



# Simulation in Perfusion, an overview

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### No conflict of interest



### Level of fidelity in perfusion simulation





https://mmcts.org/media/8597e6 2f-fa4a-4749-bdc4-418ff03e6009

\* "An Overview of Clinical Applications of 3-D Printing and BioprintingJeff Mason, Sarah Visintini, and Teo Quay.Published online: April 1, 2019"https://www.ncbi.nlm.nih.gov/books/NBK542711/#:~:text=An%20Overview,1%2C%202019



### Level of fidelity in perfusion simulation







https://mmcts.org/tutorial/1649



### Level of fidelity in perfusion simulation

Pressure bag to adjust afterload

Adjustable hight of reservoir to change drainage



ECLS Technical training

Centrifugal pump dynamics non occlusive, backflow preload/ afterload air handling

Change out pump/ oxy/ circuit

Connection for venous air entry



### What do you need?

### TIME!

### **Dedicated location**

Organisation

**Motivation** 

### Simulator?

Technical skills (individual) training device: CPB/ ECLS console, canula, surgical materials,..

possible with sim device from basic perfusion materials

#### Management skills (individual – group)

high fidelity Team CRM skills (group) possible with basic perfusion materials probably need for hemodynamic simulator high fidelity

Validation/testing new devices or techniques (eg. MiECC) Demonstration, as support for theoretical formation







### High fidelity CPB simulation

Using Califia perfusion simulator

As part of continuous training of UZL perfusionists (annualy)

As support of theoretical teaching in perfusion school: perfusion students

As part of clinical training perfusion school: perfusion trainees

CRM training, new protocols: multidisciplinairy cardiac surgery team

CPB workshop conference: HP's in cardiac surgery





# High fidelity CPB simulation

Realistic behaviour of hemodynamic pressures (CVP, ABP, PAP,..) based on volume in reservoir (pt) and pre-set patient variables

Automatic change in ECG rhytm based on CPL administration

Continuous bloodgasmonitoring on CPB

NIRS, HMS , ACT, blood gas values from  $\neq$  sample locations,...

Possibility to upload RX, echo images

Manual manipulation of venous drainage, arterial pressures, oxygenator failure, ECG,...

Transportable, easy to set up (reservoir, OR touchscreen, laptop)













### Low/ high fidelity ECLS simulation

Using IV pole, Chalice and Califia perfusion simulators

As part of training of UZL nurses (start + annualy)

As part of ECLS specialist course: multidisciplinairy ECLS team UZL + external

As support of theoretical teaching in perfusion school: perfusion students

As part of clinical training perfusion school: perfusion trainees

CPB workshop conference: HP's in cardiac surgery, intensive care











# High fidelity ECLS simulation

Manual or automatic control of hemodynamic parameters

Manual control of drainage and return pressures

Simulation of bleeding, air entry

Possibility to upload RX, echo images

Portable tablet for control and monitor

Easy to set up









#### ECLS Simulation UZ Leuven at Euro-Elso Prague, Barcelona, Maastricht

in sessions on cannulation strategies Leen Vercaemst, Tim Jones, Jonathan Goffoy















### Adaptations with high fidelity simulators

Califia + modified Rescue Anne

Multiple cannulation site

All interconnected with Califia

Possible to run ECLS in various cannulation modes and unloading with LV vent











High fidelity simulator not a must!

Find time, a dedicated room and start with a plan

Start with lower fidelity sim if necessary, level-up when possible

Maximize exposure of HP to (high fidelity) simulation

Adapt learningoals to simulator, adapt simulator to learning goals





# Thank you

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