Cost-Effectiveness of Warfarin Medication Therapy Adherence Clinic versus Usual Medical Clinic at Kuala Lumpur Hospital

Subramaniam Thanimalai, BPharm[1,2], Asrul Akmal Shafie, PhD[1,*],
Mohamed Azmi Ahmad Hassali, PhD[1], Jeyaindran Sinnadurai, MD[2]

[1]Universiti Sains Malaysia, Penang, Malaysia; [2]Ministry of Health Malaysia, Putrajaya, Malaysia

A B S T R A C T

Background: Systematic anticoagulation management clinic is recommended to manage patients on chronic warfarin therapy. In Malaysia, the service was introduced as warfarin medication therapy adherence clinic (WMTAC), which is managed by pharmacists with a physician advisory. **Objectives:** To assess the cost-effectiveness of WMTAC in comparison with usual medical clinic (UMC), which is managed by medical officers in Kuala Lumpur Hospital, a tertiary referral hospital in Malaysia. **Methods:** Data from a 6-month retrospective cohort study comparing the two clinics and the mean percentages of time in the therapeutic range for the patients were used to estimate the cost-effectiveness. The mean clinic costs were estimated using the time-motion study. A Markov model with a 6-monthly cycle was used to simulate lifetime cost-effectiveness from the perspective of the health care service provider. The base-case analysis assumed a cohort of patients with atrial fibrillation, 57 years of age with comorbid illnesses.

The transition probabilities of these clinic outcomes were obtained from a literature search. Future costs and effectiveness were discounted by 3% to convert to present values. All costs were in Malaysian ringgit standardized for the year 2007. **Results:** The mean 6-month treatment cost was lower for the WMTAC, which was significantly lower (P < 0.001). The UMC was found to be dominated by the WMTAC for both intermediate and lifetime analyses. The sensitivity analysis showed that clinic consultation costs had a major impact on the cost-effectiveness analysis. **Conclusions:** WMTAC is a more cost-effective option than UMC in Kuala Lumpur Hospital.
Keywords: anticoagulation clinic, cost-effectiveness, usual medical clinic, warfarin medication therapy adherence clinic.

© 2017 Published by Elsevier Inc. on behalf of International Society for Pharmacoeconomics and Outcomes Research (ISPOR).

Introduction

Management of warfarin is usually done through the international normalized ratio (INR) monitoring as well as via consultations in medical clinics, also known as the usual medical clinic (UMC). Various approaches have been recommended to improve anticoagulant care. These approaches include anticoagulation management services (AMS), point-of-care testing, computer decision support systems, patient self-testing, and patient self-management [1,2]. Point-of-care services and computer decision support systems can be incorporated in available clinics. AMS and UMC are common methods of managing the general anticoagulation requirements of the population.

Most available literature on the economic evaluation of warfarin management models that compare AMS and UMC are studies based in Western countries [3–7], with the exception of two in Asia [8,9]. The cost activities used for these studies were minimally described and had mostly demonstrated the cost-effectiveness of clinics on the basis of the costs of adverse events, without defining the effectiveness of the clinics.

The Pharmaceutical Service Division, Ministry of Health Malaysia, initiated the warfarin medication therapy adherence clinic (WMTAC) as part of the ambulatory pharmacy services in 2005. Although the uptake of the clinics has been slow, it is currently implemented in numerous centers as an adjunct to the UMC. The WMTAC in a few hospitals, such as the Kuala Lumpur Hospital (KLH), has grown into a parallel clinic with a physician advisory. A formal clinical outcomes evaluation of the WMTAC in KLH, one of the pioneering tertiary referral centers in Malaysia, has shown that WMTAC significantly provided better anticoagulation control than the UMC [10]. Its impact on economic outcomes has, however, not been evaluated.

Medical research shall continue to produce an ever-increasing number of alternatives for the detection, prevention, and treatment of diseases [11]. Thus, it is pertinent that newer interventions are assessed for their cost-effectiveness. Therefore, the primary objective of this study was to determine the cost per patient every 6 months and the intermediate and lifetime cost-effectiveness of both the UMC and the WMTAC in KLH from the perspective of the health care service provider.

Methods

Setting

The study was conducted at the Department of General Medicine, KLH, a 2302-bedded tertiary national referral center in Malaysia. The UMC in KLH is a clinic managed by rotational medical officers. The WMTAC is governed by pharmacists using an approved management protocol with a physician advisory.

Study Design

This is a study assessing costs and cost-effectiveness of WMTAC versus UMC from the perspective of the health care service provider. The effectiveness data are reported elsewhere [10]. The cost analysis is a 6-month retrospective study conducted during the same period as the clinical outcomes study. Regarding the cost difference, a difference of MYR25 (Malaysian ringgit) in the annual cost per patient was taken to be significant, which at 80% power and 5% significance requires 63 patients per group. The intermediate cost-effectiveness of WMTAC versus UMC was estimated from the available local data. Data from both the local cost-effectiveness study and the literature review were then used to evaluate the lifetime cost-effectiveness of WMTAC versus UMC in KLH. Prices or cost data were standardized for the year 2007 (MYR1 = US $0.30 [http://www.exchange-rates.org/Rate/MYR/EUR/12-31-2007]).

Cost Inputs

Health care costs for anticoagulation therapy management included four cost centers: monitoring, clinic consultations and dispensing, warfarin, and adverse events (see Table 1). All cost centers had diverse cost activities such as personnel costs, capital costs (clinic space, diagnostic equipment, and consumables), warfarin costs, diagnostics costs (pathology), and costs of adverse drug events (emergency department presentations and hospital admissions), which were assessed in the cost analysis.

Table 1 – Costs related to anticoagulation management.		
Cost center (types of cost)	**Cost input**	**Source**
Monitoring		
Venous blood test	Estimated cost per test	[18]
Point-of-care testing	Purchase cost	[47]
Consumables	Purchase cost	[16]
Personnel	Salary (± training cost)	[48]
Clinic consultation		
Personnel	Salary (± training cost)	[48]
Stationery	Purchase cost	[14]
Clinic space	Estimated cost	[15]
Drug		
Warfarin cost	Purchase cost	[16]
Dispensing		
Dispensing area cost	Estimated cost	[16]
Personnel cost	Salary (± training cost)	[48]
Adverse events		
Room and board	Hospital fee	[17]
Drugs	Purchase price	[16]
Investigations	Estimated cost	[17,18]
Emergency clinic	Visit fee	[17]

Personnel costs

A time-motion study was conducted to assess the time taken by each personnel category and their costs. The clinical processes involved various health personnel, such as the health care treatment assistants, nurses, assistant medical officers, assistant pharmacy officers, pharmacists, medical officers, and medical specialists.

The time was based on the mean time spent by the personnel, with each having at least 15 anticoagulation patients for different categories of the INR target (above, within, and below target level). The hourly wages of the personnel were determined by dividing their basic annual salary, in accordance to the pay scale of the Federal Civil Service Officers under the System of Remuneration Malaysia [12], with the total estimated working duration of 8 hours over 52 weeks, with the exception for the hourly wages of the pharmacists conducting the WMTAC for whom the estimated cost [13] of attending a WMTAC workshop was added to their basic salary.

Capital costs

The costs of furniture as well as clinical and nonclinical machines were obtained from the KLH procurement section [14]. To remain consistent with other Malaysian hospitals that do not adopt the reagent-rentals approach and to enhance the generalizability of the results, the costs of these reagent-rental machines were acquired from the same providing companies, assuming that KLH bought these machines rather than reagent-rented them. The cost of the building was calculated by multiplying the area of space in square feet by MYR85, which represented the cost of 1 ft^2 of a local hospital space [15]. The total capital costs were the sum of equivalent annual costs of all assets involved in the intervention per service over 6 months. Next, the asset cost per sample per patient was calculated by dividing the total capital costs by the total number of samples per patient exposed to that particular intervention for each service in the year 2007. Along these lines, several assumptions were made. The useful life of a clinical machine was assumed to be 5 years, whereas for furniture and the building, the useful life was considered to be 10 and 30 years, respectively. Straight-line depreciation with a discount rate of 3% was further assumed. At the end of an asset's useful life, the resale value was considered to be 10% of the initial cost [15].

Drug costs

The 6-month medication (warfarin) cost of each patient was calculated by multiplying the mean dose to the strength on the basis of the KLH Logistics Pharmacy Unit's acquisition cost of warfarin in the year 2007 [16].

Adverse events costs

Adverse events admissions and emergency department presentations were identified if noted in the warfarin book, and the indications were viewed as suspected warfarin-related adverse events. As for the admission costs, patient records were obtained to identify the number of admission days and types of resources used. The types of resources identified were ward admissions, laboratory tests, drugs, and blood products. The ward admission costs were acquired from the Fees Act 1951 [17]. The unit costs of laboratory tests were gathered from the KLH Pathology Department [18]. The drug and blood product costs were collected from the KLH Logistics Pharmacy Department [19] and the National Blood Bank [20], respectively. Costing errors were minimized by comparing the medical chart review and the medical bill available in the administrative claims database.