



VFN PRAHA

# **Impact of rhythm changes during CPR on ECPR outcomes: an ELSO Registry Study**

**Brno, ČKS, 2026**

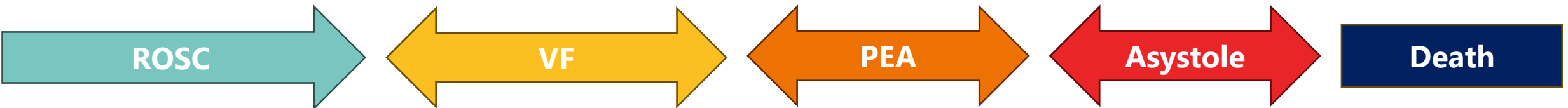
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# Background

- Initial cardiac rhythm is a well-established predictor of survival after cardiac arrest.
- Cardiac rhythm may change during resuscitation.
- Growing evidence suggests that rhythm conversion during prolonged resuscitation may have major prognostic implications.
- Objective: To evaluate the **impact of initial cardiac rhythm and rhythm at VA-ECMO cannulation during refractory cardiac arrest (ECPR) on survival** in a global multicenter cohort.



Rob, Daniel, et al. *Critical care* 26.1 (2022): 330.

Havranek, Stepan, et al. *Resuscitation* 181 (2022): 289-296.

Rob, Daniel, et al. *Resuscitation* 204 (2024): 110412.

Crespo-Diaz, Ruben, et al. *Critical care medicine* 52.7 (2024): 1065-1076.



# Metodology



- **Design:** Predefined observational international multicenter study based on the global prospective ELSO Registry (>750 centers).
- **Data:** Baseline and resuscitation characteristics, survival to hospital discharge, initial rhythm and rhythm at VA-ECMO cannulation
- **Population:** Patients with refractory OHCA and IHCA undergoing ECPR between January 2020 and March 2025.
- **Primary outcome:** Survival to hospital discharge.



# Statistical analysis

- Descriptive statistics: median (IQR) for continuous variables and absolute and relative frequencies for categorical variables. Group comparisons were performed using the Mann–Whitney U test/Welch's t-test and chi-square test.
- Associations between rhythm and survival were evaluated using **multivariable logistic regression including age, sex, witnessed arrest, arrest location, duration of resuscitation, initial rhythm, and rhythm at ECMO cannulation**. Results are presented as ORs with 95% CIs.
- The relationship between resuscitation duration and survival was modeled **nonlinearly with interaction for rhythm at cannulation** and assessed using likelihood ratio testing.
- Missing data were handled using **multiple imputation (MICE)**, and model robustness was evaluated by calendar year **cross-validation**.
- Predefined subgroup analyses: OHCA and IHCA.
- $P < 0.05$  was considered statistically significant.

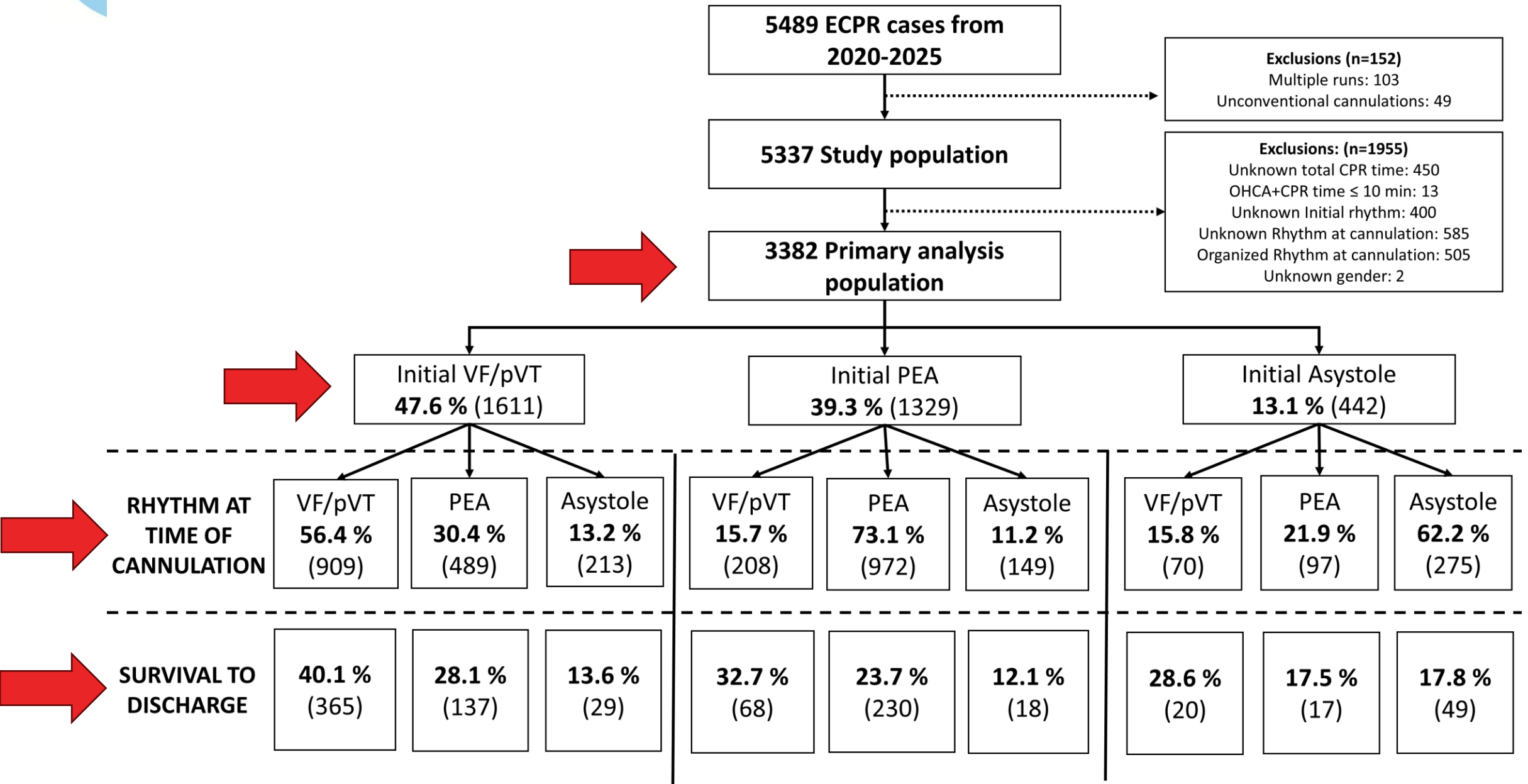


# Baseline and resuscitation characteristics

- Between 2020 and 2025, a total of **5489** adult ( $\geq 18$  years) ECPR cases with ECPR addendum were recorded in the ELSO Registry, of which **3382 (61.6%)** were included in the complete case analysis.
- Median age was **57.1** years (IQR 45.7–65.5),
- **29.1%** were female
- Median CPR duration was **44** minutes, **IHCA 35min, OHCA 60min.**

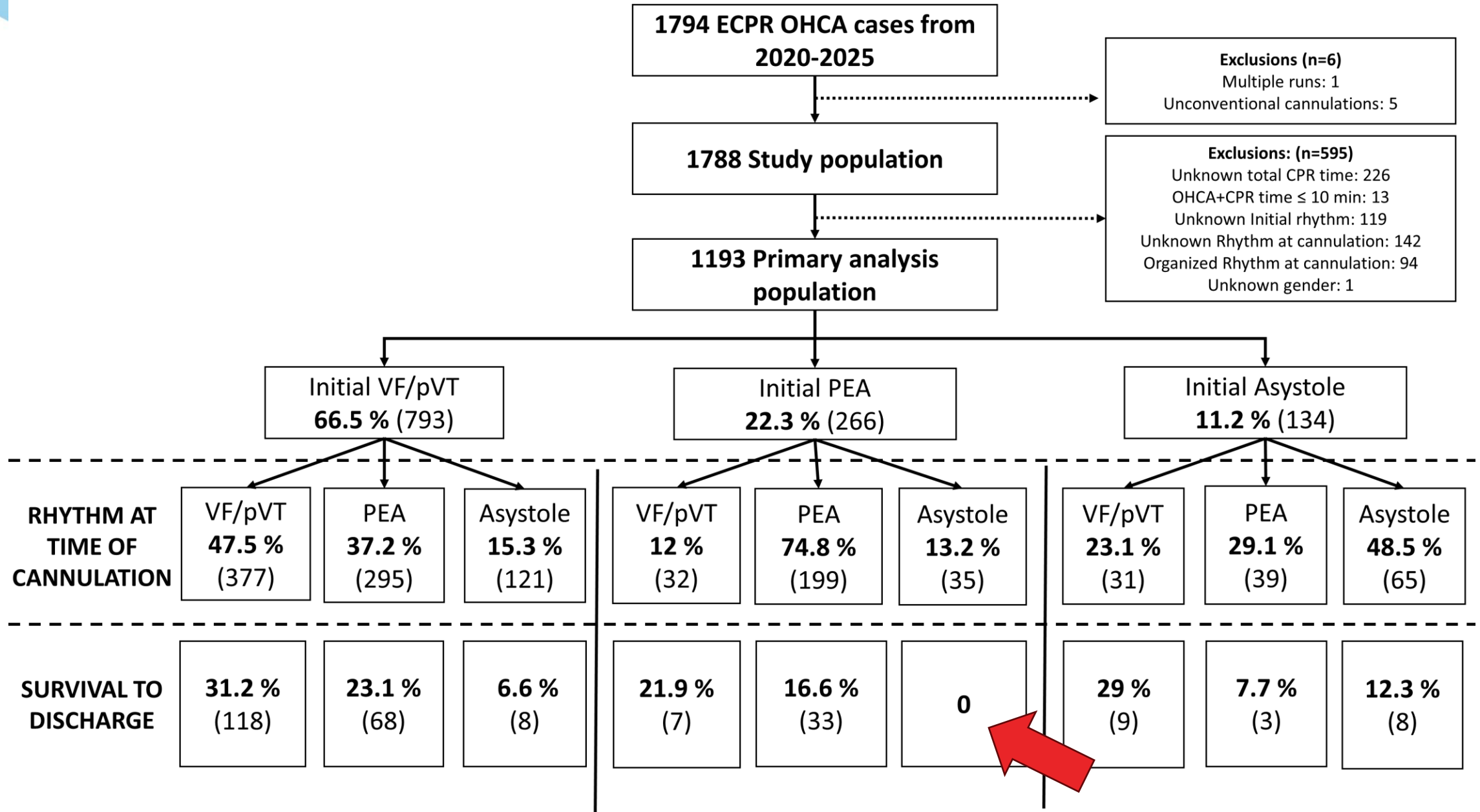


# Results, flow graph, conversions, survival



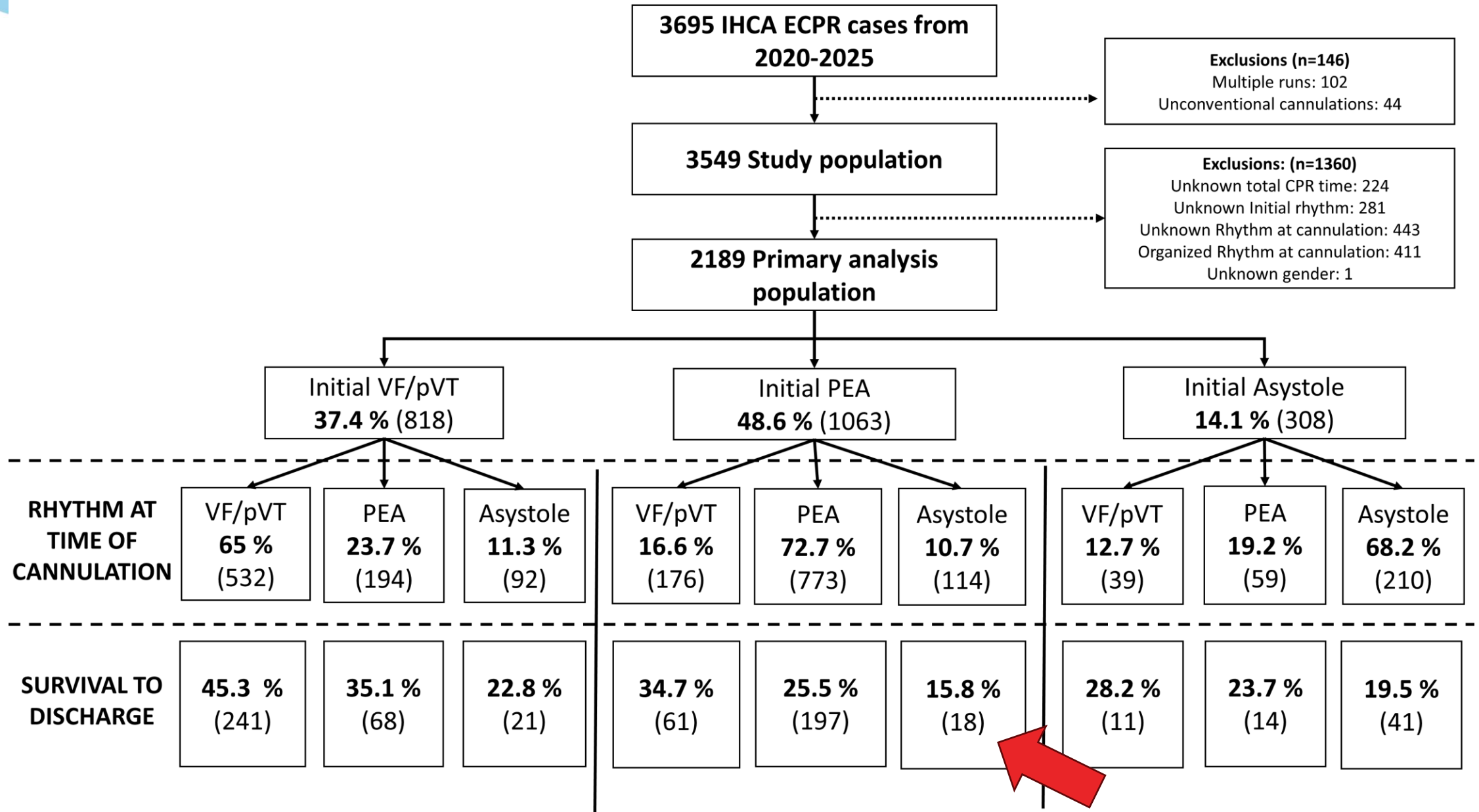


# Results, flow graph - OHCA





# Results, flow graph - IHCA

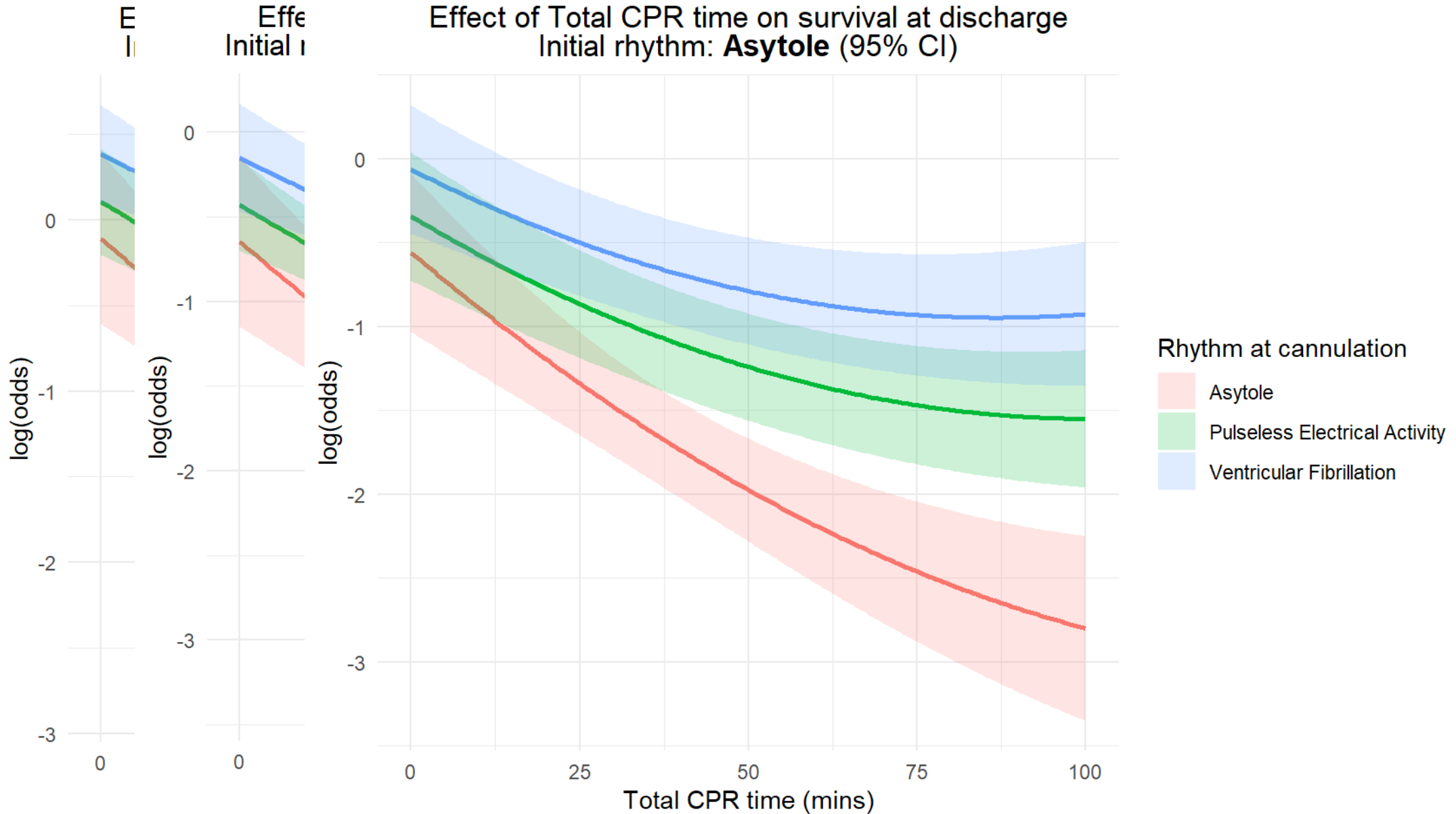


**Table 2 – Multivariable logistic regression analysis of survival to hospital discharge for complete case analysis.**

| Factor                            | Odds ratio | 95 Confidence interval | P value |
|-----------------------------------|------------|------------------------|---------|
| Age (+1 year)                     | 0.99       | (0.98; 0.99)           | <0.001  |
| Gender (male)                     | 0.94       | (0.79; 1.12)           | 0.479   |
| Witnessed status (yes)            | 1.24       | (0.89; 1.75)           | 0.221   |
| Place of arrest (vs. IHCA)        |            |                        |         |
| – OHCA-home                       | 0.48       | (0.36; 0.63)           | <0.001  |
| – OHCA-public                     | 0.77       | (0.59; 1.00)           | 0.052   |
| – OHCA other*                     | 1.07       | (0.75; 1.51)           | 0.707   |
| Initial Rhythm (vs. VF/VT)        |            |                        |         |
| – PEA                             | 0.59       | (0.48; 0.71)           | <0.001  |
| – Asystole                        | 0.64       | (0.47; 0.86)           | 0.003   |
| Rhythm at cannulation (vs. VF/VT) |            |                        |         |
| – PEA                             | 0.76       | (0.54; 1.07)           | 0.112   |
| – Asystole                        | 0.61       | (0.38; 0.99)           | 0.044   |
| Total CPR time                    | Fig. 2**   | Fig. 2**               | <0.001  |



# Time-rhythm interaction analysis





# Limitations

- **Observational** registry-based design → potential residual confounding, selection bias.
- **No neurological outcome** or long-term follow-up data; only survival to hospital discharge was assessed.
- **Limited granularity** of rhythm-transition dynamics during CPR may have affected patient stratification and interpretation.



# Conclusions

- Both **initial rhythm and rhythm at ECMO cannulation** were associated with survival in ECPR patients.
- **Conversion** to a shockable rhythm was associated with the best outcomes, while persistent or converted asystole showed the worst survival.
- **Survival declined in a rhythm-specific, time-dependent** manner with prolonged CPR, supporting rhythm and time-adapted ECPR decision pathways.





# Thanks for your attention

- Questions: [daniel.rob@vfn.cz](mailto:daniel.rob@vfn.cz)



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## Resuscitation

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### Original paper

## Impact of rhythm changes during CPR on ECPR outcomes: an ELSO Registry study



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