Quality Improvement in Neonatal Transport
- a data-driven approach -

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Neonatal Emergency and Transport Service of the Peter Cerny Foundation

- ✓ **Territorial Coverage:** covering 45% of the population in Hungary, incl. Budapest and its 100–140 km radius including 7 counties
- ✓ **Institutions Covered:** 9 NICU Level III centers,
- ✓ 8 NICU Level II units, 21 hospital delivery units
- ✓ **Transport activity**: ~**3000** transfers / year

- ✓ **Pre-hospital neonatal emergency services** commissioned by the National Ambulance Service
- ✓ **Inter-regional** neonatal transport operations
- ✓ **ECMO** transfers
- ✓ Other transport activities: **MRI - CT - US scans**

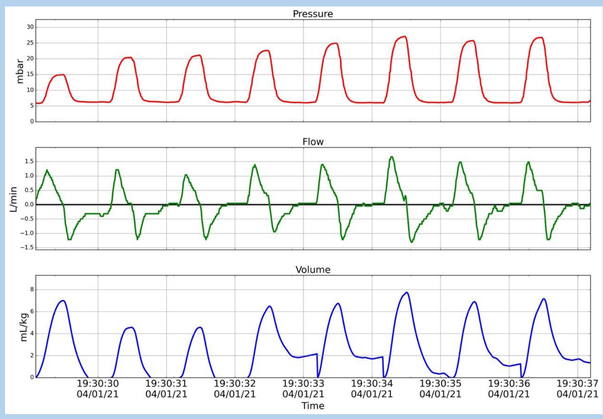
Ventilator data downloaded with high sampling rate

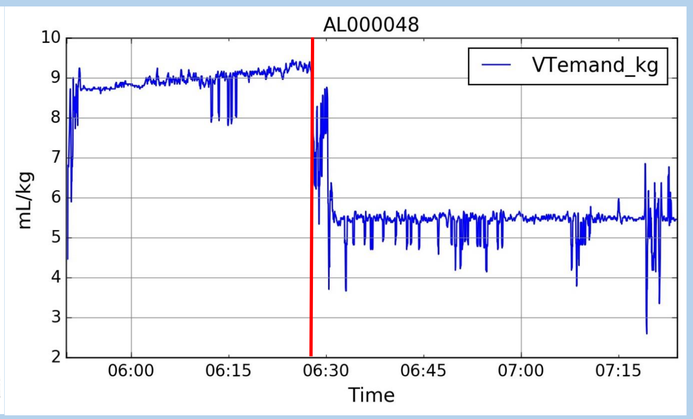
	Pressure	Flow	Volume	CO2
2021-01-13 20:04:00.590	21.00000	1.893555	8.257812	1.209961
2021-01-13 20:04:00.598	21.00000	1.799805	8.343750	1.209961
2021-01-13 20:04:00.606	21.09375	1.742188	8.398438	1.259766
2021-01-13 20:04:00.614	21.00000	1.648438	8.453125	2.220703

Analysis with Python and its data packages

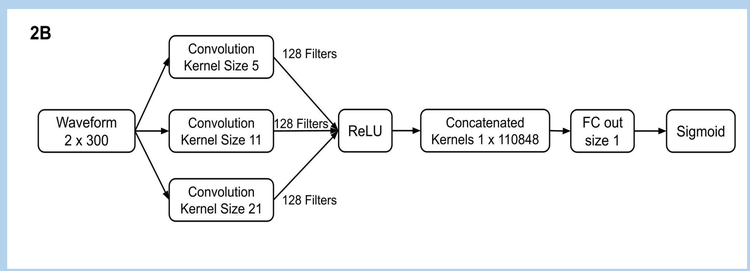
PyTorch, matplotlib, Python, NumPy, SciPy

Analysis of individual **waveforms and trends**





Developing **AI tools** for computational analysis



Own tool developed for ventilator data processing and analysis [1]

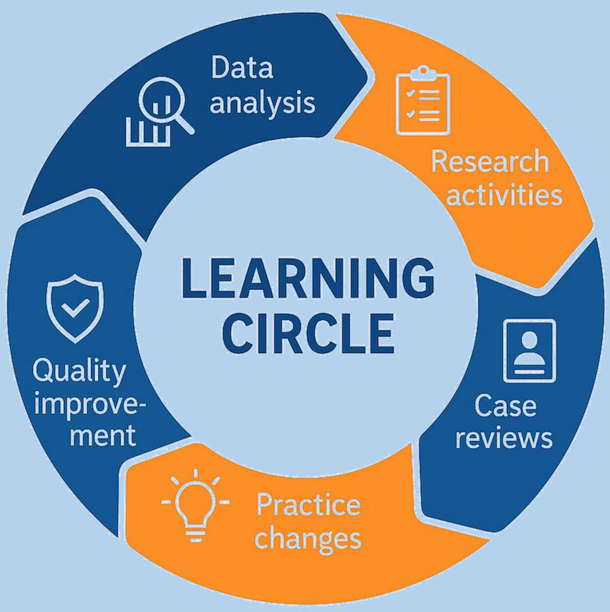
ventiliser 1.0.0

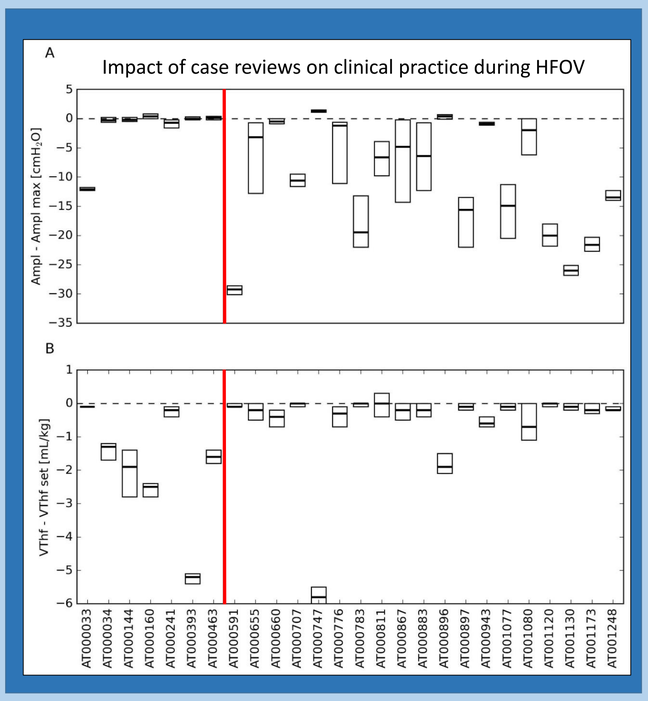
```
pip install ventiliser
```

DATA DOWNLOADED AND PROCESSED **2017 - 2025**

- 01 **2008 cases**
- 02 **986 ventilation**
- 03 **77 cases discussed**
- 04 **20 case reviews**
- 05 **6 publications**

RESULTS

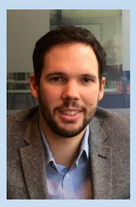




Publication highlights

- ✓ **fabian +nCPAP** ventilator delivers **volume targeted** ventilation with **high accuracy** [2]
- ✓ **fabian +nCPAP** ventilator delivers significantly **lower and less variable tidal volumes** in volume guarantee mode [3]
- ✓ Volume guarantee mode **reduces tidal volume** in babies with **HIE treated with hypothermia** [4]
- ✓ **Extreme low birth weight (ELBW) infants** transferred on first day of life can be ventilated with **5 mL/kg** tidal volume [5]
- ✓ **HFOV** and **HFOV-VG** maintain ventilator parameters with high accuracy and are **promising modalities during neonatal transport** [6]
- ✓ **Vibration forces** during emergency transport **do not interfere** with maintenance of **ventilator parameters** [7]

1. Chong D, Morley CJ, Belteki G. Computational analysis of neonatal ventilator waveforms and loops. Pediatr Res. 2021
2. Belteki G, et al. Volume-targeted ventilation with a Fabian ventilator: maintenance of tidal volumes and blood CO_2. Arch Dis Child Fetal Neonatal Ed. 2020
3. Belteki G, et al. Volume Guaranteed Ventilation During Neonatal Transport. Pediatr Crit Care Med. 2019
4. Lantos L, et al. Volume guarantee ventilation in neonates treated with hypothermia for HIE during interhospital transport. J Perinatol. 2021
5. Balog V, et al. Stabilization, respiratory care and survival of extremely low birth weight infants transferred on the first day of life. J Perinatol. 2025
6. Balog V, et al. High-frequency oscillatory ventilation with or without volume guarantee during neonatal transport. J Perinatol. 2025
7. Lantos L, et al. Acceleration during neonatal transport and its impact on mechanical ventilation. Arch Dis Child Fetal Neonatal Ed. 2023
8. Somogyvári Z. et al. A neonatális transzportszolgálat szerepe az extrém kis súlyú koraszülöttek korai ellátásában Orv Hetil. 2024



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