defining hemodynamic decompensation, depict clinical condition of intensive care patients correctly?

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Background: The RIDIMP-Project

Risk **I**ndicators for cardiopulmonary **D**ecompensation in **I**ntensive Care Units by **M**onitoring vital **P**arameters

Detection and prediction of hemodynamic and pulmonary decompensation in intensive care patients based on an artificial intelligence algorithm → "early warning system"
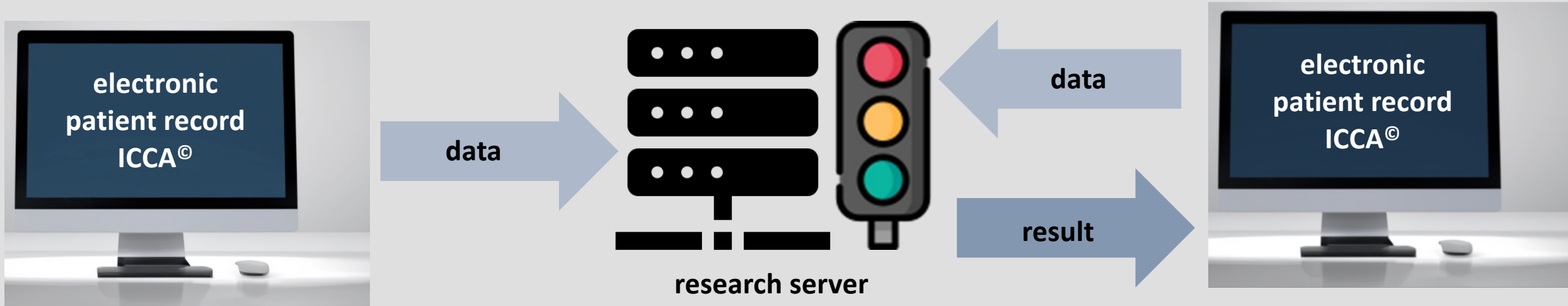
2 major challenges:

Definition of hemodynamic and pulmonary decompensation

Training process AI algorithm

Methods and procedure

research server

data

data

result

electronic patient record ICCA©

electronic patient record ICCA©

Step I
Training of the AI algorithm
> 10k cases of historical patient data (2013 - 2021)

Step II
Evaluation and validation on live data
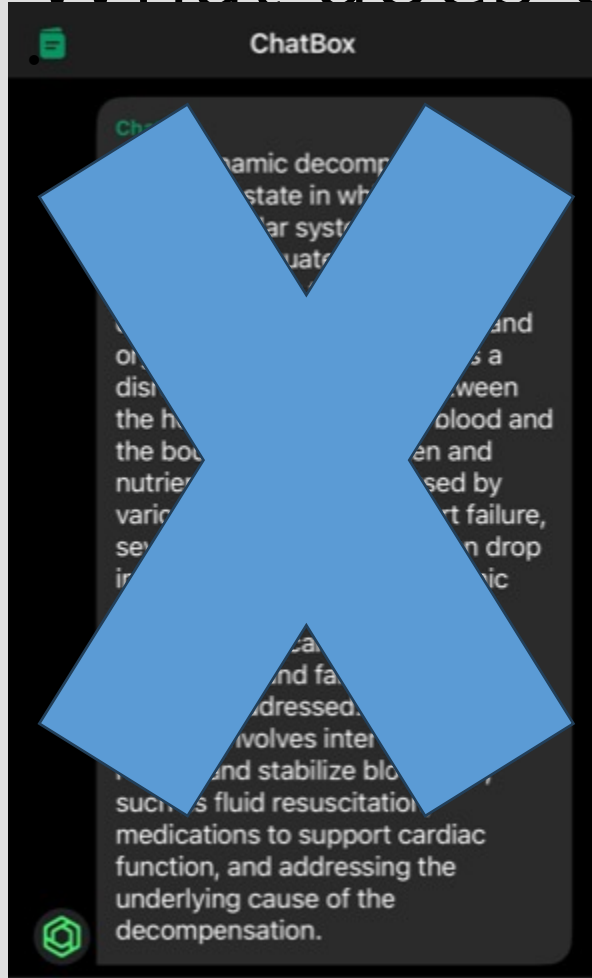> 600 current treatment cases (02 - 05/2023)

Results?
1. **Calculated score**
2. **Predicted score** after 30 h observational time } 1/h

How to define hemodynamic decompensation?
What does Chat GPT et al. say?

ChatBox AI access 25.09.2023/18:53

Scoring systems including hemodynamic parameters:

APACHE IV *(Acute Physiology And Chronic Health Evaluation)*

Zimmermann et al. 2006

SAPS III *(Simplified Acute Physiology Score)*

Metnitz et al. 2006, Moreno et al. 2006

qSOFA *(Quick Sequential Organ Failure Assessment)*

Singer et al. 2016

MODS *(Multiple Organ Dysfunction Score)*

Marshall et al. 1995

MOF *(Multiple Organ Failure)*

Gorris et al. 1985

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How to define hemodynamic decompensation?
The RIDIMP-Score

parameter / points	0	1	2	3	4
Severity class of decompensation: 0-3 none/4-5 moderate/>5 severe					
heart rate [bpm]	50-90	45-49 / 91-100	40-44 / 101-110	<40 / >110	-
mean arterial pressure [mmHg]	>64	60-64	50-59	<50	-
catecholamine therapy	none	singular	singular	combined	singular or combined
norepinephrine [μg/kg KG/min]	0	0.01-0.09	0.1-0.39	0.1-0.39	>0.5
epinephrine [μg/kg KG/min]	0	0.01-0.09	0.1-0.39	0.1-0.39	>0.5
dobutamine [μg/kg KG/min]	0	1-3	3.1-5	3.1-5	>5
vasopressin [IE/min]	0	0	0	0	>0.01

Correlation between critical clinical endpoints *CPR, death, intubation, readmission to ICU* and a high score?

Results: Scoring results /endpoint „*death*"
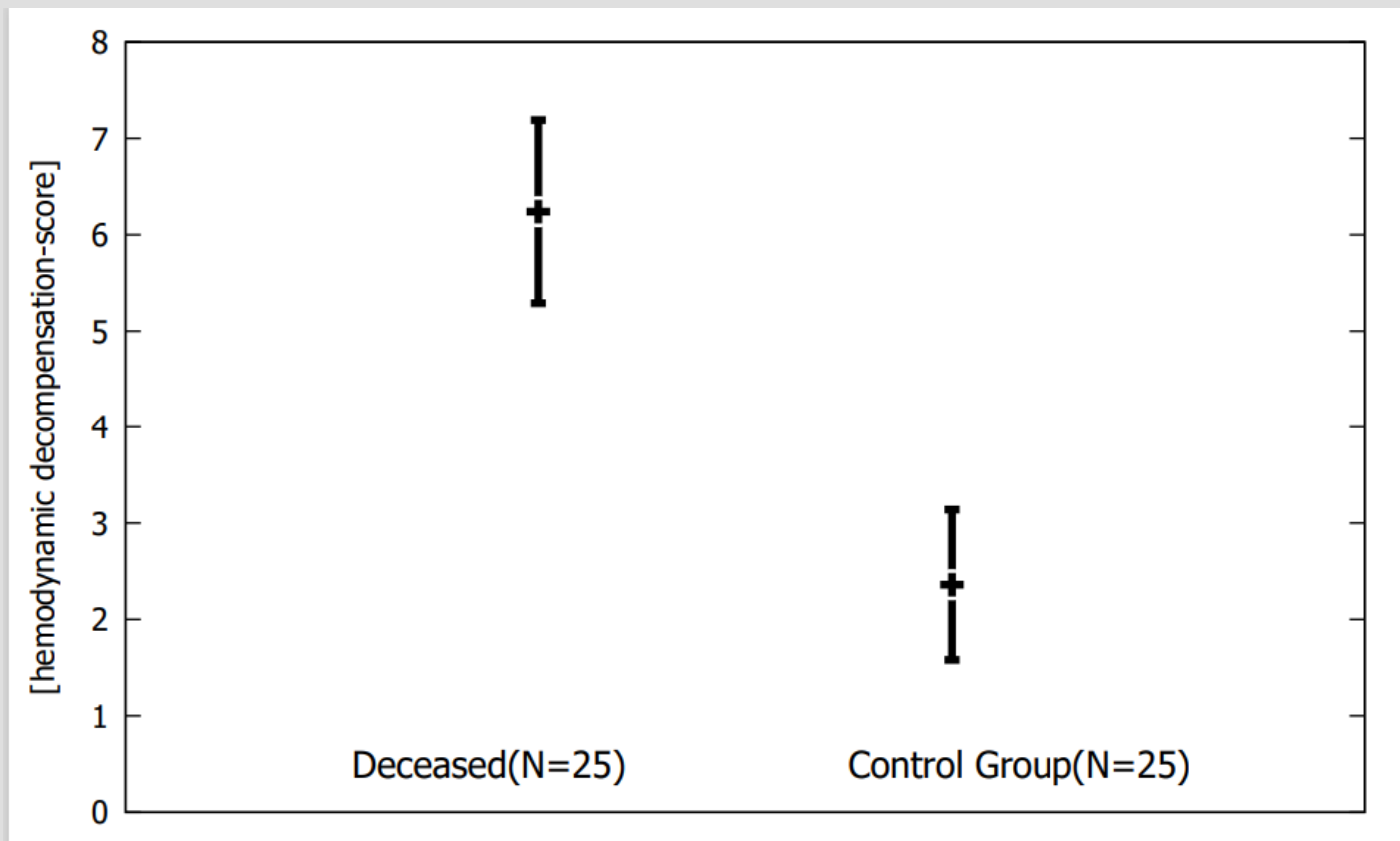
- Interim evaluation
- Raw data

- High maximum scoring results 24 hours before deceasing in contrast to the control group who survived
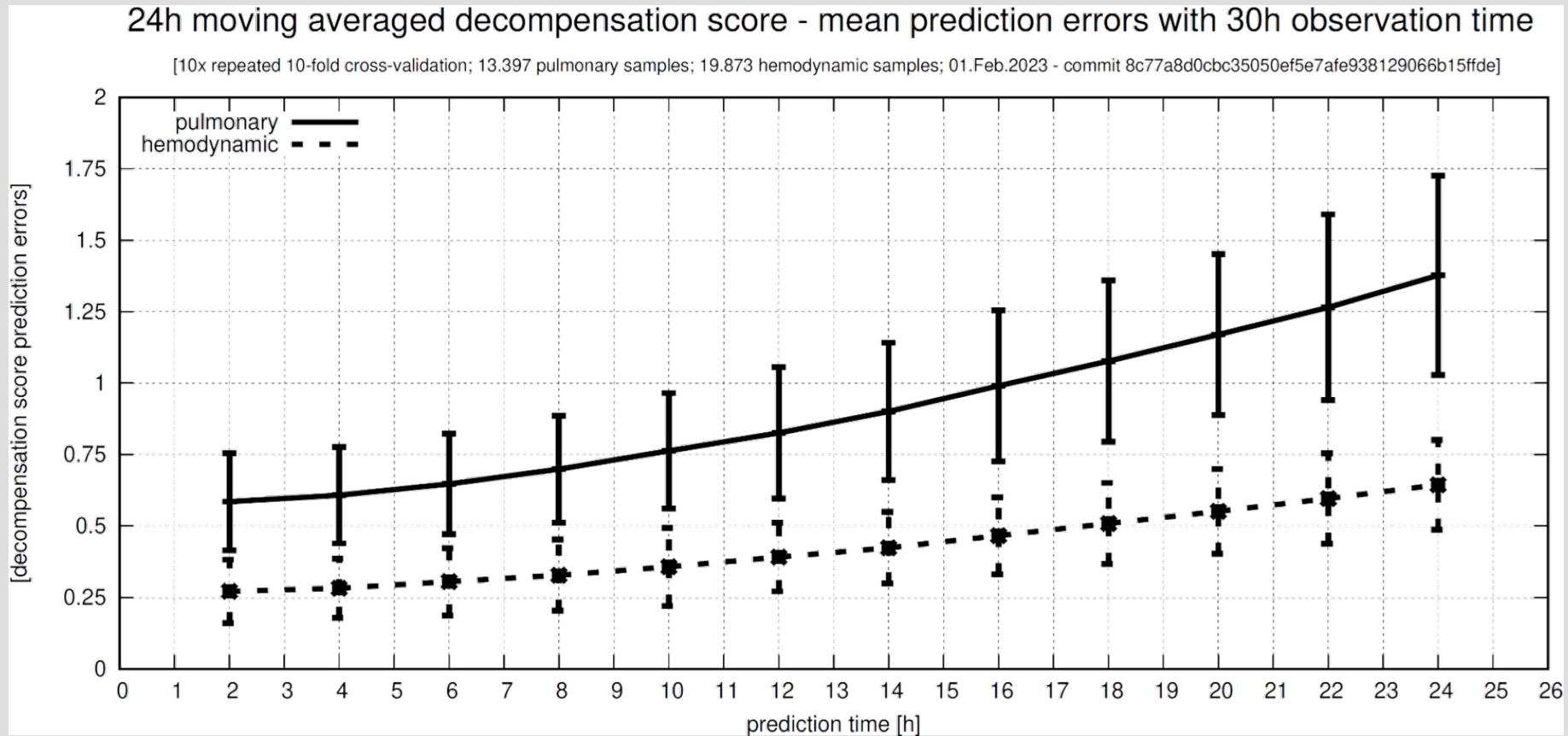
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Results: Mean prediction errors

What happens next?
Current and future work…

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1. Final statistical analysis regarding all clinical endpoints
2. Comparison of the scores with medical assessment
3. Individual case analysis
4. Consideration of score dynamics
5. Optimization of moving average filter interval