# Ablation Index in Catheter Ablation of Atrial Fibrillation: A Cost-Utility Analysis in Belgium and Germany

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## Objective

Catheter ablation is a commonly used therapy for symptomatic nonvalvular atrial fibrillation (AF). VISITAG SURPOINT™ (VS, previously named ablation index [AI]) is a module that allows annotation and tagging of ablation applications. Ablation with VS is associated with a significant reduction in atrial arrhythmia recurrence at 12 months versus ablation with catheters alone in meta-analyses. The objective of this study was **to assess the cost-effectiveness of VS for catheter ablation versus ablation with catheters alone in adult patients with drug-refractory paroxysmal or persistent AF** from the German and Belgium healthcare payer's perspectives.

## Methods

A two-stage model was built, consisting of a decision tree model that simulated clinical events, costs, and utilities over one year after the ablation procedure, followed by a Markov model that extrapolated events over a lifetime horizon. The model estimated health outcomes and costs for hypothetical cohorts of 300 patients (representing the annual case load of a typical cardiac electrophysiology treatment center) with drug-refractory paroxysmal AF (PAF) from a German and Belgium healthcare perspective.

Half-cycle correction was included since patients could transition from one state to another at any time during the cycle duration. Clinical events probabilities, costs, and utilities were obtained from a meta-analysis, published literature, and administrative data. Costs were adjusted to 2021 Euros. The effectiveness outcome was quality-adjusted life years (QALYs). Both deterministic and probabilistic sensitivity analyses were performed.

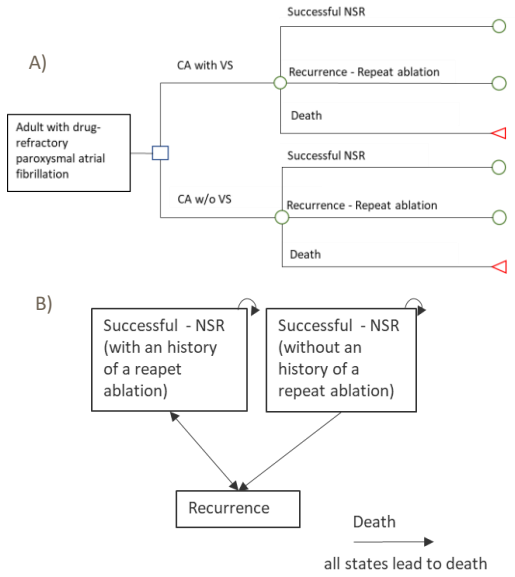


Fig 1. Structure for the A) Short-Term Decision Tree and the B) Markov (Long-Term) Health State Transitional Model Used for the Economic Evaluation. CA, catheter ablation; NSR, normal sinus rhythm; VS, VISITAG SURPOINT

Table 1. Model Inputs for the Base Case for Germany and Belgium.

| Input | Value | Source |
|---|---|---|
| **Population** | | |
| Mean age, years (SD) | 63.8 (11,7) | meta-analysis |
| Gender (% female) | 0.37 | meta-analysis |
| **Transition Probabilities** | | |
| Short-term (12 months) | | |
| Freedom of AF without VS (cumulative probability) | 0.73 | meta-analysis |
| OR freedom of AF (CA with VS vs CA without VS) | 2.35 | meta-analysis |
| Long-term (quarterly probability) | | |
| AF 1st recurrence years 2-4 | 0.025 | Leung et al. (2021) |
| AF 1st recurrence years 5+ | 0.021 | Leung et al. (2021) |
| AF additional recurrence year 2 | 0.064 | CABANA |
| AF additional recurrence year 3 | 0.071 | CABANA |
| AF additional recurrence year 4 | 0.071 | CABANA |
| AF additional recurrence year 5 | 0.069 | CABANA |
| AF additional recurrence year 6+ | 0.020 | APAF |
| **Healthcare Resource Utilization** | | |
| Procedure time, CA without VS, minutes (SD) | 172.15 (58.95) | meta-analysis |
| SMD procedure time, CA with VS | -16.64 | meta-analysis |
| **Costs** | | |
| Germany | | |
| Procedure (EP lab time cost per min), € | 8.41 | Klein et al. (2015); Statistisches Bundesamat (Destatis) (2021) |
| Cardioversion cost, € | 1,804.39 | aG-DRG System (2021) |
| AAD cost quarterly, € | 48.48 | McBride (2009) |
| NOAC cost quarterly, € | 311.40 | Diel (2019) |
| VKA cost, quarterly, € | 46.10 | Mensch (2015) |
| NOAC use | 0.43 | Garfield AF |
| VKA use | 0.28 | Garfield AF |
| Cardioversion use | 0.45 | FRACTAL Registry |
| AF recurrence episode at (3 months), € | 1,004.02 | aG-DRG System (2021) |
| Re-ablation cost with 3D mapping system, € | 7,419 | aG-DRG System (2021) |
| VS acquisition cost, € | 20,000.00 | Biosense Webster, Inc. List Price |
| Discount rate cost (yearly) | 3% | ISPOR German Guidelines (2009) |
| Discount rate QALY (yearly) | 3.0% | IQWiG (2020) |
| Belgium | | |
| Procedure (EP lab time cost per min), € | 8.85 | STATBEL (2021); Klein et al. (2015) |
| Cardioversion cost, € | 1,057.95 | STATBEL (2021); Lamotte et al. (2014) |
| AAD cost quarterly, € | 64.95 | STATBEL (2021); KCE (2012) |
| NOAC cost quarterly, € | 270.70 | STATBEL (2021); Kongnakorn et al. (2015) |
| VKA cost, quarterly, € | 202.02 | STATBEL (2021); Kongnakorn et al. (2015)[ |
| NOAC use | 0.43 | Garfield AF |
| VKA use | 0.28 | Garfield AF |
| Cardioversion use | 0.448 | FRACTAL Registry |
| AF recurrence episode cost (at 3 months), € | 712.35 | |
| Re-ablation cost with 3D mapping system, € | 7,539 | 2021 APR-DRG Tariffs |
| VS acquisition cost, € | 20,000.00 | |
| Discount rate for cost (yearly) | 3% | ISPOR Belgian Guidelines (2012) |
| Discount rate for QALY(yearly) | 1.5% | |
| **Utility** | | |
| NSR State (adjusted for controlled AF) | | |
| 35-44 | 0.868 | Sharma et al. (2015) |
| 45-54 | 0.808 | Sharma et al. (2015) |
| 55-64 | 0.758 | Sharma et al. (2015) |
| 65-74 | 0.738 | Sharma et al. (2015) |
| ≥ 75 | 0.688 | Sharma et al. (2015) |
| AF recurrence (disutility multiplier) | 0.89 | Steg et al. (2012) |

## Results

In the base-case analyses, **ablation with VS was the dominant strategy,** i.e., it was associated with cost savings (–768 and -782 €/patient in Belgium and Germany respectively) and gains in QALYs (0.01 per patient in both countries).

The incremental cost-effectiveness ratio was most sensitive to variations in odds ratio for freedom of AF at 12 months, baseline probability of freedom of AF at 12 months and the disutility associated with AF recurrence. In probabilistic sensitivity analyses, ablation with VS was the dominant strategy in 100% of the 1,000 simulations in both countries.

Table 2. Base Case Results.

| | Germany | | Belgium | |
|---|---|---|---|---|
| | with VS | w/o VS | with VS | w/o VS |
| Cost per Patient | €5,023 | €5,805 | €5,043 | €5,811 |
| QALY per Patient | 5.35 | 5.34 | 5.68 | 5.67 |
| Total Incremental Costs | €-234,623 | | €-230,370 | |
| Incremental Costs Per Patient | €-782 | | €-768 | |
| Total Incremental QALYs | 3.67 | | 3.67 | |
| Incremental QALYS per Patient | 0.01 | | 0.01 | |
| ICER | €-63,948 | | €-62,778 | |

## Discussion

**For adult patients with drug-refractory atrial fibrillation, catheter ablation with VS dominated catheter ablation without VS.** This study has policy implications favoring use of catheter ablation with VS in adult patients with drug-refractory paroxysmal or persistent AF in Belgium and Germany.

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