Cost-effectiveness of RADAR: An Innovative Model to Organize Diabetes Care in First Nations Communities in Canada

EE391

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Background

- Challenges exist for the management of diabetes care in First Nations (FN) populations in Canada.
- RADAR (Reorganizing the Approach to Diabetes through the Application of Registries) is an innovative care model developed in Alberta, Canada, that incorporates a disease registry and electronic health record for local care provision with remote coordination tailored for FN people.
- The RADAR model uses remote care coordinators, like registered nurses or dietitians, to support local health care providers in FN communities through telehealth to coordinate patient care.
- A previous study evaluated the effectiveness of RADAR in participating communities in Alberta, Canada, over a 2-year period.[1]
- RADAR improved outcomes, with 91% of patients achieving 10% improvement in HbA1c, SBP, and/or LDL cholesterol.

Objective

- To evaluate the cost-effectiveness of RADAR compared with existing baseline diabetes care in FN with type 2 diabetes.

Methods

- We used the United Kingdom Prospective Diabetes Study (UKPDS) Outcomes Model 2 to conduct the cost-effectiveness analysis.
- The UKPDS-OM2 is a patient-level simulation model with a 1-year cycle to predict major diabetes complications and death.[2]
- Clinical data from the previous study that evaluated the effectiveness of RADAR was used as inputs for this analysis.[1]
- Eligible patients were ≥ 18 years old with type 2 diabetes.
- Demographics like age, gender, and clinical parameters height, weight, diabetes duration, LDL, HDL, systolic blood pressure, HbA1c, and eGFR of RADAR users after the intervention relative to their baseline status (n=516) were used as input parameters for the model. (Table 2)
- Clinical parameters like WBC, hemoglobin, and heart rate, which were not recorded; fixed values were used. (Table 2)
- The model cycle length was one year, and the time horizon was 25 years.
- Age, diabetes duration, and event histories for IHD, MI, CHF, stroke, amputation, blindness, and renal failure are updated by the model for each cycle. All other model inputs were held constant for model simplicity.
- Costs and quality-adjusted life years (QALYs) were calculated at a discounted rate of 3% annually from the Canadian payer perspective.

Methods (contd.)

- The costs for RADAR, diabetes complications, and utility data were input into the model. (Table 1). All costs were reported in $ Canadian (2023 values)
- RADAR costs were $310 annually, which included the cost of a dietician, telehealth, and maintaining the care platform. While the baseline did not have any costs associated with the intervention.
- We considered a willingness-to-pay threshold of $50,000 for cost-effectiveness as per the Canadian Agency for Drugs and Technologies in Health (CADTH).
- The base case analysis was conducted for eligible patients using a Canadian payer perspective with a 25-year time horizon.
- In one-way sensitivity analyses, we varied individual model parameter values and assessed their effect on our results.

Parameter	Cost at time of event	Cost in subsequent years	Utilities
IHD	$7370	$4256	-0.041
MI	$23,550	$3682	-0.001
Heart Failure	$21543	$6039	-0.064
Stroke	$32,078	$4450	-0.040
Amputation	$49760	$6815	-0.272
Blindness	$3940	$2808	-0.050
Renal Failure	$31926	$14490	-0.236

Table 1. Cost and utility model input parameters

Parameter	RADAR	Baseline
Weight (kg)	93.03 (20.86)	94.60 (19.85)
Height (m)	1.68 (0.09)	1.68 (0.09)
Smoking, n(%)	119 (23)	119 (23)
HDL (mmol/l), mean (SD)	1.21 (0.33)	1.13 (0.34)
LDL (mmol/l), mean (SD)	1.86 (0.83)	2.07 (0.86)
SBP (mmHg), mean (SD)	123.61 (16.58)	131.18 (18.58)
HbA1c (%), mean (SD)	7.40 (1.48)	8.36 (2.06)
eGFR (ml/min/1.73m^2), mean (SD)	89.13 (27.92)	84.25 (27.98)
Heart rate (bpm)	71	
WBC (x10^9/l)	7.7	
Hemoglobin (g/dl)	12.4	

Table 2. Clinical model input parameters

Results

- Total discounted QALYs over the modeled time horizon were higher for RADAR users than baseline (12.69 vs 12.47) (Table 3)
- RADAR users had lower complication costs over the modeled time horizon.
- RADAR users had an incremental cost of $3971 associated with using RADAR.
- Total discounted costs over the modeled time horizon were higher for RADAR users relative to baseline ($16165 vs $14463) (Table 3)
- These values translated to an ICER of $8108 per QALY for RADAR users relative to baseline. (Table 3)

	RADAR	Baseline
Total Costs		
Acquisition Cost	$3971.45 (3915.26-4075.70)	0
Cost of Complication	$12194.36 (10302.31-13935.50)	$14463.15 (12327.84-16624.37)
Total Cost	$16165.82 (14256.73-17984.32)	$14463.15(12327.84-16624.37)
Incremental Costs	$1702.67 (1104.44-2115.76)	
Total Quality-Adjusted Life Years (QALYs)		
Life expectancy	12.81 (12.63-13.15)	12.62 (12.42-12.95)
Total QALYs	12.69 (12.52-13.03)	12.47 (12.29-12.80)
Incremental QALYs	0.21 (0.18-0.28)	
ICER, $ per QALYs	$8108	

Table 3: Summary of costs and outcomes in Base-Case analysis

Results (contd.)

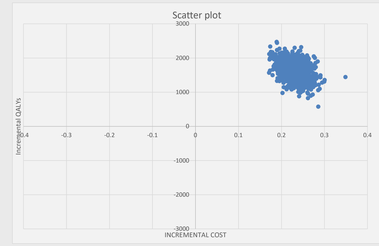

Figure 3: Scatter plot

- Figure 2 shows a scatterplot of the incremental costs and QALYs from 1000 bootstrapped simulations generated by the model.

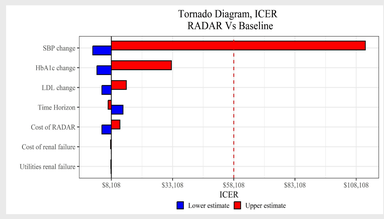

Figure2: Sensitivity Analysis (Tornado Diagram)

- The one-way sensitivity analysis revealed that ICER was most sensitive to SBP change, HbA1c change, and LDL change.
- Cost and utilities of Renal failure do not affect the ICER.

Conclusions

- RADAR users had higher life expectancy, QALY, and total costs than baseline users.
- RADAR is potentially cost-effective if a WTP of $50,000 is considered as per CADTH guidelines.
- Given the suboptimal and fragmented care for FN peoples in Canada, exacerbated by their remote and difficult access to basic social determinants of health, additional costs to improve outcomes are warranted to ensure equitable healthcare in Canada.

References

References

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