Brief Overview of Departments of the

Global Nursing Research Center
at the University of Tokyo
Global Nursing Research Center
Graduate School of Medicine
The University of Tokyo

Brief Overview of Departments
2017
Greetings from the Director

With a falling birthrate and a super-aging society, Japan is in need of a paradigm shift that will move it away from a medical care that cures toward a health care that supports. Given the central role that nursing plays in a health-supportive environment, it must develop into a new field as a science. To promote research into an innovative nursing science and to create an interdisciplinary research and educational environment that fosters young leaders in nursing research, the Global Nursing Research Center (GNRC) has been established as the first research center to be affiliated with the Graduate School of Medicine.

The GNRC will take on a leading role in the development of nursing science throughout the world since Japan is facing an unprecedented future. Further, the fostering of global leaders who can apply the findings of our current studies is precisely what is needed for the development of nursing science, and also one of the aims of the GNRC.

The Global Nursing Research Center will seek to execute the following three goals in the next four years:
1. to establish an innovative nursing research field based on interdisciplinary integration,
2. to carry out leading-edge research and present it to the world with young researchers pursuing the sciences, and
3. to build up the foundation of these new fields through repeated research trials that will strengthen the new research and education systems.

To achieve these goals, we have established two divisions. The first is the Division of Care Innovation, with the aim of the ‘developing and producing care products that lighten unfavorable conditions of daily life, due to the health impairment of each patient.’ The other is the Division of Nursing Systems, with the aim of ‘providing nursing practice solutions that reflect important cultural and social concerns, constructing Japan-origin nursing theories that support high-quality practices, and making policy proposals.’ In this book, we will provide an overview of these departments.

We would be most grateful if not only other researchers, but also many people throughout society, come to support our activities as a training center designed to develop young researchers able to play a central role in Japan and the world.

Thank you,
I. Division of Care Innovation

Professor Hiromi Sanada (Department of Gerontological Nursing/Wound Care Management)
Project Professor Taketoshi Mori (Department of Life Support Technology (Molten))
Associate Professor Gojiro Nakagami (Department of Gerontological Nursing/Wound Care Management)
Project Associate Professor Ryoko Murayama (Department of Advanced Nursing Technology)
Project Associate Professor Takeo Minematsu (Department of Skincare Science)
Project Associate Professor Koichi Yabunaka (Department of Imaging Nursing)
Project Associate Professor Makoto Oe

We promote research activities such as robotics nursing and imaging, with the aim of the developing and producing care products that lighten unfavorable conditions of daily life due to the health impairment of each person.

Robotics Nursing
We engage in R&D related to the productions of medical devices and measurement instruments for clinical settings, such as software that guides the interactions of communication robots. One of our products is a 3D scanner/printer for patients.

Biological Nursing
We are developing a new field in Nursing Science, which clarifies the mechanisms underlying various issues and identifies intervention targets for essential problems. Its method considers a patient as a life form. Understanding the biological responses helps us to develop essential solutions for care. We provide new nursing technologies by applying laboratory skills such as a skin blotting.

Visualized Nursing
We will propose nursing skills based on advanced imaging technologies related to clinical nursing fields, evaluate them by translational research, and apply them to the clinical nursing fields in order to realize a safe, secure, and comfortable period of recuperation. Moreover, we will develop new systems by integrating imaging technologies and information technologies, and establish new methods for analyzing clinical settings and home care settings.

Clinical Nursing Technology
We seek to find solutions to clinical issues in nursing through multidisciplinary studies and research. In terms of our scientific approach, we conduct epidemiologic surveys and research at a genetic level, and then evaluate the technologies/devices we have developed with companies. We try to provide epoch-making technologies that will meet clinical needs.

Reverse Translational Research
We not only seek to conduct research that bridges existing basic research with clinical application, but also aim to realize needs-orientated care through understanding data made available by clinical research and by developing products.
1. Robotics Nursing

Professor Hiromi Sanada (Department of Gerontological Nursing/Wound Care Management)
Project Professor Takefumi Mori (Department of Life Support Technology (Molten))

Overview

Robotics nursing is a research field of the Division of Care Innovation in the Global Nursing Research Center (GNRC) of the Graduate School of Medicine, the University of Tokyo. The purpose of the field is to create a life support methodology utilizing robotics technology. It is grounded in the development of a nursing approach that allows intervention based on making predictions from actual conditions and life-related symptoms and through the elucidation of mechanisms, based on such natural science as engineering, science and information science. The members of Robotics Nursing include a professor and a project professor. In addition, a project lecturer and a project assistant professor from the Department of Life Support Technology (Molten) support the activities.

Research

In order to prevent various diseases and injuries caused by daily human behavior, we conduct studies to develop advanced monitoring and preventive care systems. We will apply the research results to the clinical setting through 3D rapid prototyping of nursing equipment and measurement devices, software development of communication robots, 3D measurement of nursing behaviors and interaction, 3D rapid prototyping, design development, fabrication/production and testing. We investigate science and technology of “mimamori” engineering, nursing engineering, and human behavior measurement aiming to develop robotics nursing and sensor medical information engineering. Based on information science, mechatronics and robot engineering, we will explore a new field of transcending “mimamori,” nursing and engineering, and consider means for enriching our current and future lives. We will promote research seeking a methodology to support healthy and comfortable living by utilizing various sensor technologies, artificial intelligence (AI), ICT · IOT, and grasping the usual situation and daily life of the people from the viewpoint of big data, therein further predicting illness, injury and incidents.

Integrated Analysis of Nurse Call History Big Data

By processing large amounts of nurse call data collected from hospitals as big data, we analyze the characteristics of each ward and time series change, integrating this information with the data regarding nursing necessity, etc., to improve the nurse's work improve patient satisfaction.

Ensuring Safety of Patients by AI using Robotic Mattress

To prevent falling from a bed, we measure body pressure using robotic mattress and estimate the risk motions by AI. This automatic system contributes to ensuring the safety of patients.

Development of a Communication Robot for Elderly with Dementia

We develop and introduce new software and applications of robots such as "Pepper" and "Robohone" for appropriate voice calls and toilet guidance to elderly people with dementia.

Major Research Themes in this Fiscal Year

- Integrated analysis of nurse call history big data
- Ensuring safety of patients by AI using robotic mattress
- Development of communication robot for elderly with dementia
- Handy scanning system for 3D assessment of limbs
- Development of 4D gait modeling system and gait improvement training system for prevention of foot lesions
- Development of devices for prevention of compression wound by non-invasive positive pressure ventilation masks utilizing 3D printer
Research Achievements


2. Biological Nursing
Professor Hiromi Sanada (Department of Gerontological Nursing/Wound Care Management)
Associate Professor Gojiro Nakagami (Department of Gerontological Nursing/Wound Care Management)
Project Associate Professor Takeo Minematsu (Department of Skincare Science)

Overview
We perform biological nursing research, which is the unified science of basic biology designed to research the nature of a problem and its solution in practical nursing science so that it can be applied to the clinical field. Biological nursing is a methodology to propose a hypothesis by analytical observation at the levels of an individual, organ, tissue, and cell, and to reveal it through biochemical and molecular biological approaches. These findings can indicate novel targets for nursing intervention, and lead to the development of novel technologies.

Research
The skin is a unique organ that we can directly watch and touch. Because several sensory systems are distributed in the skin, skin disorders have physical and mental influences. Therefore, this department mainly focuses on skincare for vulnerable skin due to aging and dermopathy.

“Skin blotting” is our original technique for skin assessment. Conventionally, the physiological status of the skin had to be examined only by invasive biopsy sampling. Skin blotting actualized the possibility of a non-invasive sampling for examination. We are conducting research designed to improve this technique, establish biomarkers for skin disorders, and reveal the reliability and validity of this technique.

Our priority subjects are alopecia due to chemotherapy for breast cancer and pressure injuries in wheelchair athletes.

To date, the focus has been placed only on the loss of hair. The abnormality of the scalp has not been studied yet, though the patients also suffer from the pain and itching of the scalp. We are attempting to clarify the actual situation and pathophysiology of scalp disorders in chemotherapy-induced alopecia, and to develop effective scalp care technologies.

Wheelchair athletes exert excessive load on the buttock tissue of the seat surface so as to pursue their best performance. As a result, the developed pressure injury on buttock reduces their performance and compels them to rest. We are attempting to develop technologies to protect the buttock tissue of wheelchair athletes in daily life and recover from the damage incurred due to performance. In addition, we seek to offer education about pressure injuries. We believe that our efforts will result in their best performance, as well as an improvement in the quality of their lives.

Major Research Themes in this Fiscal Year
- Development of a predicting method for pressure injury development through the use of skin blotting
- Mechanisms of aquagenic pruritus in the elderly, and the development of a preventive skincare method for it
- Development of scalp care for chemotherapy-induced alopecia
- Study on pressure injuries in wheelchair athletes
- Development of novel materials for skin regeneration
Research Achievements


3. Visualized Nursing

Professor Hiromi Sanada (Department of Gerontological Nursing/Wound Care Management)
Associate Professor Gojio Nakagami (Department of Gerontological Nursing/Wound Care Management)
Project Associate Professor Koichi Yabunaka (Department of Imaging Nursing)

Overview
Currently, we are facing many problems in Japan, due to a shrinking and rapidly aging population. In this situation, it has become necessary to introduce technology and telemedicine, especially for use in home care settings. However, current nursing technology depends on subjectively interpreted techniques, such as inspection and palpation. Consequently, there is an urgent need for research using more objective methods in nursing science, including imaging technology. Therefore, we are introducing a new Social Cooperation Program for Imaging Nursing, which promotes the development of nursing assessment technology using ultrasound technology that can be directly applied to the clinical field.

Research
Realization of a “safe, secure, and comfortable medical care life” through the use of imaging nursing science is our first priority. For this purpose, our projects include the monitoring of nursing care developments based on imaging technology, the proposal of new nursing technologies, and the evaluation of new imaging technologies, which are so called translational research to develop a care system that can be applied to clinical field. In addition, we are constructing a model of imaging nursing science education for cultivating nurse scientists who can facilitate the usage of these new technologies.

Development that Supports the Nursing Assessment without Needing the Special Skill
The conventional imaging often shows a diagnosis by medical imaging. On the other hand, ultrasound is used most frequently for this evaluation because it is non-invasive, widely available, rapid, and relatively inexpensive. In addition, ultrasound devices have become available to nurses as a usable tool in the clinical setting. Recently, lightweight ultrasound devices can be used, offering high image quality multi-purpose advancements. However, technical knowledge and skill are required for acquisition and interpretation of the ultrasound image, and they cannot be conveniently used by nurses. To this end, our department is developing a portable ultrasound device (lightweight, high image quality, wide-band frequency) that supports the nursing assessment for coating software without needing special skills. Concretely, first, the nurse does not require the special scanning skill and can acquire imaging nursing education by e-learning. Second, it is possible for the nurse to use the image interpretation software tool (automatic measurement of urine volume, stool retention cognitive function, aspiration cognitive function, pressure ulcer evaluation function), and make a simple, accurate disease state assessment. Finally, it is possible for the patient to live with the benefit of comfortable medical care. In addition, the information service offered to the doctor is indispensable in smoothly providing medical care at home.

Major Research Themes in this Fiscal Year
- Development of software which supports nursing assessments without the need for special technology
- Development of educational software for e-learning
- Development of a method for the automatic measurement of urinary volume
- Development of a function which recognizes fecal retention in the colon
- Development of a function which recognizes signs of aspiration
- Development of a function which supports the assessment of pressure ulcers
Research Achievements


4. Clinical Nursing Technology
Professor Hiromi Sanada (Department of Gerontological Nursing/Wound Care Management)
Project Associate Professor Ryoko Murayama (Department of Advanced Nursing Technology)

Overview

Recently, medical diagnosis and treatments have developed remarkably in terms of medical services. Therefore, nursing technology has been forced to evolve rapidly along with these changes. The social cooperation program was established to further the development of nursing technology and to develop a new research model through collaborative research with clinical departments and nursing department of the University of Tokyo Hospital and the Division of Health Sciences and Nursing of the University of Tokyo.

Our primary belief is to “never allow patients to be forced to endure in their health care.” We hope that through our activities, we can assist patients to live longer and healthier. Furthermore, we will disseminate advances in nursing technology based on the needs of clinical practices worldwide from UTokyo.

Research

In Clinical Nursing Technology, we seek solutions to clinical issues in nursing through multidisciplinary studies and research. In terms of our scientific approach, we conduct epidemiologic surveys and research at a genetic level, and then evaluate the technologies/devices we have developed with companies. We try to provide epoch-making technologies that will meet clinical needs.

Major Research Themes in this Fiscal Year

- Development of Nursing Technology for Early Detection of Extravasation using the Thermosensitive Liquid Crystal Film

Intravenous therapy using a peripheral intravenous catheter is a common and useful method for peripheral venous administration of medicine or fluid. However, our previous observational study found that in medical and surgical wards, the frequency of catheter removal because of catheter failure was 18.8%. Furthermore, the most common reason for catheter failure was infiltration (Murayama R, et al., 2017).

We developed a new assessment method for extravasation causing subcutaneous induration using continuous thermographic observation (Oya M, et al., 2017). The aim of our next study is to verify the usefulness of the imaging using thermo-sensitive liquid crystal film (WO2015/045371) (Fig. 1). The final goal of this study is to develop sensing technology for the early detection of an abnormality.

- Elucidation of the Mechanism of Infiltration, the Development of a New Intravenous Catheter for the Prevention of Catheter Failures, and the Proposal of a New Program for the Management of Infusion Therapy

Our previous prospective observational study using ultrasonography found that the frequency of thrombus with subcutaneous edema in the catheter failure cases was significantly higher than that in the normal catheters (Fig. 2). A multivariate analysis demonstrated that two or more puncture attempts were significantly associated with thrombus with subcutaneous edema related to catheter failure (Takahashi T, et al., 2017). Furthermore, we previously suggested selecting a vein that was approximately three times as large as the outside diameter of the PIVC to prevent catheter failure (Tanabe H, et al., 2016).

Animal model is needed because of the need to elucidate the mechanism of infiltration. Subsequently, we will develop a new intravenous catheter for the prevention of causes of catheter failures based on these results. Furthermore, we will propose a new program for the management of infusion therapy using ultrasonography.

Figure 1 The change of color of the thermo-sensitive liquid crystal film by infiltration

Figure 2 Typical ultrasonography features
Ultrasound images showing the vessel wall (arrowheads) and catheter tip (arrows)
Research Achievements


5. Reverse Translational Research
Professor Hiromi Sanada (Department of Gerontological Nursing/Wound Care Management)
Project Associate Professor Makoto Oe

Overview
To realize medical care that “supports,” we must pursue interdisciplinary research and develop products that address daily inconveniences experienced by individuals with health issues. Previously research has focused on translational research, which analyzed all processes from the development of pharmaceuticals and medical equipment to clinical research as one single thread in handling data obtained from basic research in medicine and biology. At the same time, however, it is impossible for the results of this basic research to be applied completely to humans. Therefore, sometimes development came to a halt. In particular, in the field of nursing research that supports the everyday lives of individuals, not all fruits of the work done in basic research could be applied to nursing care products. Instead, we must take an approach that addresses the needs of the people who require nursing care and the contexts in which such care is practiced. In the department of reverse translational research, we not only seek to conduct research that bridges the existing basic research with clinical application, but will also aim to realize need-oriented care through understanding data made available by clinical research and by developing products.

This field was created in April 2017 in tandem with the opening of the Global Nursing Research Center, comprising one concurrent professor, one full-time project associate professor, and one full-time project researcher.

Research
This field seeks to conduct reverse translational research such as on wounds including diabetic foot ulcers. It also seeks to offer a model for this type of research to nursing studies. Furthermore, it will disseminate research results overseas to promote the globalization of nursing care. Specifically, the studies will focus on developing dressing materials, assessment scales, and prevention support systems for diabetic foot ulcers.

Major Research Themes in this Fiscal Year
- Development of dressing materials for diabetic foot ulcers
- Development of support systems to prevent diabetic foot ulcers by the use of thermography
- Development of assessment scale for diabetic foot ulcers

Example of development of needs-oriented care; Development of dressing materials with vibration
Research Achievements


Ⅱ．Division of Nursing Systems

Professor Kiyoko Kamibeppu (Department of Family Nursing)
Professor Noriko Yamamoto-Mitani (Department of Gerontological Home Care and Long-term Care Nursing)
Associate Professor Megumi Haruna (Department of Midwifery and Women’s Health)
Associate Professor Yukie Takemura (Department of Nursing Administration)
Associate Professor Yuki Miyamoto (Department of Psychiatric Nursing)

We promote research activities such as health-quality outcome research and care quality management with the aim of providing nursing practice solutions that reflect important cultural and social concerns, constructing Japan-origin nursing theories that support high quality practices, and making policy proposals.

Health Quality and Outcome Research

The Department of Health Quality and Outcome Research aims to improve the quality of life and health quality among patients and their family from their perspectives, including how they live and die. A methodology considering systemic effects is essential in order to evaluate their health quality, especially the health quality among the overall family and nursing system that provides cares.

Our department contributes to developing a methodology to evaluate their health quality, conducting studies using outcomes from their perspectives, and then finally creating new nursing systems that are effective and optimized in order to improve the total quality of life and health quality.

Care Quality Management

At the Department of Care Quality Management, we explore new research methodologies/innovations of research for care quality assurance and continuous quality improvement system. Examples of research projects are: developing quality indicators and benchmarking for the long-term care of the elderly; creating care quality improvement activities and evaluations based on case study conferences; delineating home visit nursing practices; and researching the innovative use of the functional assessment of the elderly in an integrated community care system. We use an action research approach for care quality assurance/improvement with clinicians.
Overview

In a multicultural society, needs among patients and their family for nursing and health care are diverse and differ between patients. The primary goal of nursing care and systems is to improve the health quality experienced by patients and families, including how they live and die, throughout evaluating them closely. A methodology considering systemic effects between patients, their family, and health professionals is essential to evaluate their health quality appropriately. Our department aims to create new nursing care and systems that will improve the health quality within among a whole family in order to prevent a situation, such as “a patient is taken care of well, but a caregiver falls sick”.

Our department develops methodologies to evaluate health quality from the perspectives of patients and their family, create knowledge regarding effective, comprehensive care and treatments, as well as nursing and social systems that collaborate with different fields in an inter-disciplinarily manner. In addition, we aim to systematically transfer more effective care and treatments based on their health quality to future generations. In short, we hope to develop preventative nursing care and systems that will help to solve present and future health problems among patients and their families.

Research

Our department conducts several types of research to evaluate health quality from the perspectives of patients and their families in collaboration with inter-disciplinary research teams in national and international regions. We would like to introduce research regarding the quality of life (QOL) of children as one of the key areas of research we focus on. Although we have conducted research to improve the QOL among people with several different backgrounds regardless their developmental stage or the presence of disease, we have been recently focusing on developing a tool to evaluate the QOL among children by the children themselves and their primary caregivers, and have been able to show the feasibility, validity, and reliability of the scale. The PedsQL can be applied to not only healthy children, ranging from infants to adolescents, but also to children with several health problems, such as cancer, brain tumor, and organ transplant. In addition, we have been increasing the knowledge necessary to interpret the QOL of children more sterically by identifying how children think about their own QOL and how parents recognize the QOL of own children.

Recently, we have been introducing new outcomes from the perspective of nursing, such as QOL, as the outcomes of medical treatments, collaborating with the Japan Children's Cancer Group (JCCG) across the country. Furthermore, we have been providing new methods related to nursing care and assessment that meet developmental stage and motivations among pediatric patients in several outpatient clinics of the University of Tokyo Hospital.

Major Research Themes in this Fiscal Year

- Identification and generalization of the characteristic care of family nursing in end-of-life care
- Family data obtained from multiple family members and case examples that improve family function as a whole
- Development an effective health program for abused pregnant women to improve their childrearing and perinatal mental health
- Development of a support program for employment focusing on illness perception among adult survivors of childhood cancer
- Longitudinal survey on the balance between care and work in family members who care for people with dementia while working
- Development and verification of health support programs for working women experiencing pregnancy and childbirth
- Maternal near miss in El Salvador: a new strategy to decrease maternal mortality
- Restraint and seclusion prevention: development of a dialogue-oriented approach based on peer support relationships
Research Achievements


2. Care Quality Management
Professor Noriko Yamamoto-Mitani (Department of Gerontological Home Care and Long-term Care Nursing)
Associate Professor Yukie Takemura (Department of Nursing Administration)

Overview
At the Division of Care Quality Management, we are striving to contribute to a super-ageing society by promoting continuous quality improvement in nursing and care and developing quality indicators and innovative interventions.

Research
In this Division, we attempt innovative research projects that are not bound by conventional research methods to build sustainable systems to ensure quality care (nursing and care) and its continuous improvement. This includes: 1) development of quality indicators for long-term care for the aged that can be used commonly across hospitals, facilities, and homecare, 2) development of a benchmarking system in long-term care, 3) evaluation of staff interventions to achieve quality improvement in medical and nursing facilities, 4) visualization of homecare nursing practices, and 5) development of continuous evaluation system for senior citizens’ physical/cognitive functions in the community.

We are conducting the following projects for Care Quality Assurance and Improvement.

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<th>Project Description</th>
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<td>① Survey on care quality and staff work engagement and burn-out at long-term care facilities</td>
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<td>② Development of quality indicators for long-term care</td>
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<tr>
<td>③ Development of an intervention framework to improve care quality through cooperation between long-term care practitioners (nurses and caregivers) and researchers, and the validation of results</td>
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Research Example
A nationwide survey on care quality in long-term care hospitals we conducted revealed that nurses and care workers in these hospitals experienced a higher level of burn-out and lower work engagement, as compared to such workplaces as acute care or home care. Based on these results, in collaboration with clinical nurses/care workers, we have developed an intervention program for nurses and care workers in long-term care hospitals to increase job satisfaction. We are now planning an intervention study to evaluate the program.

Main Research Topics
- Care quality assurance and improvement
- Community organization and collaboration in integrated community care system
- Visualization of organizational dynamics in situations of crisis and change and nursing organizational management
- Nursing management skill development and evaluation of related outcomes
- Skill development for those providing support through outreach consultations with nursing managers at small and mid-sized hospitals and evaluation of related outcomes
- Following the long-term impact of organizational fairness and workplace environment on nursing management and nursing staff
Research Achievements


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