

Assessing the day to day variability in ventilator parameters over the first six months of home NIV treatment: a prerequisite to telemonitoring alert settings

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Introduction

- Telemonitoring for Home non-Invasive ventilation (NIV) is increasingly used,**
- Enabling physicians to **early detect treatment issues** : low adherence, non-intentional leaks, obstructive events and even exacerbations,
- However, **massive amounts of data** need to be analysed,
- Alert settings** are key to **effectiveness: sensitive enough** to identify clinical issues while **minimizing** human workload,
- Patient **alert thresholds** can be set based on **ventilation parameter variability**, analyzed either individually or within a group.

Objectives

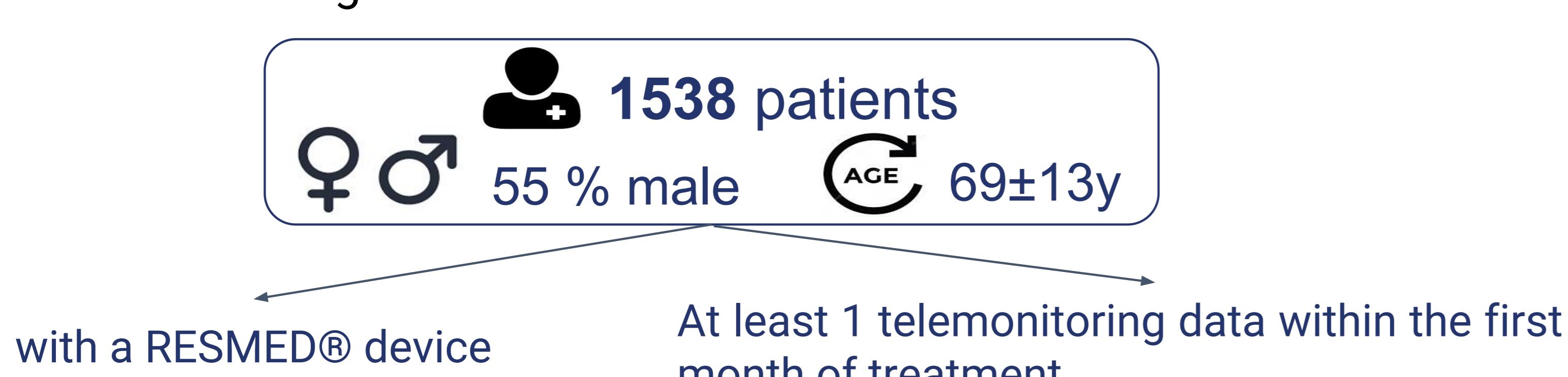
Analyze **inter- and intra-individual variability** of each **telemonitoring parameter** in the **first six months of NIV treatment**.

- Personalisation
- Parameter selection
- Time adaptation

Methods

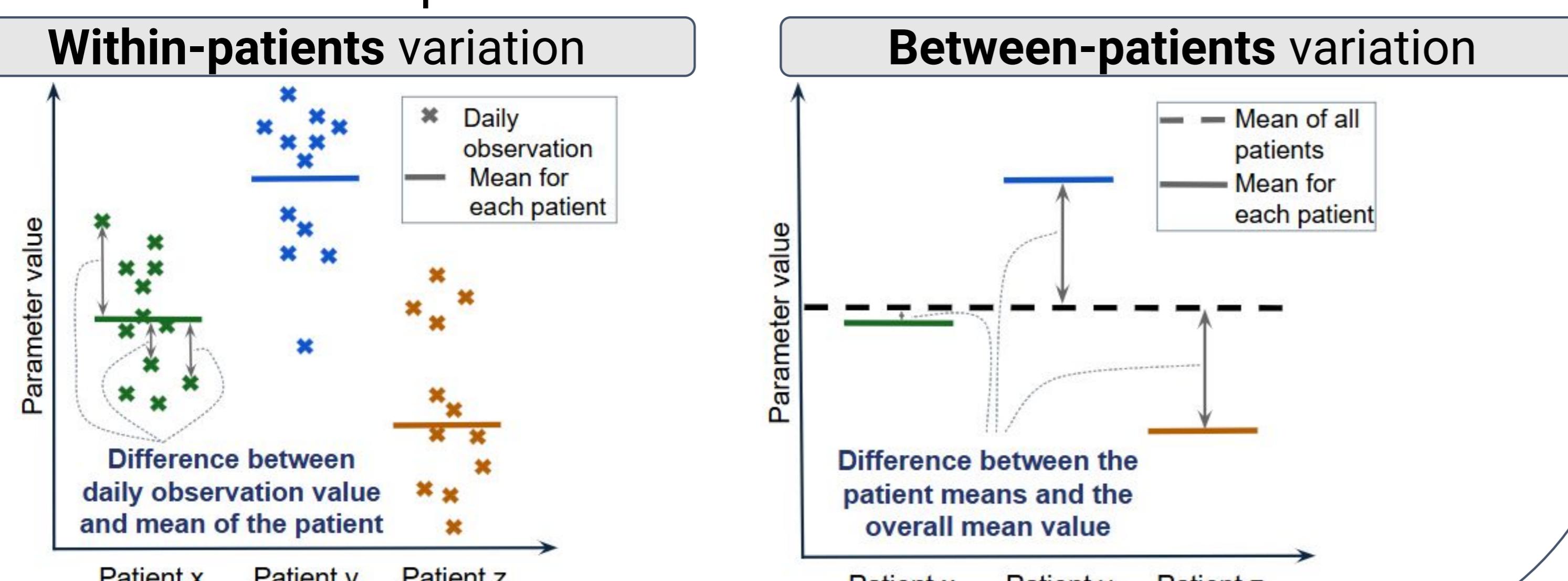
Study design and included population

Retrospective cohort of adults **starting home NIV** in 2019-2022 in **France** and followed-up by an **Air Liquide Healthcare** home service provider (Orkyn or VitalAire). From INOVAL1 study population, Healthdata hub registration number F20220607183406.



Between- and within-patient variation calculations

An analysis of variance on **each parameter** to apportion variation between and within patients.

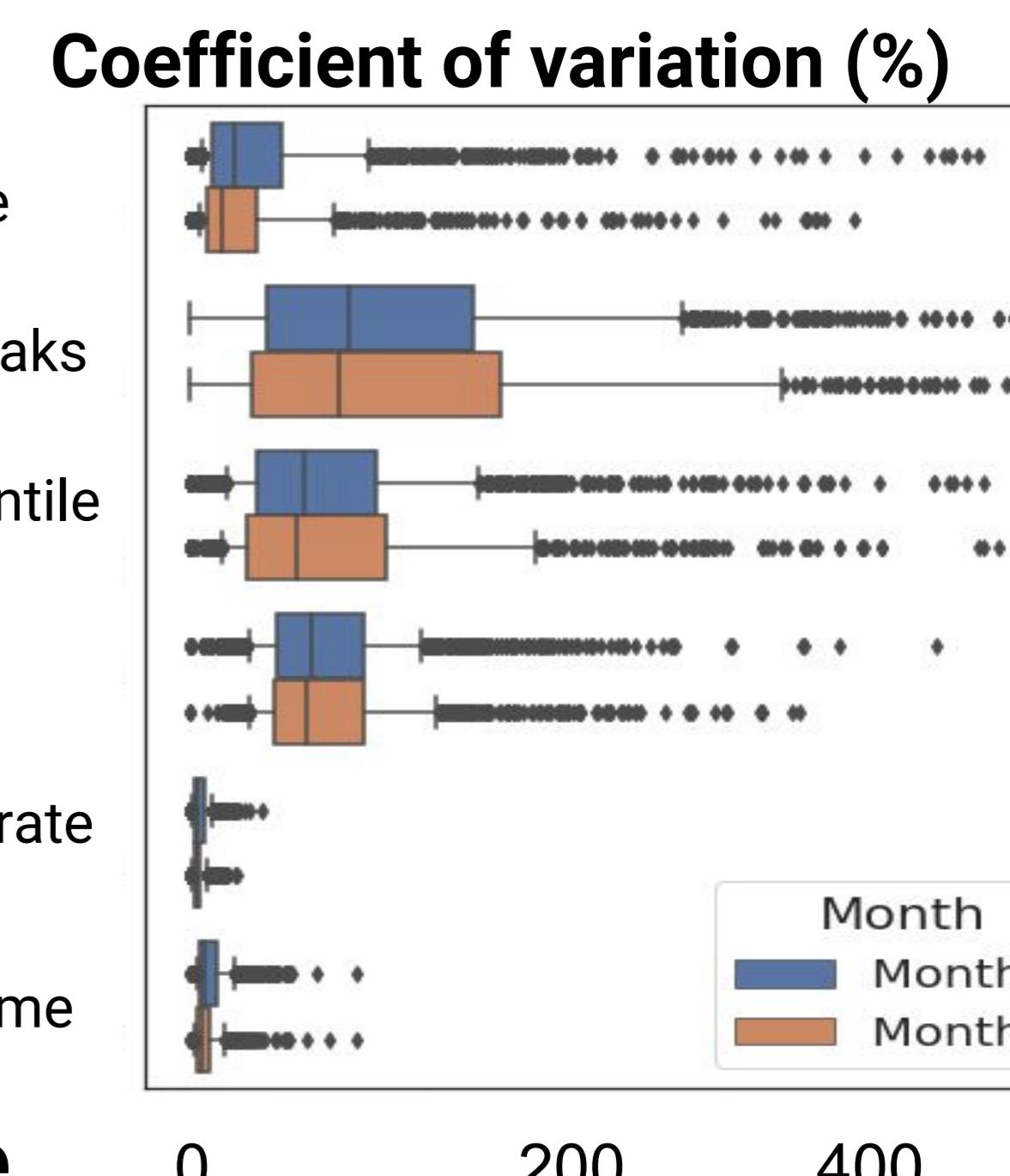


Results

Ventilation parameters description

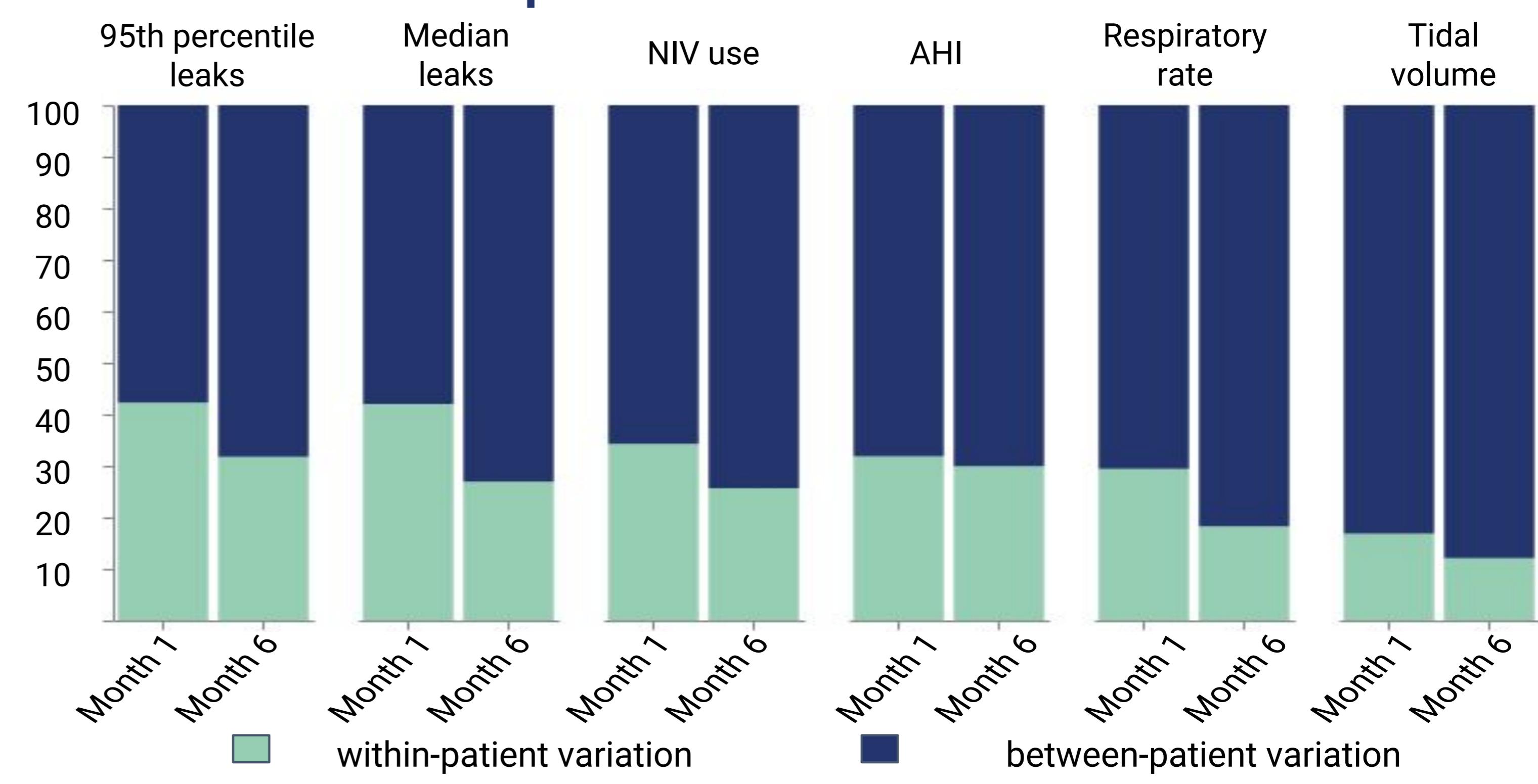
Mean and standard deviation

	Month 1	Month 6
NIV use (hour/day)	6.1±1.8	6.4±1.5
Median leaks (L/min)	7±6	7±5
95th percentile leaks (L/min)	25±15	23±13
AHI (events/hr)	5±3	4±2
Respiratory rate (bpm)	18±2	17±1
Tidal Volume (L)	0.50±0.07	0.52±0.06



- Parameter values **change over time**.
- The **coefficient of variation** differs significantly depending on the parameter.

Between- and within-patient variation



- At month 1, within-patient differences explained substantial variance in leaks, NIV use, and AHI.
- Within-patient **variability decreased** for all parameters between months 1 and 6.

Discussion

Main **limitation**: Access to a **ground truth** enabling validation of the alerts is **unavailable**.

The **high between-patient variation** suggests a need for personalized approaches.

Because **high within-patient variation** makes it hard to distinguish real change, **alerting** on such parameters is **challenging**.

Conclusion

Between-individual variability is important: **alerts** should be **individualized**.

High within-patient variability in daily use, leaks, and AHI decreases over time: alerts should be **adjusted over time**.

Conflicts of interest

M Guillemot is employed by Air Liquide R&D. J Texereau is employed by Air Liquide HealthCare. JM Arnal is consultant for Resmed, Breas Medical, Biosency, and Air Liquide HealthCare.