Economic Evaluation of Transient Elastography for Significant Fibrosis Detection in Patients with Diabetes Mellitus in Thailand

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OBJECTIVES

The association between diabetes mellitus (DM) and non-alcoholic fatty liver disease (NAFLD) is well-documented, with DM heightens risk of developing NAFLD and liver fibrosis. This study aimed to evaluate the cost-effectiveness and budget impact of transient elastography (TE) for detecting significant fibrosis in patients with DM in Thailand.

METHODS

(1 USD = 34.64 THB)

A cost-utility analysis was conducted using a decision tree and Markov model over a lifetime horizon with a one-year cycle length, adopting a societal perspective. The model included 11 health states related to NAFLD (**Figure 1**), comparing no screening against one-time screening strategies involving fibrosis-4 index then TE (FIB-4+TE), steatosis-associated fibrosis estimator score then TE (SAFE+TE), and TE alone. Key parameters are shown in the **Table**. The analysis applied a discount rate of 3% per year on costs and outcomes. Incremental cost-effectiveness ratios (ICERs) were calculated and compared against a willingness-to-pay threshold of 4619 USD per quality-adjusted life-year (QALY) gained. A 5-year budget impact was estimated from a payer perspective.

RESULTS

Among the screening methods evaluated, TE alone yielded the highest total lifetime costs (5,785 USD) and QALYs (12.81 QALYs). Compared to no screening, all strategies demonstrated cost-effectiveness with ICERs of 2193, 2321, and 2857 USD per QALY gained for FIB-4+TE, SAFE+TE, and TE alone, respectively. SAFE+TE emerged as the best-buy option when compared to the other strategies. However, the probabilistic sensitivity analysis illustrated FIB-4+TE had the highest chance of being cost-effective (**Figure 2**). Estimated annual budget impacts were substantial, amounting to 13.6, 21.8, and 19.9 million USD for FIB-4+TE, SAFE+TE, and TE alone, respectively.

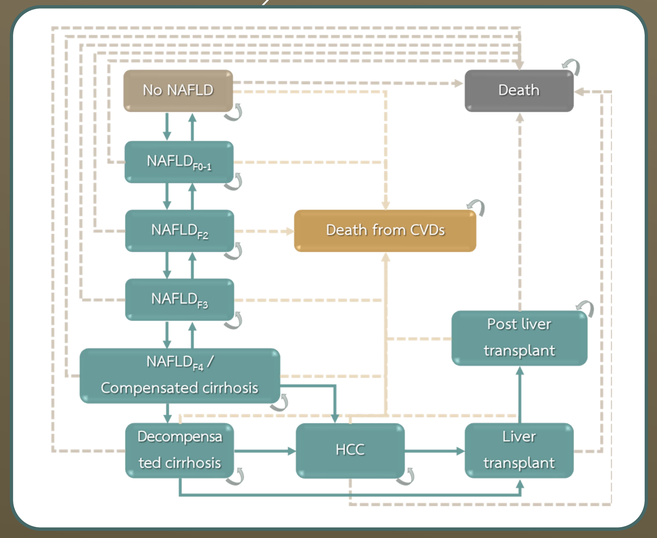

Figure 1 Markov model

Figure 2 Cost-effectiveness plane

Table Key input parameters

Input parameters	Values (ranges)	References
Performance of tests (%)		
FIB-4 ≥ 1.3	Sens: 66 (64, 78); Spec: 65 (65, 68)	Alkhouri, 2025
SAFE ≥ 0	Sens: 87 (86, 89); Spec: 35 (32, 38)	Alkhouri, 2025
TE ≥ 7.0 kPa	Sens: 80 (76, 83); Spec: 73 (68, 77)	Xiao, 2017; Selvaraj, 2021
Prevalence (%)		
DM	9.9 (9.4, 10.4)	Aekplakorn, 2018
NAFLD	34.8 (34.4, 35.2)	Phisalprapa, 2021
NAFLD$_{F2}$ (1st detection)	30.4 (23.3, 38.2)	Primary data
Incidence (%)		
DM	0.9 (0.7, 1.1)	Papier, 2016
NAFLD	4.3 (3.9, 4.7)	Park, 2021
NAFLD$_{F2}$	6.7 (1.7, 11.6)	Le, 2023
Treatment effectiveness	Risk reduction: 0.20 (0.16, 0.45)	Vilar-Gomez, 2015
Utilities		
DM, NAFLD$_{F0-F3}$	0.753 (0.526, 0.980)	Deerochanawong, 2023
NAFLD$_{F4}$	0.748 (0.666, 0.830)	Chongmalaxme, 2019
DC	0.603 (0.590, 0.754)	Prakongsai, 2014
HCC	0.380 (0.360, 0.410)	Levy, 2008
LT	0.570 (0.540, 0.600)	Levy, 2008
Post-LT	0.683 (0.640, 0.690)	Prakongsai, 2014
Costs (USD per year)		
Screening tests	**FIB-4:** 7.8	Riewpaiboon, 2009
	SAFE: 10.3	Riewpaiboon, 2009
	TE: 57.7 (± 14.4)	Primary data, Siriraj Hospital
DM treatment	277 (± 69.1)	Primary data, Siriraj Hospital
Lifestyle modification	41.2 (± 10.3)	Riewpaiboon, 2009
NAFLD	356.3 (± 89.1) – 1,118.6 (± 279.6)	Primary data
DC	4,363.9 (± 1,091.0)	Chongmalaxme, 2019
HCC	5,335.6 (± 1,333.9)	Thongsawat, 2014
LT	19,729.9 (± 4,932.5)	
Post-LT	3,183.9 (± 796.0)	
Food, Transportation	1.9 (± 0.2), 5.2 (± 0.4)	Riewpaiboon, 2009

DC, decompensated cirrhosis; F, fibrosis; FIB-4, fibrosis-4 index; HCC; hepatocellular carcinoma; LT, liver transplant; NAFLD, non-alcoholic fatty liver disease; SAFE, steatosis-associated fibrosis estimator score; sens, sensitivity; spec, specificity; TE, transient elastography

CONCLUSIONS

Implementing screening for significant fibrosis in patients with DM is deemed cost-effective. However, considerations regarding the budget impact and accessibility of TE are critical for practical implementation.

Acknowledgement

We would like to extend our heartfelt thanks to Euarat Mepramoon, our research assistant, for her exceptional coordination of the project.

We are also deeply grateful to Assistant Professor Surasak Saokaew and Assistant Professor Pimsiri Sripongpun for sharing their expert perspectives, which have significantly enhanced our understanding and contributed to the depth of this study.

Ethics approval

This study was approved by ethical committee of Faculty of Medicine Siriraj Hospital, Mahidol University (certificate of approval number: Si 990/2023) and the Human Research Ethics Committee of Thammasat University (Medicine) (certificate of approval number: 124/2024).