Epi213_Assignment2_SOLUTION

Epi213 Assignment 2
v2017

Background:

A woman is incidentally discovered to have a 6mm aneurysm (dilatation) of a blood vessel in the brain. These aneurysms are usually asymptomatic but still at risk of spontaneously bursting and bleeding into the brain, resulting in severe disability or death. The alternative is to surgically clip the aneurysm; this surgery carries a risk of peri-op mortality; but survivors can expect a normal life expectancy.

Transition Probabilities:
Life Expectancy from diagnosis = 35 years
Lifetime risk of rupture with watchful waiting = 5.0%
A ruptured aneurysm would require emergent surgery: 45% will die, 25% will have severe disability, the remaining will survive
Surgical mortality = 2%
If successfully operated, normal life expectancy (35 years)

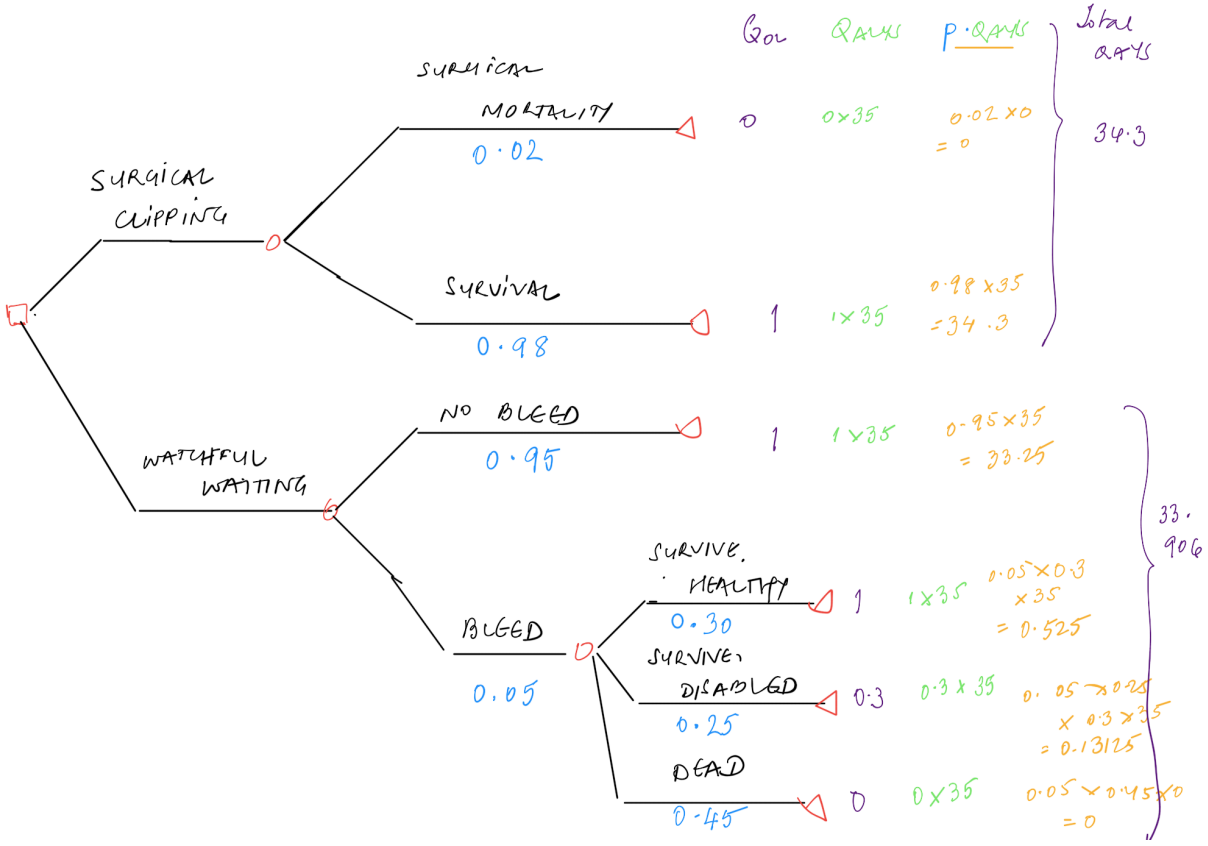
Costs:
Elective Surgery: $30,000
Emergent Surgery and recovery: $150,000
Disabled care (lifetime): $1,000,000

Quality of Life:
Full Health = 1
Severe disability = 0.3
Death = 0

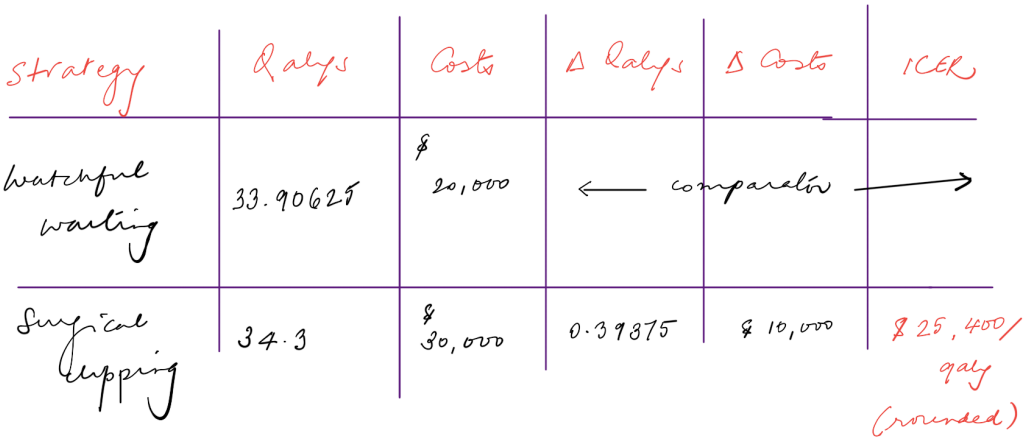
1. State the relevant CEA question here (cue: include all components of PICO-HP):

Among US adults with intracranial berry anuerysms (of 10mm or smaller), does prophylactic surgical clipping improve quality-adjusted survival and is it cost-effective relative to watchful waiting, using a health system perspective and a lifetime analytic horizon?

2. Create the decision tree (ignore the temporal component for now, assume all bleeds in the watchful waiting arm occur at time 0):



3. Roll-back the tree and report your results in the form of a table of total costs and qalys, incremental cost-effectiveness ratio, and also a complete sentence:



Among US adults with intracranial aneurysm (of 10mm or smaller), surgical clipping is has an incremental cost-effectiveness ratio of $25,400 relative to watchful waiting using a health system perspective and a lifetime analytic horizon. This would be considered cost-effective using conventional willingness-to-pay thresholds in the US.

4. Perform the following sensitivity analyses:
What if the surgical mortality increased to 2.5%

ICER increases to $45,700 per QALY.

What if the cost of elective surgical clipping declined to $15,000

gical clipping becomes the dominant (cost-saving) option.

Bonus points: what if we assumed that in the watchful waiting arm, the bleed occurred after a mean of 5 years?

In the watchful waiting arm, persons who die after the bleed still get 5 QALYs, and persons who are disabled after the bleed get 5 QALYs upfront + 30 years *0.3 = 14 QALYs. This improves outcomes in the watchful waiting arm, and hence the ICER for surgical clipping increases to $42,100 per QALY.

5. We learned the difference between rates and probabilities in class. Let's try using those formulae:
We saw in the example above that the probability of an aneurysmal bleed was 5% at 35 years. What is the estimated annual rate of aneurysmal bleed?

R = - Ln(1-p)/t = -Ln(1-0.05)/35 = 0.00146552
In other words, rate of bleeding is 14.7 per 1000 per year

The risk of aneurysmal bleeding is twice as high in a particular subpopulation. What is the 35-year probability of bleeding in that population?

Rate in this subpopulation is twice that in the population above (note you cant double probabilies)

Therefore R(subpopn, per year) = 2* 0.00146552 = 0.00293105

probability (subpopn, 35 years) = 1-exp(-r*t)
= 1-e^(-0.00293105*35) =0.0975

Note that the probability at 35years in the subpopulation is not twice that in the general popn.

<u>For next class:</u>
- Draft one or two cost-effectiveness questions that you would be interested in addressing. This will serve two purposes.
This will serve two purposes:
1) you may get feedback on the feasibility of the question; and
2) you can use this opportunity to convince one of your classmates to partner with you on this question.
If you're not going to attend class, let Sili or Vignesh know and send them a copy of your questions – they'll read these out on your behalf.

- Be sure to figure out TreeAge access. Figure out access to MyResearch (and give TreeAge a run before you show up so you know you can get it to work), or download the trial version. The latter only allows 14 days of access.