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E-assisted nutrition package for hypertension patients

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Abstract

To design and develop the nutrition package programing used for NCDs patients via web application system is the aims of this research. Three common NCDs in Thailand, diabetes, obesity, and especially hypertension, are chosen. The nutrition criteria for users with combinations from these three NCDs are determined. The decision support system is applied to match NCD patients with the food collected in the database. This nutrition lists according to conditions are provided on the web base including the analyzed information such as the details of user data, food intake, body weight, waist circumference and underlying disease.

Keywords: Web-based application; Hypertension; Nutrition; Decision support system.

1. Introduction

High blood pressure or arterial hypertension, commonly known as Hypertension (HT), is a chronic condition in medical causing from persistently elevated blood pressure in the arteries. In the primary care, HT is one of the most common health problems, seen in most countries including Thailand. It basically leads to myocardial infarction, stroke, renal failure, and finally death if not detected early and treated appropriately. Moreover, other risk factors of patients with HT including lipid abnormalities, glucose intolerance or even diabetes, hypertensive heart disease, coronary artery disease, stroke, aortic aneurysm, peripheral artery disease, and chronic kidney disease are also tended to high risk category.

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World Health Organization (WHO) annual report in 2012 showed that more than fifty percent of the people aged over 55, who have common chronic conditions, are also labeled as hypertensive related. This is due to the fact that characterized of the hypertension is primarily found in elderly people who have high systolic pressures. While the best scientific evidence is used in clinical as a guidance on hypertension management, it mostly becomes inadequate or unmanageable as the evidence-based guideline must be up-to-date[1,2]. The 1999 WHO/ISH guidelines responded to some specific concerns and addresses issues for which new evidences have been obtained from epidemiological surveys and therapeutic trials. However, even with new guidelines that are the well-established approaches to diagnosis and treatment, but fewer than half of all hypertensive patients have adequately controlled blood pressure and the successes in treating hypertension are still quit low.

To diagnose the hypertension, most major guidelines recommended using blood pressure level when a systolic blood pressure is $\geqslant$ 140 mmHg or a diastolic blood pressure is $\geqslant$ 90 mmHg, or both, on the repeated examination. Especially primary hypertension or essential hypertension, the basis for diagnosis HT is the systolic blood pressure, which is particularly important as in the most patients. The major factors of primary hypertension are genetic and environmental factors that affect to blood pressure regulation such as excess intake of salt, obesity, and perhaps sedentary lifestyle, etc. However, these are not certainly understood although many works have been intensively studied. Moreover, inappropriately high activity of the renin-angiotensin-aldosterone system and the sympathetic nervous system and susceptibility are related the genetic factors which affected to dietary salt on blood pressure.

Similar to other countries, in Thailand the prevalence of hypertension is considerably high according to the researches[3,4]. There were around 29% to be hypertensive in the central region, and more in the northeastern region due to the high amount of sodium intake[5]. Therefore in order to prevent or delay people from hypertension, and to have a system for early detection and decreasing complications from illness such as coronary artery disease, heart failure, stroke, and total mortality, the nutrient intakes and eating behavior must be re-considerate. This paper proposed the E-assisted nutrition package programing (ENPP) for patient with hypertension via the web applications. In additional HT with diabetes, HT with obesity, HT with diabetes and obesity are also included. The nutrition packages provide 3 meals daily for a week/month set that matched the patient conditions.

2. Methodology

The ENPP is designed to focus on guiding the dietary for the users who have hypertension, diabetes or obesity. In addition, it is also designed for healthy people to keep maintain their diet plans. The program is created based on the decision support system (DSS), which combines decision tree method and if-then rule. The program first lists foods and their specific individual ingredients with nutrition facts such as amount of sodium, sugar and calories matched to the user conditions. The web based application is used to create the service display pages and other user interface. The ENPP is designed to provide three modules: meal lists, user data, and reports. For the first function, the users can follow the nutrition packages that are provided regarding to their physical criteria. The DSS is applied to filter out the foods that contain sodium, sugar or calories higher than the daily value and the appropriated amount that the care taker suggested. The user can select the daily basis for three meals of choices themselves based on their set up. Moreover in the case of over feeding, the program can recalculate the nutrition amount available and represent the new menu.

The second module allows the user to keep monitoring their progresses. With the function designed for allowing users to import and export their personal information. This ENPP can retrieve the dataset from the hospital information system (HIS). This process also collects information such as medical records of users with hypertension disease, problems about poor diet choices, patients lifestyle and food intake. All data and conditions including the outcomes from using this program are presented in the report module. The charts, for example comparison results between the user progress and the safety index, are bundled.

The flowchart for ENPP for patient with Hypertension is shown in Fig. 1. MySQL as database engine is selected to create a patient data (patient history, nutrition, underlying disease) and food lists for control hypertension, diabetes or obesity imported from research. The web-based programming language PHP is used for a web service. The application has a log-in system to the record data in database for the security purpose.