

Identifying Patients at Risk and Patients in Need

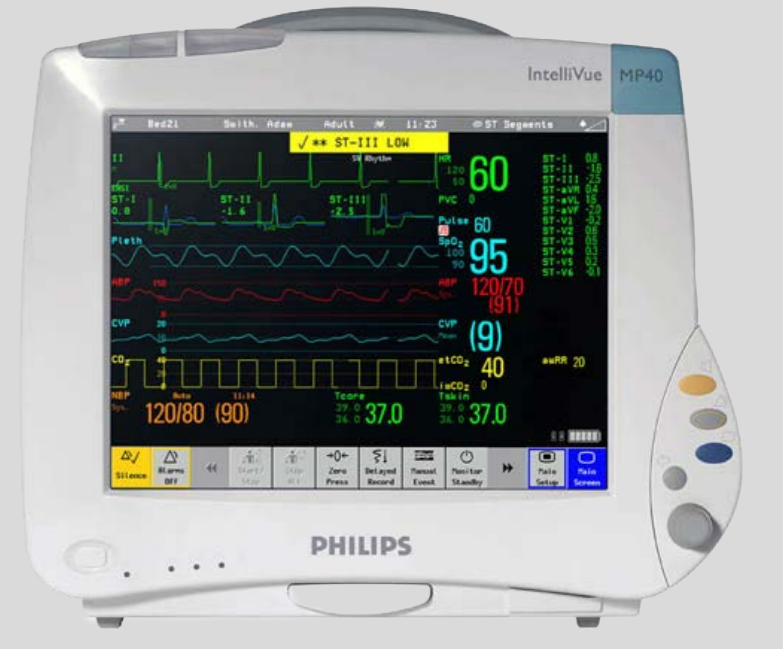
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A substantial number of patients deteriorate after being admitted to the Emergency Department – some unexpected, others not.

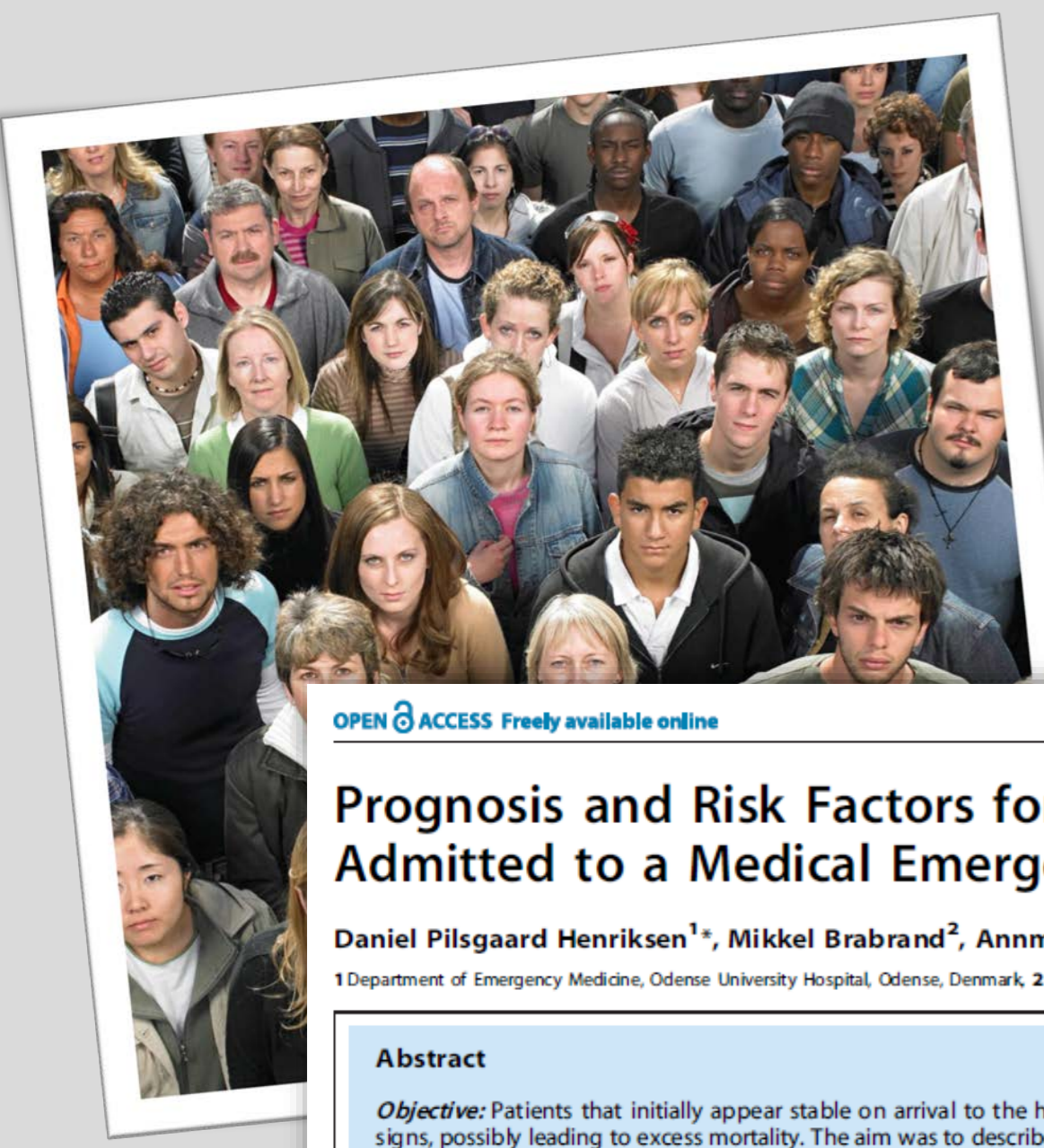
Spotting deterioration is challenged by a diverse patient population presenting with a multitude of symptoms and little background history.

Deterioration is associated with higher risks of heart/respiratory failure, ICU transfer, and mortality.

Clinicians already utilize a number of protocols, scoring systems, patient monitors, and clinical logistics systems to track patients. However, these systems struggle with the intermittent nature of current monitoring and handover practices.



Parameter	Normal	Warning	Alert	Critical
Heart rate	60-100 bpm	< 50 bpm / > 150 bpm	< 40 bpm / > 180 bpm	< 30 bpm / > 200 bpm
Respiration rate	12-20 rpm	< 10 rpm / > 25 rpm	< 8 rpm / > 30 rpm	< 6 rpm / > 35 rpm
Pulse rate	60-100 bpm	< 50 bpm / > 150 bpm	< 40 bpm / > 180 bpm	< 30 bpm / > 200 bpm
Oxygen saturation	95-100%	90-95%	85-90%	< 80%
Systolic blood pressure	120-160 mmHg	90-110 mmHg	60-90 mmHg	< 40 mmHg
Diastolic blood pressure	80-120 mmHg	60-80 mmHg	40-60 mmHg	< 30 mmHg

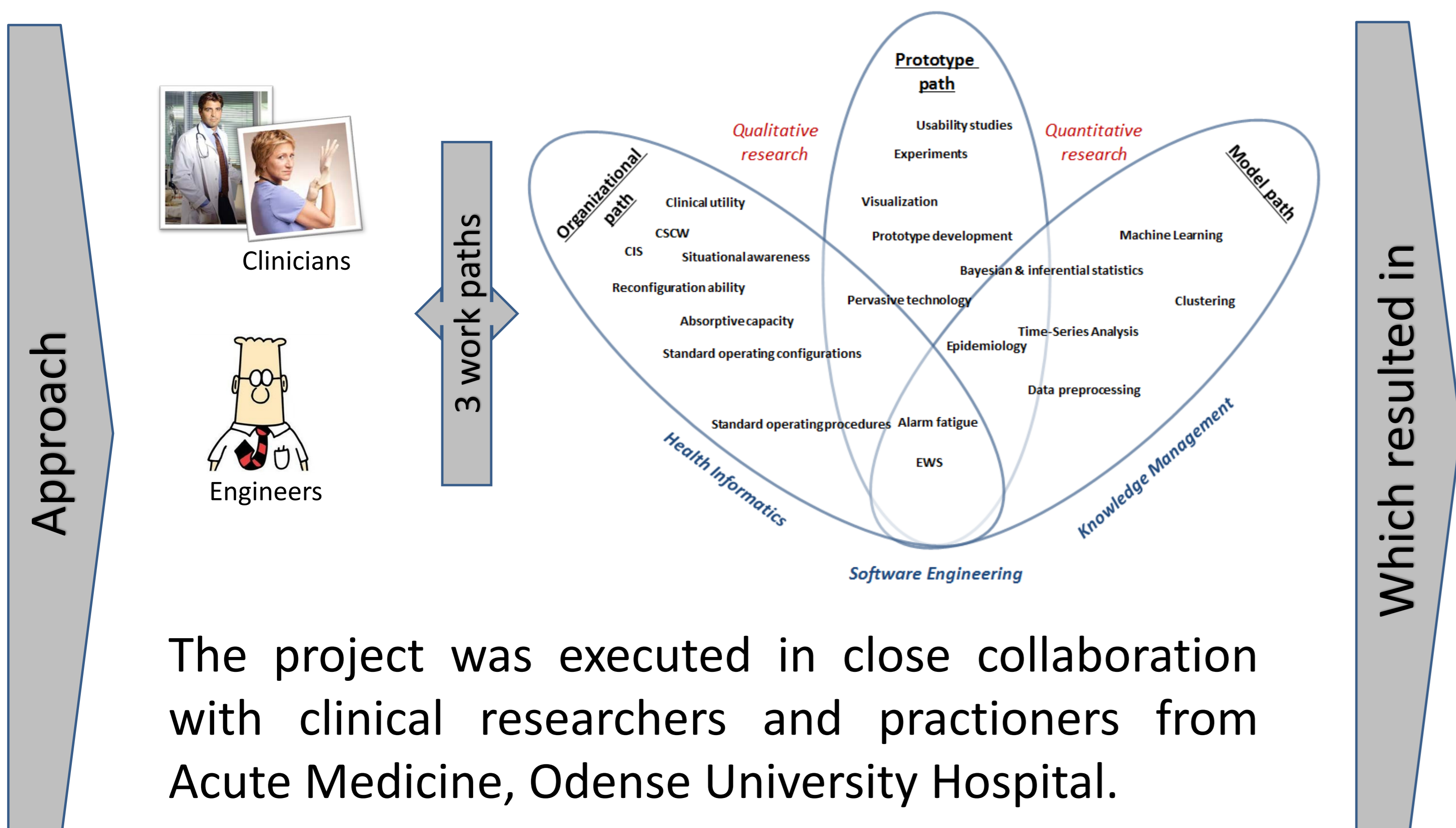


Prognosis and Risk Factors for Deterioration in Patients Admitted to a Medical Emergency Department
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Abstract
Objective: Patients that initially appear stable on arrival to the hospital often have less intensive monitoring of their vital signs, possibly leading to excess mortality. The aim was to describe risk factors for deterioration in vital signs and the related prognosis among patients with normal vital signs at arrival to a medical emergency department (MED).

The challenged posed to us

How can we help the clinicians better identify which patients are at risk of deterioration?

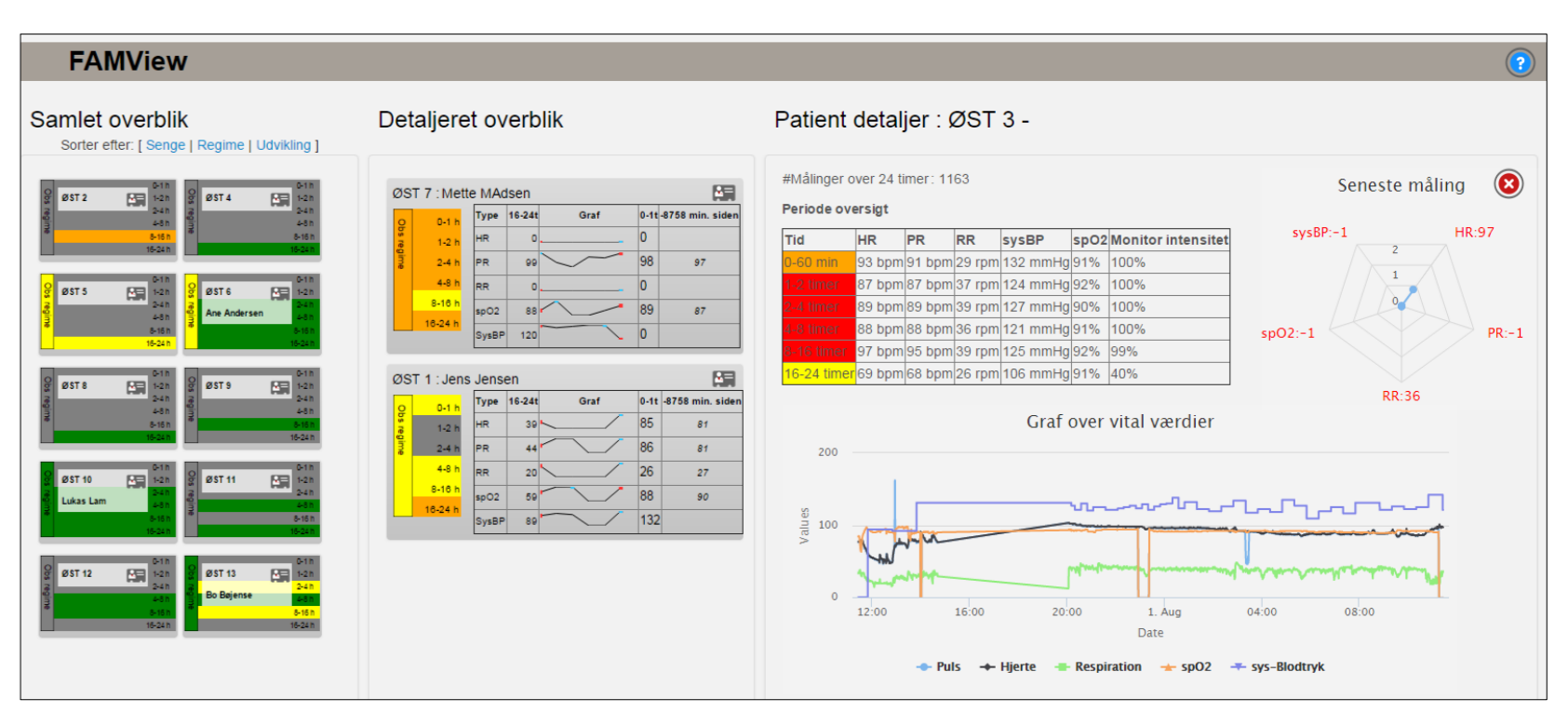


A data registration application which stored all automatically registered vital signs over a two year period. Reaching 8.3M entries; yielding unique insight into device utilization.

Vital sign	Measurements	Mean	Std Dev.
Heart rate	4,668,890	88 bpm	21 bpm
Respiration rate	4,491,545	20.4 rpm	5.7 rpm
Pulse rate	7,277,427	84.4 bpm	19.3 bpm
Oxygen saturation	7,181,287	95%	3.8%
Systolic blood pressure	232,895	124 mmHg	26.4 mmHg
Diastolic blood pressure	232,895	68.4 mmHg	17.0 mmHg

Table 6: Summary of registered vital signs.

A prototype for boosting the situational awareness of clinicians by coupling mental models with vital signs over their entire admission. The system was evaluated in a feasibility study with positive results.



We also wrote a number of articles:

Identifying patients at risk of deterioration in the Joint Emergency Department
Thomas Schmidt · Uffe Koek Wil

A 3-STAGED APPROACH TO IDENTIFYING PATIENTS AT RISK OF DETERIORATION IN EMERGENCY DEPARTMENTS
Thomas Schmidt, Uffe Koek Wil

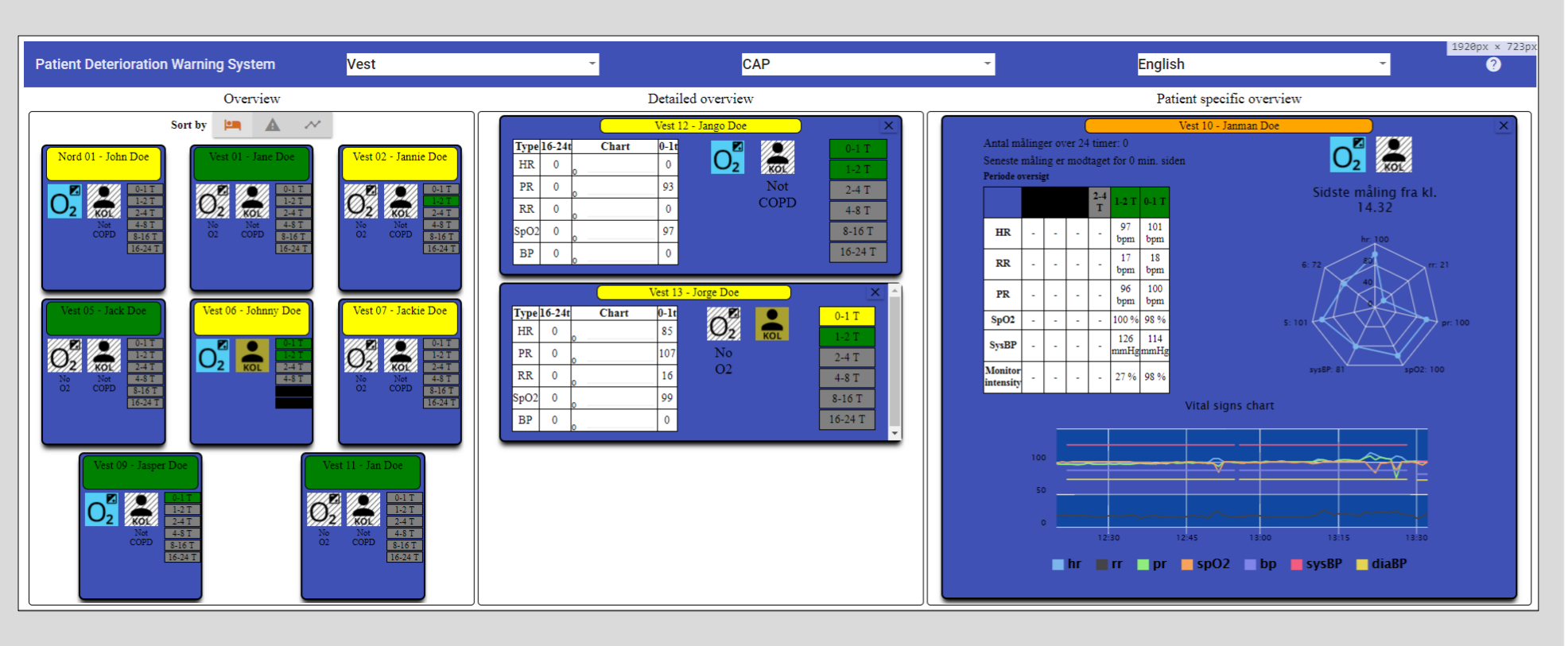
Clustering Emergency Department Patients – An Assessment of Group Normality
Thomas Schmidt, Member, IEEE, John Hallam, Anmarie Lassen, Uffe Koek Wil

Factors related to monitoring during admission of acute patients
Thomas Schmidt · Camilla Thomsen · Mikkel Brabrand · Uffe Koek Wil · Anmarie Lassen

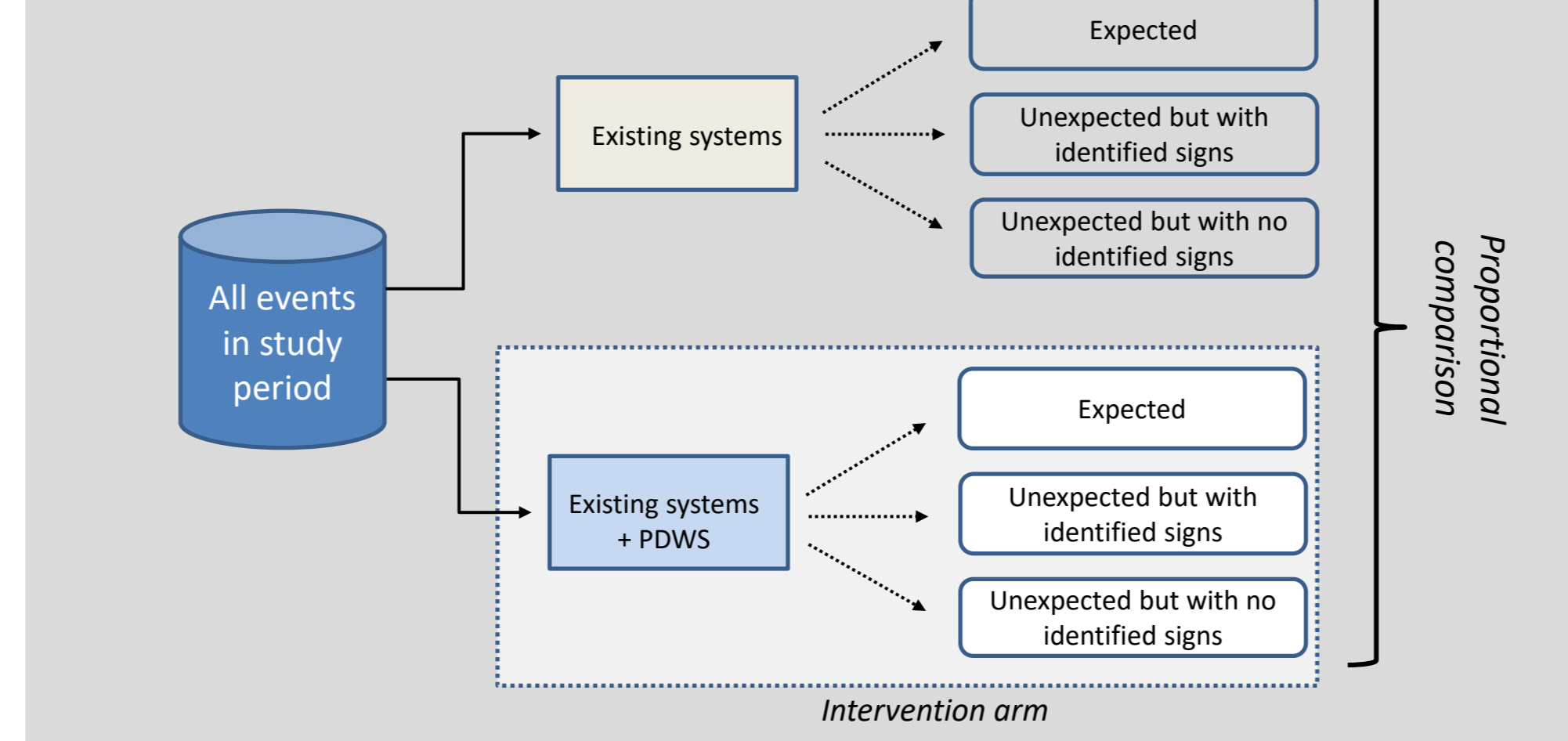
All this lead us to build

THE PATIENT DETERIORATION WARNING SYSTEM

A realistic effect evaluation of the Patient Deterioration Warning System will be conducted in 2018 over 9 months – coupling data from all admitted patients in the period.



10.500 patients will be included from the Emergency Departments of Esbjerg and Odense in a Cluster Randomized Trial.



The project will be evaluated from three perspectives:

- Clinical evaluation**
Do we see a reduction in ICU transfers, heart/respiratory failures and in-hospital mortality?
- Technical evaluation**
Is the system usable by the clinicians?
- Economical evaluation**
Does the system save society money by reducing length of stay?

This work is made possible by