

## Assessing pulse pressure variation (PPV) in patients with atrial fibrillation.

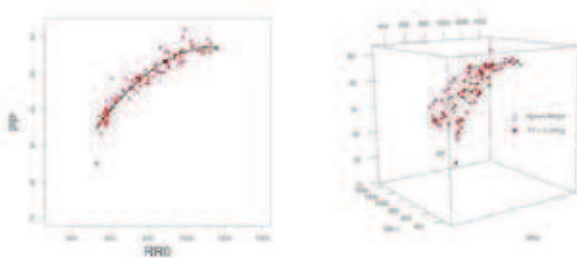
### 1. Predicting the Pulse Pressure of an irregular beat in apnea

**Background and Goal of Study:** The use of PPV to assess volume responsiveness may be unreliable in patients with atrial fibrillation (AF) because of the intrinsic variability of this parameter in the presence of an irregular heartbeat. The observed beat-to-beat PPVs are the resultant of 2 superimposed effects: heart rhythm and mechanical ventilation. We compare 3 different models to predict the beat PP during AF excluding the effect of mechanical ventilation. **Materials and Methods:** After ethical approval and informed consent, patients with AF scheduled for an ablation of the pulmonary veins under general anaesthesia, were included. ECG and invasive arterial waveforms were recorded simultaneously during a 60 sec apnea period.

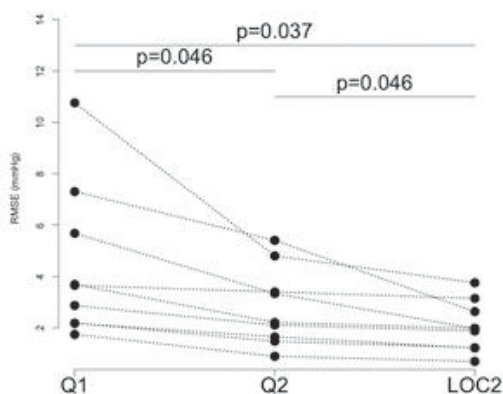
3 different models were calculated

1. A quadratic model using the preceding RR interval ( $RR_0$ ). (Q1) (see fig 1)  
 $PP = a + b \cdot (RR_0) + c \cdot (RR_0)^2$
2. A polynomial quadratic model based on the two preceding RR intervals ( $RR_0, RR_1$ ) in accordance with previously published work by Rawles. (Q2)  $PP = a + b \cdot (RR_1) + c \cdot (RR_1)^2 + d \cdot (RR_0) + e \cdot (RR_0)^2$
3. A Local Polynomial Regression Fitting based on  $RR_0$  and  $RR_1$ . (LOC2) (see fig. 1)

[Fig1: Q1 and LOC2 of Patient 1]



For every individual model, the root-mean-square-deviation (RMSE) between predictions and measurements was calculated and compared using a One-way ANOVA for repeated measures and pairwise t-test comparisons. **Results and Discussion:** 9 patients were included. The mean number of data points to determine an individual model was 69 (SD: 20). Repeated measures ANOVA showed a significant difference between the RMSE of the models. ( $p=0.002$ ). Mean RMSE (SD) for Q1, Q2 and LOC2 were 4(3) mmHg, 3(2) mmHg and 2(1) mmHg. (see fig 2).



[Fig 2]

**Conclusion:** Local Polynomial regression fitting based on the two preceding RR intervals is the most accurate model to predict individual PPs in patients with AF in apnea.

**References:** Rawles JM. Int J Biomed Comput 1988; 23:57-68.