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Medicine reminder to improve treatment compliance on geriatric patients with diabetic neuropathy at Sanglah Central Hospital, Bali-Indonesia

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ABSTRACT

Background: Geriatric patients are elderly patients who have memory impairment problems, which may have an impact on medication adherence. The aim of this study was to evaluate the effect of medicine reminder on the smartphone to increase the adherence of geriatric patients with type 2 diabetes mellitus.

Method: This study used the Randomized Control Trial (RCT) method, where the subjects were divided into 2 groups: geriatric patients who were performing diabetic neuropathic pain therapy with the help of

the Medicine Reminder (Group of Intervention) and without the aid of Medicine Reminder (Usual Care) Which are randomized using odd-even techniques. Patient therapy compliance is assessed by pill count.

Results: Subjects who received medicine reminder intervention had significantly greater adherence than the control group ($p < 0.05$). The RR value obtained is 2.38 with CI95% at intervals of 1.58-3.61.

Conclusions: The medicine reminder application can improve geriatric patient therapy adherence with significant diabetic neuropathic pain.

Keywords: Medicine Reminder, Geriatric, Compliance Therapy, Neuropathic Pain, Diabetes

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INTRODUCTION

Geriatrics is a branch of medical science with a focus on aging and management therapy. The aging process results in decreased organ system functions such as sensory systems, central nervous, digestive, cardiovascular, and respiratory systems. Geriatric patients are elderly patients who have memory impairment problems especially cognitive functions that often decrease, which may have an impact on medication adherence. Non-adherence of patients in the therapy is one factor that causes the failure of therapy, in addition to the accuracy of diagnosis and therapy provided. According to research conducted by Wijaya, et al., (2015) the rate of nonadherence of patients with chronic disease on Puskesmas in Surabaya is 75%, with the geriatric percentage greater than another age group (47.1%). Research conducted by Jaya, et al., (2016) at Sanglah Hospital Denpasar showed that geriatric patients undergoing Diabetes Mellitus therapy had a very low adherence level of 20%.²

Based on these data it can be seen that geriatric patients have very low adherence rates therefore this age group patient needs to get attention, especially when running chronic disease therapy. One of the chronic diseases that concern in Indonesia is Diabetes Mellitus disease (DM). DM disease is a disease that requires the control of medical personnel in a long time and sustainable. DM disease

can cause various complications, one of which is a complication of neuropathy. Diabetic Neuropathy is a complication that causes a decrease in nerve function due to glucose levels in the chronically high chronic patient.³ Show that patients who undergo good diabetic neuropathy therapy can improve the quality of life of patients and significantly lower the risk of foot ulcers ($p < 0, 05$), however, the success of patient therapy is very low (44%) due to poor patient adherence to therapy.² The development of science and technology help many people, especially in the field of health, one of which is the presence of applications "Medicine Reminder" in smartphones. This application was developed by developers aimed at improving the adherence of patients undergoing chronic disease therapy. Until now, no studies have examined the effect of "Reminders" application in improving patient compliance with chronic disease, especially in Bali.

METHOD

This study used the Randomized Control Trial (RCT) method, where the subjects were divided into 2 groups: geriatric patients who were undergoing diabetic neuropathic pain therapy with the help of the Medicine Reminder (Group of Intervention) and without the aid of the Reminder (Control Group) were randomized using odd-even

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techniques. Evaluation of adherence level in both groups was prospectively observed for 4 weeks with outcome number in Central Hospital of Sanglah, Denpasar. Samples of 62 samples were taken by random sampling technique in the period of December 2016 - March 2017. Independent variables in this study Geriatric patients who underwent good diabetic neuropathic pain therapy who received help with both the Medicine reminder and the Medicine Reminder without observed 4-week prospective adherence. The dependent variable in this study was an increase in patient adherence rates to neuropathy therapy greater than 90% determined using pill count method. Instruments used in the form of applications "Medicine Reminder" is downloaded for free both in IOS and Android operating system. The data obtained were analyzed using comparative test (Mann Whitney U Test). Inclusion criteria are Men and women aged ≥ 60 years, patients with type 2 diabetes mellitus undergoing diabetic neuropathy therapy.

RESULT

The demographics of the study subjects were determined by age, sex, and risk factors (dyslipidemia, hypertension, smokers, long-standing DM). The result of normality test on the demographic characteristics of the subject shows that the data is not normally distributed ($p < 0.05$) (Appendix 3), therefore the demographic characteristic analysis is used non-parametric analysis, as shown in Table 1.

Based on the result of the comparative test of demographic characteristics in both groups showed insignificant results with $p > 0.05$ (Appendix 4). The test was performed non-parametrically, using Mann Whitney U for ratio data, and Chi-Square test for nominal and ordinal data. Based on the data in Table 1 it can be seen that there is no difference in the characteristics of research subjects, both in the intervention group (medicine reminder) and the control group (usual care). It can be interpreted that the characteristics of the research subjects in both groups were equal. Therefore it would not have an effect on the outcome of increasing the percentage of adherence of geriatric patients with type 2 diabetic neuropathy pain.

Based on the analysis in Table 2 the results show that patients receiving medicine reminder intervention had significantly greater adherence than the control group ($p < 0.05$). Patients who received medicine reminder intervention had an average number of tablets remaining of 1 ± 2 tablets, while in the control group averaged 7 ± 6 tablets in 4 weeks of neuropathic pain therapy type 2 diabetes. The number of remaining tablets then calculated

the level of compliance; the patient is said to be obedient if it has a percentage of compliance $\geq 80\%$, whereas patients who have compliance percentage $< 80\%$ said to be disobedient to therapy.

The data presented in Table 2 can be studied more deeply to be able to determine relative risk (RR), and Number Need to Treat (NNT) with outcome percentage of compliance percentage $\geq 80\%$. The data is shown in Table 3.

Based on the analysis in table 3 shows the result that, the RR value of both groups in this study was 2.38 with CI95% was at the interval of 1.58-3.61. These results provide interpretations of subjects receiving medicine reminder interventions, giving $\geq 80\%$ compliance rate of 2.38 times better than controls. The NNT value in this study was 1.72 with CI95% at the interval of 1.33 to 2.46. The NNT score illustrates that, of the 2 subjects given medicine reminder intervention will give 1 outcome result that is compliance level $\geq 80\%$.

DISCUSSION

Characteristics of Research Subjects

Characteristics of the study subjects observed in this study were age, sex, and risk factors (smokers, hypertensive patients, patients with dyslipidemia, and duration of diabetes). These characteristics are important to observe as the baseline because they have a close relationship with diabetes mellitus (DM), especially type 2 diabetes as a parameter that plays a role in comorbidities and complication, one of which is neuropathy problem.⁴ Diabetes mellitus type 2 with comorbid is included in chronic disease requiring long-term and sustained medical control, therefore if the patient is not adherent to therapy, then the potential for treatment failure will increase.

All the characteristics of the study subjects looked comparable ($p > 0.05$) between the intervention and control group (Table 1). It makes the characteristics of patients in both study groups were equivalent. Therefore the characteristics would not affect the outcome of the intervention.⁵ Subjects involved in this study had an average age ranging from 62-63 years, with more men than women. According to the RCT study conducted by D'Souza, 2015, sex is one of the factors that have a significant effect on the incidence of peripheral neuropathy diabetes, where male sex is potentially more affected diabetic neuropathy compared with females (males 27.3% vs. Women 10.1%: $p = 0.001$).⁶ The high incidence rate of diabetic neuropathy in male sex cannot be known with certainty, according to Kamenov et al., 2010 and Aaberg et al., 2008 male sex potentially more affected diabetic neuropathy because of potential job pressure in men, Exposure to cigarette

Table 1 Demographic characteristic patient

Number	Characteristic	Base-line	Inter-ven-tion Group	Con- trol Group	p Val- ue	Analysis
1	Age (> 60)		62.97 ± 4.94	63.48 ± 3.57	0.550 NS	MWU
2	Sex					
	Male (M)	[n (%)]	20 (64.52%)	17 (54.84%)	0.437 NS	Chi-S
	Female (F)	[n (%)]	11 (35.48%)	14 (45.16%)		
3	Risk Factors					
	Dyslipidemia [n (%)]					
	• Y		16 (51.61%)	14 (45.16%)	0.611 NS	Chi-S
	• N		15 (48.39%)	17 (54.84%)		
	Hypertension [n (%)]					
	• Y		13 (41.94%)	15 (48.39%)	0.610 NS	Chi-S
	• N		18 (58.06%)	16 (51.61%)		
	Smoker [n (%)]					
	• Y		11 (35.48%)	7 (22.58%)	0.263 NS	Chi-S
	• N		20 (64.52%)	24 (77.42%)		
	Duration of diabetes [n (%)]					
	< 5 Y		18 (58.06%)	20 (64.52%)	0.602 NS	Chi-S
	> 5 Y		13 (41.94%)	11 (35.48%)		

Note :
 DM = Diabetes Mellitus
 MWU = Mann Whitney U Analysis
 Chi-S = Chi-Square Analysis
 NS = Not Significant
 n = subject

Table 2 Analysis effect of Medicine Reminder on Compliance Level of Geriatric Patient Therapy with Diabetic Neuropathy Pain

Group re- search	Test para- meters	value	Deviation standart (SD)	P Value between groups
Interven-tion (Medicine Reminder) (n = 31)	% adherence	95.91 %	6.01 %	0.001 Sig.
	N tab remaining	1 Tab	2 Tab	
Control (Usual Care) (n = 31)	% Adhe-rence	76.67 %	19.49 %	
	N Tablet remaining	7 Tab	6 Tab	

Note :
 Sig. = Significant
 n = subject

Table 3 RR and NNT Analysis

Group trial	% Adherence		RR (% CI)	NNT (% CI)
	≥ 80 %	< 80%		
Intervention (Medicine Reminder) (n = 31)	31 (100)	0 (0)	2.38 (1.58-3.61)	1.72 (1.33-2.46)
Control (Usual Care) (n = 31)	13 (41.94)	18 (58.06)		

smoke, and greater alcohol in men where these factors are associated with increased oxidative stress that is the cause of degradation of the peripheral nervous system.

Effect of Medicine Reminder on Therapeutic Adherence Level

The development of science and technology brought rapid changes to the information system. Currently, the information system used is more focused on computer-based information system (C-BIS) including smart phone devices in it. The expectation is that with the use of information technology or C-BIS, the resulting information can be more accurate and quality. Increasing public dependence on information systems (software, hardware, databases, and telecommunications), can be a gap to improve the quality of life especially in the health sector.⁷

In this study, it was found that medicine reminder intervention was able to give adherence improvement up to 100% compared to usual care. This improvement in adherence was significantly statistically significant ($p < 0.05$). Similar results were obtained from RCT research conducted by Vervolet, M., 2012 and Dayer, L., 2013 where there were significant changes in adherence to subjects given SMS reminder, booklet, and 10 compliance applications on OS and Android-based smartphones significantly ($P < 0.05$). In the study, adherence outcomes will increase in patients with poor medication adherence backgrounds.^{8,9}

Based on the results of research that has been done, the use of medicine reminder can be considered to be applied in health facilities specifically addressed to patients who will perform chronic (long-term) therapy such as hypertension, diabetes, pulmonary TB, cardiovascular disease, etc. The success of a therapy can be achieved if supported by appropriate diagnosis and appropriate drug therapy, in addition to medication adherence, is one of the important factors that can support the success of therapy. The results obtained can be used as a consideration to overcome the non-adherence therapy patients who are running a therapy. The recommendations proposed by the researchers are described as follows:

1. Medicine reminder is recommended to be installed on patient smart phones, by pharmacists when counseling, dispensing, or IEC in health facilities such as pharmacies, clinics, or hospital pharmacy installations.
2. This application is devoted to patients undergoing long-term (chronic) therapy such as

hypertension, diabetes, pulmonary tuberculosis, cardiovascular disease, etc., in the hope that no treatment failure occurs.

CONCLUSION

The medicine reminder application can improve geriatric patients' treatment adherence with significant diabetic neuropathic pain.

ADVICE

Based on the research that has been done, there are some suggestions that can be considered for further research, is:

3. Better randomization techniques are required, such as using computerized randomization method and double-blind random sampling.
4. Further research is needed for patients with more complex treatment levels (polypharmacy) that can be directly attributed to therapy outcomes.
5. It is necessary to recruit more subjects. Thus the potential for obtaining the normal distribution of data is greater, therefore, it can do a parametric test.
6. Need to increase the scope of research in terms of the age of the subject, which must be expanded from the age category of young adults, adults, and elderly holistically.
7. Socio-demography factor analysis such as education level, welfare level, etc. on the ability to use technology, in this case, is medicine reminder.

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