



INSTITUTE FOR CLINICAL
AND ECONOMIC REVIEW

**Economic Model of Multiple Radiation
Therapy Treatments for Low-Risk
Prostate Cancer: Overview**

June 4, 2008

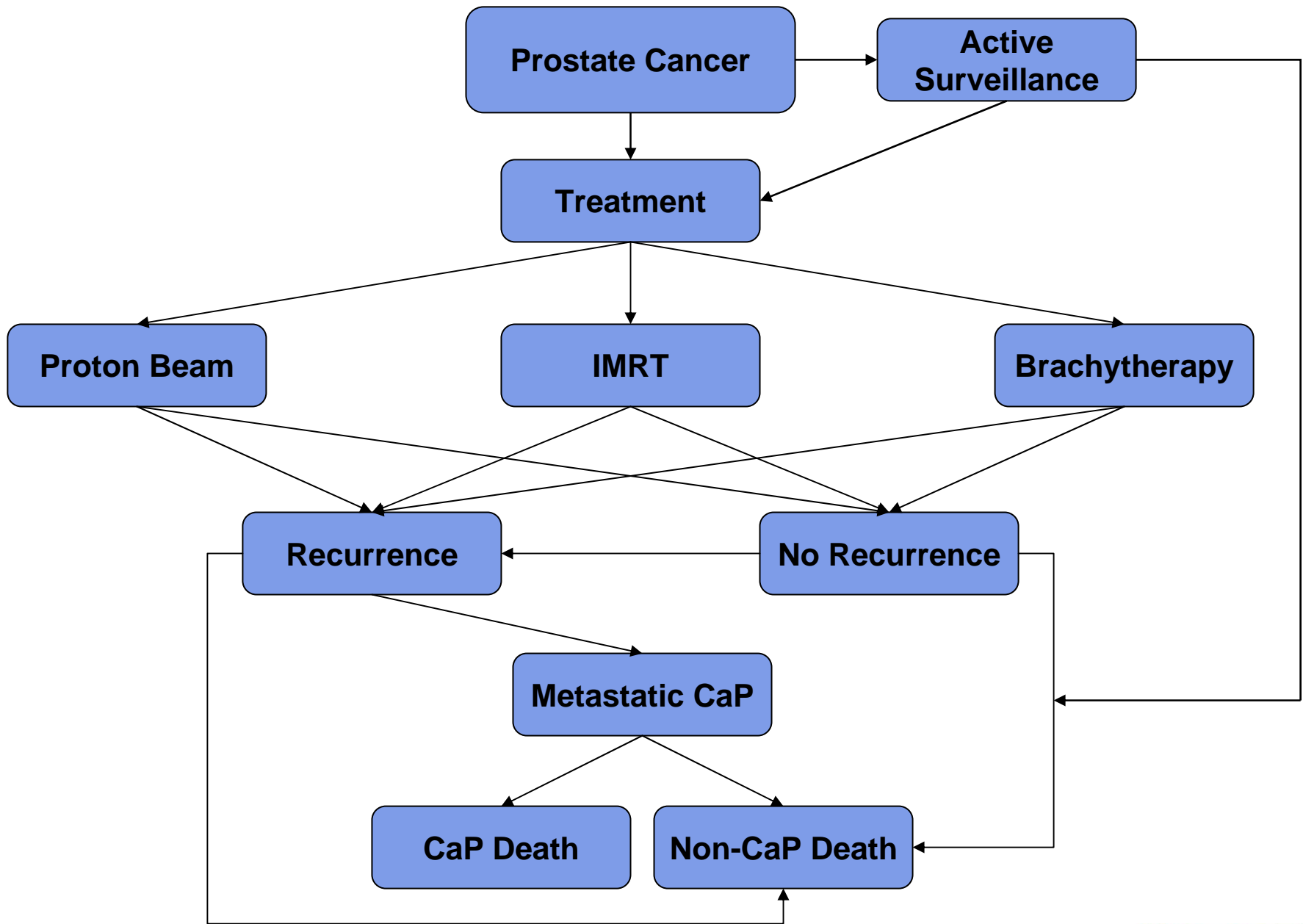
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ICER Model: Overview

- Markov cohort model
- One year cycle length
- Patient population
 - Low-risk disease (D'Amico criteria)
 - Gleason ≤ 6 , PSA < 10 , stage $\leq T2a$
 - Base case: 65 year old man
 - Limited analyses will be conducted for 55 year old man, varying selected age-specific risks

ICER Model: Overview

- Multiple treatment strategies evaluated
 - Initial treatment at diagnosis
 - Brachytherapy
 - Proton beam therapy
 - IMRT (common referent standard)
 - Active surveillance
 - Treated upon clinical progression
 - Treated based on patient decision without progression



ICER Model: Overview

- Health states will reflect presence or absence of treatment-related complications
 - Short- and long-term complications of all 3 treatments
 - Acute urinary retention with brachytherapy
- Utilities will be assigned to each health state
- Major cost categories will include:
 - Treatment-related (incl. management of complications)
 - Treatment-unrelated (e.g., annual medical costs, costs of terminal care)

ICER Model: Overview

- Primary Outcomes
 - Life Expectancy
 - Overall mortality, prostate cancer-specific mortality
 - Quality adjusted life expectancy
 - Cost-effectiveness (\$/QALY)
- Secondary Outcomes
 - Biochemical freedom from failure
 - Cost per complication averted

Model Assumptions: Disease Course

- No men die of prostate cancer within 3 years of diagnosis
- All men who recur after definitive therapy will recur biochemically (BCR)
- Probability of progressing from BCR to metastatic disease same for all low-risk patients regardless of treatment
- Men die of prostate cancer only after the development of metastatic disease
- The probability of progressing from metastatic disease to death is the same regardless of treatment

Model Assumptions: Disease Course

- Active surveillance (AS)
 - Progression on AS is defined as
 - Increase in Gleason score or
 - Rapid PSA rise
 - No patients progress to metastatic disease while on AS
 - Patients who progress are treated with IMRT plus 6 months of androgen deprivation therapy (ADT)
 - 3 additional strategies for non-progressing patients who choose to be treated (1 each for brachytherapy, proton beam therapy, and IMRT respectively)
 - Patients who choose to be treated have same disease outcomes as those treated at diagnosis

Model Assumptions: Complications of Treatment/Disease

- All complications will be treated
- The occurrence of any complication is independent of the occurrence of a second complication

Model Assumptions: Complications of Treatment

- Long-term treatment complications
 - Erectile dysfunction (ED)
 - Genitourinary (e.g., incontinence)
 - Gastrointestinal (e.g., proctitis)
 - Occur at least 90 days after treatment
 - All long-term complications will have occurred by 24 months after treatment
 - All patients treated with 6 months ADT/IMRT will have ED during the year of treatment

Model Assumptions: Complications of Treatment

- Short-term complications
 - Genitourinary
 - Gastrointestinal
 - Acute urinary retention (for brachytherapy only)
 - All occur within 90 days of treatment
- Secondary malignancy after radiation (any tx):
 - Patients will receive associated disutility

Model Assumptions: Complications of Disease

- Active surveillance (AS)
 - ED
 - Incontinence
 - Occur beginning two years after placement on AS

ICER Model: Utilities

- Utility for each health state remains constant for life, with 2 exceptions:
 - Short-term complication utilities will be applied to first year only and will be adjusted to be proportionate to 3-month duration
 - ED from ADT therapy assumed to persist for year in which treatment given only
- Disutility for secondary malignancy will differ between brachytherapy and other forms of radiation
 - Will be subject to sensitivity analyses as well

Categories of Cost

- Annual medical care costs (unrelated)
- Terminal care costs
 - Prostate cancer vs. other cause
- Direct medical costs
 - Outpatient surveillance
 - Outpatient treatments
 - Patient out of pocket costs
- Patient time costs (e.g., time-in-therapy)

Direct Medical Costs

- Outpatient surveillance
 - Active surveillance
 - Post-treatment surveillance
- Outpatient treatments
 - Initial treatments
 - Management of treatment-related complications
- Patient copayments, coinsurance, and deductibles

Base Case

- Perspective = “payer plus”
 - Costs from CMS, RedBook + patient time + out-of-pocket
 - Sensitivity analyses will focus on payer-only perspective
- Time horizon = lifetime
- Discounting = 3% annually
- Constant 2007 US \$
 - CPI adjusted, +/-medical care component
- For each CPT:
 - $\text{RVU} \times \text{annual units} \times \text{national conversion factor}$

Omitted Costs

- Caregiver time
- Costs incurred by all patients prior to entering model
 - Diagnosis, staging of prostate cancer
- Non-health care resource use costs
 - Add a constant to each year of life; little variation in survival across treatments
- Amortization costs (e.g., for proton-beam facility)