

●Development Stage

(Fiscal Year 2008-2010)

Nagasaki Area

Use of non-invasive sensing technology for patient-friendly preventive and home medical care systems

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● Framework for Project Promotion

- Project Director.....Jun Oyama
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● Core Research Organization

- Nagasaki University

● Major Participating Research Organizations

- Industry...Konica Minolta Medical & Graphic, Inc., Kenzmedico Co., Ltd., SystemSoft Corp., Nihon Riko Medical Corporation, FujiFilm Corporation, Order-Made Souyaku Co., Ltd., Mechatronics Co., Ltd., Kyushu Dentsu Co., Ltd., Science Research Co., Ltd., Terumo Corporation, SFK Medical Corporation, Apple Doctor K.K., DOCOMO Technology, Inc.
- Academia...Nagasaki University, Nagasaki Institute of Applied Science, Kawasaki Medical University
- Government...Industrial Technology Center of Nagasaki, RIKEN, Kumamoto Techno Sangyo Zaidan

Aims of Project

Nagasaki Prefecture includes a number of isolated islands and remote areas from where it is difficult to access medical facilities. In addition, the aging of the population necessitates the establishment of a preventive and home medical care system for residents of these regions. This project aims to improve the precision and portability of lung-sound examination systems, urine-flow management systems, and blood-glucose measurement systems based on non-invasive sensing technology developed as part of the Basic Stage of the City Area Program. The project will ultimately aim to develop health-monitoring devices that will enable the assessment of patient health at home or at the hospital bedside by the patient themselves or by nurses, care specialists, or other field staff with restricted medical-care responsibilities. We will also develop experimental preventive and home medical care systems in which the units are connected to the existing medical network via, for example, mobile phones. The effectiveness of these systems will be investigated in actual settings via the cooperation of medical institutions and care facilities located on isolated islands and in remote areas, and the Nagasaki University Hospital of Medicine. This will lead to the establishment of a new patient-friendly preventive and home medical care system approach, called the "Nagasaki System."

Contents of Project

1. Development of a Lung-Sound Examination System

...The Lung-Sound Examination System currently under development will convert the lung sounds collected via an electronic stethoscope to digital signals that will be read into the examination section of the Lung-Sound Examination System. The data will be compared with those obtained from other lung disease patients in order to determine the closest matches and to (1) determine whether the lung sound is normal or abnormal, (2) judge whether it may indicate the presence of disease, and (3) inform users of the progress of known disease. The tone quality of lung sounds varies with factors such as the type and progress of disease, age, and body type. To precisely examine lung-sound abnormalities, lung-sound samples will be collected throughout the research period from patients with various diseases, with the aim of improving the lung-sound database and achieving high precision for the algorithm used to identify abnormal sounds.

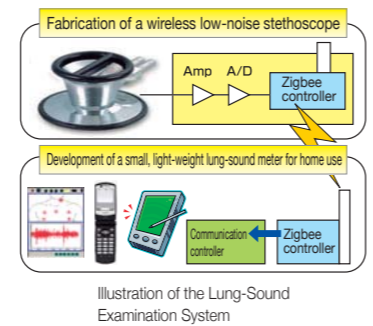


Illustration of the Lung-Sound Examination System

2. Development of an Optical, Non-Invasive Blood-Glucose-Level Measurement System

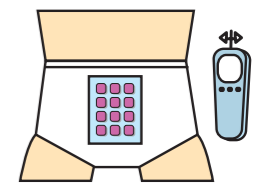
...The goal of this project is to develop and commercialize a blood-glucose-level meter capable of measuring blood glucose levels from outside the body using only light. The Three-Fiber-Based Diffuse Reflectance Measurement (TFDRM) is an original system developed as part of the Basic Stage of the City Area Program. This system minimizes errors in blood glucose measurement arising from differences in the path length of scattered light due to measurements undertaken at different sites, and variations among individuals due to differences in body composition, including fat. The system will be used as the basis for producing a test device for clinical use that is capable of making measurements in areas of the body with a high concentration of arteries with a detectable pulse, such as the palm of the hand. The accumulation of long-term clinical data using this device will enable optimization of the measurement parameters for each site, including the palm of the hand, and the wavelength for the calibration model. The reliability of the system will also be evaluated. Based on the results, we will produce a prototype tabletop blood-glucose meter suitable for blood glucose measurements at home or at hospital bedsides.



Tabletop Blood-Glucose Meter

3. Development of a Urination Management System

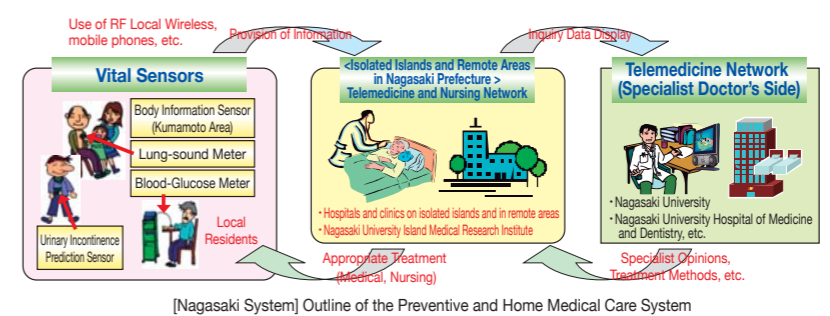
...We aim to develop a urinary incontinence prediction sensor based on measurement technology developed as part of the Basic Stage of the City Area Program. The sensor utilizes ultrasonic waves to precisely measure the three-dimensional shape of the bladder and other organs from a limited space. Furthermore, the amount of urine will be calculated based on the pooled urine volume prior to voiding and the residual urine. The urination recording and management system will be developed with a urination recording unit that automatically and simultaneously measures and records the pooled and residual urine. We will also develop software that manages the urination records.



Urination recording and management system

4. Development and verification of the preventive and home medical care system

...Improved measurement devices and devices developed by the Kumamoto City Area Program (e.g., body information sensors) will be connected to Nagasaki Prefecture's telemedicine system for isolated islands and remote areas via mobile phones and other electronic media. This will help to establish a new preventive and home medical care system for patients on isolated islands and in remote areas. Tests will be conducted to verify the system's effectiveness, and we will conduct post-project evaluations of the system and the precision and safety of each measurement device. Obstacles related to commercialization of the device will be identified, and measures to address these problems will be investigated in order to contribute to product development after completion of the program.



[Nagasaki System] Outline of the Preventive and Home Medical Care System

