

The AI Agent in the Room: A New Frontier in Objective Medical Decision Making and Organ Allocation

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Background



Liver Transplantation (LT) is the only definitive treatment for end stage liver disease; access is explicitly rationed.

- Decided by the LT selection committee.
- Process of selecting candidates is prone to^{1,2}:
 - Inconsistency
 - Center-specific rules (written or unwritten)
 - External pressures
 - Hidden biases against select psychosocial profiles

AI agents: autonomous large language models that can perform tasks, learn, and collaborate for complex decision making.

Research Objectives

Simulate the LT selection committee as a step towards objectivity in candidate selection.

AI Selection Committee (AI SC): select patients for LT if they believe LT will offer a survival benefit >1 year.

- Secondary aims:
 - Decide to transplant based on projected 6-month benefit, identifying absolute contraindications to LT
 - Interpretation of reports with cosine similarity to identify key characteristics in AI agent decision making

Methods

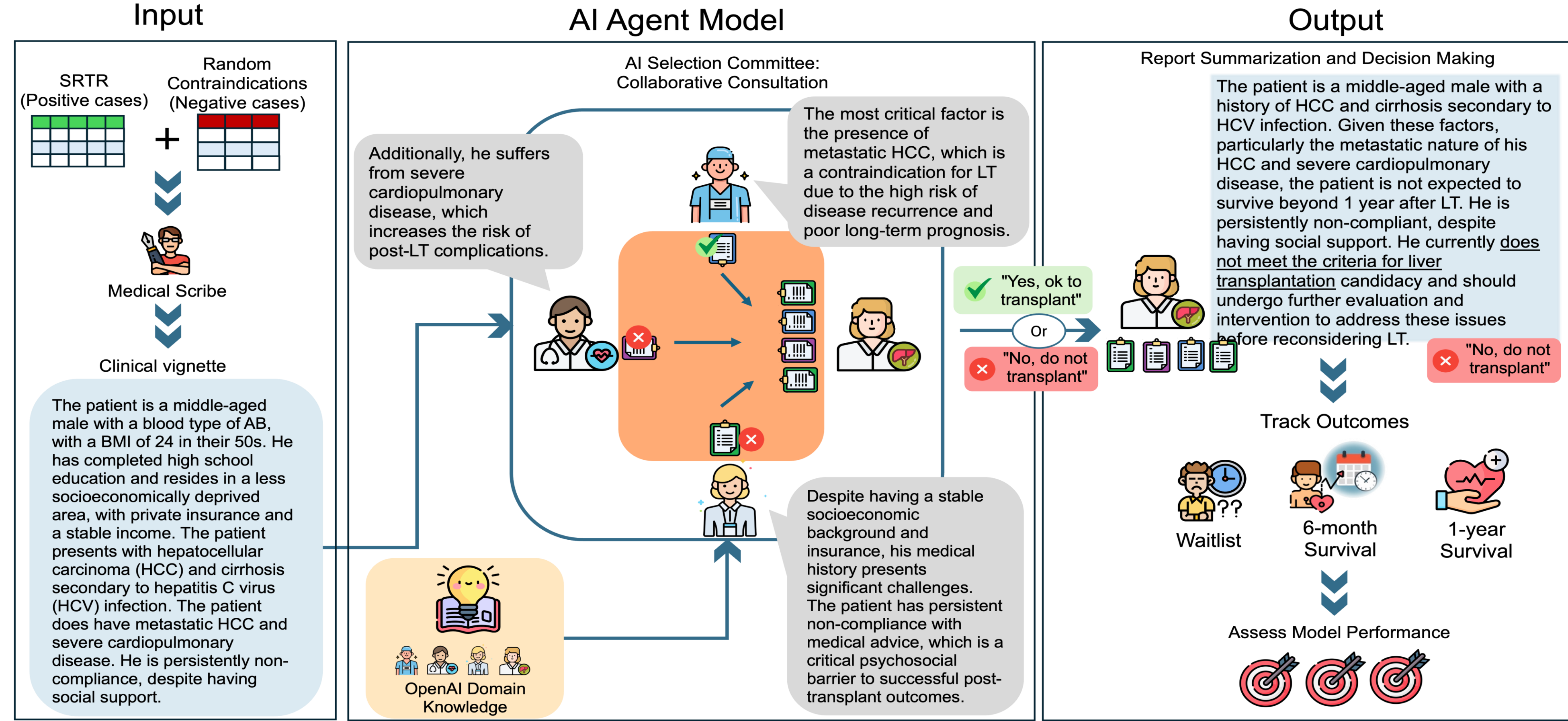
Scientific Registry of Transplant Recipients (SRTR)

- Adult (≥18-years-old) patients who received LT (2004-2023).
- Clinical endpoints/“benefit”: survival >6 months, >1 year; no contraindications to LT.
 - Randomly generated cases with contraindications to transplant.

Model:

- GPT-4 from OpenAI.
- To minimize hallucinations:
 - Temperature set to 0.1.
 - Only used variables with <20% missingness.

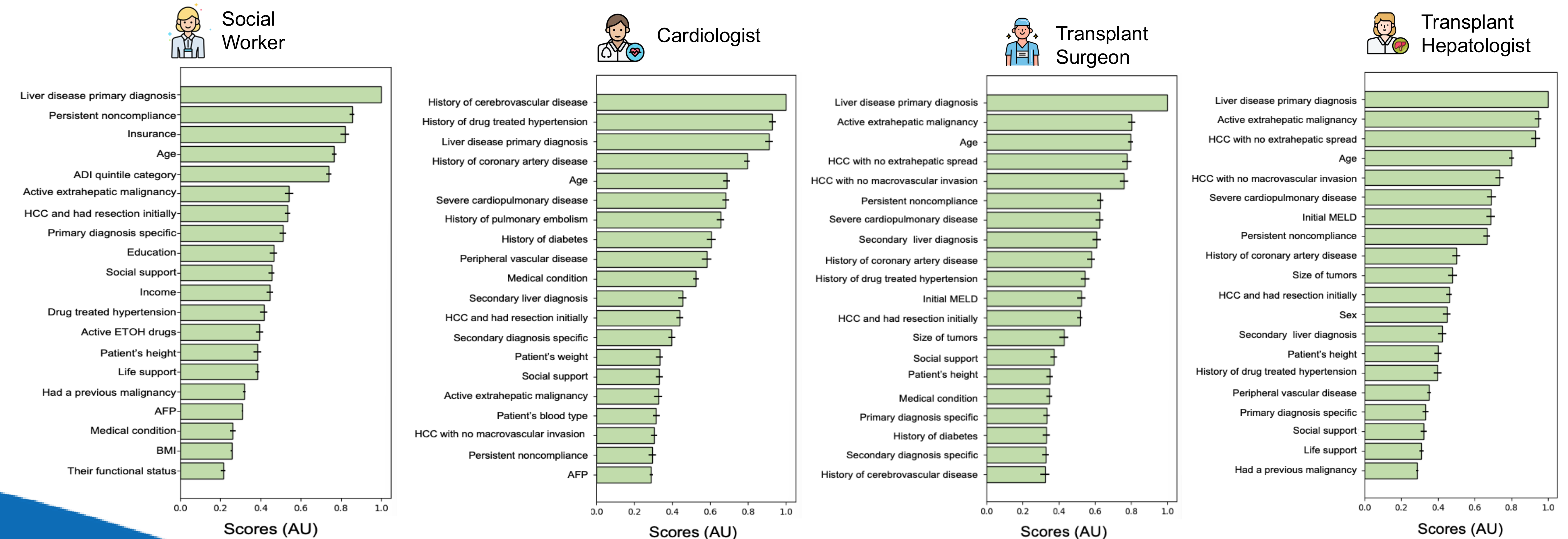
AI Selection Committee Framework of Agents



AI Selection Committee Performance

	Accuracy (95%CI)	Sensitivity (95%CI)	Specificity (95%CI)	Precision (95%CI)	Recall (95%CI)	F1-score (95%CI)
LT Contraindications	98.19% (97.90%-98.44%)	1.00 (0.99-1.00)	0.91 (0.89-0.92)	0.98 (0.98-0.99)	1.00 (0.99-1.00)	0.99 (0.99-0.99)
6-month survival	94.88% (94.37%-95.29%)	1.00 (0.99-1.00)	0.75 (0.73-0.77)	0.94 (0.94-0.95)	1.00 (0.99-1.00)	0.97 (0.97-0.97)
1-year survival	92.00% (91.43%-92.58%)	1.00 (0.99-1.00)	0.66 (0.64-0.68)	0.91 (0.90-0.92)	1.00 (0.99-1.00)	0.95 (0.95-0.95)

Cosine Similarity Index



Results

- Of 8,412 patients, 83.6% were waitlisted and 16.4% had contraindications to LT.
- False Negative: HCC burden beyond Milan criteria was the most common reason for accepted patients who were declined (53.8% contraindications to LT; 53.8% 6-month survival; 60.9% 1-year survival).
- False Positive: most frequent cause of death were infections at 6-months (21.7%) and malignancy at 1-year (28.5%).

Conclusions

- Able to accurately waitlist LT candidates (98.2%) and project 6-month (94.8%) and 1-year (92.0%) post-LT survival.
- AI agents can be used to simulate the LT-SC and apply medical domain knowledge of various LT subspecialists to objectively identify patients who may benefit from LT.
- Proof-of-concept for maintaining objectivity in the LT selection process

References

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- Martin P, DiMartini A, Feng S, Brown R, Fallon M. Evaluation for liver transplantation in adults: 2013 practice guideline by the American Association for the Study of Liver Diseases and the American Society of Transplantation: Martin et al. *Hepatology* 2014; **59**: 1144–65.

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