

# Mobile Healthcare System for Preventive of Metabolic Syndrome

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**Abstract**—Recently, metabolic syndrome affects a great number of people in Japan. Glycemic control can delay the onset and slow the progression of vascular complications. Lifestyle modification including weight reduction can contribute significantly to glycemic control. This paper describes the mobile application of the healthcare support system for metabolic patients.

## I. INTRODUCTION

Metabolic syndrome such as diabetes is a combination of medical disorders that increase the risk of developing vascular disease and diabetes. Recently, metabolic syndrome affects a great number of people in Japan. Glycemic control can delay the onset and slow the progression of vascular complications. Lifestyle modification including weight reduction can contribute significantly to glycemic control. The Health Support Intelligent System for Metabolic Patients (HSIS) can provide guideline-based decision support for lifestyle modifications in the treatment. Generally, HSIS has two functions:GDS (Guideline-based Decision Support) and TC (TeleCounseling)[1]. This paper describes the mobile application of the healthcare support system for metabolic patients to aim at the lifestyle modification by user's self check. Although the TC function inquires about the patient's actual condition and offers advice to the patient by interactive communication devices such as mobile phone, PDA, and so on, the developed system can execute the function in a mobile phone. Most of the questions are filled by selecting the values and checking the boxes. The system can record user's weight every day and draw the situation of weight decreases. Therefore, the user can modify lifestyle to achieve the predetermined plan for weight decreases. The developed software can be downloaded in the web site[2].

When the system is on the Web, users can't check an own data. So we make the system implementable on the mobile.

## II. METHOD

The mobile application in this research has been developed by the *iappli* development kit for DoJa-5.1 [3], which supports the development of mobile application and includes the emulation on Windows. In the emulation tool, Java2 SDK (Standard Edition Version 1.4.2), Eclipse (3.0.x, 3.1.x), NetBeans (NetBeans IDE 4.1), DirectX (8.1) are required.

The user must accept the license agreement of the developed software, because the patient of serious case are not permitted in the use. The system consists of 3 kinds of questionnaire: basic questionnaire, questionnaire for meals, and questionnaire for exercises. If a user answers all questions in the questionnaire, the system advises the comment and the plan of lifestyle modification automatically. The comments are generated according to the degree of BMI (Body Mass Index, Daily). Some plans of lifestyle modification are generated according to questionnaire. Daily records of weight are shown in the line chart.

Because the 3 kinds of questions are important, we explain them in details. First, the system asks some questions about user's daily life style. The questionnaire is divided into 3 detailed categories.

### 1)Basic questionnaire

Firstly, Fig.1 shows the basic questionnaire. This sheet includes the questions for "Height," "Weight," "daily life style," and "limitation for exercise." The answer for the question of "lifestyle" is selected from the list of "I usually do desk work or housework," "I usually work with standing," or "I usually do physical labor." The 4th question is "yes-no" question.

Fig. 1. Basic questionnaire

### 2)Questionnaire for meals

Secondly, Fig.2 shows the questionnaire for meals. These sheets include the questions of "Do you often eat something

between meals or late night snack?,” “Do you eat 3 meals everyday?,” “How much time do you spend on a meal?,” “Do you eat rice or bread, a main dish, and a salad?,” “How often do you eat vegetables?,” “Do you eat some fried foods?,” “Do you put dressing or mayonnaise on a salad?,” “How often do you drink alcohol?,” “How much do you drink alcohol?” The answer for the 1st question is selected from the list of “I often eat,” or “I don’t eat.” The answer for the 2nd question is selected from the list of “I eat everyday,” or “I don’t eat everyday.” The answer for the 3rd question is selected from the list of “I take less than 20 minutes,” or “I take more than 20 minutes.” The answers for the 4th and the 5th question are selected from the list of “I always eat it,” “I eat it once a day?,” or “I don’t eat it everyday.” The answers for the 6th and the 7th question are selected from the list of “I often do,” or “No, I don’t.” The answer for the 8th question is selected from the list of “I drink everyday,” or “I don’t drink everyday.” The answers for the 9th question are selected from the list of “0,” “1,” “2,” or “3 or more.” The degree of alcohol means “a bottle of beer,” “180 ml of sake,” “180 ml of shochu,” “a cup of whiskey,” or “two cups of wine.”

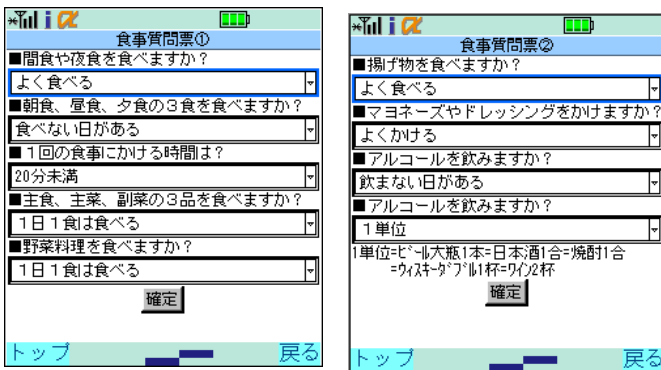


Fig. 2. Questionnaire for meal

### 3) Questionnaire for exercises

Finally, Fig.3 shows the questionnaire for exercises. This sheet includes the questions of “How many minutes do you walk in a day?,” “How many times do you play sports in a week?,” “How many times do you do leisure activity in a week?,” “Do you smoke?,” “How do you smoke in a day?” The answer of the 1st question is selected from the list of “less than 30 minutes,” “less than 60 minutes,” “more than 60 minutes.” The answers for the 2nd and the 3rd question are selected from the list of “more than twice,” “once,” or “almost never.” The 4th question is “yes-no” question. The answer for the 5th question is selected from the list of “less than 10,” “less than 20,” or “more than 21.”

## III. RESULTS

After a user answers all questions in the questionnaire, the system checks the answers and retrieves the comments and the plan of lifestyle modification automatically as shown in Fig.4. The comments are generated according to the degree of BMI. Some plans of lifestyle modification are generated according to questionnaire.

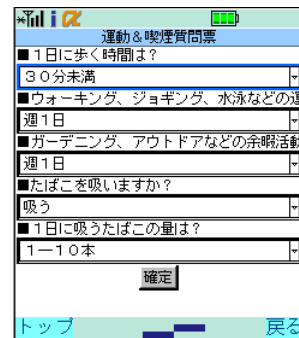


Fig. 3. Questionnaire about exercise

The developed application depicts the chart of variance of weight as shown in Fig.5. It is important for a user to know the variance of weight everyday. The developed system can encourage the user to check his/her condition by himself/herself. If the user feels so hard, the plan will be changed by inputting the new answers in the questionnaire.

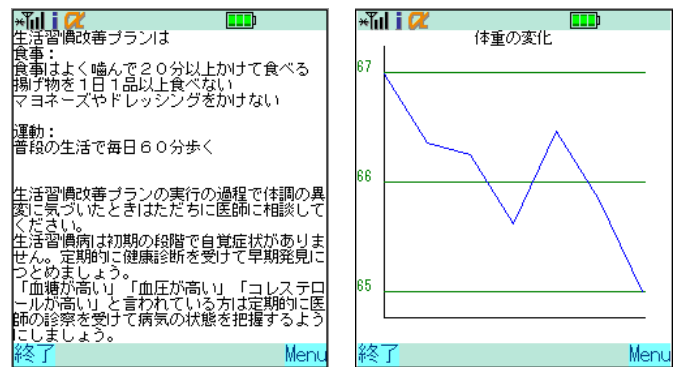


Fig. 4. Comment and plan

Fig. 5. Weight chart

## IV. CONCLUSIVE DISCUSSION

This paper describes the mobile application of the Health Support Intelligent System for Metabolic Patients. We will develop the new function of the calculation of nutritive value at each meal, the record function of meal management and so on. Furthermore, we will see the weight variance through the Internet in near future.

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