

BACKGROUND & PURPOSE

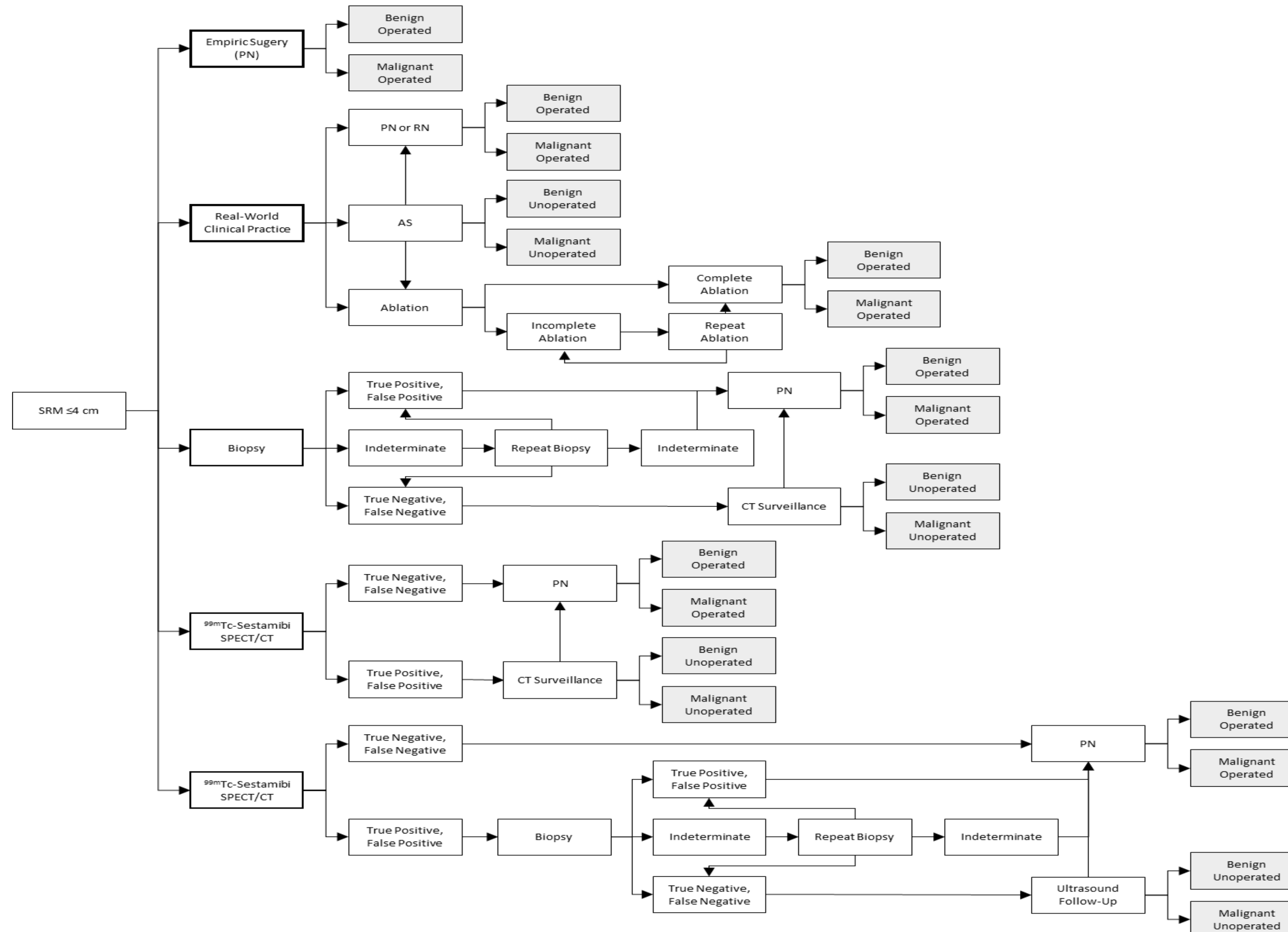
- Incidentally detected small renal masses (SRMs) may be one of several benign or malignant tumor histologies and are thus heterogeneous in oncologic potential.
- Although renal mass biopsy (RMB) can be used to determine the histology of SRMs, this invasive approach has significant limitations.
- Technetium-99m sestamibi single photon emission computed tomography/computed tomography (^{99m}Tc-sestamibi SPECT/CT) is a promising imaging tool that can aid in identifying benign renal oncocytomas and hybrid oncocytic/chromophobe tumors.
- We conducted this study to evaluate the clinical and economic value of ^{99m}Tc-sestamibi SPECT/CT in guiding the management of SRMs.

METHODS

Model Design

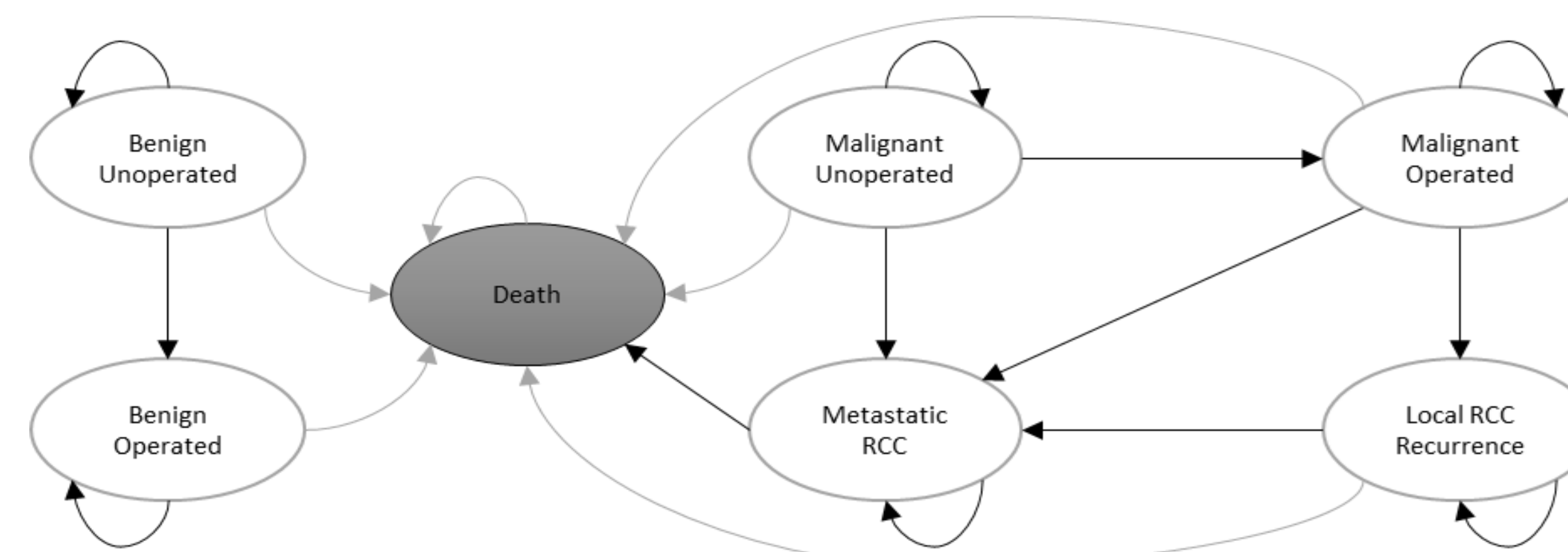
- We developed a decision analytic Markov model to estimate the costs and health outcomes of managing a healthy 65-year old patient with an asymptomatic SRM using competing management strategies, including empiric partial nephrectomy (PN; reference arm); RMB (option 1); ^{99m}Tc-sestamibi SPECT/CT (option 2); and ^{99m}Tc-sestamibi SPECT/CT followed by RMB to confirm benign SRMs (option 3).
- A secondary analysis compared options 1-3 versus real-world clinical practice (RWCP) consisting of a mix of empiric surgery via PN and radical nephrectomy (RN), thermal ablation, and active surveillance (treatment mix based on 2010–2015 data for patients with cT1aN0M0 renal lesions in the National Cancer Database).

Model decision trees



METHODS (continued)

Markov model



Model Outcomes

- We assessed lifetime health utilities, measured in quality adjusted life-years (QALYs), and direct medical costs from a health care payer perspective in the United States.
- We calculated the incremental cost-effectiveness ratio (ICER) for options 1-3 versus the reference arm, with a willingness to pay threshold of \$50,000/QALY.

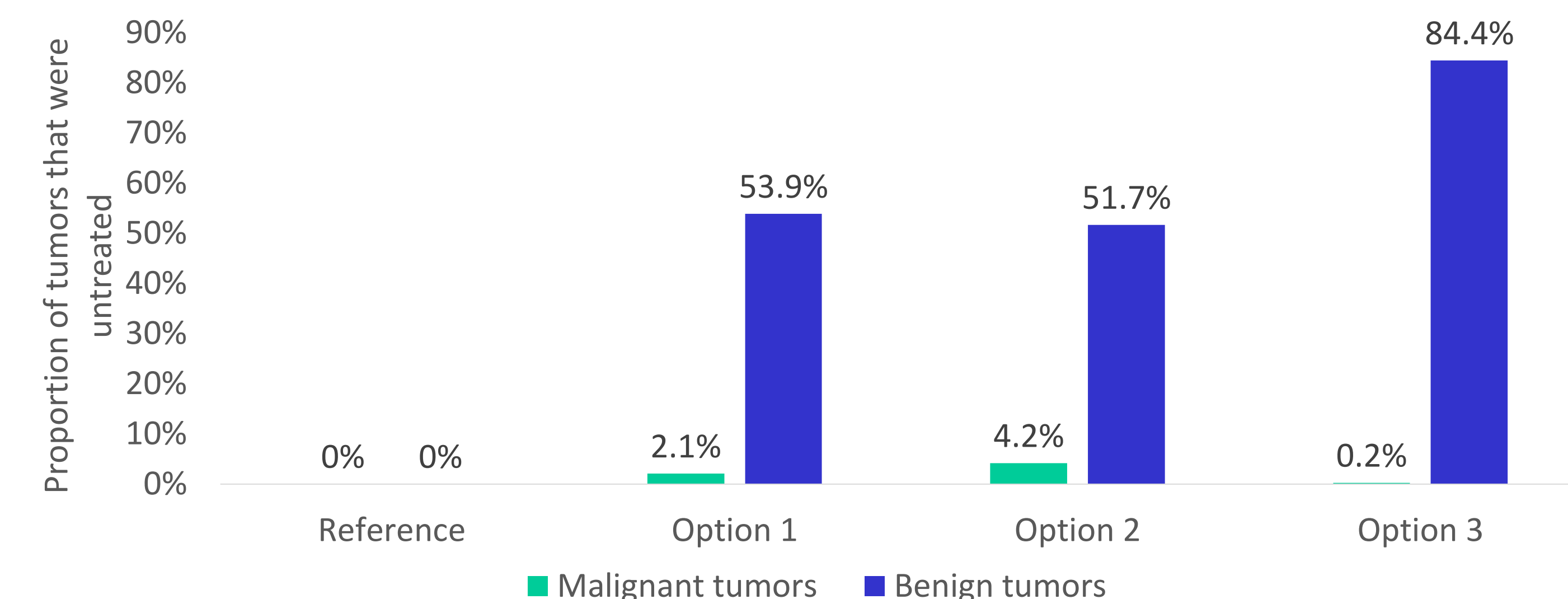
Sensitivity Analyses

- Uncertainties in model input values were addressed via univariate, multivariate, and probabilistic sensitivity analyses.

RESULTS

Primary Analysis

- Option 3 had a very low risk of untreated malignant tumors (0.2%, vs. 2.1% for option 1, 4.2% for option 2, and 0% for empiric PN) and the highest probability of leaving benign tumors untreated (84.4%, vs. 53.9% for option 1, 51.7% for option 2, and 0% for empiric PN).



- Option 3 dominated empiric surgery and options 1 and 2 (lower costs, higher QALYs).

Strategy	Reference: Empiric PN	Option 1: Biopsy	Option 2: Sestamibi	Option 3: Sestamibi → biopsy
Total per patient				
Total costs	\$322,822	\$322,174	\$321,165	\$320,192
Total LYs	12.675	12.684	12.678	12.694
Total QALYs	9.957	9.954	9.961	9.972
Incremental (vs. empiric PN)				
Δ costs	-	-\$648	-\$1,657	-\$2,629
Δ QALYs	-	-0.003	0.004	0.015
ICER, \$/QALY	-	Less Costly and Less Effective	Dominant	Dominant

RESULTS (continued)

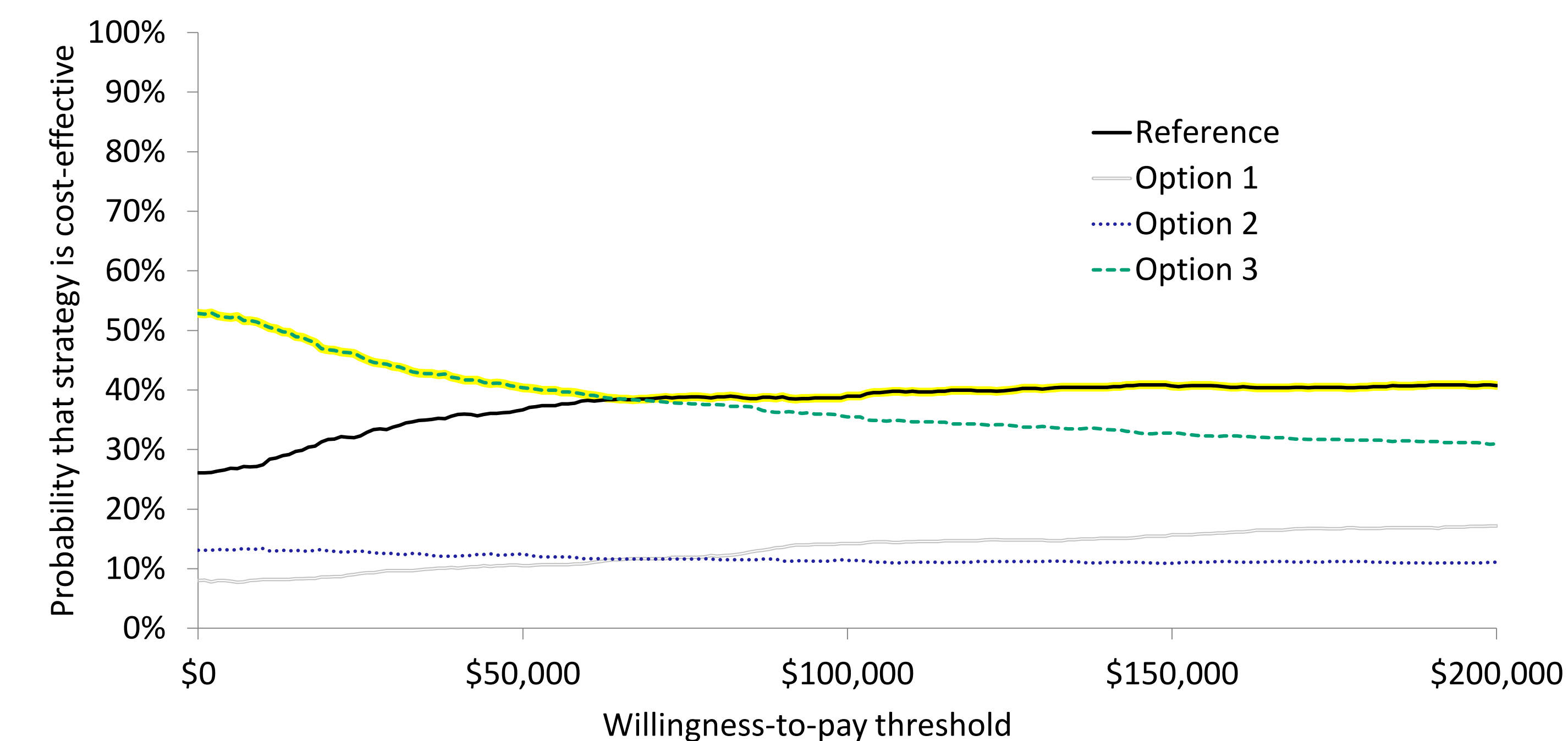
Secondary Analysis

- Option 3 had the lowest risk of untreated malignant tumors (0.2%, versus 2.1% for option 1, 4.1% for option 2, and 5.5% for RWCP) and the highest probability of leaving benign tumors untreated (84.4%, versus 53.5% for option 1, 51.4% for option 2, and 5.1% for RWCP)
- Versus RWCP, options 1-3 were all cost-effective; option 3 had the lowest ICER.

Strategy	Reference: Real-world clinical practice	Option 1: Biopsy	Option 2: Sestamibi	Option 3: Sestamibi → biopsy
Total per patient				
Total costs	\$297,040	\$301,091	\$300,085	\$299,097
Total LYs	14.010	14.107	14.100	14.120
Total QALYs	11.106	11.195	11.200	11.215
Incremental (vs. real-world clinical practice)				
Δ costs	-	\$4,051	\$3,046	\$2,057
Δ QALYs	-	0.089	0.094	0.109
ICER, \$/QALY	-	\$45,281	\$32,234	\$18,821

Sensitivity Analyses

- Option 3 was the optimal strategy across a wide range of values of most model parameters in univariate sensitivity analyses and in multiple scenarios in which a combination of alternative input values and assumptions were applied to the model.
- In probabilistic sensitivity analyses, at a WTP threshold of \$50,000/QALY, option 3 had a 40.4% probability of being the most cost-effective, higher than all other strategies. Option 3 had the highest probability of being the optimal strategy when the WTP threshold was no greater than \$67,000/QALY (probability ranged from 52.9% to 38.4%). Beyond \$67,000/QALY, empiric surgery surpassed option 3 and had a higher probability of being the most optimal strategy.



- Results of the secondary analysis were similarly robust to alternative input values and model assumptions in univariate, scenario, and probabilistic sensitivity analyses.

CONCLUSIONS

- ^{99m}Tc-sestamibi SPECT/CT followed by confirmatory biopsy helps avoid unnecessary treatment of benign SRMs, minimizes risks of untreated malignant SRMs, and is cost-effective versus existing strategies.