

OPEN ACCESS

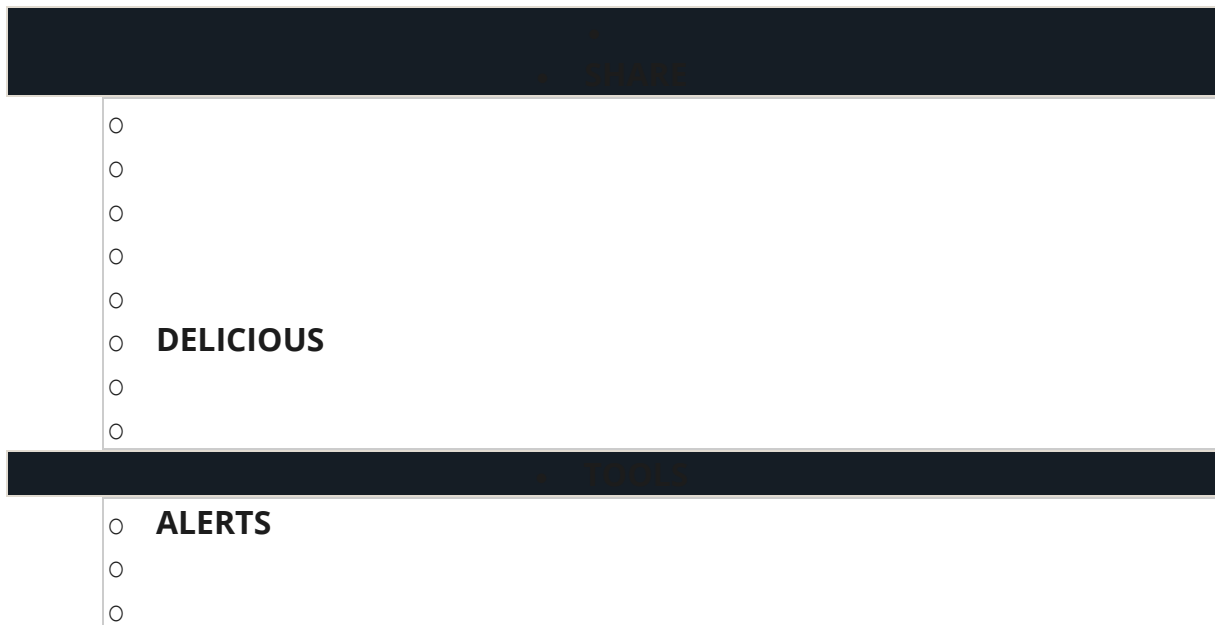
ARVO Annual Meeting Abstract | June 2021

Developing Behavior-Based Diabetic Retinopathy Screening Guidelines

[Taewoo Lee](#); [Poria Dorali](#); [Zahed Shahmoradi](#); [Christina Y Weng](#)

Author Affiliations & Notes

Investigative Ophthalmology & Visual Science June 2021, Vol.62, 1141. doi:



Abstract

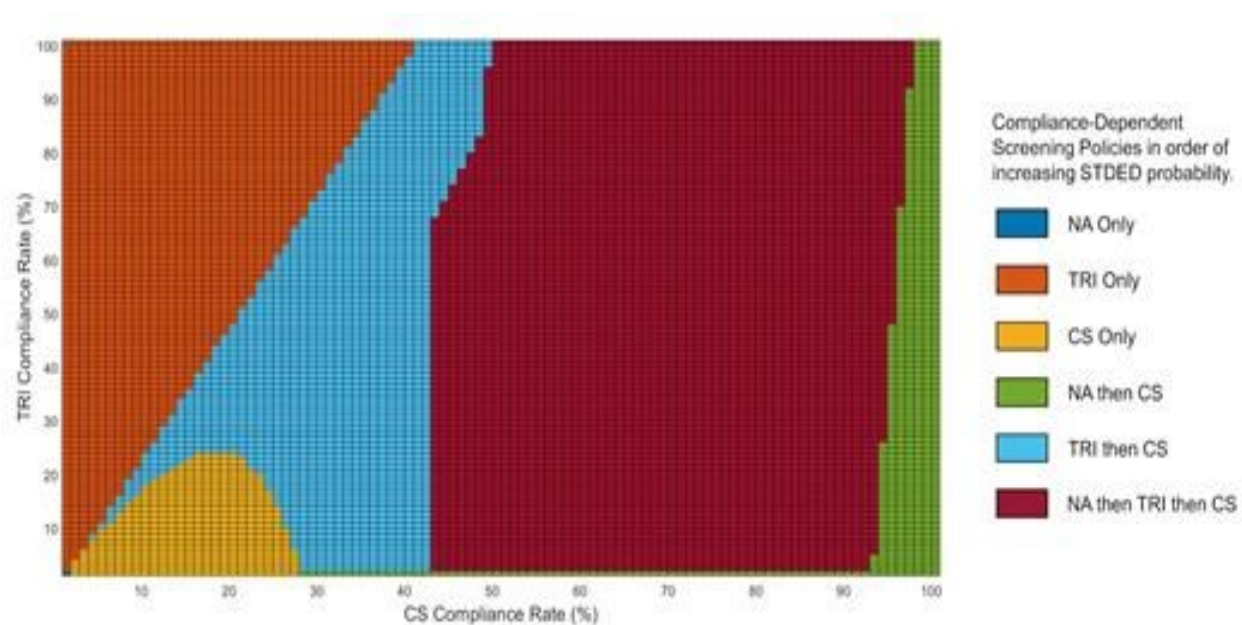
Purpose : Personalized screening guidelines can be an effective strategy to prevent diabetic retinopathy (DR)-related vision loss. However, these strategies typically do not capture behavior-based factors such as a patient’s compliance or cost preferences. This study develops a mathematical model to identify screening policies that capture both DR progression and behavioral factors to provide personalized recommendations.

Methods : A partially observable Markov decision process model (POMDP) is developed to provide personalized screening recommendations. For each patient, the model estimates the patient's probability of having a sight-threatening diabetic eye disorder (STDED) yearly via Bayesian inference based on natural history, screening results, and compliance behavior. The model then determines a personalized, threshold-based recommendation for each patient annually—either no action (NA), teleretinal imaging (TRI), or clinical screening (CS)—based on the patient's current probability of having STDED as well as patient-specific preference between cost saving (\$) and QALY gain. The framework is applied to a hypothetical cohort of 40-year-old African American male patients.

Results : For the base population with TRI and CS compliance rates of 65% and 55% and equal preference for cost and QALY, NA is identified as an optimal recommendation when the patient's probability of having STDED is less than 0.72%, TRI when the probability is [0.72%, 2.09%], and CS when the probability is above 2.09%. Simulated against annual clinical screening, the model-based policy finds an average decrease of 7.07% in cost/QALY (95% CI; 6.93-7.23%) and 15.05% in blindness prevalence over a patient's lifetime (95% CI; 14.88-15.23%). For patients with equal preference for cost and QALY, the model identifies 6 different types of threshold-based policies (See Fig 1). For patients with strong preference for QALY gain, CS-only policies had an increase in prevalence by a factor of 19.2 (see Fig 2).

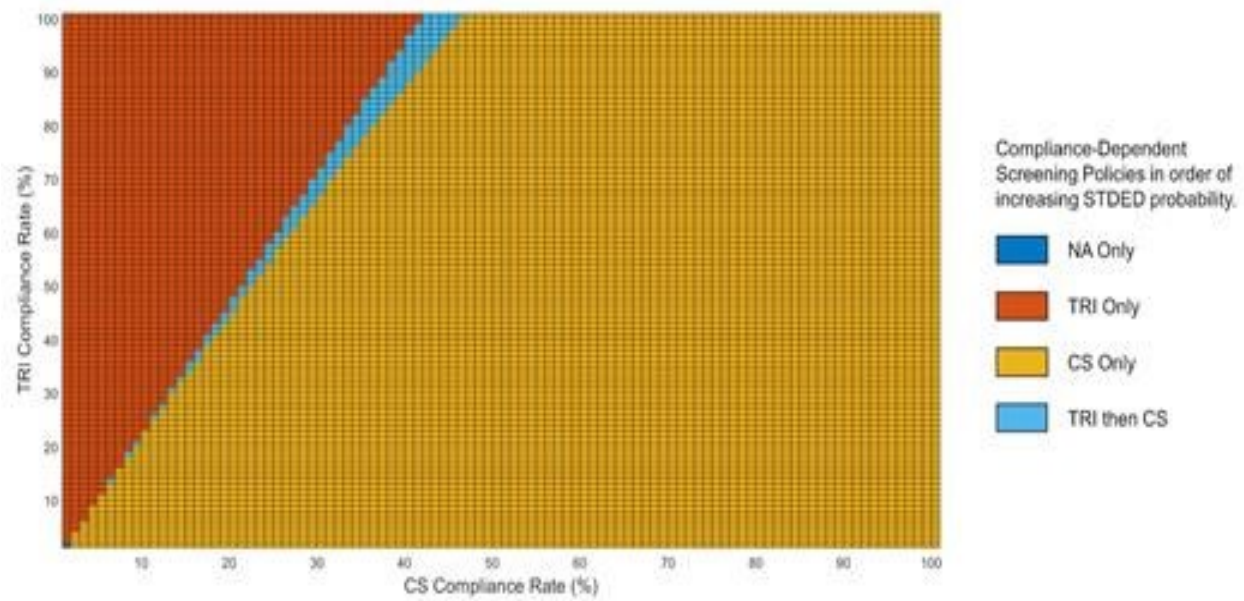
Conclusions : The POMDP model is highly flexible and responsive in incorporating behavioral factors when providing personalized screening recommendations. As a decision support tool, providers can use this modeling framework to provide unique, catered recommendations.

This is a 2021 ARVO Annual Meeting abstract.



[View OriginalDownload Slide](#)

Fig (1) Screening policies in order of increasing STDED probability with equal costs (\$) and QALYs preference.



[View OriginalDownload Slide](#)

Fig (2) Screening policies in order of increasing STDED probability with strong QALYs preference.