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Judul : A pharmaco-economic study: cost-utility analysis of modern wound dressings vs conventional wound dressings in patients with diabetic foot ulcer

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“A PHARMACOECONOMIC STUDY: COST-UTILITY ANALYSIS OF MODERN WOUND DRESSINGS VS CONVENTIONAL WOUND DRESSINGS IN PATIENTS WITH DIABETIC FOOT ULCER IN WOUND CARE CLINIC”

explained that the aforementioned documents have been read and evaluated in grammar and punctuation without changing the meaning & information from the original document.

Yogyakarta, November 19, 2020

Proofreader



Endang Setyowati, M. Hum

A Pharmacoeconomic Study: Cost-Utility Analysis of Modern Wound Dressings Versus Conventional Wound Dressings in Patients with Diabetic Foot

Ulcer Patients in Wound Care Clinics

Cyntia Rahmawati,^a Baiq Leny Nopitasari,^b

Department of Pharmacy, Muhammadiyah University of Mataram



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And Public Health Centers?

Abstract

Diabetic foot ulcers (DFU) are complications resulting from neuropathic symptoms that require long-term treatment. Duration of treatment and outcome of therapy ~~is-are one~~ ~~some~~ of the factors that affect the quality of life of patients and will ~~have an impact on~~ ~~require~~ higher medical costs. One of the DFU treatments ~~is by using~~ ~~both modern and conventional~~ wound dressings, ~~both modern and conventional~~. The use of modern wound dressings provides higher benefits but is expensive compared to conventional wound dressings. This study ~~aims-aimed~~ to choose an alternative wound dressing that provides the best utility / quality of life at the most efficient cost. The research method used ~~is-was~~ ~~pharmacoeconomics~~ in the form of utility analysis with the Diabetic Quality of Life (DQOL) questionnaire and cost analysis with a patient's perspective. The research was conducted ~~in-at a~~ wound care clinics and ~~several~~ public health ~~center~~ ~~centers~~. The ~~number of samples~~ ~~obtained-were-consisted of~~ 11 patients using modern wound dressings and 5 patients using conventional wound dressings, for a total of 75 visits. The results showed that: (1) the ~~average-mean~~ cost of modern wound dressings was IDR 347,131/visit, while ~~that of~~ conventional wound dressings ~~were-was~~ IDR 47,140/visit; (2) Patients with modern wound dressings had a high average of quality of life (100.4), while patients with conventional wound dressings had a moderate average of quality of life (87.25) and the comparison of the quality of life of both was significantly different with P value < 0.05; (3) The ICUR value ~~is-was~~ IDR 22,813/QOL. The conclusion is that modern wound dressings provide a higher quality of life at a higher cost. To change from conventional wound dressings to modern wound dressings, it costs more than IDR 22,813 to increase 1 unit of quality of life, but patients get an additional 13.15 quality of life.

Keywords: ~~pharmacoeconomics~~, cost-utility analysis, diabetic foot ulcer, wound dressing, DQOL questionnaire

Introduction

According to WHO, diabetic foot ulcers (DFU) occur due to diabetes accompanied by reduced blood flow ~~of-or~~ neuropathy in the legs, which can lead to infection, ~~to-even~~ leg amputation [1]. It is estimated that around 5.3 million people suffer from DFU in Indonesia and it is the most common cause of ~~the-most~~ hospital admissions (80%) for Diabetes Mellitus [2]. DFU ~~is-still lacking-lacks~~ attention ~~so-which that-the~~ makes its existing basic concept ~~appears-that-is-to be~~ not precise, as a result-consequence many patients develop osteomyelitis, ~~sufferers-until-even~~ amputation [3]. In 2010-2011, the incidence of amputation in Indonesia due to DFU increased sharply from 35% to 54.8% [3].

Diabetic ulcers are the most feared chronic complication for diabetes mellitus ~~suffererspatients~~, ~~both~~-in terms of both the duration length-and cost of treatment, ~~the-high cost-required-for-treatment~~ which costs 3 times more than the treatment of diabetes mellitus without ulcers [2]. In Indonesia, diabetic ulcer patients require a high cost of 1.3 million to IDR. 1.6 million per month and IDR 43.5 million per year for a ~~sufferer-patient~~ [2].

From the onset of the wound, patients need more rapid wound care. There are 30 days ~~time-needed~~ to prevent breakdowns, infections, and amputations, ~~because~~ prompt immediate intervention can save both the costs and ~~save~~-the patient's leg [4]. Interventions that are cost-saving and feasible in developing countries according to WHO include: moderate blood glucose control, blood pressure control, and foot care [1].

The use of modern wound dressings, for example foam dressings, has major advantages, namely the ability to ~~load~~ exudates, high absorption, ~~is-effective~~ness for ~~heavy dripping wounds~~ reduces pain, is easy to remove, and protects the periwound area ~~around-the-wound-from~~ additional trauma further-damage-[5,6]. On the other hand, Compared-to conventional wound dressings (wet-dry gauze with normal saline) it is ~~incapable-unable of-to~~ maintaining a moist environment, ~~where-while~~ moisture can provide optimal conditions for wound healing. Gauze can interfere with wound healing because it dries out and causes tissue damage when the gauze is removed [5]. In addition, conventional treatments take longer to heal [7]. Based on several studies, it was found that modern wound dressings provide 100% healing effectiveness ~~in-the-form-of-healing~~ while conventional wound dressings only have 50% healing effectiveness, ~~other-Other~~ results showed that ~~are~~-the use of modern wound dressings such as hydrogel is 3 times

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more effective than 0.9% NaCl and the use of modern moist wound dressings. ~~Wound Healing-healing~~ is more effective than NaCl 0.9% + real honey [8-10].

~~It's-Unfortunately, just that~~ modern wound dressings are more expensive than conventional wound dressings. Based on the research, it was found that modern wound care provides better comfort because it reduces the smell of the wound, but financially conventional wound dressings are more cost-effective because they use health insurance from the government [11].

~~So-Therefore~~ it is necessary to ~~do-conduct~~ a ~~pharmacoeconomy-pharmacoeconomic~~ analysis with a cost-utility analysis on the use of modern wound dressings compared to conventional wound dressings, to ~~get-determine~~ which wound dressings are the ~~most cost-utility~~ by looking at the results of the quality of life of DFU patients using the DQOL (Diabetic Quality of Life) questionnaire ~~compared to the average. the total cost~~ of each wound dressing. This study ~~aims-aimed~~ to choose an alternative wound dressing that provides the best utility or quality of life at the most cost efficient way for diabetic foot ulcer patients.

Material and Method

This research ~~is-was~~ a ~~pharmacoeconomy-pharmacoeconomic~~ study with ~~an~~ ~~analytic-analytical~~ observational method and cross sectional approach. It has been reviewed and approved by the ethics review committee. This study compared the utility and cost of two alternative treatments for diabetic foot ulcers, namely modern wound dressings and conventional wound dressings. The ~~average-mean~~ utility data were obtained by using the DQOL questionnaire, while the cost data were obtained from the average total cost from the patient's perspective. The cost components calculated ~~are-consisted of~~ direct medical and non-medical costs, as well as indirect costs. Then ~~performed~~ a cost-utility analysis ~~was performed~~ by calculating the value of the incremental cost utility ratio (ICUR). ~~The validity of the~~ DQOL questionnaire ~~has-had~~ been ~~conducted-validity-test~~ ~~tested~~ with validity value $r = 0.428-0.851$ and Cronbach alpha 0.963 [12].

The population and sample of the study were all diabetic foot ulcer patients who needed wound dressings at the AWCC Lombok wound care clinic and several public health ~~center-centers~~ (~~puskesmas~~ ~~Puskesmas~~) in West Lombok Regency and ~~Mataran~~ ~~Mataram~~ City. The sampling technique used was total sampling. ~~Obtained-a-A~~ total sample of 16 ~~patients were obtained~~, consisting of 11 patients using modern wound dressings and 5

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patients using conventional wound dressings. ~~Total-The total~~ patient visits were 75 visits, ~~namely-consisting of 55 visits by~~ patients with modern wound dressings ~~were 55 visits~~, ~~while-and 20 visits by~~ patients with conventional wound dressings ~~were 20 visits~~. Informed consent was obtained from all the patients. ~~Calculation-of-The~~ utility and cost ~~were calculated~~ based on the visits of each patient. The utility and cost comparisons were performed statistically using the SPSS version 20 software application.

Results and Discussion

Overview of Utility of Diabetic Foot Ulcer Patients-Utilities

In this study, the patients' demographic data obtained were gender, age, grade of diabetic foot ulcers, education, occupation, marital status, and smoking status. This is based on factors that affect the quality of life of diabetes mellitus patients, namely gender, age, education level, ethnicity, and marital status [13].

Diabetic foot ulcer patients who ~~use-used~~ modern wound dressings ~~of-consisted~~ of patients with various grades of wounds, ranging from grade 4, 3, 2, and 1. Similarly, patients who ~~use-used~~ conventional wound dressings ~~consisted of those with from~~ grades 3 and 1. The patients selected as the samples are-were those who ~~need-needed~~ wound dressing. ~~All the~~ patients were followed by the development of their quality of life from the time they first came to the clinic or public health care (~~puskesmasPuskesmas~~), until they were ~~declared-cured-healed~~ or ~~did-not-no longer need-needed~~ wound dressing. ~~So~~ This way, that-the average-mean utility and costs ~~are-were~~ calculated based on the total visits-visits.

Patients with modern wound dressings were only found ~~in-at~~ wound care clinics, namely AWCC Lombok, while patients with conventional wound dressings were only found ~~in-at several public health centerspuskesmas, namely-several-puskesmas~~ in West Lombok Regency and Mataram City, ~~so-In other words, the-there were two different~~ research locations ~~were-different~~.

Table 1. Overview of Utility of Diabetic Foot Ulcer Patient-Patient-Utilities

| Demography of patients | Modern Wound Dressing | | | Conventional Wound Dressing | | |
|---------------------------|-----------------------|--------------------------|---|-----------------------------|--------------------------|--|
| | SumTotal (n=11) | Percentage Percentage | Mean Utility/Utilitas Average (n=55) | SumTotal (n=5) | Percentage Percentage | Mean Utilitas AverageUtility (n=20) |

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The quality of life of the patients was observed...

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| Gender | | | | | | |
|--------------------------|----|--------|-------------|---|-----|------------|
| Male | 5 | 45.45% | 104.38±9.49 | 3 | 60% | 89.25±6.94 |
| Female | 6 | 54.55% | 97.32±15.01 | 2 | 40% | 84.25±7.59 |
| Age | | | | | | |
| < 46 years old | 2 | 18.18% | 106.00±5.46 | 2 | 40% | 85.63±6.44 |
| ≥ 46 years old | 9 | 81.82% | 99.16±14.19 | 3 | 60% | 88.33±8.14 |
| Education | | | | | | |
| < SMA/Senior High School | 5 | 45.45% | 94.42±14.67 | 3 | 60% | 84.00±6.15 |
| ≥ Senior High School/SMA | 6 | 54.55% | 105.76±9.19 | 2 | 40% | 92.13±6.77 |
| Occupation | | | | | | |
| Work/ Employed | 10 | 90.91% | 99.24±13.33 | 3 | 60% | 90.00±7.81 |
| Not Work/ Not Employed | 1 | 9.09% | 112.00±4.00 | 2 | 40% | 83.75±5.60 |
| Marital Status | | | | | | |
| Married | 10 | 90.91% | 103.94±9.97 | 4 | 80% | 87.38±7.21 |
| Not Married | 1 | 9.09% | 79.63±11.29 | 1 | 20% | 86.75±4.57 |
| Smoking | | | | | | |
| Status | 3 | 27.27% | 102.33±9.96 | 2 | 40% | 85.13±4.09 |
| Smoking | 8 | 72.73% | 99.68±14.36 | 3 | 60% | 88.67±8.93 |
| Not Smoking | | | | | | |

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The utility scoring on DQOL is: the score for low quality of life score was less than 60, that for moderate quality of life was between 60-90, and that for high quality of life was more than 90 [12]. From Table 1 it can be seen that almost all the patients with diabetic foot ulcers who use used modern wound dressings almost all have had an average high quality of life high, except for the those who were status of the unmarried partner, who had moderate the quality of life is moderate. Whereas Meanwhile, patients in using conventional wound dressing users who have had high quality of life consisted of only in patients with those who graduated from high school education and or above, and patients

~~those with who were employed working status. So Thus~~, it appears that modern wound dressings ~~provide provided~~ a high ~~average-mean~~ utility compared to conventional wound dressings. Based on ~~a~~ research conducted at ~~Karanganyar~~ General Hospital, the quality of life of diabetes mellitus patients was significantly influenced ($P < 0.05$) by gender, age, education, ~~disease duration-of-suffering~~, including complications ~~in the form~~ of diabetic ulcers [14].

Complications experienced such as diabetic ulcers can result in a lower quality of life in diabetes mellitus patients, where these complications can result in ~~limitations-both~~ physical~~ly~~, psychological~~ly~~, and even social~~ly~~ ~~limitations~~ [12]. Based on the results of ~~a~~ research conducted by Utami (2014), patients with diabetic ulcers ~~have-had~~ a low quality of life where physical health is closely related to patient feelings about the pain and anxiety experienced by ~~the~~ patients, dependence on medical care, energy and fatigue, mobility, sleep. and rest, daily activities, and work capacity [15].

Cost of Modern Wound Dressing and Conventional Dressing

The cost calculation ~~is-was~~ carried out based on the patient's perspective, so ~~that~~ the calculated cost components ~~are-were~~ direct medical costs consisting of wound dressing costs and wound care ~~feescost~~, direct non-medical costs (homecare costs for modern wound dressing patients and transportation costs for conventional wound dressing patients), and indirect costs, namely the cost of lost productivity. The cost of lost productivity ~~is-was~~ calculated based on the human capital approach, which is to calculate the number of days lost due to illness or treatment according to the income earned every day [16].

Table 2. Cost of Modern Wound Dressing and Conventional Dressing ~~Perper~~

| Cost | Visits | | P-value |
|--------------------------|--|--|---------|
| | Modern Wound Dressing (n=55) Total IDR | Conventional Wound Dressing (n=20) Total IDR | |
| Direct Medical Cost | IDR 12,034,000 | IDR 0 | 0.000* |
| - Cost of wound dressing | (IDR 5,094,000) (IDR 6,940,000) | (IDR 0) (IDR 0) | |
| - Cost of wound care | | | |

| | | | |
|--------------------------|---------------------|-------------------|--------|
| Direct non-medical cost | IDR 1,650,000 | IDR 88,000 | 0.000* |
| Indirect Cost | IDR 5,408,223 | IDR 854,795 | 0.009* |
| Total cost | IDR 19,092,223 | IDR 942,795 | |
| <u>Average-Mean</u> Cost | IDR 347,131±129,309 | IDR 47,140±39,183 | 0.000* |

Based on ~~table-Table~~ 2, the direct medical cost of conventional wound dressings was IDR 0, ~~it-This~~ is because the patient ~~earries-underwent out~~ wound care at ~~the puskesmas-a public health center so that it-which~~ is free of charge. The medical direct costs ~~are-were~~ borne by ~~the Social Security Administrator for Health (BPJS Kesehatan)~~. ~~Patients-The patients~~ only ~~incur-incurred~~ direct non-medical costs in the form of transportation costs from home to the ~~puskesmaspublic health center~~. Meanwhile, the direct non-medical cost of modern wound dressings ~~is-was~~ high because the ~~patient patients performs-performed~~ wound care at home. The average cost of modern wound dressings was IDR 347,131, ~~which-is-or~~ 7 times higher than the total cost of conventional wound dressings.

Based on ~~the~~ statistical results, it was found that there were significant differences in ~~the~~ direct medical costs, direct non-medical costs, indirect costs, and the average cost between modern and conventional wound dressings with a P value < 0.05. According to the results of ~~a~~ research conducted at ~~Karanganyar~~ General Hospital, complications significantly affected direct medical costs (P < 0.05), and the average cost of complications for diabetes ulcers was IDR 765,662.00 ± 42,085.58 [14].

According to the results of ~~a~~ research conducted at ~~Sanglah~~ General Hospital Denpasar, it was found that the average cost of modern wound dressings was IDR 335,500, where the average cost ~~is-was~~ not much different from the average cost of modern wound dressings in this study, which is IDR 347,131, ~~while-In addition~~, in the study conducted at ~~Banyuwangi~~ Hospital, the unit cost of ~~complicating-the service for hospitalized patients with~~ Diabetes Mellitus ~~complications patient-service-with hospitalization~~ in 2015 was IDR 4,147,032.53, ~~and-Meanwhile~~, based on ~~a~~ research conducted at Prof. Dr. R. Kandou Manado, ~~it was~~ stated that the average treatment for type 2 diabetes mellitus with ~~a~~ complications ~~in the form~~ of diabetic foot ulcers in the period September - November 2019 was IDR 29,139,247 [17-19]. The difference~~s~~ in cost ~~is-are~~ influenced by: the grade or severity of the wound ~~that-is-owned-by-the-patient, so-it~~

~~which~~ requires more complete therapy, ~~such as the~~ cost of action including accommodation costs in the hospital. ~~In addition, it can also be caused by the time the patient has experienced of healing time.~~

Cost-Utility Analysis

Based on ~~the~~ statistical results, there was a significant difference in ~~the~~ mean cost between modern wound dressings and conventional wound dressings with a P value = 0.000, and there was a significant difference in ~~the~~ mean utility between modern dressings and conventional wound dressings with a P value = 0.000. ~~So-Thus~~ it can be said that the two alternatives provide different quality of life results, where modern wound dressings provide a higher quality of life than conventional wound dressings.

Table 3. Cost-Utility Analysis ~~between~~ Modern ~~Vs-vs~~ Conventional Wound Dressing

| Calculations | Dressing | | P-value |
|---|---------------------------------|---------------------------------------|---------|
| | Modern Wound Dressing (n=55) | Conventional Wound Dressing (n=20) | |
| Mean Cost Average | IDR 347,131±129,309 | IDR 47,140±39,183 | 0.000* |
| Mean Utility Average | 100.4±13.27 | 87.25±7.45 | 0.000* |
| Cost Utility Ratio (CUR) | IDR 3,457 | IDR 540 | |
| Incremental Cost Utility Ratio (ICUR) | | IDR 22,813 | |

After obtaining the results of ~~the~~ utility and Cost Calculations, the CUR and ICUR ~~PROOFREADER~~ ~~slatam~~ ~~EN~~ Based on the results of the CUR, it was found that modern ~~wound dressings were in quadrant I and while conventional wound dressings were in quadrant 3, so that a cost-utility analysis was carried out by calculating the ICUR value.~~ Modern wound dressings ~~provide-provided~~ a higher quality of life at a higher cost than conventional wound dressings. The results of ICUR ~~show-showed~~ that to change from conventional wound dressings to modern wound dressings, it costs more than IDR 22,813

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to increase 1 unit of quality of life, but patients get-obtained an additional 13.15 quality of life. To determine whether the addition is commensurate or not, further analysis is required by comparing the GDP per capita value, or the threshold value, or with the willingness to pay value.

Conclusion

The conclusion is that modern wound dressings provide a higher quality of life at a greater-higher cost. To change from conventional wound dressings to modern wound dressings, it costs more than IDR -22,813 to increase 1 unit of quality of life, but patients get an additional 13.15 quality of life.

The next recommendation can be carried out by calculating the willingness to pay or the threshold to find out whether the additional cost with the addition of quality of life is worth it.

November 19, 2020

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It is recommended for future studies to update...

**4. Bukti konfirmasi review dan hasil review
manuskrip
(4 Juli 2021)**



Baiq Leny Nopitasari <baiqleny.nopitasari@gmail.com>

Fwd: [PIT Virtual IAI 2020] Revisi Manuskrip dari Pharmacy Education Journal (PEJ)

1 message

Cyntiya Rahmawati <cyntiya.apt@gmail.com>

Tue, Apr 18, 2023 at 9:31 AM

To: Baiq Leny Nopitasari <baiqleny.nopitasari@gmail.com>

----- Forwarded message -----

Dari: **Cyntiya Rahmawati** <cyntiya.apt@gmail.com>Date:

Sen, 12 Jul 2021 11.45

Subject: Re: [PIT Virtual IAI 2020] Revisi Manuskrip dari Pharmacy Education Journal (PEJ)To:
rhendra <rhendra@iai.id>

Assalammualaikum Wr. Wb.

Selamat Pagi,

Kepada Yth: Bapak Dr. Rudy, Apt.

Berikut saya lampirkan artikel yang sudah saya perbaiki pak,Mohon
arahannya,

Terimakasih banyak pak bantuannya

*Sincerely,**Cyntiya Rahmawati, S.Farm.,MKM.,Apt.*-----
Phone / WA : +62 81 838 6563

Line ID: cyntiya__

Email : cyntiya.apt@gmail.com

Pada tanggal Sen, 12 Jul 2021 pukul 08.35 rhendra <rhendra@iai.id> menulis:

Salam,

Dalam penulisan menggunakan APA style. Sitasi nya tidak menggunakan nomor seperti di dalam manuskrip ibu (contoh attached). Sitasi menggunakan nomor itu Vancouver atau Hatvard style. APA style contohnya.....(Rahmawati et al, 2021)....

Sent from my Galaxy

----- Original message -----

From: Cyntiya Rahmawati <cyntiya.apt@gmail.com>Date:

12/07/2021 07:00 (GMT+07:00)

To: rhendra <rhendra@iai.id>

Subject: Re: [PIT Virtual IAI 2020] Revisi Manuskrip dari Pharmacy Education Journal (PEJ)

Selamat Pagi Bapak Dr. Rudy, Apt.Mohon

maaf sebelumnya pak,

Saat menuliskan referensi ini saya menggunakan insert citation pada MS Word dan sudah menggunakan style APA.Kemudian saat revisi ini, saya cek ulang kembali secara manual dg style APA juga.

Kira-kira kekeliruannya ada dimana ya pak?Mohon

pencerahannya pak ☐

Terimakasih sebelumnya pak ☐

Pada tanggal Min, 11 Jul 2021 14.25, rhendra <rhendra@iai.id> menulis:

Kepada
Yth ibu Cyntiya

Setelah kami periksa, daftar pustaka ibu tidak menggunakan APA style. Mohon diperbaiki style nya menjadi APA style.

Sent from my Galaxy

----- Original message -----

From: Cyntiya Rahmawati <cyntiya.apt@gmail.com>

Date: 11/07/2021 08:56 (GMT+07:00)

To: Rudi Hendra <rhendra@iai.id>

Subject: Re: [PIT Virtual IAI 2020] Revisi Manuskrip dari Pharmacy Education Journal (PEJ)

Kepada Yth: Bapak Dr. Rudy, Apt. Selamat

Pagi, Pak.

Terimakasih atas informasinya, berikut saya kirimkan hasil revisinya. Salam,

Cyntiya Rahmawati, S.Farm.,MKM.,Apt.

Phone / WA : [+62 81 838 6563](tel:+62818386563)

Line ID: [cyntiya__](#)

Email : cyntiya.apt@gmail.com

Pada tanggal Min, 4 Jul 2021 pukul 16.21 Rudi Hendra <rhendra@iai.id> menulis:Kepada

Yth Ibu Cyntiya Rahmawati

Bersama dengan ini, kami informasikan bahwa pihak Pharmacy Education Journal sedang melakukan proses finalproofreading. Untuk manuskrip ibu, pihak PEJ meminta merevisi style reference ibu menggunakan APA style reference. Revisi dilakukan menggunakan file manuskrip yang saya kirimkan bersamaan dengan email ini.

Kami tunggu perbaikan manuskrip ibu paling lama 7 hari setelah email ini dikirimkan. Terima

kasih

--

Dr. Rudi Hendra Sy., M.Sc., AptSeksi

Ilmiah

PIT Virtual IAI 2020



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**A Pharmacoeconomic Study: Cost-Utility Analysis of Modern Wound Dressings vs.
Conventional Wound Dressings in Patients with Diabetic Foot Ulcer**

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Abstract

Introduction:Duration of treatment and outcome of therapy of diabetic foot ulcers are some of the factors that affect the quality of life and will require higher medical costs.

Objectives:This study aimed to choose an alternative wound dressing that provides the best utility at the most cost-efficient.

Methods:The research method used was pharmacoeconomics with a patient's perspective.

Results:The results showed that that, per visit, the mean cost of modern wound dressings per visit was IDR 347,131, while that of conventional wound dressings was IDR 47,140. The quality of life with modern vs. conventional wound dressing was significantly different (P -value <0.05). The ICUR value was IDR22,813/QOL.

Conclusions:This study showed that modern wound dressings provide a higher quality of life at a higher cost. Indeed, it cost more than 22,813 IDR to change from conventional to modern wound dressings and increase 1 unit of quality of life, but patients obtained an additional 13.15 quality of life.

Keywords: pharmacoeconomics, cost-utility analysis, diabetic foot ulcer, wound dressing, DQOL questionnaire

Introduction

According to the World Health Organization (WHO), diabetes mellitus (DM) combined with reduced blood flow and neuropathy (nerve damage) in the feet increases the chance of foot ulcer infections and the eventual need for limb amputation (WHO, 2020). In Indonesia, around 5.3 million people suffer from Diabetic Foot Ulcer (DFU), which is the most common cause of hospital admissions (80%) for DM (Hastuti, R.T, 2008). DFU is often overlooked, making its existing core concept imprecise; consequently, many patients develop osteomyelitis, even amputation (Misnadiarly, 2006). In 2010-2011, the incidence of amputation in Indonesia due to DFU increased sharply from 35% to 54.8% (Misnadiarly, 2006).

Diabetic ulcers are the most feared chronic complication for diabetes mellitus patients in terms of both the duration and cost of treatment. The latter costs three folds the treatment of diabetes mellitus without ulcers (Hastuti, R.T., 2008). In Indonesia, the cost of diabetic ulcer management is high 1.3 million to 1.6 million IDR per month and 43.5 million IDR per year per patient (Hastuti, R.T., 2008).

Patients need more wound care from the onset of the wound, with 30 days required to prevent breakdowns, infections, and amputations because immediate intervention can save both the costs and the patient's leg (McGuire, 2014). According to the WHO, cost-saving and feasible interventions in developing countries include moderate blood glucose control, blood pressure control, and foot care (WHO, 2020).

The use of modern wound dressings, foam dressings, for example, has major advantages, including the ability to retain exudates, high absorption, effectiveness for wounds with excess fluid, reducing pain, ease to remove, and protecting the peri-wound area from additional trauma (Jones, et al, 2006; and Hilton, et al, 2004). Furthermore, conventional wound dressings (wet-dry gauze with normal saline) cannot maintain a moist environment, required to provide optimal

conditions for wound healing. Gauze can interfere with wound healing because it dries out and causes tissue damage when it is removed (Jones, V., Grey, J., & Harding, K., 2006). Additionally, conventional treatments take longer to heal (Allenet, et al., 2000). Several studies found that the healing efficacy of modern wound dressings is 100%, while that of conventional wound dressings is only 50% (Nurhaida, 2017). Other results showed that modern wound dressings, such as hydrogel, are three times more effective than 0.9% NaCl and that moist wound healing dressings are more effective than NaCl 0.9% + real honey (Purnomo, S., et al, 2014; and Riani, et al., 2017).

Unfortunately, modern wound dressings are more expensive than conventional wound dressings. Modern wound care provides better comfort and reduces the smell of the wound, but financially, conventional wound dressings are more cost-effective because they use health insurance from the government (Minarningtyas, A., & Tami, A., 2018).

Therefore, it is necessary to conduct a pharmacoeconomic and cost-utility analysis on the use of modern wound dressings compared to conventional wound dressings using the quality of life of DFU patients measured by the DQOL (Diabetic Quality of Life) questionnaire and the average total cost of each wound dressing. This study aimed to perform a cost-utility analysis between modern versus conventional wound dressings in diabetic foot ulcer patients to determine an alternative cost-effective wound dressing that would provide the best utility or quality of life for diabetic foot ulcer patients.

Methods

This pharmacoeconomic research is analytical and observational and uses a cross-sectional approach. It has been reviewed and approved by the Health Research Ethics Commission University of Mataram No.:109/UN18.F7/ETIK/2020. This study compared the utility and cost of two treatments for diabetic foot ulcers, i.e., modern wound dressings and conventional wound dressings. The mean utility data were collected using the DQOL questionnaire, while the cost data were obtained from the average total cost from the patient's perspective. The cost components calculated consisted of direct medical and non-medical costs and indirect costs. Then, a cost-utility analysis was performed by calculating the value of the incremental cost-utility ratio (ICUR). The validity of the DQOL questionnaire had been tested with validity value $r = 0.428-0.851$ and Cronbach alpha 0.963 (Yusra, A., 2011). DQOL consists of 30 questions covering satisfaction, the impact of illness, concerns about physical function in addition to psychological and social problems. All answers are rated on a Likert scale, with DQOL scores categorized into low (less than 60), moderate (60-90), and high (more than 90) quality of life (Yusra, A., 2011).

The study population consisted of diabetic foot ulcer patients who needed wound dressings recruited from the AWCC Lombok wound care clinic and several public health centers (*Puskesmas*) in West Lombok Regency and Mataram City. The total sampling technique was used because the number of diabetic foot ulcer patients who needed wound dressings was small. The final sample included 16 patients; 11 used modern wound dressings, and 5 used conventional wound dressings. The patients' quality of life was monitored from their first visit to the clinic or public health center until they recovered or no longer needed wound dressing. Hence, the mean utility and costs were calculated based on the total number of visits, i.e., 75 visits distributed as follows: 55 visits by patients with modern wound dressings and 20 visits by patients with

conventional wound dressings. Informed consent was obtained from all the patients. The utility and cost comparisons were performed statistically using SPSS version 20 software.

Results

Overview of Utility of Diabetic Foot Ulcer Patients

In this study, demographic data collected were based on factors that affect the quality of life of diabetes mellitus patients, namely gender, age, education level, ethnicity, and marital status (Rubin, R., & Peyrot, M., 1999) in addition to grade of diabetic foot ulcers and smoking status.

Diabetic foot ulcer patients who used modern wound dressings had various wound grades, ranging from 4, 3, 2, and 1, while those who used conventional wound dressings had grades 3 and 1.

Patients with modern wound dressings were only found at the AWCC Lombok wound care clinic, while patients with conventional wound dressings were only found at public health centers in West Lombok Regency and Mataram City. In otherwords, there were two different research locations. Currently, more patients prefer wound care clinics than public health centers, where they will receive a modern wound dressing even though they have to spend more money. Those who choose public health centers get a conventional wound dressing for free.

Table I shows that almost all the patients with diabetic foot ulcers who used modern wound dressings had a high quality of life, except for those who were unmarried (they had a moderate QOL). Patients using conventional wound dressing who had a high quality of life consisted of those who had a high school education level or above and those who were employed.

Cost of Modern Wound Dressing and Conventional Dressing

The cost calculation was carried out based on the patient's perspective. The calculated cost components were direct medical costs (wound dressing costs and wound care costs), direct non-medical costs (homecare costs for modern wound dressing patients and transportation costs

for conventional wound dressing patients), and indirect costs (loss of productivity cost). The loss of productivity cost was calculated based on the human capital approach, i.e., the number of days lost due to illness or treatment according to daily income (Setiawan, D., Endarti, D., & Suwantika, A., 2017).

Table II shows that the direct medical cost of conventional wound dressings was 0 IDR since patients underwent wound care at a public health center free of charge. The direct medical costs were borne by the Social Security Administrator for Health (BPJS Kesehatan). Patients only incurred direct non-medical costs in the form of transportation costs from home to the public health center. Even if the care is provided free of charge, the indirect costs (loss of productivity cost) create a financial burden. Meanwhile, the direct non-medical cost of modern wound dressings was high because patients received wound care at home. The average cost was IDR 347,131, or 7 times higher than the total cost of conventional wound dressings.

Discussion

This study results show that modern wound dressings provided a high mean utility compared to conventional wound dressings. Basic wound treatments rely heavily on antiseptics misuse and drying of the wound, resulting in lengthy, expensive, and painful care (Vuagnat, H., & Comte, E., 2016). Complications experienced, such as diabetic ulcers, can result in a lower quality of life in diabetes mellitus patients, where these complications can result in physical, psychological, and even social limitations (Yusra, A., 2011). Patients with diabetic ulcers had a low quality of life as physical health is closely related to patient feelings about the pain and anxiety experienced, dependence on medical care, energy and fatigue, mobility, sleep and rest, daily activities, and work capacity (Utami, D., Karim, D., & Agrina., 2014). The quality of life of diabetes mellitus patients was significantly influenced ($P\text{-value} < 0.05$) by gender, age, education, disease duration, including complications in the form of diabetic ulcers (Eristina, 2017).

The statistical results (Table II) showed significant differences in the direct medical costs, direct non-medical costs, indirect costs, and the average cost between modern and conventional wound dressings ($P\text{-value} < 0.05$). A study conducted at Karanganyar General Hospital reported that complications significantly affected direct medical costs ($P\text{-value} < 0.05$) and that the average cost of complications for diabetes ulcers was $765,662.00 \pm 42,085.58$ IDR (Eristina, 2017). Another research conducted at Sanglah General Hospital Denpasar found that the average cost of modern wound dressings was 335,500 IDR, not much different from the average cost of modern wound dressings in our study (347,131 IDR). Furthermore, in a study conducted in 2015 at Banyuasin Hospital, the unit cost of the service for hospitalized patients with diabetes mellitus complications was 4,147,032.53 IDR. Previous research conducted between September and November 2019 concluded that the average treatment for type 2 diabetes mellitus with the complication of diabetic foot ulcers was 29,139,247 IDR (Tiara, S., 2012; Rahman, F., 2016;

and Rondonuwu, et al., 2020). The differences in costs are influenced by the grade or severity of the wound (which requires more extensive therapy), cost of action, including accommodation costs in the hospital.

Cost-Utility Analysis

Table III shows a significant difference in the mean cost and the mean utility between modern wound dressings and conventional wound dressings (P-value=0.000). Thus, the two methods yield different quality of life results, where modern wound dressings provide a higher quality of life than conventional wound dressings.

The CUR and ICUR values were calculated after obtaining the results of the utility and cost calculations. The results of the CUR (Table III) show that modern wound dressings were in quadrant 1, while conventional wound dressings were in quadrant 3, so a cost-utility analysis was carried out by calculating the ICUR value. Modern wound dressings provided a higher quality of life at a higher cost than conventional wound dressings. The results of ICUR showed that it costs more than 22,813 IDR to change from conventional to modern wound dressings and increase 1 unit of quality of life, but patients obtained an additional 13.15 quality of life. Further studies comparing the GDP per capita, or the threshold value, or the willingness to pay are necessary to determine whether the addition is commensurate or not.

A study conducted in Germany reported that patients who used the new wound dressing (foam dressing) had a reduced mean frequency of dressing change by 1.3 times per week (from 4.6 to 3.3). The cost of dressings per change increased slightly, but the average cost of dressings per week was reduced by approximately 23% (Kronert, G. T., Roth, H., & Searle, R. J., 2016). Another study conducted at Jss Hospital, India, found that topical sucralfate was more cost-effective than conventional dressings, as it required a lower number of dressings and reduced hospital stay significantly (Preethi, S. P., & Dhanasekaran, V., 2019). Based on there search

conducted in the USA, the incremental cost-effectiveness ratio of Dermagraft(R) (human dermal replacement) equals 38,784 FF, indicating the extra investment that the decision-maker has to accept for an additional ulcer healed with Dermagraft(R) compared with conventional treatment (Allenet, B., et al. 2000). However, it is different from the results of research in the UK reporting no difference in effectiveness and quality of life of N-A (a non-adherent, knitted, viscose filament gauze), Inadine (an iodine-impregnated dressing), both traditional dressings, and Aquacel, a newer product. The only statistically significant difference found in the health economic analysis was the cost associated with the provision of dressings (mean cost per patient: N-A 14.85 pounds, Inadine 17.48 pounds, Aquacel 43.60 pounds) (Jeffcoate, W., et al 2009).

Conclusion

This study showed that modern wound dressings provide a higher quality of life at a higher cost. Indeed, it cost more than 22,813 IDR to change from conventional to modern wound dressings and increase 1 unit of quality of life, but patients obtained an additional 13.15 quality of life. Further studies comparing the GDP per capita, or the threshold value, or the willingness to pay are necessary to determine whether the addition is commensurate or not.

Limitations of the Study

The number of patients included in the evaluation was small, so the analysis in this study used the number of patients visits. Nevertheless, it would be beneficial to undertake further work in other wound care clinics and public health centers to increase confidence in the generalizability of the results.

Acknowledgements

We would like to thank KemristekDikti for the grant. We thank the Azmi Wound Care Center (AWCC) Lombok and several Public Health Centers in West Lombok Regency and Mataram City, West Nusa Tenggara, for supporting and providing data for research purposes. We thank Kirana Asari and Melia Sari for their research assistance.

Conflict of Interest

The authors declare no conflict of interest.

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Table I. Overview of Utility of Diabetic Foot Ulcer Patients

| Demography of patients | Modern Wound Dressing | | | Conventional Wound Dressing | | |
|-------------------------------|------------------------------|------------|-------------------|------------------------------------|------------|-------------------|
| | Total | Percentage | Mean | Total | Percentage | Mean |
| | (n=11) | | Utility (n=55) | (n=5) | | Utility (n=20) |
| Gender | | | | | | |
| Male | 5 | 45.45% | 104.38±9.49 | 3 | 60% | 89.25±6.94 |
| Female | 6 | 54.55% | 97.32±15.01 | 2 | 40% | 84.25±7.59 |
| Age | | | | | | |
| < 46 years old | 2 | 18.18% | 106.00±5.46 | 2 | 40% | 85.63±6.44 |
| ≥ 46 years old | 9 | 81.82% | 99.16±14.19 | 3 | 60% | 88.33±8.14 |
| Education | | | | | | |
| <Senior High School | 5 | 45.45% | 94.42±14.67 | 3 | 60% | 84.00±6.15 |
| ≥ Senior High School | 6 | 54.55% | 105.76±9.19 | 2 | 40% | 92.13±6.77 |
| Occupation | | | | | | |
| Employed | 10 | 90.91% | 99.24±13.33 | 3 | 60% | 90.00±7.81 |
| Not Employed | 1 | 9.09% | 112.00±4.00 | 2 | 40% | 83.75±5.60 |
| Marital Status | | | | | | |
| Married | 10 | 90.91% | 103.94±9.97 | 4 | 80% | 87.38±7.21 |
| Unmarried | 1 | 9.09% | 79.63±11.29 | 1 | 20% | 86.75±4.57 |
| Smoking Status | | | | | | |
| Smoking | 3 | 27.27% | 102.33±9.96 | 2 | 40% | 85.13±4.09 |
| Not Smoking | 8 | 72.73% | 99.68±14.36 | 3 | 60% | 88.67±8.93 |

Table II. Cost of Modern Wound Dressing and Conventional Dressing per Visit

| Cost Components | Modern Wound | Conventional Wound | P-value |
|--------------------------|---------------------|---------------------------|----------------|
| | Dressing | Dressing | |
| | (n=55) | (n=20) | |
| | Total IDR | Total IDR | |
| Direct Medical Cost | IDR 12,034,000 | IDR 0 | 0.000* |
| - Cost of wound dressing | (IDR 5,094,000) | (IDR 0) | |
| - Cost of wound care | (IDR 6,940,000) | (IDR 0) | |
| Direct non-medical cost | IDR 1,650,000 | IDR 88,000 | 0.000* |
| Indirect Cost | IDR 5,408,223 | IDR 854,795 | 0.009* |
| Total cost | IDR 19,092,223 | IDR 942,795 | |
| Mean Cost | IDR 347,131±129,309 | IDR 47,140±39,183 | 0.000* |

Table III. Cost-Utility Analysis between Modern vs Conventional Wound Dressing

| Calculations | Modern Wound Dressing (n=55) | Conventional Wound Dressing (n=20) | P-value |
|---|---------------------------------|---------------------------------------|---------|
| Mean Cost | IDR 347,131±129,309 | IDR 47,140±39,183 | 0.000* |
| Mean Utility | 100.4±13.27 | 87.25±7.45 | 0.000* |
| Cost Utility Ratio (CUR) | IDR 3,457 | IDR 540 | |
| Incremental Cost Utility Ratio (ICUR) | | IDR 22,813 | |

**3. Bukti pemberitahuan submit manuskrip
(19 Juli 2021)**



Baiq Leny Nopitasari <baiqleny.nopitasari@gmail.com>

Fwd: [PE] Submission Acknowledgement - Pharmacy Education

1 message

Cyntiya Rahmawati <cyntiya.apt@gmail.com>
To: Baiq Leny Nopitasari <baiqleny.nopitasari@gmail.com>

Tue, Apr 18, 2023 at 9:30 AM

----- Forwarded message -----

Dari: **Marwan El Akel (Managing Editor)** <pej@fip.org>

Date: Sen, 19 Jul 2021 20.51

Subject: [PE] Submission Acknowledgement - Pharmacy Education

To: Cyntiya Rahmawati <cyntiya.apt@gmail.com>, Baiq Leny Nopitasari <a@email.com>

Hello Authors,

Celeste Watson has submitted the manuscript, "IAI PROCEEDING: A pharmacoeconomic study: cost-utility analysis of modern wound dressings vs conventional wound dressings in patients with diabetic foot ulcer " to Pharmacy Education.

If you have any questions, please do not hesitate to contact me. Thank you for considering this journal as a venue for your work.

Kind regards

Pharmacy Education

**4. Bukti penerimaan publikasi
(25 Juli 2021)**

Education

omissions

1405 / Nop

Workflow

Submiss

Prod

Name

[PE].A

Confir

[PE] Approval for publication

Participants

- Sherly Meilianti (smeilianti)
- Baiq Leny Nopitasari (bnopitasari)

Messages

| Note | From |
|--|--|
| <p>Dear Baiq Leny Nopitasari,</p> <p>We would like to invite you to do a final review of your manuscript: "IAI CONFERENCE: The effect of stress level on the therapeutic outcomes of type 2 diabetes mellitus at the regional public hospital of West Nusa Tenggara province ," before we publish it.</p> <p>May you have a final look and let us know if there are any changes needed by 27 July 2021, 23:59 GMT? Please note that if we do not receive any feedback by that time, we will consider this as approval for the publication of your article.</p> <p>Submission URL: https://pharmacyeducation.fip.org/pharmacyeducation/authorDashboard/submission/1405</p> <p>Thank you and we look forward to hearing from you.</p> <p>Best, PEJ team</p> | <p>smeilianti 25-07-2021 09:26</p> |

Pharmacy Education



Baiq Leny Nopitasari <baiqleny.nopitasari@gmail.com>

Fwd: [PE] Approval for publication

1 message

Cyntiya Rahmawati <cyntiya.apt@gmail.com>
To: Baiq Leny Nopitasari <baiqleny.nopitasari@gmail.com>

Tue, Apr 18, 2023 at 9:46 AM

----- Forwarded message -----

Dari: **Sherly Meilianti** <sherly@fip.org>Date:

Min, 25 Jul 2021 04.56

Subject: [PE] Approval for publication

To: Cyntiya Rahmawati <cyntiya.apt@gmail.com>, Baiq Leny Nopitasari <a@email.com>

Dear Cyntiya Rahmawati, Baiq Leny Nopitasari,

We would like to invite you to do a final review of your manuscript: "IAI CONFERENCE: A pharmacoeconomic study: cost-utility analysis of modern wound dressings vs conventional wound dressings in patients with diabetic foot ulcer," before we publish it.

May you have a final look and let us know if there are any changes needed by **27 July 2021, 23:59 GMT**? Please note that if we do not receive any feedback by that time, we will consider this as approval for the publication of your article.

Submission URL: <https://pharmacyeducation.fip.org/pharmacyeducation/authorDashboard/submission/1406> Thank you

and we look forward to hearing from you.

Best,

PEJ team

Pharmacy Education

**5. Bukti konfirmasi artikel published online
(29 Juli 2021)**

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missions

1405 / Nop

Workflow

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Name

[PE] A

Confir

Confirmation of publication

x

Participants

Celeste Watson (celestewatson)

Baiq Leny Nopitasari (bnopitasari)

Messages

| Note | From |
|------------|-----------------------------------|
| Dear Baiq, | celestewatson 28-07-2021 22:09 |

We are pleased to confirm that your paper entitled: "The effect of stress level on the therapeutic outcomes of type 2 diabetes mellitus at the regional public hospital of West Nusa Tenggara province" has been published and is available on our website for access and download. The DOI is: <https://doi.org/10.46542/pe.2021.212.6770>

We would like to encourage the authors to share this publication through your social media. Feel free to tag us at our Twitter account: @PharmEd_journal

Thank you for your submission and for choosing Pharmacy Education.

Best regards,

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Discussion

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Fwd: [PE] New notification from Pharmacy Education

1 message

Cyntiya Rahmawati <cyntiya.apt@gmail.com>
To: Baiq Leny Nopitasari <baiqleny.nopitasari@gmail.com>

Tue, Apr 18, 2023 at 11:38 AM

----- Forwarded message -----

Dari: **Sherly Meilianti** <sherly@fip.org>Date:
Kam, 29 Jul 2021 00.41
Subject: [PE] New notification from Pharmacy EducationTo:
Cyntiya Rahmawati <cyntiya.apt@gmail.com>

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issue has been published.

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regards

Marwan El Akel (Managing Editor)

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