

# Cost-Effectiveness Of Active Surveillance for Incidentally Detected Early-Staged Papillary Thyroid Cancer: A Microsimulation Study

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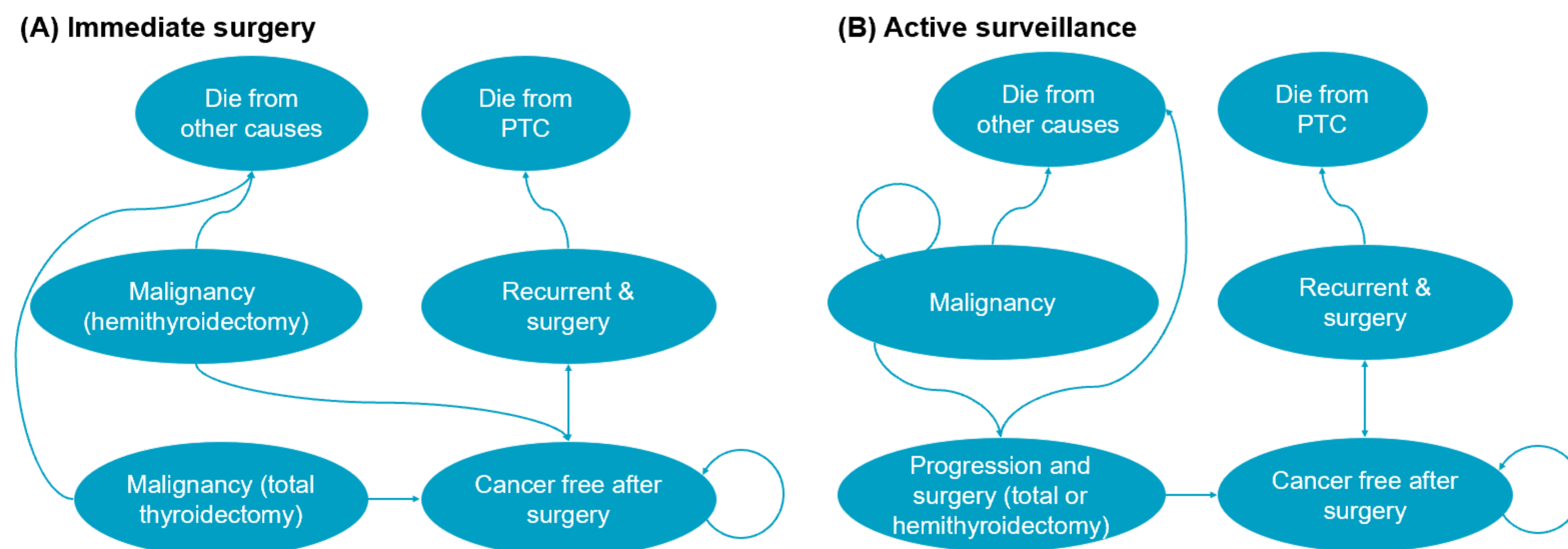
## Background

Incidence of papillary thyroid cancer (PTC) has been increasing rapidly worldwide, with a large proportion being overdiagnosed and overtreated with radical thyroidectomy. Our previous study found that the upsurge of PTC was primarily driven by incidentally detected early-staged cancers, which manifested very low mortality risk. We aimed to estimate the cost-effectiveness among those low-risk patients of active surveillance (followed by intervention if progression is detected) compared to immediate surgery, the standard care recommended by the 2023 Chinese guidelines.

## Methods

We developed a Markov microsimulation model and the model-based evaluation was performed from a healthcare system perspective in China (**Figure 1**). We simulated 10,000 patients aged 40 years for 50 cycles. Probabilities of cancer progression, recurrence and death, together with direct medical costs and health utility values related to surgery, complications and active surveillance, were obtained from published literature and our previously established retrospective PTC cohort by detection route. The probabilities of dying from other causes were derived using the China life tables. Costs and quality-adjusted life years (QALYs) were discounted at a rate of 3% (**Table 1**). Sensitivity analyses were conducted to assess the impact of parameter uncertainty in the model.

**Figure 1. Graphical representation of the Markov microsimulation model**



**Table 1. Model parameters**

Parameter	Base-case value	Description of data source
Annual probability of progression	0.0125	Meta analysis of active surveillance studies
Annual probability of recurrence	0.0500	PTC cohort by detection route <sup>¶</sup>
Annual probability of dying from PTC among the early-staged	0.0007	PTC cohort by detection route <sup>¶</sup>
Annual probability of dying from other causes	Sex-age-specific	Life table of China
Proportion of complications after surgery	Hypoparathyroidism and recurrent laryngeal nerve injury under hemi- and total thyroidectomy	Published meta-analysis
Costs and utilities related to surgery and complications	Depending on surgery type and complication occurrence	Published literature (the cost data were from Chinese general hospitals)
Discounting rate	3%	Assumption

<sup>¶</sup> A retrospective cohort study among patients diagnosed with PTC at Sun Yat-sen University Cancer Center

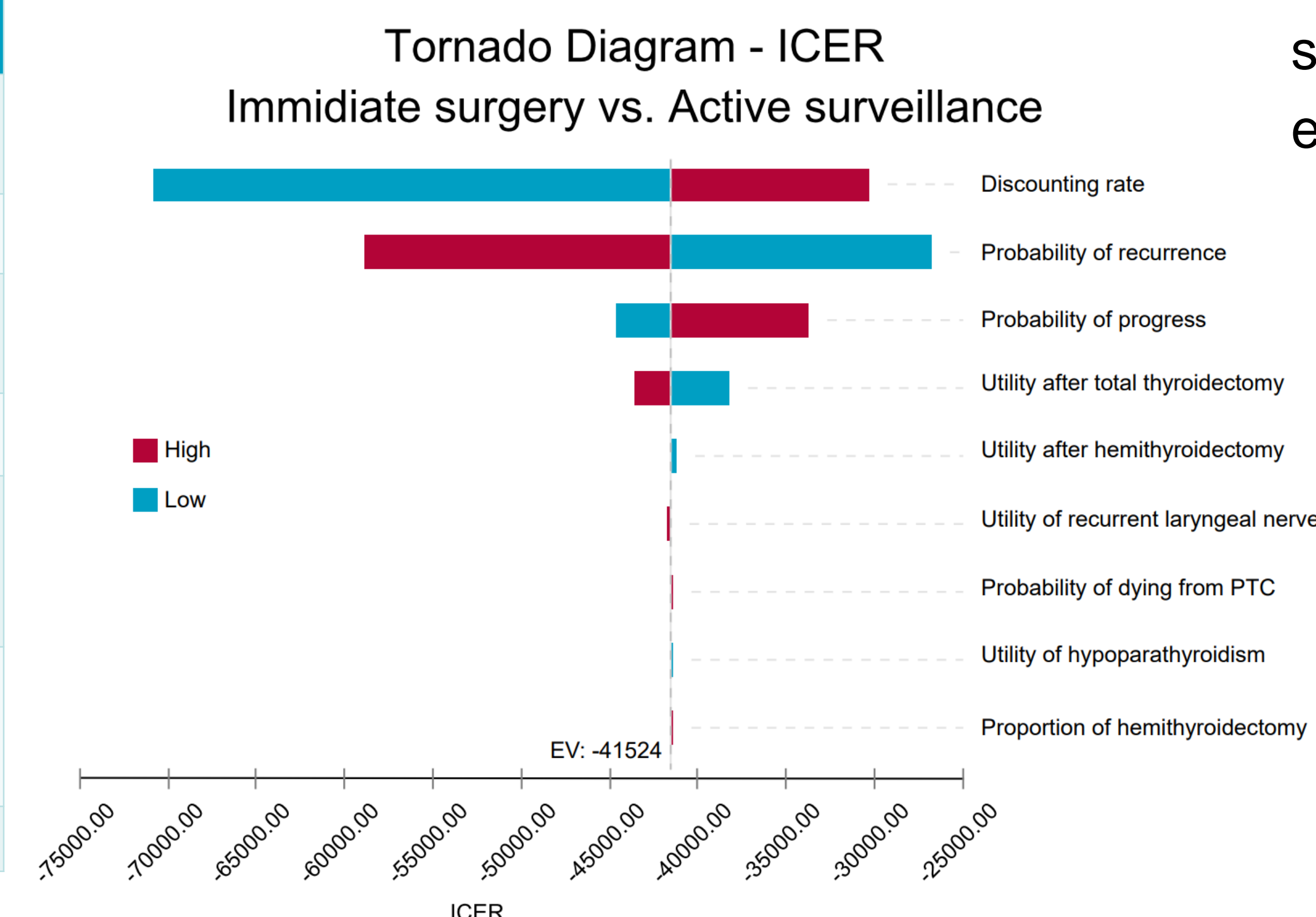
## Results

On average, active surveillance of the incidentally detected early-staged PTC followed by intervention if progression was detected yielded 18.0 QALYs per patient with a cost-effectiveness ratio (CER) of ¥1706/QALY, compared to 16.9 QALYs per patient and ¥4553/QALY associated with immediate surgery. The incremental cost-effectiveness ratio (ICER) was -¥41,524/QALY (**Table 2**). Sensitivity analyses showed that the discounting rate, probabilities of cancer progress and recurrence after surgery, and the utility value after total thyroidectomy had large influence on ICER, but active surveillance remained cost-effective (**Figure 2**).

**Table 2. Cost-effectiveness of active surveillance versus immediate surgery**

Strategy	Cost (CNY)	ΔCost	Effectiveness, QALY	ΔQALY	CER	ICER, CNY/QALY
<b>The whole cohort</b>						
Immediate surgery	76947	N/A	16.9	N/A	4553	N/A
Active surveillance	30726	-46221	18.0	1.1	1706	-41524
<b>Women</b>						
Immediate surgery	77137	N/A	16.9	N/A	4551	N/A
Active surveillance	31790	-45347	18.7	1.7	1703	-26340
<b>Men</b>						
Immediate surgery	76510	N/A	16.8	N/A	4556	N/A
Active surveillance	28271	-48239	16.5	-0.3	1713	165220

**Figure 2. Tornado diagram presenting the one-way sensitivity analysis results.** The tornado diagram ranks the parameters in order of their influence on ICER.



## Conclusions

Active surveillance of incidentally detected early-staged PTC is likely cost-effective from a healthcare system perspective in China. This study provides continuing evidence of the de-escalation in low-risk thyroid cancer management.

