Cost-Effectiveness of Pharmacist Led Care in Prevention of Cardiovascular Diseases in Type 2 Diabetic Jordanians: A Markov Model simulation

Rimal Mousa[1] , Eman Hammad[1]

1Department of Biopharmaceutics and Clinical Pharmacy, School of Pharmacy, University of Jordan, Amman, Jordan

Background

Cardiovascular diseases (CVDs) are responsible for one third of global deaths and Diabetes Mellitus (DM) is considered a major risk factor [1, 2]. Heart disease is the main cause of death among Jordanians [1, 2]. Pharmacist led care was found previously as an effective approach in the management of Type 2 DM (T2DM) [3,4]. However, the cost-effectiveness in low to middle income countries is not well studied.

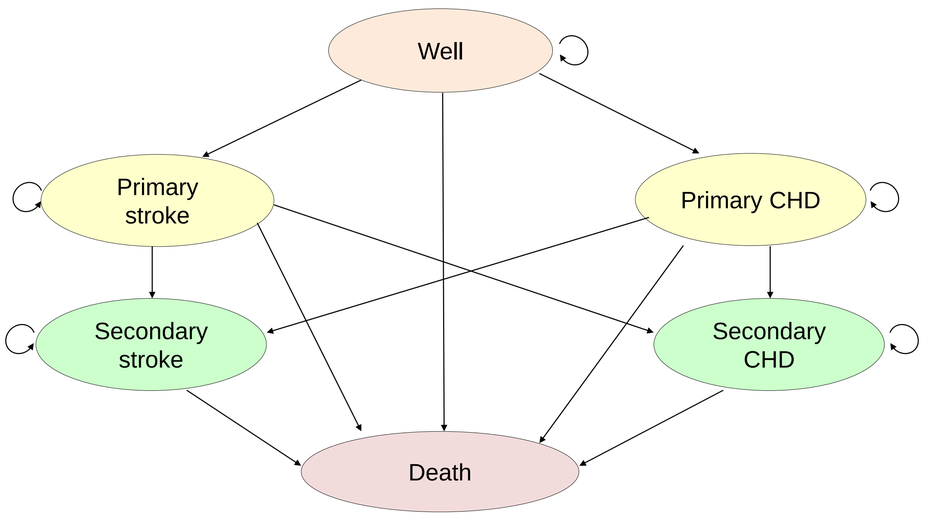
Aim and Objectives

To assess the cost-effectiveness of pharmacist led care compared to usual care in preventing CVDs in T2DM

Methods

A Markov model of one year cycle length and 10 year-time horizon was developed to simulate long term CVD events, death risk, and associated costs for two hypothetical cohorts (including the usual care and pharmacist-led group) of Jordanian patients suffering from T2DM (Figure 1).Ten-year risk for CVD events, including coronary heart disease (CHD) (fatal and nonfatal) and stroke (fatal or nonfatal) based on patients demographics and clinical parameters were predicted (Table 1). The clinical inputs used for the prediction of CVD risks in Jordanians were derived from a systematic review of randomized controlled trials. Health resource utilization rates relevant to different health states in the model were derived via review of clinical guidelines, published literature and clinical experts elicitation. The final outcomes examined included incremental cost and effectiveness measured by Jordanian dinar (JOD), and life years gained (LYG), respectively. The base case analysis was estimated using the mean CVD risks from the 10-year follow-up. Probabilistic sensitivity analysis was conducted for the base case to allow all variables to vary simultaneously to assess the robustness of the results.

Figure 1. A Markov model of CVDs events in patients with T2DM



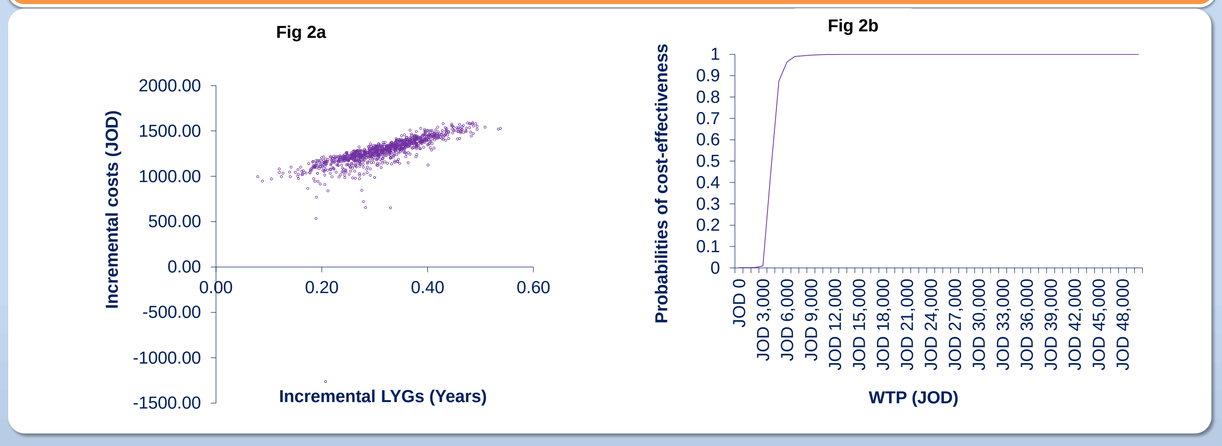
Results

The estimated risks for CVD at the end of follow-up were consistently lower in the pharmacist-led care group compared with the usual care group. The absolute risk reduction between the pharmacist-led and usual care groups increased over time (Table 1). Base case analysis showed that pharmacist-led care resulted in an estimated incremental costs of JOD 1238.78 (1747.24 US$) when comparing to the usual care group. The service was associated with incremental LYGs of 0.3. The probabilistic sensitivity analysis showed similar results to the base case analysis. The probability of a pharmacist being cost-effective at willingness to pay (WTP) of JOD 9,023.23 (12,723 US$) per LYG was 100% (Figure 2b).The incremental cost-effectiveness ratio (ICER) was JOD 4058.87 per LYG, 95%CI: (3208.8, 6117.8). All the ICER points were distributed in the northern east (NE) quadrant (Figure 2a).

Table 1. 10-year CVD risk estimation based on the clinical inputs derived from the systematic review

		CHD		Stroke	
CVD risk		Non-fatal	Fatal	Non-fatal	Fatal
Group	Years	Mean (95%CI)	Mean (95%CI)	Mean (95%CI)	Mean (95%CI)
Intervention	1	1.92 (1.5, 2.45)	1.28 (0.98, 1.68)	0.86 (0.6, 1.22)	0.09 (0.05, 0.17)
	2	3.94 (3.08, 5.03)	2.68 (2.04, 3.51)	1.83 (1.28, 2.61)	0.19 (0.11, 0.35)
	3	6.06 (4.73, 7.74)	4.2 (3.2, 5.5)	2.93 (2.05, 4.18)	0.31 (0.17, 0.56)
	4	8.3 (6.46, 10.59)	5.84 (4.44, 7.65)	4.18 (2.9, 5.97)	0.44 (0.24, 0.81)
	5	10.64 (8.27, 13.59)	7.61 (5.77, 9.97)	5.58 (3.86, 8.01)	0.59 (0.33, 1.08)
	6	13.09 (10.14, 16.74)	9.51 (7.19, 12.46)	7.16 (4.92, 10.33)	0.76 (0.42, 1.39)
	7	15.65 (12.07, 20.03)	11.53 (8.69, 15.13)	8.94 (6.08, 12.96)	0.95 (0.52, 1.74)
	8	18.31 (14.06, 23.47)	13.68 (10.28, 17.98)	10.94 (7.36, 15.96)	1.16 (0.63, 2.14)
	9	21.08 (16.11, 27.06)	15.96 (11.94, 21)	13.16 (8.75, 19.33)	1.4 (0.75, 2.59)
	10	23.94 (18.2, 30.78)	18.36 (13.67, 24.18)	15.64 (10.26, 23.13)	1.67 (0.89, 3.09)
Control	1	2.59 (2.02, 3.3)	1.89 (1.45, 2.46)	1.03 (0.75, 1.42)	0.13 (0.08, 0.22)
	2	5.29 (4.14, 6.74)	3.92 (3.01, 5.1)	2.2 (1.59, 3.03)	0.28 (0.17, 0.47)
	3	8.11 (6.34, 10.32)	6.09 (4.67, 7.91)	3.51 (2.53, 4.86)	0.45 (0.28, 0.75)
	4	11.05 (8.62, 14.05)	8.41 (6.44, 10.91)	5 (3.58, 6.95)	0.65 (0.39, 1.07)
	5	14.1 (10.97, 17.93)	10.86 (8.3, 14.09)	6.67 (4.74, 9.32)	0.86 (0.52, 1.43)
	6	17.26 (13.39, 21.94)	13.45 (10.26, 17.44)	8.55 (6.01, 12.02)	1.11 (0.66, 1.84)
	7	20.52 (15.87, 26.09)	16.18 (12.3, 20.97)	10.65 (7.41, 15.08)	1.38 (0.82, 2.31)
	8	23.88 (18.39, 30.35)	19.03 (14.43, 24.65)	13 (8.93, 18.53)	1.68 (0.99, 2.84)
	9	27.32 (20.96, 34.7)	21.99 (16.62, 28.47)	15.6 (10.58, 22.42)	2.02 (1.18, 3.43)
	10	30.84 (23.56, 39.14)	25.07 (18.88, 32.42)	18.49 (12.35, 26.74)	2.39 (1.39, 4.09)

Figure 2. Cost-effectiveness plan (fig 2a) and cost-effectiveness acceptability curve (fig 2b) of pharmacist-led care compared to usual care



Discussion

- **Key findings**

The model demonstrated that pharmacist intervention can overt CVD events and thus contribute to significant cost saving. Previously studies highlighted that clinical pharmacists diabetic care is associated with reduction in direct costs but could not account for cost savings associated with reducing long-term diabetes-related complications. Our study outlined monetary benefits on a generic economic outcome that evaluate the benefit of an intervention on the quantity of life lived or death averted.

- **Implication to policy**

- This study highlights that clinical pharmacist led care might be a promising care approach that can respond to the increased in demand for employing preventive strategies in non-communicable disease management in areas of high properties particularly in developing economies facing increased demands on health services and complexity of disease mix.

Conclusion

This is the first study to examine the cost-effectiveness of pharmacist-led care in averting CVD risks in T2DM in the Eastern Mediterranean region. The findings outline long-term economic benefits of expanding clinical pharmacist's roles in direct patient care services.

References

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 Correspondent: Rimal Mousa (r.mousa@ju.edu.jo)