

# The predictive performance and usage of Artificial Intelligence-based Fistula Failure Model in Singapore haemodialysis clinics

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## BACKGROUND

- AVF failure causes significant morbidity in HD patients, leading to setbacks in patient management.
- There is an urgent need to identify patients at risk of AVF failure [1].
- The Fistula Failure Model (FFM) is a clinical decision tool designed to predict personalized risk-based AVF failure using common clinical measurements.



## OBJECTIVE

- The objective of this study was to evaluate the usage and efficacy of the FFM in Fresenius Medical Care (FMC) clinics in Singapore, in comparison to other countries.

## METHODS

- This retrospective study analyzed 83,126 electronic health records of adult patients receiving HD in 7 countries (Australia, Czech Republic, Italy, Portugal, Singapore, Slovakia and Spain) to compare the performance of FFM in Singapore with its global performance.
- Data was collected for 12-month from February 2023 to January 2024.
- The predictive accuracy of FFM was evaluated by comparing the actual failure incidence using the Area Under the Curve (AUC) of the Receiver Operating Characteristic (ROC).
- Physicians' degree of agreement with FFM prediction was assessed using a 5-point scale.

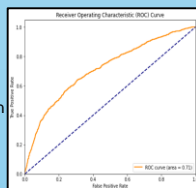
## RESULTS

- A total of 9,795 records from 1,031 patients were analyzed (Table 1).
- The ROC - AUC score in Singapore was 71.5% with a fistula failure incidence of 8.1% (Figure 2).
- The global ROC-AUC score across the 7 countries was 78.1%, with a global failure incidence percentage of 6.2%.
- FFM adoption increased overtime (not shown).
- Physician's degree of agreement with FFM's prediction increased over time (Figure 3 A-B).

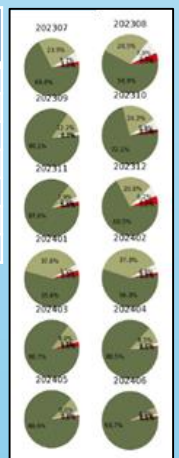
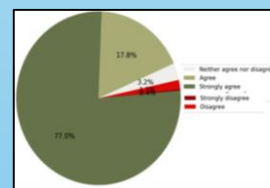
**Table 1:** Number of records analyzed, the percentage of fistula failure incidence, and ROC-AUC score for each country.

Country	#	AUC	Failure Incidence (Count)	Fistula Failure Risk
Australia	7512	70.3%	5.1% (386)	5.4 ± 6.0%
Czech Republic	9997	79.2%	8.5% (854)	8.4 ± 10.6%
Italy	13184	79.9%	2.6% (342)	3.4 ± 5.4%
Portugal	15714	77.5%	9.3% (1464)	7.8 ± 9.5%
Slovakia	10214	74.8%	3.6% (368)	5.7 ± 8.6%
Spain	16710	79.1%	5.3% (891)	4.8 ± 7.0%
Singapore	9795	71.5%	8.3% (808)	5.6 ± 6.2%

**Figure 2:** The ROC - AUC score for the overall FFM performance in Singapore.



**Figure 3: A-** The overall degree of agreement for validated AVF risk scores. **B-** Degree of agreement with time.



## CONCLUSION

- FFM demonstrated robust global predictive performance, although there was some variation across different clinical settings.
- FFM performance in Singapore was satisfactory, but localized adaptation is required to improve model's performance.
- Fine-tuning the FFM to suit different clinical settings will help reduce time-consuming procedures and costs, while improving patient outcomes

## Reference

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