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Penulis : Satriya Pranata, Shu-Fang Vivienne Wu, Tsae-Jyy Tiffany Wang, Shu-Yuan Liang, Difran Nobel Bistara, Yeu-Hui Chuang, Kuo-Cheng Lu, Atmaja Hadi Kusuma

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Achmad Syafiuddin, Ph.D

NPP: 20071300

**LPPM Universitas Nahdlatul Ulama Surabaya**

Website : lppm.unusa.ac.id

Email : lppm@unusa.ac.id

Hotline : 0838.5706.3867

# Paper 6

*by* Difran Nobel Bistara

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# A Pilot Test for Implementing Precision Healthcare Programme in Patients with Diabetes in Indonesia

<sup>1</sup>Satriya Pranata,<sup>1</sup> Shu-Fang Vivienne Wu,<sup>2</sup> Tsae-Jyy Tiffany Wang,<sup>2</sup> Shu-Yuan Liang,<sup>2</sup> Difran Nobel Bistara,<sup>3</sup> Yeu-Hui Chuang,<sup>4</sup> Kuo-Cheng Lu,<sup>5,6</sup> Hadi Kusuma Atmaja<sup>7</sup>

## Abstract

**Background/Aim:** An evaluation of precision healthcare interventions among patients with diabetes in a small sample through a pilot test before being tested in a larger sample is needed. Thus, the purpose of this study was to evaluate the feasibility of a precision healthcare programme. It also assesses the programme's outcome among patients with diabetes in Indonesia.

**Methods:** Data were collected during December 2020. The researchers first gathered data about participant characteristics. Furthermore, the strategies of precision healthcare were implemented in sixty respondents to evaluate the feasibility and outcome of the programme in a month.

**Results:** The participants mentioned that they can follow all procedures of precision healthcare. However, they asked the researcher to provide a guide and monitoring book which provides safe choices information on diet, exercise, glucose monitoring and drug medication. Moreover, participants mentioned that they could complete all questionnaires but needed a company of a research assistant. The benefits of a month of precision healthcare were improved diabetes self-care activity, blood pressure and blood glucose level. However, the body weight, body mass index (BMI), triglyceride, cholesterol and triglyceride glucose index were not significantly improved.

**Conclusion:** A pilot test is needed to ensure the feasibility of the implementation strategy with the culture and background of diabetic patients in Indonesia. Improving diabetes self-care activity stabilised blood pressure and blood glucose during a month, so it can be assumed that precision healthcare approaches were potentially being applied in Indonesia. On the other hand, it is needed more than a month to improve body weight, BMI, triglyceride, cholesterol and triglyceride glucose index. Thus, testing the precision healthcare approach in a larger sample with long time series for patients with diabetes in Indonesia through a randomised controlled trial (RCT) is needed.

**Key words:** Precision health; Strategy; Personalised; Patient preference; Genetic.

## Introduction

Diabetes mellitus has become a global problem. In 2019, there were 463 million people with diabetes in the world. The number will probably increase to 700.2 million people in 2045.<sup>1</sup> Patients with diabetes have a significant risk of experiencing

complications in the future, which are 2-3 times more at risk of developing cardiovascular disease (CVD), more than 10 times likely to experience kidney problems and even amputation.<sup>2</sup> Among these complications, heart disease was the

- <sup>1</sup> Department of Nursing, Faculty of Nursing and Health Sciences, Universitas Muhammadiyah Semarang, Semarang, Central Java, Indonesia.
- <sup>2</sup> School of Nursing, National Taipei University of Nursing and Health Sciences, Taipei City, Taiwan.
- <sup>3</sup> Department of Nursing, Faculty of Nursing and Midwifery, Universitas Nahdlatul Ulama Surabaya, Surabaya City, East Java, Indonesia.
- <sup>4</sup> School of Nursing, College of Nursing, Taipei Medical University, Taipei City, Taiwan.
- <sup>5</sup> Department of Medical Research, Taipei Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Taipei City, Taiwan.
- <sup>6</sup> Fu-Jen Catholic University Hospital, School of Medicine, Fu-Jen Catholic University, Taipei City, Taiwan.
- <sup>7</sup> Department of Nursing, Poltekkes Kemenkes Mataram, Mataram, West Nusa Tenggara, Indonesia.

Correspondence:  
SATRIYA PRANATA  
E: satriya.pranata@unimus.ac.id

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number one killer. The total state expenditure for patients with diabetes in 2019 due to complications reached US\$ 760 million and will even reach US\$ 845 million in 2030.<sup>1</sup>

Efforts made by health professionals in the community and hospitals to prevent complications for people with diabetes were focused on health education and self-management.<sup>3, 4</sup> However, in reality, there are many patients with diabetes who admit that it is difficult to carry out at-home self-management. It is because health information through health education is difficult to understand and does not match each patient's preferences.<sup>5</sup> Ideally, the approach given to diabetic patients is more focused on an individualised approach. This approach has been known as precision healthcare in various countries.<sup>6-9</sup>

Precision healthcare is an approach in the nursing field that emphasises patient preferences, personal goals, characteristics and genetics to achieve better patient self-management.<sup>10</sup> Personalised care is one of essential element in precision health or precision medicine.<sup>11</sup> Meanwhile, precision healthcare for patients with diabetes prioritise each patient's preferences, personal goals, characteristics, glycaemic control and genetics.<sup>10, 12</sup> The precision healthcare programme for diabetic patients in Indonesia has begun to be developed. Implementation strategies and consensus on the implementation of precision healthcare have also been developed. Health professionals such as doctors, nurses and nutritionists believe that precision care will be the solution to reduce the risk of CVD complications in diabetic patients because precision healthcare can improve self-management among patients with diabetes through better glycaemic control.<sup>10, 12</sup>

An evaluation of precision healthcare implementation among patients with diabetes in Indonesia has never been conducted yet. Therefore, the researchers considered that this study needed to be done. Evaluation of precision healthcare in a small sample through a pilot test is necessary to ensure that the implementation strategy follows the culture and background of diabetic patients in Indonesia before being tested in a larger sample through a randomised controlled trial (RCT). Thus, the purpose of this study was to evaluate the feasibility of a precision healthcare programme. It also assesses the programme's outcome among patients with diabetes in Indonesia.

## Methods

### Research design

A pilot test by quasi-experiment with one group was used to test the feasibility of a precision healthcare programme. Data were collected in December 2020. Furthermore, the strategies of precision healthcare to evaluate the outcomes (diabetes self-care activity, blood pressure, blood glucose, body weight, body mass index (BMI), triglyceride, cholesterol and triglyceride glucose index) among patients with diabetes were implemented. The strategies were modified after receiving comments from respondents before testing the new design with a randomised controlled trial in the future study.

### Sample and setting

Patients eligible for the pilot study were people over 20 years of age at the time of recruitment, Indonesian and willing to participate in the trial. The respondents also had no history or diagnosis of ischaemic heart disease, transient ischaemic attack (TIA), peripheral vascular disease and enduring mental health problems. Sixty participants were tested for implementation of a precision healthcare programme. All participants were recruited in a primary healthcare facility in Sumbawa City, East Java, Indonesia.

### The procedure of the pilot study

The procedures were divided into pre-intervention and intervention phases. In the pre-intervention stage, the permission letter of the local government and Research Ethics Committee for Ethical Clearance and further trained research assistance for implementing precision healthcare among respondents was acquired. In addition, for the intervention phase: 1) Sixty potential participants were asked for their participation in the pilot test; 2) Diabetes self-care activity, blood pressure, blood glucose, body weight, BMI, triglyceride, cholesterol and triglyceride glucose index of participants were assessed; 3) Participants were grouped for brainstorming the difficulties on glycaemic target and specific target behaviour; 4) Difficulties experienced by participant were discussed together with health professionals then selected strategies to overcome; 5) Facilitator made a list of participant needs, then ranked participants priorities further setting a goal and writing action as detailed for achieving their glycaemic target and medication management based on their condition and preferences; 6) Based on

comments and validation of sixty participants about the precision healthcare implementation, the strategies were modified for the following study in the future; 6) After a month of precision healthcare programme implemented, the outcomes were evaluated.

**Instruments**

Instruments used in data collection included: the diabetes self-management questionnaire (DSMQ),<sup>13</sup> ISH CVD risk,<sup>14,15</sup> summary of diabetes self-care activity (SDSCA),<sup>16</sup> diabetes quality of life (DQoL)<sup>17</sup> and diabetes distress scale (DDS).<sup>18</sup> The instruments have been tested for validity and reliability in Indonesia.

**Data analysis**

Research assistants collected data. Descriptive statistics such as frequency and percentage, mean, standard deviation (SD), minimum and maximum, as well as the response of respondents to follow all study processes, were used to describe an overview of respondents and the feasibility of precision healthcare strategies. Moreover, paired t-test was utilised to analyse changes of study outcomes. Data were entered into SPSS 24 for Windows and checked for accuracy and missing data.

**Ethical consideration**

The research protocols were approved by the intuitional review board STIKES Bina Usada Bali (study number: 232/EA/KEPK-BUB-2020).

**Results**

**Participant characteristics**

Participant characteristics, status regarding diabetes self-care and physiological value of 60 respondents were collected and reported. Respondents comfort with following precision healthcare programmes through interviews in the pilot study were noted. Respondent’ feedback was used to change precision healthcare strategies for diabetes (Table 1).

Likert-type items assessed age and duration of diabetes among participants is showed in Table 2.

Respondents included in the pilot study were mostly female (80 %). The education of 40 % of respondents was college level and 80 % did not get health information from health professionals.

*Table 1: Characteristics of participants in the pilot study*

Variables	N = 60	%
<b>Gender</b>		
- Male	12	20
- Female	48	80
<b>Ethnic</b>		
- Sumbawa	60	100
<b>Religion</b>		
- Islam	60	100
<b>Education level</b>		
- Literacy	12	20
- Junior high school	12	20
- Senior high school	12	20
- College	24	40
<b>Marital status</b>		
- Married	60	100
<b>Resident status</b>		
- Live with family	60	100
<b>Complication</b>		
- Hypertension	60	100
<b>Received health information</b>		
- None	48	80
- Yes, but only health education, support groups, or diabetes coaching	12	20
<b>Health checks to health facilities routinely</b>		
- No	12	20
- Yes	48	80
<b>Received emergency treatment in the last three months</b>		
- None	60	100
<b>Hospitalised in the previous three months</b>		
- No	60	100
<b>Self-management of diabetes currently</b>		
- Oral drug	12	20
- Diet and exercise	24	40
- Diet, exercise and herbal	24	40
<b>Tobacco smoking</b>		
- Yes	12	20
- No	48	80

*Table 2: Age of participants and duration of diabetes*

Variables	N = 60
<b>Age</b>	
- Mean	53
- Range	47 - 61
- SD	5.523
<b>Duration of diabetes (years)</b>	
- Mean	5.8
- Range	2 - 10
- SD	3.347

40 % of respondents chose diet, exercise and herbal medication in self-management at home. On the other hand, 80 % of respondents were not smoking and had a CVD risk of < 10 %. An average

participant in this study was 53 years old and had suffered from diabetes for 5.8 years.

### The feasibility of a precision healthcare programme among patients with diabetes

After the questionnaires were distributed and filled out independently, the respondents mentioned that it was challenging to complete them by themselves because it took a long time to understand questions. Respondents claimed to be able to fill out all questionnaires if they were accompanied by a research assistant. They argued 30 minutes was more than enough for brainstorming.

Almost all participants in the pilot study asked the researcher to provide a guide and monitoring book in simple language and easy to understand. Based on these conditions, it was necessary to prepare a monitoring book completed with types of diet, training and herbal medications that were safe, according to their values and preferences. Changes and strategies of precision healthcare for patients with diabetes are shown in Table 3.

The difference in diabetes self-care activity, blood pressure, blood glucose, body weight, BMI, tri-

**Table 3:** Changes and strategies of precision healthcare for patients with diabetes

Type of changes	Strategies
<b>Content</b>	
Measurement tools	Respondents claimed they could complete all measurement tools if a research assistant accompanied them.
Monitoring and guidebook	It was necessary to prepare a monitoring book complete with types of diet, exercise and herbal medicines that are safe for them to consume when doing self-management according to their values and preferences in simple and easy language.  The book should provide choices about diet, exercise, drugs and both chemical drugs and herbal medicines that are safe for them.  Books needed to be discussed with experts (physicians, nurses and nutritionists). The experts referred to were those who have worked for at least five years in the field they were involved in the management of diabetic patients.
<b>Research process</b>	
The sharing of information did not flow well due to lack of familiarity with other participants.	During the brief deducting teaching, respondents were grouped into small groups first and then they introduced themselves to other members before the brainstorming session on another day.

**Table 4:** Diabetes self-care activity, blood pressure, blood glucose, body weight, body mass index (BMI), triglyceride, cholesterol and triglyceride glucose index difference before and after intervention

Variables	Pre-intervention (mean)	Post-intervention (mean)	Difference (mean ± SD)	p-value
Diabetes self-care activity	45.68	60.96	15.28 ± 1.30	< 0.001
Systolic blood pressure	133.10	126.88	6.22 ± 2.07	< 0.001
Diastolic blood pressure	86.09	85.43	0.66 ± 2.07	< 0.001
Blood glucose	255.19	245.60	9.59 ± 6.78	< 0.001
Body weight	57.83	59.46	1.63 ± 0.54	0.402
BMI	22.98	23.67	0.69 ± 0.35	0.671
Triglyceride	227.86	225.80	2.06 ± 5.71	0.278
Cholesterol	186.74	190.56	3.82 ± 12.97	0.393
Triglyceride glucose index	5.23	5.14	0.09 ± 0.24	0.165

glyceride, cholesterol and triglyceride glucose index pre and post-precision healthcare programme implementation in a month are shown in Table 4.

Data in Table 4 show the difference in diabetes self-care activity, blood pressure, blood glucose, body weight, BMI, triglyceride, cholesterol and triglyceride glucose index before and after implementing precision healthcare. The paired dif-

ferences t-test showed that the p-value of self-care activity, blood pressure and blood glucose were  $p < 0.001$ , meaning there was a significant difference before and after the intervention. On the other hand, body weight, BMI, triglyceride, cholesterol and triglyceride glucose index before and after the implementation of precision healthcare were not significant differences before and after intervention with  $p\text{-value} > 0.05$ .

## Discussion

Respondents included in the pilot study were women in 80 % of cases. Following data from INFODATIN of the Ministry of Health Information Data Centre, which states that the prevalence of the population of women with diabetes in Indonesia was higher than men, even in the past five years, the increase was quite significant than in previous years.<sup>19</sup> Postmenopausal contributes to diabetes in women because of decreasing of producing oestrogen and progesterone hormones.<sup>20-22</sup> Low growth hormone causes the metabolism to drop and can result in obesity.<sup>23, 24</sup>

Respondents in the pilot study had hypertension complication. This data correlate with a study where diabetes was closely related to hypertension.<sup>25</sup> Two in three people with diabetes in Indonesia have hypertension.<sup>19</sup> The higher blood sugar levels can cause the formation of blockages and fatty deposits in the blood vessels. Moreover, it will increase the total amount of fluid in the body, increasing blood pressure.<sup>26, 27</sup> Diabetes can decrease the ability of blood vessels to stretch. As a result, it will increase blood pressure.<sup>26</sup>

The education of 40 % of respondents was college level and 80 % did not get health information from health professionals. However, 80 % of them routinely checked their condition in health facilities. The support of health workers is needed to improve the health quality of patients with diabetes.<sup>28-30</sup> If patients with diabetes regularly receive information from health workers, health behaviour and knowledge will also enhance their awareness of self-management.<sup>31</sup>

Furthermore, 40 % of respondents had chosen diet, exercise and herbal medication for self-management at home, however it can be assumed that not all diabetic patient populations had the same characteristics as the respondents in the study. This data was supported by a study where self-management behaviours in the Indonesian population were self-regularly taking medication, managing daily exercise activity, managing food and diet intake and monitoring blood sugar and hypo/hyperglycaemia symptoms.<sup>32</sup> After evaluating a culturally appropriate intervention for people with diabetes in Indonesia, using herbal medicine remains an option chosen by patients with diabetes in self-management.<sup>5, 33</sup>

Diabetic patients in Indonesia also choose oral medication and insulin to lower their blood glucose, especially patients with complications.<sup>34</sup>

Moreover, 80 % of respondents were not smoking and had a CVD risk of < 10 %. It might relate to most respondents in the pilot study being women. In general, women in Indonesia do not smoke. Therefore, the risk of CVD may be lower. On the other hand, if most respondents were male with smoker characteristics, the CVD risk might undoubtedly be more significant. That statement was supported by a study that smoking has significance in the incidence of CVD in the future.<sup>35, 36</sup>

**1** The mean of respondents' ages in this study was 53 years old. Data from other research that analysed the age of diabetic patients in developing countries from 1995-2015 showed mean age was 45-64 years.<sup>37</sup> Decreasing pancreatic  $\beta$  cells' function to produce insulin due to aging factors plays a significant role in diabetes incidence.<sup>31</sup> Self-care activity, blood pressure and blood glucose level of participants who received precision healthcare programmes were changed significantly. When education programmes support behaviour change, change **1** potentially effective and accurate.<sup>38</sup> Moreover, intervention based on the participant's preferred language and incorporated culturally sensitive dietary information and the same cultural group through precision healthcare, potentially influencing participants' engagement in behavioural changes, improved adherence and further decreased the blood sugar level, blood pressure and improved self-care activity among respondents.<sup>10, 12, 39, 40</sup> On the other hand, body weight, BMI, triglyceride, cholesterol and triglyceride glucose index before and after the implementation of precision healthcare were not significantly different. These variables cannot be evaluated in a short time, like a month, but need to be considered for an extended period, at least three months.

Through brainstorming activities with support groups, respondents also revealed that they got a lot of new experiences with each other. The support group makes respondents more cheerful. They felt that they had many friends who understand their feeling and difficulties.<sup>30, 41, 42</sup> Brainstorming with support group activities strongly correlated with decreasing diabetes distress and increasing quality of life among patients with diabetes.<sup>43, 44</sup>

## Conclusion

It was necessary to modify the strategies of precision healthcare for diabetes. Firstly, respondents must be accompanied by a research assistant when filling out all questionnaires. Participants argued that 30 minutes was more than enough for the brainstorming process. Researchers must provide a guide and monitoring book that is in simple language, easy to understand and related to patients' values and preferences in brainstorming sessions. The book was also used to see the progress related to patients' glycaemic targets. Due to improvement in diabetes self-care activity, stabilised blood pressure and blood glucose during a month it can be assumed that precision healthcare approaches has the potential to be applied in Indonesia. It is needed more than a month to improve the body weight, BMI, triglyceride, cholesterol and triglyceride glucose index. There was no control group and small samples which were limitations of this study. Therefore, future studies with large samples with long evaluation time are needed.

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## Conflict of interest

None.

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