaching methods of the Nightingale Training School (Kalisch & Kalisch, 2004) [8]. In 1909, the British government enacted the Nurses Registration Act, which required nurses to pass a unified national exam to practice, marking the formal integration of nursing education into the national medical education system (Hutchinson, 1989) [6]. The institutionalization of nursing also involved the reconstruction of nursing professional norms, including the redefinition of roles, the establishment of standardized procedures, and the construction of career development paths. These changes transformed nursing from a "doctor's assistant" into an "independent care provider" (Kalisch & Kalisch, 2004) [8].

First, the "redefinition of nursing roles" (redefinition of nursing roles). Before Nightingale's reform, nurses were only responsible for cleaning, moving patients, and changing bedding, and occasionally assisting doctors in passing instruments, with no responsibility for wound care or condition observation. After the reform, nursing roles were repositioned: nurses were required to independently observe changes in patients' conditions (e.g., monitoring temperature and pulse), perform medical operations (e.g., dressing changes and injections), provide psychological support, and even participate in discussions on treatment plans (Nightingale, 1859) [12]. This role transformation formed a collaborative model of "doctors for diagnosis and treatment + nurses for comprehensive care," clarifying the independent value of nursing in the medical system. Second, the "establishment of standardized procedures" (establishment of standardized procedures). Hospitals began to formulate detailed nursing operation guidelines, covering every link of nursing work: from the process of wound disinfection (e.g., the order of cleaning and disinfection, the concentration of disinfectants) to the frequency of vital sign monitoring (e.g., measuring temperature every 4 hours for fever patients), and from the norms of patient transfer (e.g., the angle of lifting and the use of equipment) to the procedures for emergency treatment (e.g., the steps of cardiopulmonary resuscitation). In 1922, the American Nurses Association (ANA) published Standards of Nursing Practice, which systematized and documented these procedures, making them the global operating guidelines for the nursing profession (ANA, 1922) [2]. Third, the "construction of career development paths" (construction of career development paths). To attract more outstanding talents to join the nursing profession, the medical community established a hierarchical career advancement system for nursing: from junior nurses (responsible for basic care) to specialist nurses (e.g., pediatric nurses, psychiatric nurses, responsible for specialized care), and then to nursing managers (e.g., head nurses, responsible for ward management) and nursing researchers (responsible for nursing science research). This clear career path not only improved the professional identity of nurses but also promoted the continuous improvement of nursing quality (Kalisch & Kalisch, 2004) [8].

By the mid-20th century, nursing had completed its transformation from a professional skill to an independent discipline, which was reflected in three aspects: recognition by international organizations, the upgrading of education levels, and the integration into the medical research system. In 1950, the World Health Organization (WHO) formally listed nursing as an "indispensable part of the medical field" in its Global Strategy for Health for All, recognizing the independent status of nursing in the global medical system (WHO, 1950) [17]. In the 1960s, many universities in the United States (e.g., Yale University, Columbia University) began to offer bachelor's degree programs in nursing, upgrading nursing education from vocational education to higher education. This upgrade enabled nursing to absorb more advanced medical knowledge and research methods, laying the foundation for the development of nursing science (Kalisch & Kalisch, 2004) [8]. In the 1970s, nursing was integrated into the global medical research system: nurses could apply for research funds from government agencies or academic institutions to conduct studies on improving care quality, preventing chronic diseases, and promoting health education. For example, the National Institute of Nursing Research (NINR) established by the U.S. National Institutes of Health (NIH) in 1986 specialized in funding nursing research projects, further promoting the development of nursing as a discipline (NINR, 1986) [10].

The Rise of Women's Roles in Medicine and the Transformation of Healthcare Concepts

The institutionalization of nursing was accompanied by a profound change in women's roles in the medical field. Before the 19th century, medicine was almost an exclusive

domain of men; women faced triple barriers of social prejudice, educational monopoly, and professional restrictions if they wanted to engage in medical work (Jordan, 1999) [7]. The rise of women in medicine, driven by pioneers such as Nightingale and Elizabeth Blackwell, not only achieved gender equality in the medical field but also promoted the transformation of healthcare concepts from pure technicalism to humanistic care. The breakthrough of women's roles in medicine began with the efforts of individual pioneers and was later promoted on a large scale through the institutionalization of nursing. Elizabeth Blackwell was the first woman in the United States to obtain a medical degree. In 1847, she applied to 29 medical schools and was rejected by all of them; finally, Geneva Medical College in New York admitted her as a "joke" (Jordan, 1999) [7]. After graduating in 1849, Blackwell founded the "New York Infirmary for Women and Children" to provide medical services to poor women and children, challenging the social prejudice that "women are not suitable for practicing medicine" (Blackwell, 1852) [3].

Nightingale's contribution to promoting women's participation in medicine was more systematic. The Nightingale Training School for Nurses was open to "respectable women" (mainly middle-class women), providing them with a formal channel to engage in the medical profession. These educated and empathetic women not only improved the quality of nursing but also changed the social perception of nursing—nursing was no longer seen as a "low-level job" but as a "respectable profession" (Dossey, 2000) [5]. By the late 19th century, more and more women began to engage in nursing work; in the United Kingdom, the proportion of women in the nursing profession exceeded 90% by 1900 (Hutchinson, 1989) [6]. In the early 20th century, women began to enter specialized medical fields, especially in maternal and child health. In 1915, the "American Medical Women's Association" (AMWA) was established, which promoted women's participation in obstetrics, pediatrics, and public health (AMWA, 1915) [1]. For example, Margaret Sanger, a female physician, advocated for birth control and founded the first birth control clinic in the United States in 1916, making important contributions to the promotion of women's reproductive health (Sanger, 1920) [15].

By the mid-20th century, women's participation in the medical field had increased significantly. According to statistics from the WHO, women accounted for more than 70% of the global healthcare workforce by 2020, dominating fields such as clinical care, maternal and child health, and health management (WHO, 2020) [18]. This change not only broke the gender monopoly in the medical field but also injected a humanistic atmosphere into the previously cold medical environment. Women's entry into the medical field did not merely change the gender composition of the workforce but more importantly reshaped the ethical temperament of medicine, promoting the transformation of healthcare from "disease-centered" to "patient-centered." First, "paying attention to the patient's overall experience" (paying attention to the patient's overall experience). Female healthcare workers tend to focus not only on disease indicators (e.g., blood pressure, blood sugar) but also on the patient's subjective experience, such as whether they are in pain, whether they feel scared, and how their diet and sleep are (Jordan, 1999) [7]. This care model that "sees the patient" breaks the cold perception of "patients as mere carriers of diseases" and emphasizes the integrity of the patient's physical and mental state. For example, in pediatric care, female nurses are more likely to observe subtle changes in children's emotions (e.g., anxiety caused by separation from parents) and take corresponding comfort measures, which helps improve children's compliance with treatment (Dossey, 2000) [5]. Second, "establishing communication and trust" (establishing communication and trust). Female healthcare workers are more inclined to adopt two-way communication: they patiently listen to patients' questions, explain the condition in plain language, and respect the patient's choices (Jordan, 1999) [7]. This communication method helps establish a trusting doctor-patient relationship. Studies have shown that patients who communicate well with female healthcare workers have higher treatment compliance and better rehabilitation outcomes (WHO, 2020) [18]. For example, in the care of elderly patients with chronic diseases, female nurses often spend more time listening to the elderly's concerns about the disease and their needs for daily care, which helps develop more personalized care plans.

Third, "focusing on the health needs of vulnerable groups" (focusing on the health needs of vulnerable groups). Female healthcare workers pay more attention to the neglected health needs of vulnerable groups, such as women, children, and the poor (AMWA, 1915) [1]. They promote the popularization of women's health screenings (e.g., breast cancer screening, cervical cancer screening) and pay attention to issues previously ignored, such as postpartum depression and menopausal health, promoting health equity. For example, in low-income countries, female community health workers play a key role in promoting maternal and child health, reducing maternal and infant mortality rates through home visits and health education (WHO, 2020) [18].

It should be emphasized that the rise of women's roles in medicine is not intended to replace men but to form an ideal complementary model. The rationality and decisiveness of male healthcare workers are suitable for surgical decision-making and emergency handling, while the empathy and meticulousness of female healthcare workers are suitable for long-term care and psychological support. The combination of the two forms an ideal medical model of "technology + humanism" (Jordan, 1999) [7].

The Transformation of Hospital Functions: From "Treatment Factory" to "Healing Community"

The institutionalization of nursing and the rise of women's roles in medicine jointly promoted a profound transformation in hospital functions. In the 19th century, hospitals were "cold treatment factories" that only focused on removing lesions and killing bacteria; after the 20th century, hospitals gradually became "warm healing communities" that integrated treatment, care, rehabilitation, and health education. This transformation was reflected in the optimization of functional zoning, the design of humanistic environments, and the implementation of full-cycle care (Loudon, 2000) [9]. Before the 19th century, hospitals had no reasonable functional zoning—patients with different diseases (e.g., infectious diseases and surgical patients) were mixed in the same ward, which easily led to cross-infection (Loudon, 2000) [9]. With the promotion of nursing institutionalization, hospitals began to optimize functional zoning, dividing wards into specialized units according to disease types (e.g., internal medicine wards,

surgical wards, infectious disease wards), and each unit was equipped with a professional nursing team and specialized equipment.

This zoning not only reduced the risk of cross-infection but also improved the professionalism of care. For example, infectious disease wards were equipped with independent ventilation systems and disinfection facilities to prevent the spread of pathogens; surgical wards were equipped with operating rooms, recovery rooms, and sterile storage areas to ensure the safety of surgical operations (Kalisch & Kalisch, 2004) [8]. In addition, hospitals also set up specialized departments such as pharmacies, laboratories, and radiology departments to provide comprehensive medical support for patient treatment.

The design of hospital environments also began to focus on the "therapeutic effect" of the environment, breaking away from the previous cold and depressing style. This change was influenced by Nightingale's concept of "healing environment" and the humanistic care concepts brought by female healthcare workers (Loudon, 2000) [9]. First, the improvement of lighting and ventilation: Hospitals increased the number of windows in wards to ensure sufficient natural light and fresh air; some hospitals even designed "sunlight wards" to provide patients with more sunlight exposure, which was beneficial to the recovery of patients with tuberculosis and other diseases (Dossey, 2000) [5]. Second, the optimization of color and decoration: Hospital walls began to use soft colors (e.g., light blue, light green) instead of the previous white, which could reduce patients' anxiety; some hospitals also hung paintings and placed potted plants in wards to create a warm atmosphere. Third, the setting of family-friendly facilities: Hospitals set up family companion beds in wards to allow family members to accompany patients; some hospitals also opened "healing gardens" where patients could walk and relax, helping to alleviate their psychological pressure (Loudon, 2000) [9].

Hospitals no longer limited their services to the "inpatient period" but extended care to the pre-operation, post-operation, and post-discharge stages, forming a "full-cycle care" model (full-cycle care) that integrated treatment, rehabilitation, and health management. In the pre-operation stage, nurses conduct pre-operation visits to understand the patient's health status and psychological state, help the patient prepare physically and mentally for the operation (e.g., explaining the operation process, alleviating the patient's fear of the operation), and guide the patient to complete pre-operation examinations (Nightingale, 1859) [12]. In the post-operation stage, nurses not only monitor the patient's wound condition and prevent infection but also guide the patient to conduct rehabilitation training (e.g., limb function training after orthopedic surgery), pay attention to pain management (e.g., using analgesics reasonably), and provide psychological support to help the patient recover as soon as possible (Kalisch & Kalisch, 2004) [8]. In the post-discharge stage, hospitals connect with community health services through community nursing, telephone follow-up, and online consultation to continue paying attention to the patient's rehabilitation status, guide the patient's daily care (e.g., diet adjustment, medication compliance), and prevent the recurrence of diseases (WHO, 2020) [18].

The Inheritance and Development of Nightingale's Ideas in Modern Holistic Care

Nightingale's innovations and the subsequent institutionalization of nursing have laid the ideological foundation for modern holistic care. Holistic care, as a core concept of contemporary healthcare, emphasizes paying attention to the overall needs of individuals (including physical, psychological, social, and spiritual needs) and providing comprehensive and personalized care (WHO, 2020) [18]. The inheritance and development of Nightingale's ideas in modern holistic care are mainly reflected in the following aspects. Nightingale's emphasis on environmental factors in healthcare has been fully inherited and developed in modern medical institution design and community health management. In modern hospital design, ventilation systems, lighting conditions, and ward layout all consider the "therapeutic effect" of the environment. For example, modern hospitals use advanced central ventilation systems to ensure the air quality of wards; operating rooms adopt laminar flow technology to reduce the concentration of pathogens in the air; psychiatric wards are designed with soft colors and non-slip floors to ensure the safety and comfort of patients (Loudon, 2000) [9].

In community health management, the focus on living environment quality (e.g., air quality, drinking water safety, green space) is an extension of Nightingale's environmental concept. For example, public health departments in many countries conduct regular monitoring of community air quality and drinking water safety, and take measures to improve the environment (e.g., reducing air pollution, purifying drinking water) to prevent the occurrence of diseases (WHO, 2020) [18]. During the COVID-19 pandemic, Nightingale's emphasis on ventilation, cleaning, and space management showed new value—public health departments around the world recommended measures such as opening windows for ventilation, frequent hand washing, and maintaining social distance to prevent the spread of the virus, which were consistent with Nightingale's environmental intervention ideas (WHO, 2020) [18]. Nightingale's emphasis on the emotional needs of patients has been developed into a systematic psychological care model in modern holistic care. Modern research has confirmed Nightingale's intuition: psychological state directly affects physical health. Studies have shown that good psychological support can accelerate wound healing and enhance immune function (Spiegelhalter, 2012) [16]. Therefore, psychological care has become part of the standard service in modern healthcare.

In clinical practice, hospitals have set up psychological counseling departments to provide psychological intervention for patients with mental health problems (e.g., depression, anxiety); nurses have received professional training in psychological care to identify and alleviate patients' psychological problems in daily care (WHO, 2020) [18]. For example, in the care of cancer patients, nurses not only provide physical care (e.g., pain management, nutrition support) but also conduct psychological counseling to help patients face the disease positively and improve their quality of life. In community health services, community health workers pay attention to the psychological status of the elderly and left-behind children, providing them with emotional support to prevent the occurrence of mental health problems. Nightingale's pioneering work in health data visualization has been developed into a data-driven

health management model with the support of modern technology. Today, we collect health data through wearable devices (e.g., smart bracelets, smart watches), analyze disease trends using big data technology, and display health information through visualization tools (e.g., health dashboards), all of which continue Nightingale's idea of "using data to speak" (Spiegelhalter, 2012) [16].

In public health management, big data technology is used to predict the occurrence and spread of diseases (e.g., predicting the incidence of influenza based on search engine data), providing a basis for formulating public health policies; in individual health management, wearable devices collect data such as heart rate, blood pressure, and sleep status, helping individuals and healthcare workers understand health conditions in real time and adjust care plans (WHO, 2020) [18]. For example, patients with chronic diseases (e.g., hypertension, diabetes) can monitor their blood pressure and blood sugar through home monitoring devices, and transmit the data to doctors in real time; doctors can adjust medication plans according to the data, improving the effect of disease management. Nightingale's preventive concept (emphasizing the role of environment in disease prevention) and the long-term care concept brought by female healthcare workers have inspired modern health management to shift from treating diseases to preventing diseases and promoting health, forming a "full-cycle health management" model (full-cycle health management) covering the prevention, treatment, and rehabilitation stages. In the prevention stage, health management focuses on disease prevention through health screenings (e.g., physical examinations, cancer screenings) and health education (e.g., promoting healthy lifestyles such as reasonable diet and regular exercise); in the treatment stage, health management provides medical services that combine technology and humanism, ensuring the effectiveness and safety of treatment; in the rehabilitation stage, health management helps patients recover functions and return to normal life through community rehabilitation and home care (WHO, 2020) [18]. This full-cycle health management model is the ultimate practice of the core spirit of nursing institutionalization and the rise of women's roles in medicine, reflecting the essence of modern holistic care.

Discussion and Conclusion

The historical process of Nightingale's nursing innovation and the development of modern holistic care reveals three core insights: First, the progress of healthcare is not only a breakthrough in technology but also a "return to the person." Nightingale's reforms broke the "disease-centered" medical model of the 19th century and emphasized the integrity of the patient's physical and mental state; modern holistic care further developed this idea by paying attention to the social and spiritual needs of individuals, reflecting the continuous deepening of the understanding of "health" (WHO, 2020) [18].

Second, the institutionalization of nursing is a key link in the professionalization of healthcare. Before Nightingale's reform, nursing was in a state of disorder and non-professionalism, which restricted the improvement of healthcare quality. The establishment of standardized nursing education systems and professional norms not only improved the quality of nursing but also integrated nursing into the medical system, forming a collaborative medical model of "doctors + nurses" (Kalisch & Kalisch, 2004) [8]. This model has been proven to be an effective way to improve healthcare quality and is still an important part of the modern medical system. Third, the rise of women's roles in medicine has injected humanistic vitality into healthcare. Women's participation in medicine not only broke the gender monopoly in the medical field but also promoted the transformation of healthcare concepts from pure technicalism to humanistic care. The empathy and meticulousness of female healthcare workers complement the rationality and decisiveness of male healthcare workers, forming an ideal medical model of "technology + humanism" (Jordan, 1999) [7]. This model provides an important reference for addressing the problem of "technical alienation" in contemporary healthcare (e.g., over-reliance on medical equipment and neglect of patient communication). However, modern holistic care also faces challenges in inheriting Nightingale's ideas. With the rapid development of technologies such as artificial intelligence (AI) and telemedicine, there is a risk of "dehumanization" in healthcare—some medical institutions over-rely on technical means and ignore the humanistic care needs of patients (WHO, 2020) [18]. In this context, it is particularly important to re-examine Nightingale's ideas: technology should always be a tool to enhance rather than replace humanistic care. The warm handshake, concerned eyes, and patient listening that Nightingale emphasized are still irreplaceable healing forces (Dossey, 2000) [5].

Florence Nightingale's nursing innovation in the mid-19th century was a landmark event in the history of medical care. Her three core innovations—environmental intervention, humanistic care, and data-driven practice—not only reversed the chaotic state of medical care in the Crimean War era but also laid the ideological foundation for modern holistic care. The subsequent institutionalization of nursing transformed nursing from an "unskilled labor" to a professional discipline, while the rise of women's roles in medicine promoted the transformation of healthcare concepts from pure technicalism to humanistic care. Together, these two processes promoted the transformation of hospitals from "cold treatment factories" to "warm healing communities" (OpenAI, 2023) [13]. In the context of modern healthcare, Nightingale's ideas have been inherited and developed in multiple aspects, including the design of medical institution environments, the integration of psychological care, the visualization of health data, and the promotion of full-cycle health management. The core of Nightingale's legacy lies in the integration of scientific rationality and humanistic care, which provides important enlightenment for addressing the challenges of contemporary healthcare (e.g., technical alienation, health inequity) and promoting the equitable and humanized development of healthcare. As we enter the era of precision medicine and AI healthcare, we should always remember Nightingale's teaching: "The essence of nursing is to place the patient in the most favorable environment for recovery" (Nightingale, 1859) [12]. Only by adhering to the core of "people" and integrating scientific technology with humanistic care can we promote the continuous development of modern holistic care and build a more equitable, warm, and comprehensive healthcare system.

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