Multi-state Modeling of Tricuspid Regurgitation Disease Progression Rate using an EHR-integrated Natural Language Processing Platform

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Tricuspid Regurgitation is a morbid disease with negative outcomes

Disease progression is poorly characterized

Understanding disease progression is crucial for optimizing patient outcomes and determining timing of intervention
Methods

- Tempus Next (Tempus Labs Inc, Chicago, IL) studied patients with TR at baseline between August 2018 to December 2021 with a follow up echo until May 2023.

- Demographic and Echo indices were parsed from the Echo report using natural language processing.

- The endpoint was progression to severe TR (“progression”), characterized using a multi-state Markov model.

- Patients with a Tricuspid Valve (TV) intervention after the index echo but before the follow up echo were excluded.
Results

- 52,090 patients (93,335 echoes) were retrospectively analyzed and screened for TR, (8,041 mild; 1,005 mild-moderate; 1,230 moderate; 280 moderate-severe), with an average observation window of 557 days (range: 31-1723 days)

- 27% of patients that were moderate-severe at the time of their index echo experienced progression, and this was significantly higher (p<0.001) than the progression rates for moderate (10%), mild-moderate (4%) and mild TR (1%).
Results

No Tricuspid Regurgitation

Mild Tricuspid Regurgitation
2.65 years (95% CI 2.55-2.75) in this state

Mild-Mod Tricuspid Regurgitation
0.92 years (95% CI 0.89-0.96) in this state

Moderate Tricuspid Regurgitation
2.34 years (95% CI 2.20-2.49) in this state

Mod-Sev Tricuspid Regurgitation
1.14 years (95% CI 1.00-1.29) in this state

1.64 years (±1.08) to severe TR

1.63 years (±1.16) to severe TR

1.45 years (±1.19) to severe TR

1.26 years (±1.18) to severe TR

Severe Tricuspid Regurgitation
Results

- Patients indexed at moderate-severe TR had 10%, 16% and 24% probability of progression within 6 months, 1 year, and 2 years, respectively.

- However, the time to progression was not significantly different when comparing patients indexed at mild, mild-moderate, moderate, or moderate-severe TR (p=0.178).

- For example, the time to progress to severe TR from mild TR (n=72) was 1.64 years, while the time to progression from moderate-severe was 1.26 years.

- The average time patients stayed in mild TR was 2.65 years (95% CI 2.55-2.75), 2.3 years in moderate TR (95% CI 2.20-2.49), and 1.2 years in moderate-severe (95% CI 1.00-1.29).
Conclusions

- The study findings provide insights on the progression of TR which can be incorporated into future efforts to assess frequency of follow-up imaging.

- These findings highlight the importance of vigilant monitoring which can help guide future tricuspid intervention trials.

- Further research is needed to elucidate the underlying mechanisms influencing TR progression.