Innovation of Community-Based Integrated Care: The History and Current Status of Telenursing in Japan

Takayasu Kawaguchi and Keiko Toyomasu

Abstract This chapter defines telenursing as follows: "Telenursing is a nursing practice that uses information and communication technology. This technology is used to understand and educate patients about their health." The elements required to develop a telenursing system are shown in a user-oriented telenursing application based on the structure of personal health records. In recent years, numerous information application tools have been developed for smartphones and incorporated into daily life. The functions necessary for telenursing include information sharing, the structure of medical care, and patients (Doctor to Patient with Nurse [D to P with N]). Telenursing could extend the lifespan through not only the optimization of operations but also interprofessional information sharing and early detection and treatment. Further, telenursing could lead to the reduction in medical expenses while simultaneously providing peace of mind and comfort to people in all situations in hospitals and communities.

Consequently, this chapter is an attempt to identify necessary elements and challenges of a telenursing system primarily from the viewpoint of translational health information sciences.

Keywords Telenursing · Telecare · Home care

1 The Definition of Telenursing

Telenursing can be defined as "nursing practice utilizing telecommunication (electronic/long distance communication)" (American Nurses Association: ANA, Milholland, 1997) (Kumar & Snooks, 2011) or "providing nursing to subjects at physically distant locations by connecting a home or hospital with a mobile terminal using telecommunication techniques" (International Council of Nurses: ICN, Milholland, 2000). Sharpe, a leader in telenursing research, provided the definition

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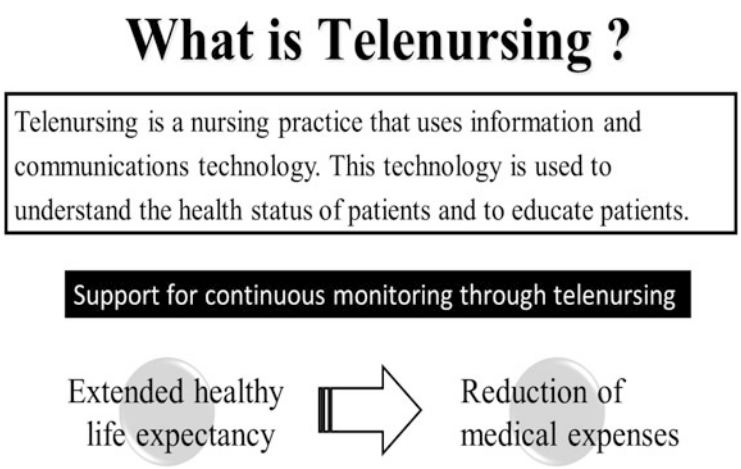

Fig. 1 What is telenursing?

for the American Nurses Association and designated telenursing as a new field that combines nursing science and information science and is a vital nursing practice for the future of medical care (Sharpe, 2001). The authors defined telenursing as shown in Fig. 1. Through the use of information science to manage health and assist in treatment, telenursing is expected to become a major touchstone of future strategic medical policy intended to extend healthy life expectancy and reduce medical expenses.

2 Advances in Information Technology and Japanese Medical Policy

In this section, we briefly outline the history of telemedicine and telenursing in Japan. The Telemedicine Research Group was organized by the Ministry of Health, Labour and Welfare in 1996, and the first Telemedicine Research Conference in Japan was held in March 1997, marking an increase in societal interest in the field.

In December 1997, national and local governing bodies enacted the Long-Term Care Insurance Act responsible for building a community-based, integrated care system. At the same time, a notice from the director of the Health Policy Bureau of the Ministry of Health and Welfare, entitled "Medical Treatment Utilizing Telecommunication Equipment (i.e.) 'telemedicine,'" ruled that telemedicine did not infringe directly on Article 20 of the Medical Practitioners' Act (i.e., you may not provide medical examination without face-to-face contact). In addition, the notice stipulated

that face-to-face examination would be the general rule and specified the following warnings.

1. Face-to-face examination is mandatory for initial examinations and acute-phase diseases.
2. Telemedicine can be performed only in cases in which the patient's condition is stable (e.g., those with chronic illness).
3. Telemedicine can be performed only in cases in which performing direct, face-to-face examination is difficult (e.g., on isolated islands and in remote areas).

In January 2001, the Cabinet Office established "the Strategic Headquarters for the Advanced Information and Telecommunications Network Society" (abbreviated as IT Strategic Headquarters) and proposed the "e-Japan Strategy," which established an IT environment. The foundation of this strategy was to facilitate reliable information exchange, even in remote areas, through a network and allow patients to receive high-quality medical and care services including response to emergency situations at home. The "e-Japan Strategy II," which was proposed in July 2003, presented seven fields, including medicine, and led efforts to realize a "lively, secure, inspired, and convenient" society.

Goals proposed by this strategy included patient-centered collaboration by medical facilities; health promotion through affordable, secure, and safe medical care; and the provision of telemedical services to remote mountainous areas and isolated islands using IT. The "i-Japan Strategy (Towards Digital Inclusion & Innovation) 2015" was proposed in July 2009. The field of medicine/health was presented as a key pillar of this strategy. Specific goals, including the application of telemedicine technology, maintenance/improvement of physicians' techniques, and realization of community-based medical collaboration, were established to address certain challenges, such as a shortage of community physicians, faced by those in the field of medicine. Proposed plans to realize the implementation of this strategy included the accumulation of data based on the scientific basis for telemedicine, the appropriate use of medical fees, and—for telemedicine technologies that had verified safety/efficacy data—striving for appropriate introduction and expansion of the range of applications.

In February 2013, the "Office of Healthcare Policy" was established by the Cabinet Secretariat, and the "Headquarters for Healthcare Policy" was established in August of the same year. "On the promotion of ICT in the fields of health, medicine, and caregiving" was proposed by the Ministry of Health, Labour and Welfare in March 2014, and the "Health and Medical Strategy Promotion Act" was enacted in May 2014. Accompanying the establishment of the Health and Medical Strategy Promotion Act, the Headquarters for Healthcare Policy adopted a commanding role as headquarters as stipulated in the aforementioned law in June 2014. In the same month, the "Law Pertaining to the Development of Related Laws to Promote Comprehensive Guaranteed Medical Care and Caregiving in the Community" was enacted.

3 Outline of Research on the Implementation of Telenursing

Early research on telenursing in Japan included studies evaluating the outcomes of patients with chronic respiratory failure living at home who received telenursing, assessing nursing triage and telementoring practices through medical interview data from home care patients, investigating the cost-effectiveness of telenursing practices for patients receiving home oxygen therapy (HOT) for chronic obstructive pulmonary disease (Kamei, Yamamoto, Kajii, et al., 2010), verifying the content of and time spent on telenursing for patients receiving HOT living at home (Yamamoto, Kamei, Kajii, et al., 2010), and evaluating nursing techniques through a randomized controlled trial examining the preventive effects of telenursing practice on the acute exacerbation of illness and rehospitalization in home-based monitoring of patients with chronic obstructive pulmonary disease receiving HOT (Kamei, Yamamoto, Kajii, et al., 2013).

Moreover, 2013 saw a randomized comparative study examining telephone-delivered cognitive-behavioral therapy (tCBT) for workers via a remote workplace CBT program (Furukawa & Hayasaka, 2013), a study examining a multimodal, home-based, telephone-delivered care and support system using video calls to patients with diabetes (Kubota, Hosoda, Eguchi, et al., 2013), and research exploring the effects of tCBT on decreased work productivity related to depressive symptoms and the effectiveness of an in-home care system using multifunctional video calls (Nakamura, Koga, & Iseki, 2014). According to a secondary source, research on this topic consisted of several studies before 2014, but the number of studies conducted has since increased (Toyomasu, 2005).

As practical research providing strong evidence continued to expand, accompanied by the country's incremental policy and societal changes related to the development of telecommunication technology, an official notice (10 August 2015, notice from the director of the Health Policy Bureau of the Ministry of Health, Labour and Welfare) was presented in 2015 and proclaimed that it was acceptable to conduct telemedicine in response to patient requests and in combination with appropriate face-to-face examinations. This notification allowed businesses to enter the market to provide full-scale services.

In July 2017, it was ruled that situations in which telemedicine was provided through e-mail or Social Networking Service did not directly violate the Medical Practitioners' Act. In particular, the provision of examination for outpatient smoking cessation through telemedicine alone was permitted on the condition that a physician confirms the performance of regular health examinations/checkups. During the short period from February to March 2018, a review meeting was held to discuss the establishment of guidelines concerning medical care involving the use of telecommunication equipment, resulting in the creation of "Guidelines for the Appropriate Implementation of Online Medical Care."

Japan has a universal health insurance coverage system. Within such system, the calculation criteria for public health insurance are determined by the national fee

reimbursement schedule. In the 2018 revision to this schedule, "online medical care" was listed as covered under insurance, meaning that for the first time, online care would be partially covered by public medical insurance if certain conditions were met. In addition, there were limitations on the medical treatment covered by health insurance premiums. Specifically, it covered specific conditions and only treatment provided at emergency medical institutions capable of examination and treatment within approximately 30 min of the occurrence of an emergency.

Accompanying these new stipulations, phone-based reexaminations were reviewed, and fees were calculated under insurance limited to "cases in which necessary instruction was provided when a patient, etc. requested an opinion on treatment." It was ruled that "fees cannot be calculated under insurance for cases carried out with regular medical administration as the goal." Regarding online medical care, care based on a treatment plan and phone-based reexamination were classified as emergency medical care. Because of this and major developments in devices and online information, the "Investigative Commission for the Review of Guidelines for the Appropriate Implementation of Online Medical Care" was established in January 2019.

In the commission's first guideline review, they concluded that, in reality, online medical care was provided through teamwork by D to P and home care nursing during home care visits in home-based medical care settings. Therefore, in addition to establishing a setting for D to P with N (online medical care when the patient is with a nurse), the commission began organizing and reviewing the positions of patients, doctors, and nurses within the guidelines, caution during implementation, and supplementary medical care procedures in which a physician could instruct a nurse.

4 Factors Underlying the Need for Telenursing

In addition to the revision of telemedicine, the information revolution has advanced rapidly, creating a basis for new technological innovation in the realm of information and ICT including cloud, big data, mobile, and Social Networking Service technology. These types of technology were termed the "smart revolution" by the "2012 Telecommunications White Paper." Concerning their effects on society, they have led to a structural transformation in the ICT industry, particularly that of mobile phones. Moreover, the progress of telecommunication technology is accelerating, and remarkable developments in human decision support tools, such as the Internet of Things (IoT) and artificial intelligence (AI), have been achieved. As information evolves, technological innovations that apply this information are expected in the field of medicine, which is steadily becoming more complex.

According to a figure representing the relationship between medical expenses and illness presented by Daniel Kraft, (2011), almost 80% of medical expenses are accounted for by patients with chronic or terminal illnesses who veer beyond the space between health and sickness. The promotion of healthy life expectancy has

become important in reducing medical expenses, and bias in medical expenditure and the implementation of personalized medicine through the application of information technology has been proposed as a means via which to achieve this.

The foundation of modern medicine involves the provision of care based on experience, with the goal of universal standardization for all. However, in the future, although standardization (evidence-based practice) will continue to develop, medical care that reflects patients' individuality will also be required. Therefore, it is necessary to ensure that those providing medical care today acquire the ability to predict future care needs through personalized medicine.

5 Telenursing Required for Community-Based, Integrated Care

Figure 2 depicts a future model of community-based integrated care presented by the Ministry of Health, Labour and Welfare (2017). To achieve this, interprofessional information sharing will be vital. Previously, expert opinion was commonly at the forefront of intervention in medicine and caregiving. Consequently, the implementation of a mutual action plan involving two different perspectives: "medical/nursing" shown in the top left and "caregiving/welfare" in the top right of Fig. 2 were the focus, with the "client" often disregarded from start to finish. In other words, conventional medicine at treatment-focused hospitals has progressed as medical care that manages patients. Currently, hospitalization durations are approximately 2 weeks on average; therefore, once the necessary treatment is complete, the patient is discharged and returns to the community when typical nursing care would start. In this situation, hospital nurses perform only duties supporting in-hospital medical care (organizing and communicating observation information), and nursing care, such as lifestyle support or therapeutic care techniques, begins after the patient has

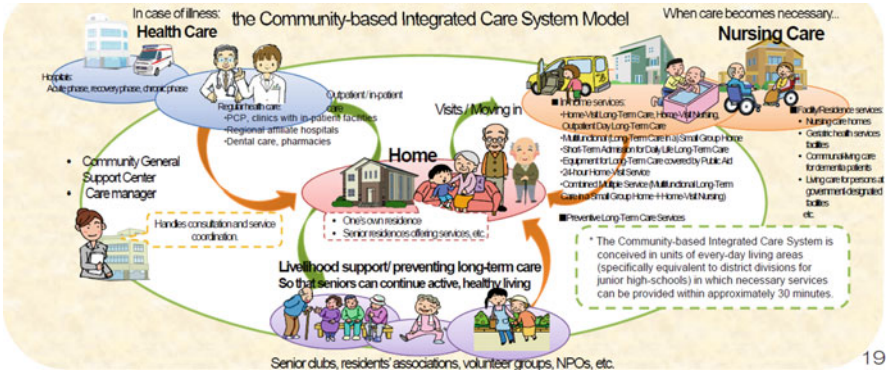

Fig. 2 Establishing the community-based integrated care system. *NPOs* nonprofit organizations, *PCP* primary care physician

returned to the community. Once discharged, patients are out of reach of hospital nurses and begin recuperation with home care/nursing. For community-based medicine in particular, the smooth handover of information from hospital nurses to visiting nurses and other related professionals who take over the responsibility for care is extremely important for the inclusion of "caregiving/welfare" professionals, whose primary duties involve lifestyle support.

In the plan for a community-based integrated care system (Fig. 2), presented by the Ministry of Health, Labour and Welfare (2017), two professions collaborate to provide client-focused care. The present shift from hospital-focused to community-focused medicine indicated that a client-centered approach, which is built upon information sharing between medical/nursing and caregiving/welfare professions, is essential. In community-based recuperation in particular, care does not merely end with the isolated world of the hospital and requires highly personalized observation and nursing support. Given this situation, the application of telecommunication technology is of particular importance in striving to realize a community-based integrated care system. As nurses have become responsible for medical information in hospitals, they are expected to play the role of information coordinators in the community-based integrated care system.

6 The Information Environment Required to Develop a Telenursing System

As shown in Fig. 3, the development of a telenursing system requires four basic functions: "a plan for organizing and managing healthcare information," "sharing and communication of records allowing Interprofessional collaboration," "application of information technology such as AI or robotic process automation to utilize data," and "information literacy in both the professionals managing information and users (clients)." Concerning IoT, the extent to which observation information pertaining to health care can be shared and collected is an important issue for health literacy and the protection of personal information. In the future, all devices used in a client's daily life are expected to be maintained and managed over the Internet; therefore, it will be necessary to use information processing, which accounts for this.

The application of information focused on AI and robotic process automation technology, as shown in the top right section of Fig. 3, is advancing particularly rapidly in the modern day. This field is a vital resource for both the development of health application tools and the realization of personalized medicine. Decisions based on big data, which are essential in predicting health status at an individual level accurately, are also necessary for the realization of personalized medicine.

Considering these issues as prerequisites, rapid research advances, including (1) the development of methods for decision support using AI, including rules engines and machine learning; (2) availability of information (for professionals and clients) through the use of big data; and (3) the development of multilingual,

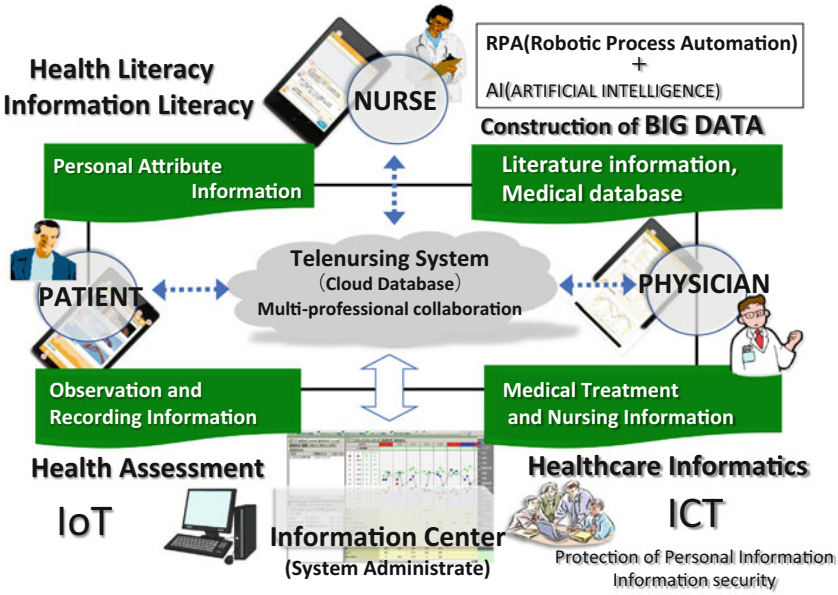

Fig. 3 The information environment required for a telenursing system. *IoT* Internet of Technology

cross-platform software independent of the operating system or hardware will be required for next-generation telenursing. Moreover, the creation of a cloud database from which these data can be managed entirely and working on information security measures are pressing tasks for medical/nursing and related professionals in an age of rapidly advancing information utilization (Kawaguchi, Toyomasu, Imai, 2018).

7 Necessary Elements of and Challenges to the Development of a Telenursing System

The elements required to develop a telenursing system are shown in Fig. 4. Point ① is a user-oriented telenursing application based on the structure of personal health records. In recent years, many information application tools have been developed for smartphones and incorporated into daily life. The functions most necessary for telenursing include information sharing, the structure of medical care, and patients (D to P with N). Concerning information sharing, various systems based on web applications are presently in development for medical use. However, information sharing remains difficult because programs developed for different platforms are used in different ways. In future, it will be essential to develop applications based on a cross-platform structure that is compatible with all platforms. In addition, it will be necessary to develop software that takes ease of use (usability) and use with

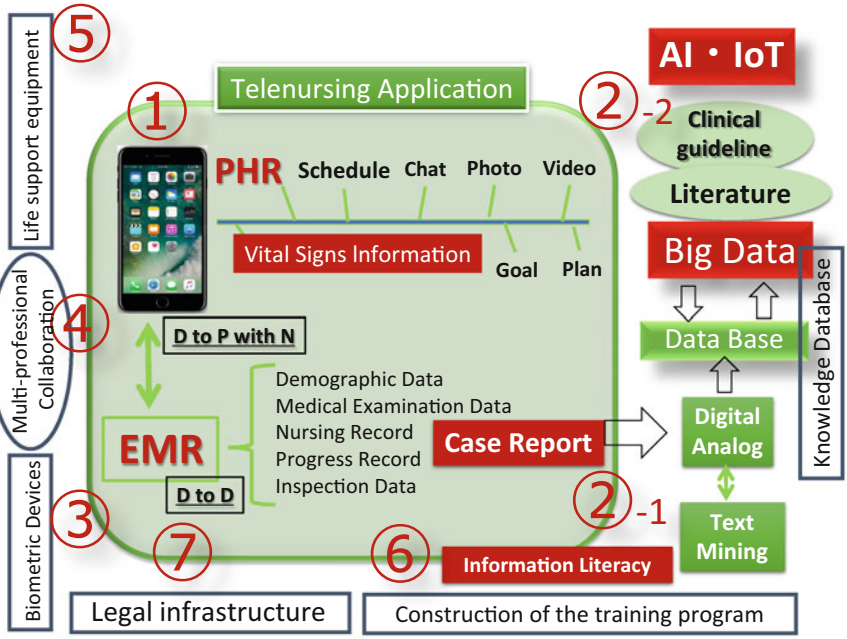

Fig. 4 Elements necessary for telenursing. D = Doctor, N = Nurse, P = Patient

smartphones, which have become a part of the infrastructure of everyday life, into consideration.

Point ② involves the use of databases including AI and IoT. Daily observation data will be accumulated in a database constantly and become a resource for decision-making with future patients. Further, written data sources used as clinical evidence, such as clinical guidelines, in the form of external sources, including numerous research articles and provided through external links, are expected to support decision making by both experts and clients.

Point ③ involves the development of devices that allow remote observation of the body. These devices could contribute considerably to the prediction of risk and support health maintenance through an understanding of day-to-day changes in the body over time. Many studies have examined such devices, but they developed equipment to measure only parts of the body. We remain hopeful that a device will be developed to capture systemic changes and predict health impairments that can be used practically in telenursing.

Points ④ and ⑤ reflect the necessity of information sharing in Interprofessional collaboration. Collaboration with caregiving/welfare professional is particularly important. An advanced electronic medical chart system, which coordinates various medical treatment systems and caregiving service providers rather than individual medical institutions or caregiving facilities, has been proposed, and implementation is underway and aims to provide excellent service that involves central management

of health, medical, and caregiving information related to the improvement and maintenance of citizens' health.

Point ⑥ involves the importance of training personnel capable of understanding and handling this type of information system to operate and manage the next generation of telemedicine and telenursing. Moreover, reeducation and a training/licensing system for each profession are necessary. In addition, training in professional skills that will facilitate the use of this type of system will be vital in not only medical education but also basic nursing education to cultivate new expertise for the next generation.

Point ⑦ involves the clarification of legal rules pertaining to these activities. With respect to legislation concerning information security, it will be essential to prepare cybersecurity measures and related legislature, as the system will maintain and manage highly personal information. Further, because the system will require knowledge of information and computer science in addition to medical and nursing science, it will be important to establish certification systems for these fields.

8 Conclusion

In this chapter, we discussed the expected effects of telenursing by introducing research results that should be addressed in the development of a telenursing system. Topics to be addressed in nursing research can be divided mainly into two categories. The first category is "the development of sensing technology capable of observing healthy lifestyle behaviors over time." A multitude of devices and applications are currently being developed, but only partial problem-solving has been possible thus far, and the level of integration necessary for information sharing is yet to be reached. Therefore, initiatives that foster standardization and collaboration between businesses involved in health devices will be necessary. The second category is "the development of an integrated application for the management of health information that is simultaneously useful for day-to-day self-management and allows sharing of health information by hospitals and the community." To achieve this, the development of a multilingual, cross-platform operating system is required. A primary application should be developed to provide a comprehensive link between hospitals and communities.

By addressing the abovementioned challenges, telenursing could extend lifespan through not only the optimization of operations but also interprofessional information sharing and early detection and treatment. Furthermore, telenursing could lead to the reduction in medical expenses while simultaneously providing peace of mind and comfort to people in all situations in hospitals and communities.

Conclusively, this chapter identified necessary elements and challenges of a telenursing system primarily from the viewpoint of translational health information sciences.

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