HAD 5304 2023 Midterm Assignment

DUE AT 2:00 PM ON OCTOBER 18,2023

ASSINGMENTS MUST BE SUBMITTED ELECTRONICALLY ON QUERCUS.

You can submit ONLY ONE tree for each question. For R users feel free to submit all (or some) of the responses on the same RMarkdown file (whatever works best)

You have been asked to make recommendations regarding the optimal therapy for elderly patients with atrial fibrillation.

Atrial fibrillation is an irregular and often rapid heart rate that can increase your risk of strokes, heart failure and other heart-related complications. A major concern with atrial fibrillation is the potential to develop blood clots within the upper chambers of the heart. If a blood clot forms, it could dislodge from the heart and travel to the brain. There it might block blood flow, causing a stroke.

Warfarin or aspirin may be prescribed to prevent blood clots. Warfarin is very effective but may cause dangerous bleeding. Aspirin is less effective but there is no risk of bleeding. Ignore newer anticoagulants.

Assume the following:

- Consider only the risk of stroke and the risk of bleeding. For both strokes and bleeds, you can assume for now that rates equal probabilities. Use the CHADS2 score to estimate the risk of stroke and the HAS-BLED Bleeding Risk Score to estimate the risk of bleeding for patients on anticoagulants (i.e., warfarin).
- 10% of all strokes are fatal, independent of the treatment. Assume that deaths occur at the beginning of the year.
- 20% of non-fatal strokes are severe, independent of the treatment
- 1% of bleeds are fatal
- Assume that the effectiveness of warfarin in preventing strokes is the same across all risk groups and is equal to the average effect.
- Aspirin is associated with 50% of the risk reduction for stroke associated with warfarin. There is no disutility from taking aspirin.
- Ignore other causes of death
- Assume that the disutility is the amount subtracted from the utility associated with being on warfarin. Assume that the utility of combined states (for example, stroke and bleeding), is equivalent to the lowest utility of the two states.
- Tables for CHADS2 and HAS-BLED scores and for utilities are at the end of this document.

Questions

1. Construct a decision tree with a **one-year time horizon** and **three strategies: no therapy, aspirin, and warfarin**. Assume that the base case is an 80 year old with diabetes, hypertension, and a past bleed. Use **life years as the outcome**. Construct the tree using all of the best practices in decision modeling. Fold back

and provide your findings and discussion (maximum 200 words).Your discussion must include an interpretation of your findings and clinical or policy implications.
Save this tree as LASTNAME_1.TREX (or .Rmd), substituting your last name for LASTNAME. [10 points]. If you use R/Rstudio please use RMarkdown to make sure

2. Modify your tree in Question 1 to **incorporate utilities**.
Fold back and provide your findings and discussion (maximum 200 words).Your discussion must include an interpretation of your findings and clinical or policy implications. Make sure to compare your response to question 1 to what you observed in question 2.
Save this tree as LASTNAME_2.TREX (or .Rmd), substituting your last name for LASTNAME. [10 points]

3. Using your tree from Question 2, perform a **sensitivity analysis on the disutility for being on warfarin**, varying this from 0 to 0.1.
Graph, report and discuss your findings (maximum 200 words). Your discussion must include an interpretation of your findings and clinical or policy implications.
Perform a **sensitivity analysis on the proportion of strokes that are fatal**, varying this from 5 to 25%.
Graph, report and discuss your findings (maximum 200 words). Your discussion must include an interpretation of your findings and clinical or policy implications.
Paste the graphs into a word document if using Treeage or use RMarkdown. Do not submit separate graph files. [10 points]

4. Using your tree from Question 2, perform a **two-way sensitivity analysis showing all possible combinations of CHADS-2 and HAS-BLED scores**.
Graph, report and discuss your findings (maximum 200 words). Try using tables if you are using TreeAge. Your discussion must include an interpretation of your findings and clinical or policy implications.
Repeat this analysis, assuming no disutility for being on warfarin.
Graph, report and discuss your findings (maximum 200 words). Your discussion must include an interpretation of your findings and clinical or policy implications.
Paste the graphs into a word document. Do not submit separate graph files. [13]

5. Modify your **tree from Question 1** to **extend the time horizon to 2 years**. Construct the tree using all of the best practices in decision modeling.
Fold back and provide your findings and discussion (maximum 200 words).Your discussion must include an interpretation of your findings and clinical or policy implications. Save this tree as LASTNAME_3.TREX (or Rmd), substituting your last name for LASTNAME. [10 points]

CHADS2

Letter	Clinical parameter	Points
C	Congestive heart failure (any history)	1
H	Hypertension (prior history)	1
A	Age ≥75 years	1
D	Diabetes mellitus	1
S	Secondary prevention in patients with a prior ischemic stroke or a transient ischemic attack; most experts also include patients with a systemic embolic event	2

CHADS2 score	Strokes per 100 person-years	
	Warfarin	No warfarin
0	0.25	0.49
1	0.72	1.52
2	1.27	2.50
3	2.20	5.27
4 5 or 6	2.35	6.02
	4.60	6.88

HAS-BLED

Letter	Clinical characteristic	Points
H	Hypertension	1
A	Abnormal renal and liver function (1 point each)	1 or 2
S	Stroke	1
B	Past Bleeding	1
L	Labile international normalized ratios (INRs)	1
E	Elderly (age>75)	1
D	Drugs or alcohol (1 point each)	1 or 2

HAS-BLED score (total points)	Bleeds per 100 patient-years•
0	1.13
1	1.02
2	1.88
3	3.74
4 5 to 9	8.70
	Insufficient data (Assume equal to 4)

Utilities

Health State	Utility
Well	1
Mild Stroke	0.80
Severe Stroke	0.60
Bleed	0.75
Death	0
Disutility for being on warfarin	0.02