

## 2024\_Economic Evaluation Individual Assignment

### The case

Mary is an avid soccer player. Recently while playing she injured her left knee, which has caused her significant pain and limited her mobility. Her quality of life, as measured by the EQ-5D utility score, has dropped to 0.60.

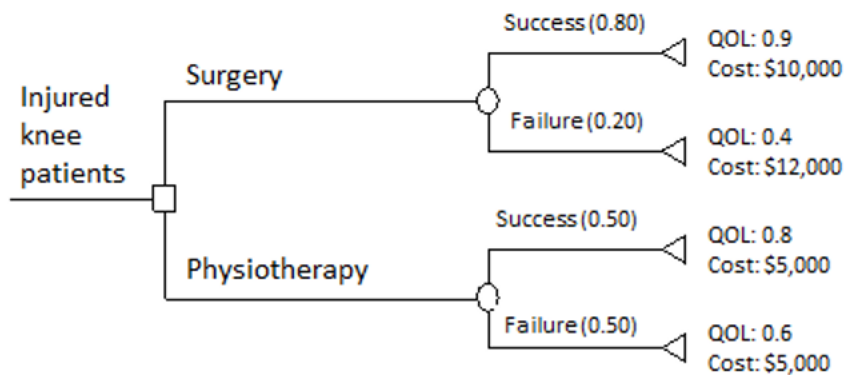
Mary visits the doctor, who informs her that she has two options for treatment:

**Option 1:** surgery, which has an 80% chance of success of improving her quality of life to 0.90, but a 20% chance of a worse outcome which would reduce her quality of life to 0.40. The cost of surgery is \$10,000. When surgery is not successful, there are also additional costs of \$2,000. This is the optional treatment.

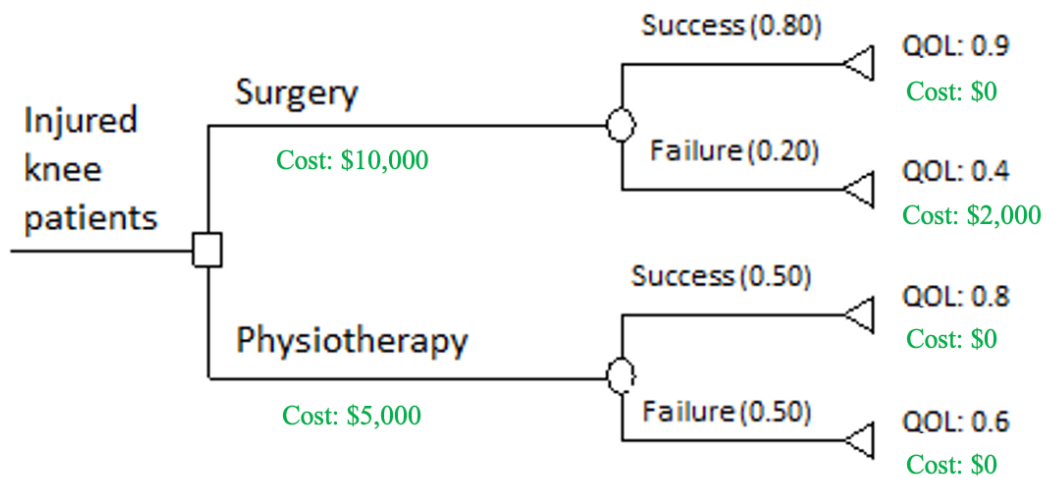
**Option 2:** physiotherapy, which has a 50% chance of success of improving her quality of life to 0.80, and a 50% chance of making no improvement. The cost of physiotherapy is \$5000. This is the standard treatment.

You are Mary's trusted health economist. Answer the following questions:

- a. Draw the appropriate decision tree for Mary, and put the given values in the appropriate places along the tree



Or alternatively



- b. Calculate the likely health state of Mary under surgery versus physiotherapy. Which option would you suggest?**

The expected value of Mary's quality of life following surgery is calculated as:

$$EV\_surgery\_QOL = (0.8 \times 0.9) + (0.2 \times 0.4) = 0.8$$

The expected value of Mary's quality of life following physiotherapy is calculated as:

$$EV\_physio\_QOL = (0.5 \times 0.8) + (0.5 \times 0.6) = 0.7$$

The expected value of Mary's quality of life is higher from surgery than from physiotherapy.

- c. Calculate the expected costs of both the surgery and the physiotherapy treatments.**

The expected value of the cost of surgery is calculated as:

$$EV\_surgery\_costs = (0.8 \times \$10,000) + (0.2 \times \$12,000) = \$10,400$$

The expected value of Mary's quality of life following physiotherapy is calculated as:

$$EV\_physio\_costs = (0.5 \times \$5,000) + (0.5 \times \$5,000) = \$5,000$$

Or alternatively:

The expected value of the cost of surgery is calculated as:

$$EV\_surgery\_costs = \$10,000 + (0.8 \times \$0) + (0.2 \times \$2,000) = \$10,400$$

The expected value of Mary's quality of life following physiotherapy is calculated as:

$$EV\_physio\_costs = \$5,000 + (0.5 \times \$0) + (0.5 \times \$0) = \$5,000$$

- d. **Calculate the incremental cost utility of surgery relative to physiotherapy. Assume that both the physiotherapy and surgery outcomes last for 5 years. Is the surgery cost-effective?**

The incremental improvement in QOL of surgery versus physio is calculated as:

$$\begin{aligned}\text{Incremental\_QOL} &= \text{EV\_surgery\_QOL} - \text{EV\_physio\_QOL} \\ &= 0.8 - 0.7 = 0.1\end{aligned}$$

The incremental QOL is expected to last 5 years. The incremental QALY improvement from surgery versus physio is therefore:

$$\text{Incremental QALY} = 0.1 \times 5 = 0.5 \text{ QALYs}$$

The incremental cost from surgery versus physio is calculated as:

$$\begin{aligned}\text{Incremental\_cost} &= \text{EV\_surgery\_costs} - \text{EV\_physio\_costs} \\ &= \$10,400 - \$5,000 = \$5,400\end{aligned}$$

The incremental cost utility of surgery versus physio is calculated as:

$$\text{ICUR} = \text{Incremental\_cost} / \text{Incremental\_QALY}$$

$$\begin{aligned}&= \$5,400 / 0.5 \\ &= \$10,800 \text{ per QALY.}\end{aligned}$$

At a threshold of \$50,000/QALY, this would be cost-effective.

- e. **What are some of the limitations of this modelling? What would you test in a sensitivity analysis?**

We have assumed perfect certainty about the parameters in the model. Is this realistic?

- What would happen if surgery only improved outcomes between 70-80% of the time? How would this change our results?
- What about other parameters? Which is the model most sensitive to? How would you check? Complete a sensitivity analysis by varying the key parameters.

Are there other factors that should be considered?

- Who pays for the treatment? What is the perspective of the analysis!
- Are there any other costs to consider? Time away from work and family?
- Does Mary have other reasons why she might not want surgery?