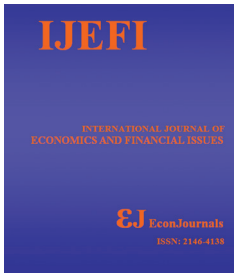

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2021, 11(1), 126-134.

A Framework for Developing a Model Structure of Budget Impact Analysis for New Health Care Interventions in Jordan

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Received: 07 September 2020 **Accepted:** 05 December 2020 **DOI:** https://doi.org/10.32479/ijefi.10573

ABSTRACT

This paper assesses the impact of substituting clopidogrel with ticagelor to treat patients after an acute attack of Ischemic Heart Disease from the perspective of Jordanian MOH in its tenders, using Budget Impact Analysis (BIA). A multiple regression analysis used to estimate the elasticities associated of implementing the two treatments, and then Matlab used to compare the old and new treatments. The study recommends the gradually substitution of the new treatment using ticagelor because it achieves total cost savings of approximately 200,000 Jordanian dinars, and that the flexibility of the new treatment costs is less than in the case of the old treatment, which means that the increase in numbers of patients will lead to a lower increase in the total costs when using the new treatment.

Keywords: Budget Impact Analysis, Acute Coronary Syndrome, Ticagrelor
JEL Classifications: I11, I15, I19

1. INTRODUCTION

Jordan is a middle-income developing country. Its population amounted to 10.3 million in 2018, including refugees; mainly from Syria (DoS, 2018). Jordan has a small economy with limited natural resources and growing political pressure, and is expected to remain significantly affected by regional events.

The Gross Domestic Product (GDP) in 2018 was 27.8 billion Dinars (US$ 38 billion) and the GDP per capita was 4098 US$ (World Bank, 2018). According to the National Health Account (NHA) 2013, Jordan spent approximately JD 1.88 billion on health. This represented 7.89% of Jordan's GDP at that time. About one third of the health care spending was on pharmaceuticals, (Alabbadi, 2015) a high percentage for a middle income country, especially when compared to countries with richer natural resources.

All of the above mentioned factors challenge the government to develop strategies and policies for medicines regulation and cost containment. These strategies of course should not compromise the quality of patient care and delivering the most up to date health care practice to all citizens. The Ministry of Health (MOH) governs the health care system in the country, through mandating the public health law and other legislations to monitor and regulate all health professions and institutions in the country (WHO, 2018).

During the past decade, significant health policy changes have occurred in terms of recognizing the need for evidence based decision making. Policy makers would substantially benefit from health economics based decision making to cope with increasing difficulties in funding medical care in a rapidly growing demand for health services (Soto-Gordoa, et al., 2017). Furthermore, the high and rising cost of pharmaceuticals has made it increasingly necessary for drug budget administrators to allocate the resources in their hands efficiently (Brenna, et al., 2006).

Based on the International Society for Pharmaco-economics and Outcomes Research (ISPOR), the information sought by decision makers for drug reimbursement and drug economic evaluation for market entry and administration was limited to safety, efficacy

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and quality (ISPOR, 2014). In recent years, and according to the fast growing number of pharmaceuticals, Cost Effectiveness (CE) studies were required by manufacturers when submitting new drugs for reimbursement decisions (Squires, et al., 2016).

The reason for that is to measure and compare the added value of new treatments to existing ones. As CE studies provide decision makers with estimation of investment required to realize a specific change in health, attention has now begun to focus on affordability (Foroutan, et al., 2019). Nowadays, policy makers adopt Budget Impact Analysis (BIA) studies to estimate fiscal consequences of adopting new health technology or new medication (ISPOR, 2014). BIA estimates financial consequences of adopting a new health technology or intervention within a specific context (Garagiola, et al., 2016).

That's why BIA studies alongside CE studies are requested to submit evidence for formulary approval. Some countries follow local guidelines for BIA and others follow the ISPOR guidelines for conducting BIA studies (Garattini and de Vooren, 2011).

This paper discusses the impact of substituting clopidogrel with ticagelor to treat patients after an acute attack of Ischemic Heart Disease from the perspective of Jordanian MOH in its tenders, using BIA.

2. LITERATURE REVIEW

Guidance on how BIA studies are conducted is limited. The study of (Mauskopf et al., 2007) recommended that the budget impact of a new health technology should consider the perspective of a specific health-care decision-maker. As such, the BIA should be performed using data that reflect, for a specific health condition, the size and characteristics of the population, the current and new treatment mix, the efficacy and safety of the new and current treatments. They also recommended that budget impact analyses be generated as a series of scenario analyses in the same manner that sensitivity analyses would be provided for Cost Effectiveness Analysis.

Orlewska and Gulácsi, 2009 reviewed budget-impact analyses (BIAs) with reference to current best practice, and discussed where future research needs to be directed. They indicated that, recently, BIAs has appeared more frequently in peer-reviewed journals, providing stimulus to development, validation and dissemination of methods used to conduct budget impact studies. They also found that published studies fail to reach the desired quality, but this situation should change with good research practice principles that will help codify and clarify important issues and promote standardization and transparency. Future research needs to be directed to quality assurance of published BIAs and investment in data collection for parameters specific to BIAs.

In their study, Jamshidi et al., 2014, clarified the most important published international BIA guidelines. These studies began in UK in 2001 and studies from Canada, Poland and the ISPOR task force continued to add insight on the milestones for conducting BIA for economic evaluation. Upon exploring these guidelines they noticed a common finding between most of them, that is although the value of BIA is well recognized, the analysis has been slow to develop. For example the Belgian and the Canadian guidelines did not systematically review the BIA literature. In contrast, the French BIA guidelines provide a comprehensive review of the BIA literature. Nevertheless, the French review did not provide sufficient details regarding the individual guidelines reviewed and cannot be used as a foundation for constructing a new set of BIA guidelines or updating existing versions.

Factors that are considered the backbone of the analysis are almost the same in these guidelines. They include model design, model perspective, scenarios to be compared, target population, time horizon, treatment costs, uncertainty analysis and model validation.

The perspective is an important aspect in healthcare economic evaluations. The budget holder perspective is usually recommended, however studies can also take the societal perspective into consideration (Orlewska and Gulácsi, 2009). It is suggested that heath care providers such as hospitals take the most advantage of BIAs reports.

The question of whether BIA should be positioned as complementary to health economic evaluation or viewed as a standalone financial evaluation is answered by Trueman et al., 2001. He concluded that the two methods might work. Mauskopf and Earnshaw, 2016, conducted a review of models used in the US, and their primary finding is that the recommended practice is not followed in many BIA studies. Usually health economic evaluation studies uses excel templates to build decisions based on the simplest models available to support practice. In these studies, the model simply compares direct medical costs of treating a cohort of patients using different types of treatments, (Sullivan et al., 2014), Also, (Leelahavarong, 2014) recommended including guidelines on appropriate analytic framework design, study design, perspective, scenarios for comparison, target population, costing and resource use, uncertainty analysis, and discounting, in the BIAs studies.

(Chang and Sung, 2005) Estimated the percentage of patients seeking care, treatment patterns, and quantities of medications dispensed for atopic dermatitis (AD) or eczema, using BIA analysis for the 2001 and 2002 medical and pharmacy records in a proprietary database for health plans distributed throughout the United States. The addition of Pimecrolimus as a treatment option for AD had a minimal impact on Per-Member-Per-Month (PMPM) costs for AD-related care in 2003 dollars. As with all pharma economic models, health plans should perform their own budget forecasting using assumptions derived from their own pharmacy and medical claims data.

(Mar et al., 2010) combined BIA with Markov modeling to study the impact of treating part of the population of a certain disease on budget. First Markov model was used to calculate the prevalence of stroke in the Basque country. Then BIA was used to estimate the impact on health budget if 10% of this population was treated 6 years back. They concluded that the budget impact analysis of thrombolysis for stroke starting in 2000 showed a positive impact

on the health budget because it saved costs after 2006 and produces a net benefit in health from the beginning of treatment.

(Mar et al., 2010) calculated by means of a discrete event simulation model the budget impact of thrombolysis in Spain. Using BIA based on stroke incidence rates and the estimation of the prevalence of stroke-related disability in Spain and its translation to hospital and social costs, found that the impact of thrombolysis on society's health and social budget indicates a net benefit after 6 years, and the improvement in health grows continuously. The validation of the model demonstrates the adequacy of the discrete event simulation approach in representing the epidemiology of stroke to calculate the budget impact.

Nuijten et al., 2011 addressed the importance of dealing systematically and comprehensively with uncertainty in a budget impact analysis (BIA) in more detail. They argued that the use of standard sensitivity analyses for BIA data set might be limited because of the lack of appropriate distributions as data sources are limited, or because of the need for forecasting. Therefore, scenario analyses might be more appropriate to capture the uncertainty in the BIA data set in the overall BIA model.

In addition (Brodszky et al., 2015) estimated budget impact of the introduction of biosimilar infliximab in RA over a 3-year time period in six selected countries, namely Bulgaria, the Czech Republic, Hungary, Poland, Romania and Slovakia. Two scenarios were compared to the reference scenario (RSc) where no biosimilar infliximab is available, scenario 1 (BSc1), only patients who start new biological therapy are allowed to use biosimilar infliximab, scenario 2 (BSc2), where 80% of patients treated with originator infliximab are interchanged to biosimilar infliximab. They concluded that the net savings are estimated to be €15.3 or €20.8 M in BSc1 and BSc2, respectively, over the 3 years. If budget savings were spent on reimbursement of additional biosimilar infliximab treatment, approximately 1,200 or 1,800 more patients could be treated in the six countries within 3 years in the two biosimilar scenarios, respectively.

3. THE JORDANIAN HEALTH SECTOR

The health sector in Jordan consists of sub-sectors providing health services, namely: the public sector; the private sector; International organizations; NGOs and Charities. Among the institutions and councils working on developing health policies are the High Health Council; The Higher Population Council; The medical board; The Nursing Council; The National Council for Family Affairs; The Jordanian Food and Drug Administration and the unified procurement department (MOH, 2019).

The public sector includes: the Ministry of Health; Royal medical services; University hospitals (University of Jordan Hospital; Founding King Hospital) and the Center for Diabetes, Genetics and Endocrinology. The private sector includes: private hospitals; Diagnostic and therapeutic centers; In addition to hundreds of private clinics. The International Organizations, NGOs and Charitable Societies sector provide their services through the UNRWA Relief Work Centers (UNRWA) clinics; The United Nations High Commissioner for Refugees (UNHCR) and some charitable hospitals, such as: the Hussein Cancer Center; The Islamic Hospital; Noor Al Hussein and the Caritas Foundation; The Jordanian Family Planning Association; and charity clinics (MOH, 2019).

The National Health Accounts Report for the year 2015 showed that Jordan spent 236 dinars on an individual's health, and the total health spending amounted to (2 billion and 200 million). While the volume of total health spending as a percentage of the gross domestic product reached 7.89% in 2013. The total spending on medications was about 581 million dinars and constituted 26.6% of the total spending on health in 2013. It should be noted here that the percentage of spending from the citizen's pocket from the total spending for the year 2015 was about 26%. Jordan achieved universal immunization for children in 1988, and made great progress in reducing the major health risks to infants and children (DoS, 2018).

The percentage of insured population reached 68% of the Jordanian citizens and 55% of the population of the Kingdom, according to the population census in 2015. The health insurance is divided into: Civil Health Insurance, which covers about 44.5% of the total percentage of the insured, and Military Health Insurance, which covers about 38% of the insured (DoS, 2018).

As mentioned earlier the amount of spending on medicine in the year 2015 was about JD 581 million, distributed between the two sectors. The volume of spending on medicines is considered part of the total health expenditures in Jordan. This percentage reached 25.8% in the year 2015 compared to 19% in the European Union countries.

The Ministry of Health provides primary, secondary and post-secondary health care services, and provides primary health care primarily through a network of health centers (102 comprehensive centers, 380 primary health centers, 194 sub-health centers, 464 maternity and childhood centers and 405 oral and dental health clinics) (MOH, 2019).

As for secondary and post-secondary health care services, it is provided through 31 hospitals affiliated to the Ministry of Health and distributed over 12 governorates in Jordan. The number of beds is 5177 beds, representing more than a third of the number of beds in hospitals in Jordan, 36.4% (MOH, 2019).

The Ministry of Health is responsible for managing the civil health insurance program that covers civil servants and their beneficiaries. Individuals classified as poor, people with disabilities, children under the age of 6 years and blood donors or members who are officially covered by the civil health insurance program. The Ministry of Health recently opened its services to all citizens; part of whom are refugees, whereby anyone can receive the health services available through any center affiliated to the Ministry with fees supported by the government.

Together, MOH, the Royal Medical Services and the university hospitals constitute 66.17% of total health spending of the public

sector. In 2012, 72.2% of the above public sector spending was on hospitals. This requires a focus on policies and procedures that help contain health costs in hospitals. However according to a recent analytical study on health spending in Jordan, the Jordanian Government is not organized or prepared to continue providing health services at the present trend, namely fast increase in demand over publicly funded services in the absence of efficiency gains (MOH, 2019).

Not only clinical trials and cost effectiveness studies need to be implemented when taking decisions about where to allocate budget efficiently, but also, as proved earlier budget impact studies are to be considered. Especially when deciding about adopting new healthcare technologies that may increase burden on health budget without serving its claimed added value.

This study investigates the impact of using ticagrelor, a new medication used in the treatment of Acute Coronary Syndrome ACS (the number one leading cause of death in Jordan according to the Centre for Disease Control DSC report on Jordan in 2010) and compares it to the traditional old treatment of this disease in the healthcare facilities of Jordanian MOH.

4. DISEASE AND MEDICATION

Acute Coronary Syndrome (ACS) was the number one leading cause of death in Jordan in 2010; however no specific study addressed the burden of heart disease on the MOH budget. Old studies indicated that ACS were responsible for 34% of female mortality and 43% of male mortality in Jordan (MOH, 2019).

Dual antiplatelet therapy with aspirin and clopidogrel is recommended in guidelines for the treatment of patients with ACS. Newer ticagrelor antiplatelet therapy was proved by clinical trials to be superior in preventing death and myocardial infarction. However newer novel therapeutic innovations face not only safety and efficacy clinical assessments, but also economic implications of their reimbursement in different health care facilities. In Jordan ticagrelor entered the MOH tenders in the year 2014, and since then its impact on the budget of medication tenders has not been studied yet. Budget impact is needed to study its effect after 6 years of adopting the new medication to treat ACS patients.

PLATO is the major international randomized, double blinded driven trial involving more than 18 thousand patients hospitalized for ACS. The study compared the use of clopidogrel 300 mg with ticagrelor 180 mg after an incidence of an acute event of ACS for 6-12 months. PLATO study found that the new treatment ticagrelor significantly reduced the rate of death from vascular causes, myocardial infarction or stroke (the consequences of an acute event of ACS attack).

Following the PLATO trial, detailed resource use and clinical data were used to assess the impact of substituting clopidogrel with ticagelor to treat patients after an acute attack of ACS from the perspective of MOH in its tenders.

5. EMPIRICAL WORK

5.1. Description of the Sample and Models

This study estimated the cost functions associated with the use of two different medications indicated for the treatment of Acute Coronary Syndrome ACS. Clopidogrel which has been recommended in guidelines as the standard treatment and the new medicine ticagrelor approved lately for the same indication. Ticagrelor (180 mg); loading dose and 90 mg twice daily their after [the new scenario] vs. clopidogrel (300-600 mg); loading dose and 75 mg daily their after [the baseline scenario] for the prevention of cardiovascular events. Study sample is composed of 1012 patients admitted to MOH hospitals with ACS. The studied sample for the old treatment included 495 patients while the sample studied for the new treatment depended on 517 patients of which; 65% of the cases were maintained on the old treatment and 35% were switched to the new one.

The sample for the baseline scenario was distributed over the years, 115 patients in 2015, 103 patients in 2016, 117 patients in 2017, 101 in 2018, and 59 in 2019. As for the new scenario, the sample was divided into 224 patients who were on the old medication and switched to the new treatment from the old one in 2018 and 79 new patients underwent the new treatment right after diagnosis in the same year. In 2019, 112 patients shifted from the old treatment to the new and 102 underwent the new treatment to make a total of 214 patients in 2019. The new scenario treatment groups were balanced with regard to all baseline characteristics and non-study medications and procedures, using MATLAB. Normally, as mentioned earlier, BIA studies take on average 3.5 years. That's why patient sample covered the period from 2015 to 2019, as 2018 was the year the new scenario entered the tenders. Patient eligible for enrollment were patients who had an acute onset coronary syndrome during the last 24 h, admitted to MOH healthcare facilities during the period (2015-2019). Data differ from one patient to another according to the disease and age, so there are slight differences between the patients in terms of the cost that are evident in the sample. The data used for model analysis were extracted from the tenders of the Ministry of Health (MOH) and the unit costs for services in its facilities. The choice of cost elements or variables used in the model relied on clinical trials that were conducted on these drugs in both the United States and Australia, mainly the PLATO clinical trial (Yagudina, et al., 2017).

Following Orlewska and Mierzejewski (2004) our study depended on two scenarios in forecasting the BIA, baseline scenario which consisted of the analysis of the current state and the forecasting of the current state if the new procedure not implemented. The new scenario which consisted of the state when the new procedure adopted.

In order to estimate the baseline scenario the study will adopted the following model:

$$logCost_i = \alpha_0 + \alpha_1 logOPC_i + \alpha_2 logDS_i + \alpha_3 logOC_i + \mu_i \ldots \quad (1)$$

In order to estimate the new scenario the study will adopted these models:

$$logCost_j = \gamma_0 + \gamma_1 logOPC_j + \gamma_2 logDS_j + \gamma_3 logOC_j + \varepsilon_j \dots (2)$$

Were:
$logCost_i$ = The cost of using the procedure
$logOPC_i$= Operational cost
$logDS_i$ = the cost of dose
OC_i = other cost related to the procedure
α_{is}, γ_{is} = estimated elasticity (parameters)
μ_t, ε_t = Error terms
Were j refers to the new procedure and γ, δ refers to the forecasting parameters.

The costs studied in the study models includes the administrative costs, the dose cost for each patient, the costs related to the period of treatment, and any other costs. Costs considered where related to Operational cost (OPC) which includes follow up hospitalization and out patients visits and related diagnostic tests such as PCI, cardiac surgeries, coronary angiography, cardiac imaging and transfusions. In addition to, the cost for major procedure related to old or new scenario requiring blood transfuses and hospitalization. Dose cost (DS) which includes also the storage of the medicine, and any other costs (OC). The sample relied on patient readings during the treatment period when performing the catheterization process, and the various costs of the operation and health care were monitored after the procedure from setting up, medication and healthcare device to doctors and nurses. Costs of follow up in outpatients clinics where also considered OPC, DC and OC.

5.2. Analysis

5.2.1. Estimation results

Using of ordinary least squares (OLS) study models were estimated and the results were as follows:

The results in Table 1 indicate that there is:

- A positive significant relationship between the Management Cost (OPC) and Total Cost (TC), thus, 1% increase of (OPC) increases (TC) by 0.81%. The results indicate that the TC is inelastic to the changes in OPC.
- A positive significant relationship between the Cost of Dose (DS) and Total Cost (TC), thus, 1% increase of (DS) increases (TC) by 0.038%. The results indicate that the TC is inelastic to the changes in DS.
- A positive significant relationship between the Other Cost (OC) and Total Cost (TC), thus, 1% increase of (OC) increases (TC) by 0.13%. The results indicate that the TC is inelastic to the changes in OC.

Further, diagnostic tests indicates that the estimated model is suffer from multicollinearity as the Variance Inflation Factor (VIF) statistics show in Table 2 that all values is greater than 10. And there is no Heteroscedasticity problem The F statistic indicates that there is no problem of Heteroscedasticity in terms of its probability value, which confirms the inability to reject the null hypothesis.

For the new scenario we adopted the same method to estimate the results:

Table 1: Base line scenario

Dependent Variable		LnCost	
Method		Least Squares	
Date: 05/13/20		Time: 23:22	
Sample: 1 495		Included observations: 495	
Variable	Coefficient	Std. Error	t-Statistic
LNDS	0.038796	0.003181	12.1939*
LNOPC	0.814110	0.013970	58.27651*
LNOC	0.129205	0.005057	25.54788*
Constant	0.615202	0.088292	17.17715*

*Significant at 1%. ***Significant at 10%. Prepared by the author.

Table 2: Diagnostic tests base line scenario

Diagnostic tests		
ARCH Heteroskedasticity test		Prob. F(20,454) 0.1785 Prob. Chi-Square(20) 0.1801
VIF	LNDS	132.4907
	LND	163.2145
	LNOPC	19.02188
	LNOC	1.104227

Prepared by the author.

Table 3: New scenario

Dependent Variable		LnCost	
Method		Least Squares	
Date: 04/02/20		Time: 02:22	
Sample: 1 517		Included observations: 517	
Variable	Coefficient	Std. Error	t-Statistic
LNDS	0.039213	0.002546	15.4018*
LNOPC	0.849025	0.011610	73.13178*
LNOC	0.122714	0.004261	28.80237*
Constant	0.537025	0.033684	15.94305*

*Significant at 1%., ***Significant at 10%. Prepared by the author.

Table 4: Diagnostic tests New scenario

Diagnostic tests		
ARCH Heteroscedasticity Test		Prob. F (20,496) 0.4608 Prob. Chi-Square (20) 0.4505
VIF	LNDS	102.0471
	LND	135.1025
	LNOPC	15.05669
	LNOC	10.96712

Prepared by the author.

The results in Table 3 indicate that there is:

- A positive significant relationship between the Management Cost (OPC) and Total Cost (TC), thus, 1% increase of (OPC) increases (TC) by 0.85%. The results indicate that the TC is inelastic to the changes in OPC.
- A positive significant relationship between the Cost of Dose (DS) and Total Cost (TC), thus, 1% increase of (OPC) increases (TC) by 0.039%. The results indicate that the TC is inelastic to the changes in DS.
- A positive significant relationship between the Other Cost (OC) and Total Cost (TC), thus, 1% increases of (OC) increases (TC) by 0.122%. The results indicate that the TC is inelastic to the changes in OC.

Further, diagnostic tests indicates that the estimated model is suffer from multicollinearity as the Variance Inflation Factor (VIF) statistics show in Table 4 that all values is greater than 10. And there is no Heteroscedasticity problem The F statistic indicates that there is no problem of Heteroscedasticity in terms of its probability value, which confirms the inability to reject the null hypothesis. For the multicollinearity problem it does not affect dependence on the estimated parameters, because the cost function in the original depends on the types shown in the equation, and for the purposes of the study it can be ignored.

5.2.2. Elasticity analysis

Using the above estimated equations for total costs, the cost response will be analyzed for steady growth in the number of patients undergoing treatment whether the old treatment is continued to be used or patients were shifted to the new treatment. It is noted from the above equations that the elasticity of the new treatment for changes in costs according to the above equations is less than the new treatment, but this estimate is not sufficient to give a decisive result on which treatments are better to continue.

To this end, the Matlab software will be used to analyze the cost elasticity of possible changes in patient numbers, the Matlab software provides the ability to estimate the expected costs of increasing the number of patients undergoing treatment in different proportions, taking into account possible changes in the characteristics of actual data and simulating the actual reality of the process. Through the use of appropriate codes, we can find out if the increase, for example, by 10% of patients with the same average treatment period and the average age of patients, and the possible change in the true value of costs paid to each patient, as it takes into account possible changes in rates of inflation, how can it effect on the total costs.

5.2.3. Matlab estimation for baseline scenario

The results in Figure 1 show that an increase in the number of patients by 10% will lead to an increase in the total costs by 686.7 thousand JD, while an increase of 10% in subsequent cases, i.e. between 10% and 20% marginally, will increase the total costs by 683.9 thousand JD. The results indicate the difference in the effect of the consecutive increases in marginal costs on the total costs, and the value of the largest marginal increase between the increase was 50% and 60%, reaching 1 Million JD.

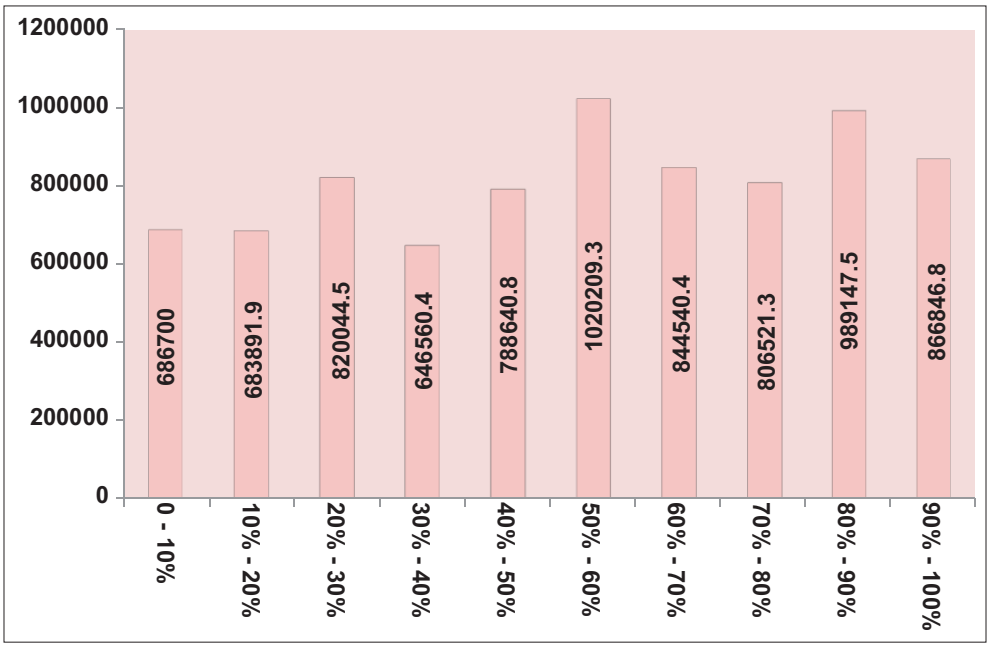
Figure 2 shows the cumulative increase in the numbers of patients compared to the Steady State, and the data in the figure indicate that if dependence on the same old treatment continues, the costs will continue to increase to reach 8.2 million JD if the same number of patients is treated, i.e. 495 patients. And that we will reach the same costs if the number of patients increases by 70%, or approximately 347 patients.

5.2.4. Matlab estimation for new scenario

The results in Figure 3 show that an increase in the number of patients by 10% will lead to an increase in the total costs by 592.9 thousand JD, while an increase of 10% in subsequent cases, i.e. between 10% and 20% marginally, will increase the total costs by 623.1 thousand JD. The results indicate there is also a difference in the effect of the consecutive increases in marginal costs on the total costs as it in the case of the Baseline Scenario, and the value of the largest marginal increase between the increase was 60% and 70%, reaching 971.2 thousand JD.

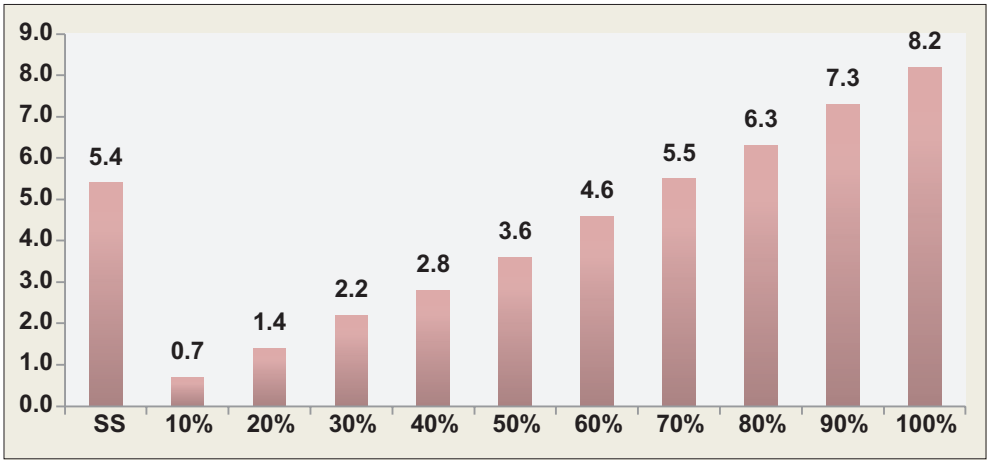
Figure 4 shows the cumulative increase in the numbers of patients compared to the Steady State, and the data in the figure indicate that if we adopt the new treatment, the costs will continue to increase

Figure 1: Effect of marginal increase of the number of patient in the Baseline Scenario



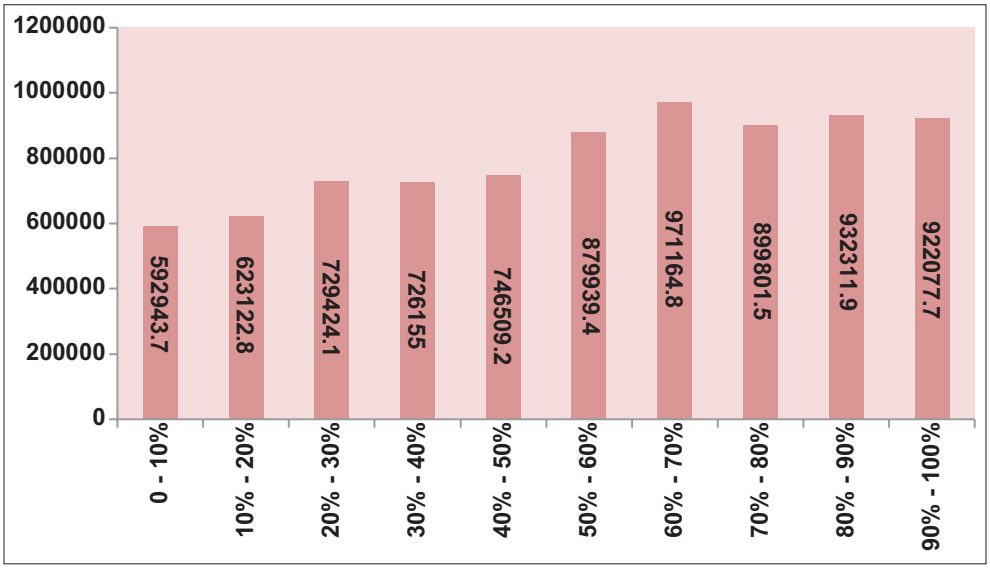
Prepared by the author.

Figure 2: Accumulative cost as a result to the gradual increase in number of patients/Baseline Scenario



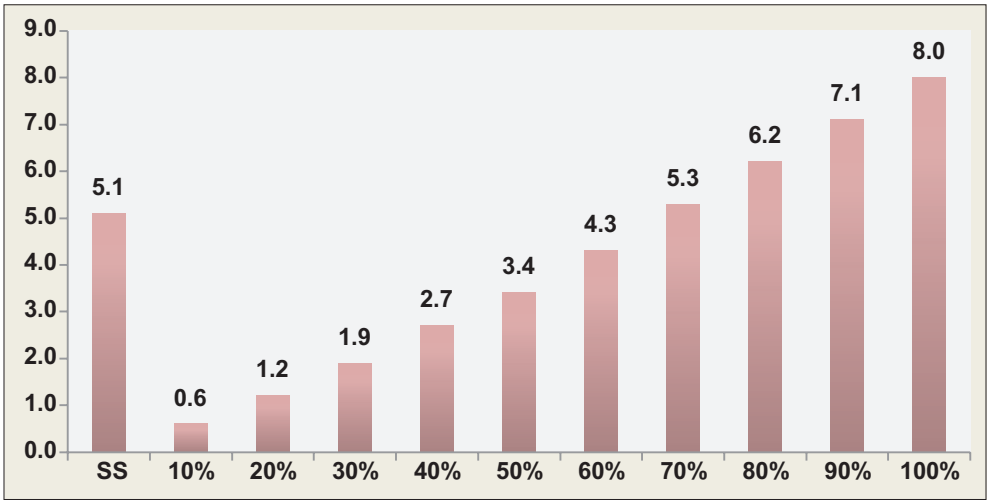
Prepared by the author.

Figure 3: Effect of marginal increase of the number of patient in the new scenario



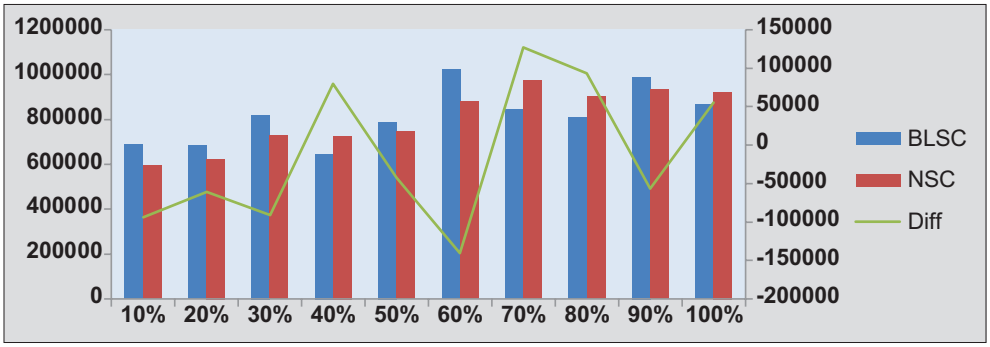
Prepared by the author.

Figure 4: Accumulative cost as a result to the gradual increase in number of patients/ New Scenario



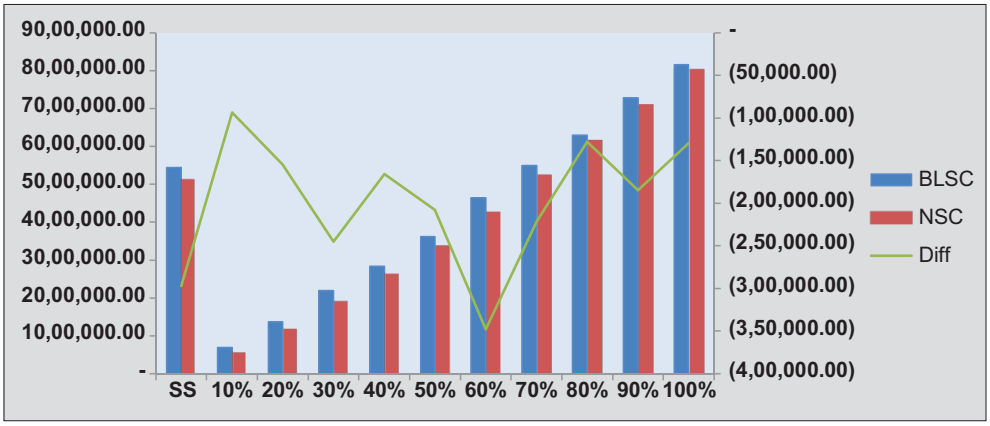
Prepared by the author.

Figure 5: Effect of marginal increase in both scenarios



Prepared by the author.

Figure 6: Accumulative cost as a result to the gradual increase in number of patients/New Scenario



Prepared by the author.

to reach 8.0 million JD if the same number of patients, i.e. 517 patients, which less than the baseline scenario by 200 thousand JD. And that we will reach the same costs if the number of patients increases by 70%, or approximately 362 patients.

5.2.5. Comparing baseline scenario with new scenario

Figure 5 show a comparison between the marginal increase in the number of patients in the baseline scenario and the new scenario. It is noted that the marginal increase in the baseline scenario is greater than the marginal increase in the new scenario in the case of an increase in the number of patients by 10%, 20%, 30 %, 50%, 60%, and 90%, but in the rest of the cases the marginal increase in the new scenario was the highest. It is noted that the difference in the largest increase was in a 60% increase in the number of patients.

In Figure 6, a comparison of the total costs between the baseline scenario and the new scenario. It is noted that the total costs will be greater if the reliance on the old treatment continues in all cases. This is despite the fact that the marginal increase as shown above is greater in some cases in the new scenario.

6. CONCLUSION

The study tested the difference between adopting the old treatment () and the new treatment ticagelor in treating disease ACS, and the multiple regression was used after performing the necessary tests to estimate the total cost function associated with both treatments.

Matlab software was also used to include the estimated equations for elasticity analysis between the two treatments. The study found that:

a. The overall cost elasticity of change in patient numbers is lower when using the new treatment.
b. The marginal change in the total costs as a result of using the old treatment varies in the case of increasing patients between one patient and another as a result of the difference in age and period of use.
c. The marginal change in total costs as a result of the use of the new treatment varies in the case of increasing patients from one patient to another as a result of the difference in age and period of use.
d. The cumulative costs of using the new treatment are lower than when using the old treatment.
e. The approval of the old treatment will lead to the same costs in the main case when increasing the number of patients by 346 patients while in the new treatment the number will be 362 patients.

Accordingly, the study recommends the approval of the new treatment using ticagelor because it achieves total cost savings of approximately 200,000 Jordanian dinars, and that the flexibility of the new treatment costs is less than in the case of the old treatment, which means that the increase in numbers of patients will lead to a lower increase in the total costs when using the new treatment.

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