NON-LINEAR ASYNCHRONOUS SIMULATION

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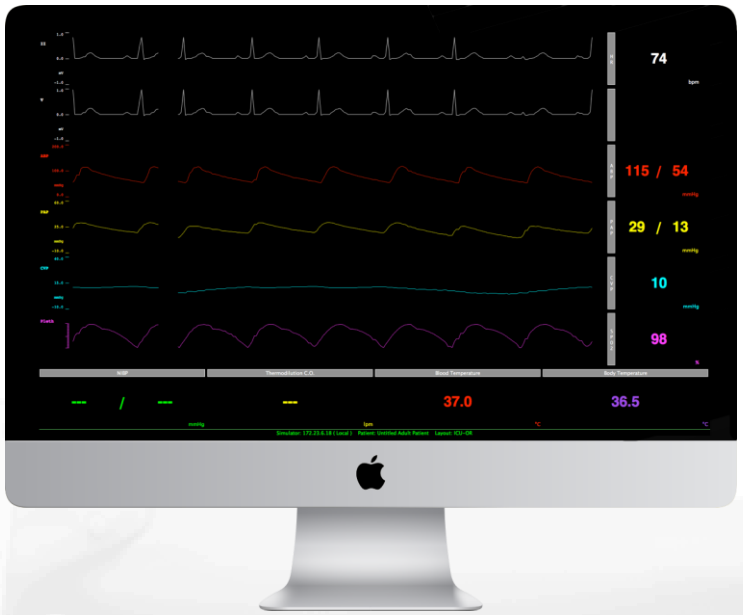
HFS – CONVENTIONAL USE



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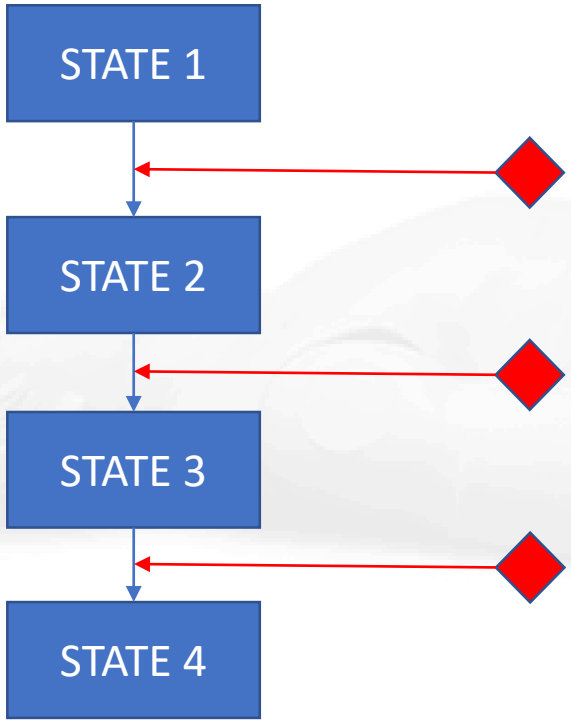
SCENARIO – CONVENTIONAL USE



BP	120/70 mm Hg
HR	75 bpm
RR	12 bpm
SpO2	98%
Temp	36.7C
Rhythm	NSR
Eyes	Blinking (both)
EtCO2	38 mm Hg

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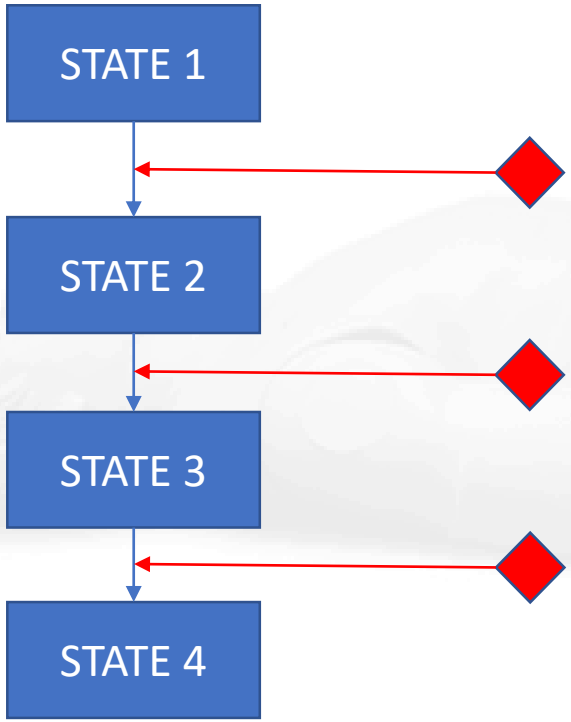
SCENARIO – CHF with pulmonary edema



MONA protocol

1. Morphine
2. O_2
3. Nitroglycerine
4. Aspirin
5. Furosemide (Lasix)

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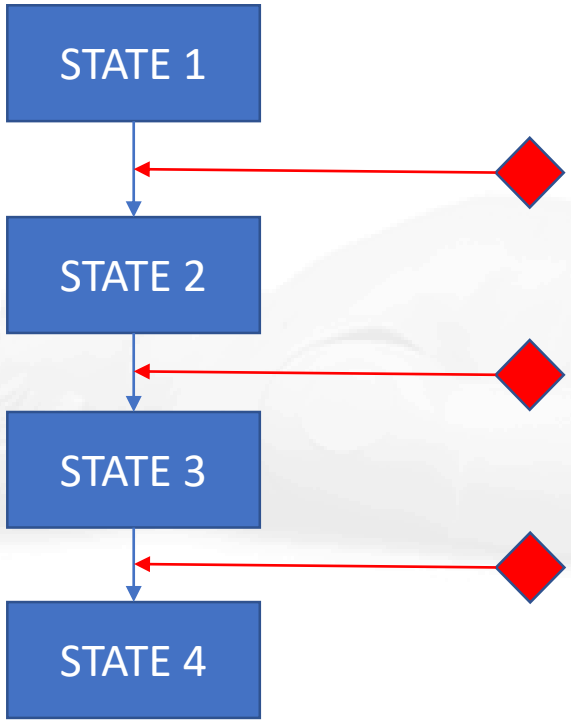

Challenges

1. Correct medications could be given in a different order
2. Correct medication, wrong dosage
3. Wrong medication
4. Unanticipated intervention (intubation, defibrillation etc)

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SCENARIO – CHF with pulmonary edema
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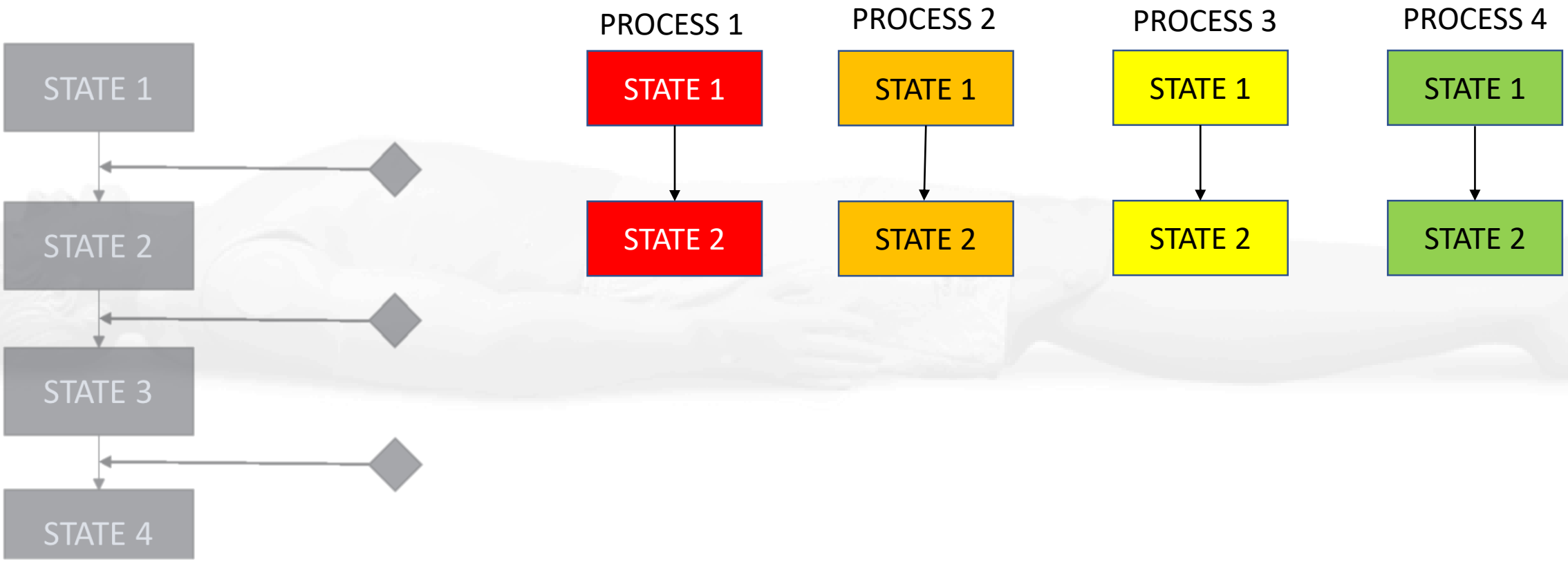

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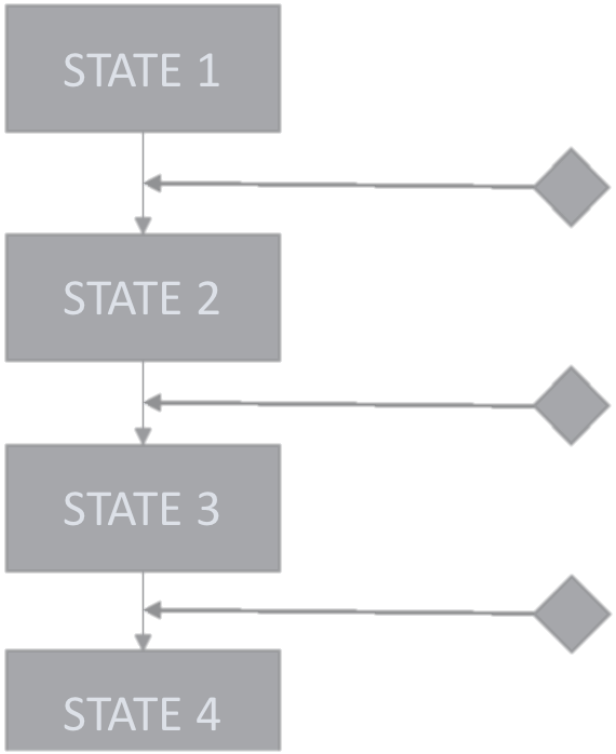
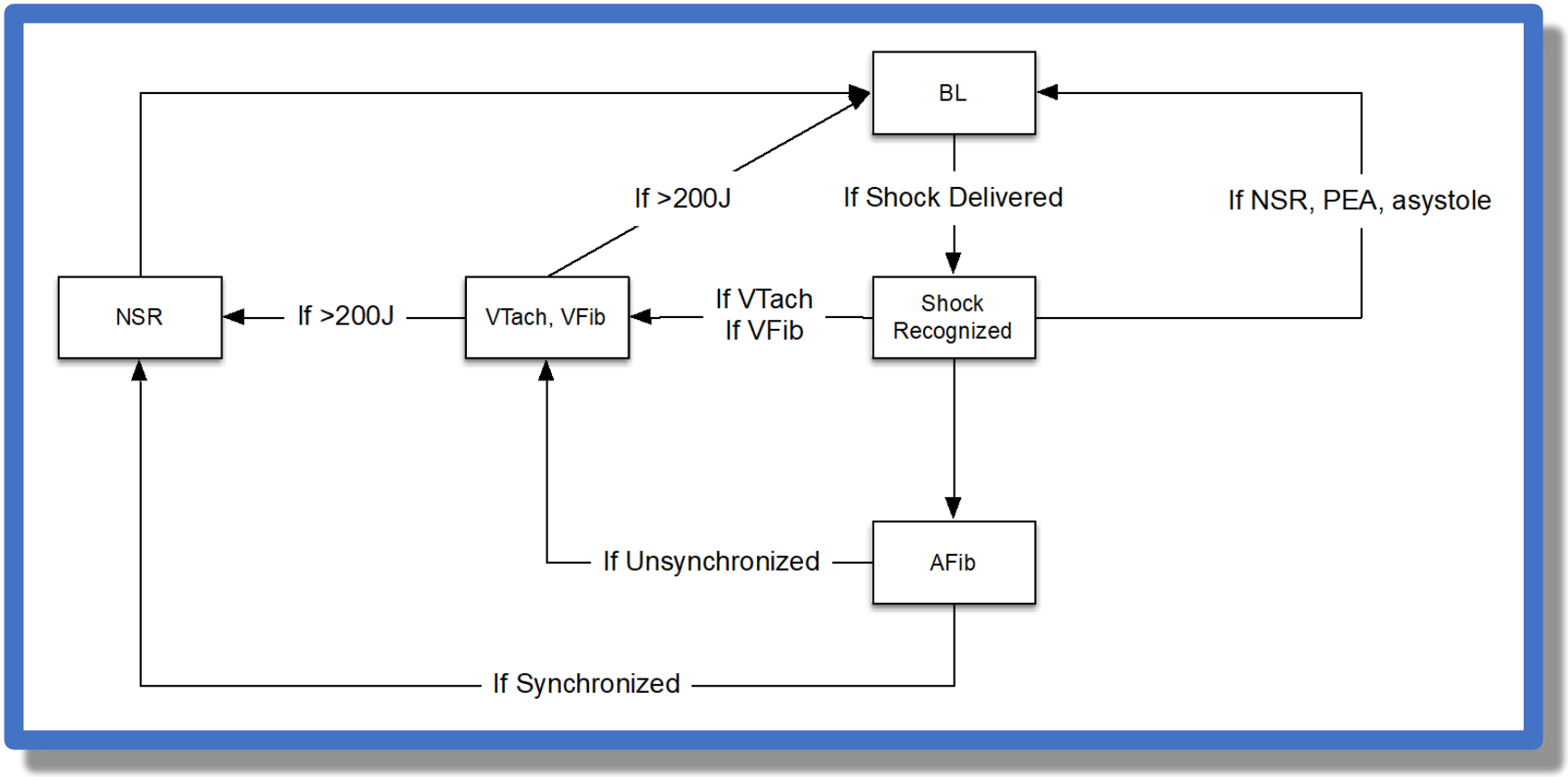
SCENARIO – CHF with pulmonary edema
NON-LINEAR ASYNCHRONOUS CYCLIC





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IMPLEMENTATION – CAE simulators

1. Using one ”scenario” per process
2. Assigning and using custom variables
3. Effective using transitions

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IMPLEMENTATION – CAE simulators

Parameters:

1.	Cardiac Rhythm	NSR
2.	LV contractility Factor	0.5
3.	RV contractility Factor	0.5
4.	Oxygen consumption	0.5
5.	Venous Capacity	2.0
6.	Custom Variable 1 (user defined)	1

Transitions:

1. If [Parameter x] equals […], then go to Sate […]

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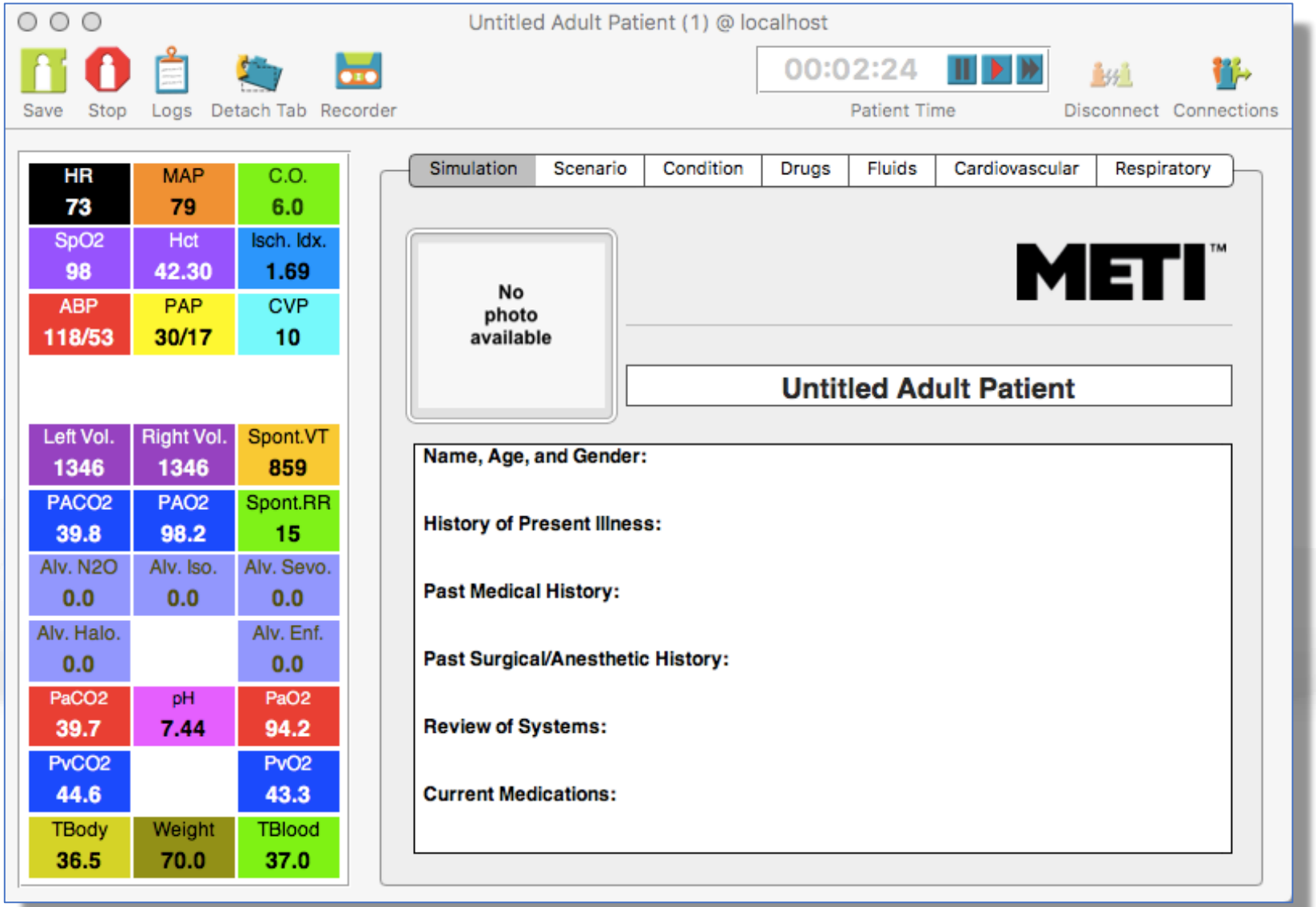
IMPLEMENTATION – CAE simulators



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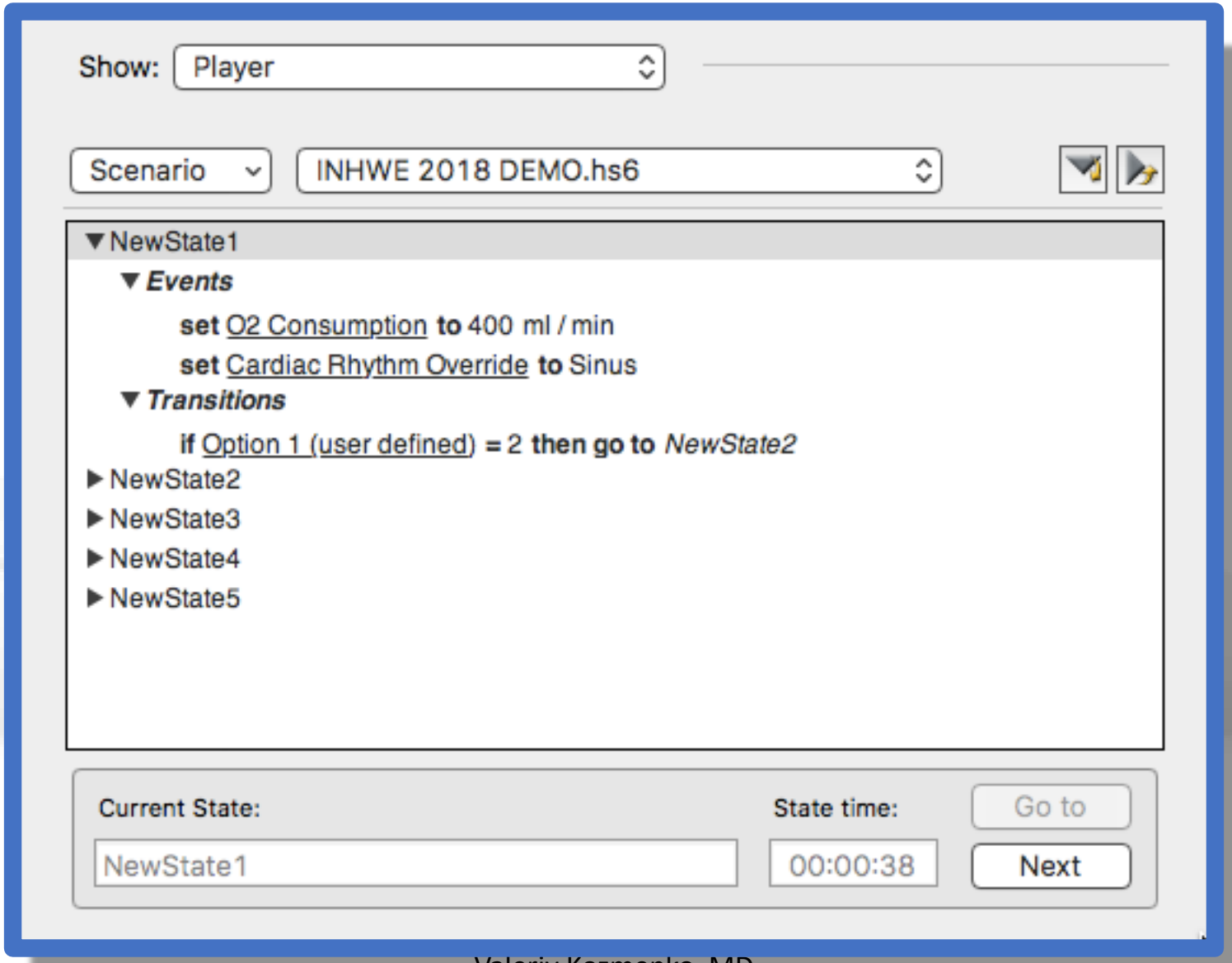

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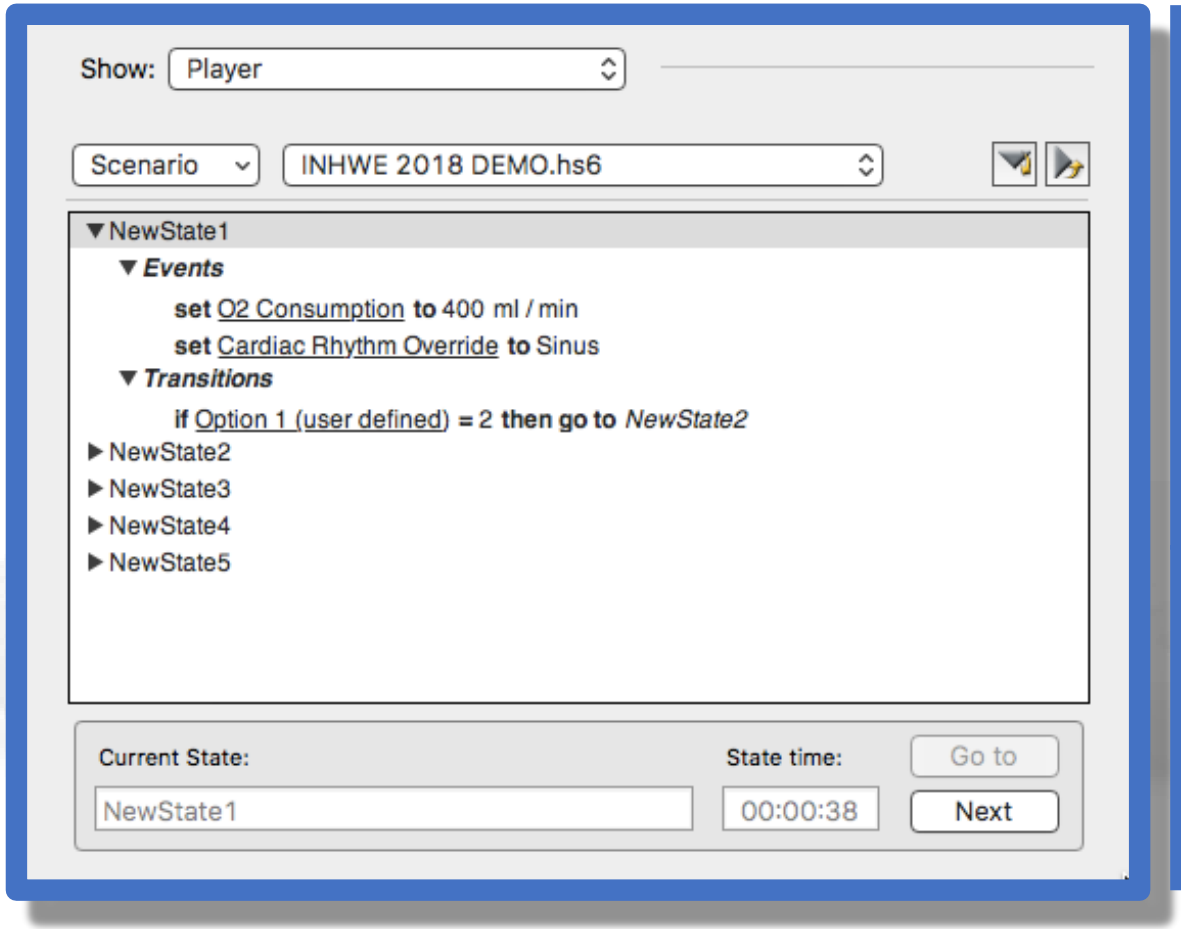

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IMPLEMENTATION – CAE simulators

Louisiana State University was awarded an international patent for this innovation in 2013

https://patents.justia.com/inventor/valeriy-v-kozmenko

Valeriy Kozmenko and Charles Hilton were the inventors

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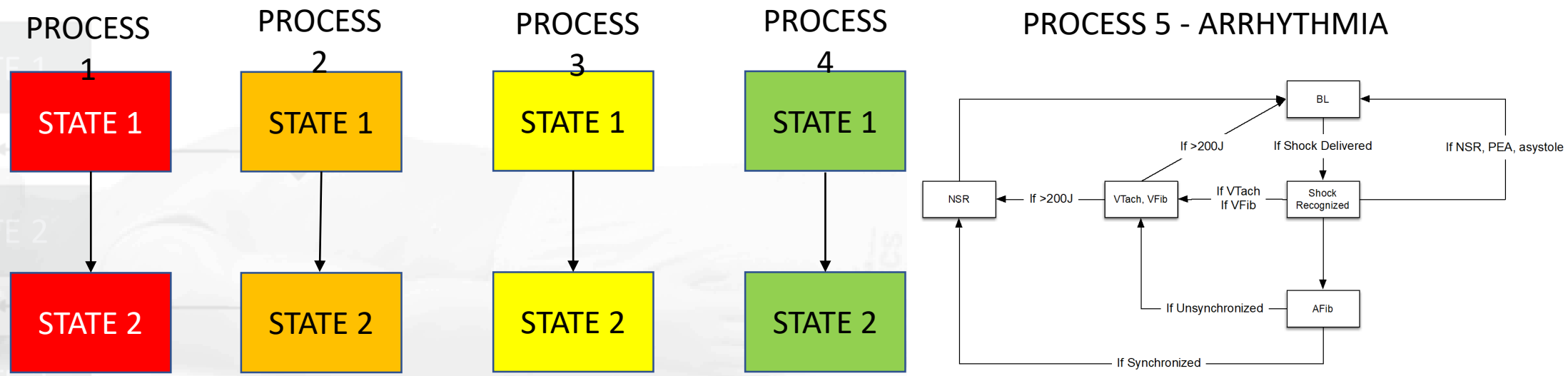

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IMPLEMENTATION – Laerdal

The HUB technique was developed at USD Sanford School of Medicine and received an award for technological innovation by the Society for Simulation in Healthcare at the annual meeting in New Orleans in 2015.

Valeriy Kozmenko and Brian Wallenburg were the inventors

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NON-LINEAR ASYNCHRONOUS PROGRAMMING ENHANCES REALISM OF HEALTHCARE SIMULATION

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