A Cost-Utility Model Supports Changes in Post-treatment Surveillance Associated with the 2022 American College of Gastroenterology Guidelines.

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Introduction

- Radiofrequency ablation is a safe and effective treatment for neoplastic Barrett's esophagus (BE).
- Surveillance after endoscopic eradication has only been studied observationally without any studies of this disease's natural history.
- Recent natural history modeling work has allowed qualified estimation of a natural history scenario.
- We sought to apply our multi-state model of post-ablation natural history to study the cost effectiveness of surveillance after endoscopic eradication of neoplastic BE.

Methods

- **Study design**: Microsimulation cost-utility analysis
- **Population:** Simulated to match the distribution of age, gender, baseline segment length, and worst pre-surveillance histologic grade in the United States Radiofrequency Ablation registry.
- **Intervention**: Surveillance according to the 2022 *American College of Gastroenterology* guidelines.
- **Comparator:** Simulated natural history of recurrence and progression.
- Transition probabilities for the natural history were estimates from recently published multi-state models.
- The model was Markov generalized to allow differing rates of progression based on BE characteristics as covariates to the multi-state model and for other-cause mortality to depend on age.
- There were states for: no recurrence, recurrence with various histologic grades, ablative re-treatment, endoscopic mucosal resection, invasive adenocarcinoma, and death.
- We considered a willingness-to-pay threshold of 100,000 2017 US dollars ($) per quality-adjusted life year (QALY).

Results

Table: Microsimulation model parameters in the base case scenario and their sources.

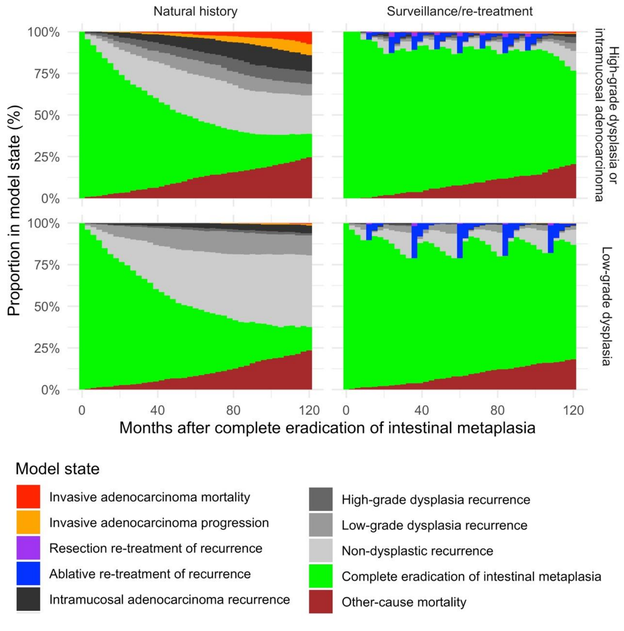
Model variable	Base case value	Reference/details
Structural model assumptions		
Model cycle length	3 months	
Model time horizon	10 years	
Model starting year	2017	For other-cause mortality and inflation adjustment
Other cause mortality	Population	2020 Social Security actuarial cohort life tables
Time for resection	1 cycle	Resection for all recurrent HGD or IMC
Resection success rate	100%	Simplifying assumption
Time for ablation	1 cycle	Repeated until successful
Discounting of costs/utilities	3%	Per year
Probabilities per cycle from the literature		
Death from invasive adenocarcinoma	7.63%	SEER 5-Year Relative Survival Rates 2012-2018*
Complete eradication of intestinal metaplasia after recurrence	57.7%	Guthikonda et al., The American Journal of Gastroenterology, 2017
Cancer progression from recurrence	0.1625%	Guthikonda et al., The American Journal of Gastroenterology, 2017
Utilities per cycle from the literature		
Surveillance after CEIM	97%	Boger et al., Alimentary Pharmacology and Therapeutics, 2010
Retreatment endoscopy	94%	Boger et al., Alimentary Pharmacology and Therapeutics, 2010
Esophageal adenocarcinoma	96%	Boger et al., Alimentary Pharmacology and Therapeutics, 2010

Table continued: Microsimulation model parameters in the base case scenario and their sources.

Costs per cycle from the literature		
Surveillance endoscopy	$1,019	Inadomi et al., Gastroenterology, 2009†
Cost of cancer care	$13,532	Inadomi et al., Gastroenterology, 2009†
Cost of ablation re-treatment	$4,317	Inadomi et al., Gastroenterology, 2009† Assumed half cost of initial treatment
Cost of resection re-treatment	$934	Filby et al., Journal of Comparative Effectiveness Research, 2017**

***Assumes cumulative incidence = 1 – e^(-incidence x time), †Assuming 17.7% inflation, **Assumes 133% exchange rate with the British Pound.**

Figure: Microsimulation model parameters in the base case scenario and their sources.



- In the base case scenario of the model, surveillance and re-treatment decreased progression to invasive esophageal adenocarcinoma at ten years by 1.2% in LGD and 13.0% in HGD/IMC.
- Compared to the natural history scenario, the incremental cost effectiveness ratio for surveillance at ten years was $79,125 for LGD and $10,952 for HGD/IMC.

Conclusions

- In the base case scenario of this cost-utility model, newly recommended surveillance intervals were highly cost effective for HGD/IMC and approached the margins of cost-effectiveness for LGD in a microsimulation cost-utility model.
- This supports the new guideline recommendation to decrease the frequency of post-treatment surveillance of HGD/IMC and LGD.
- While development of the model requires probabilistic sensitivity analysis and calibration, the model has the potential to inform the health economics of clinical processes after CEIM.