MSc PROGRAM
MEDICAL
INFORMATICS

CICLO DE
PALESTRAS
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Biomedical simulation: applications to training, evaluation and research

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BIOMEDICAL SIMULATION

Definition

"Instructional process that substitutes real patient encounters with artificial models, live actors, or virtual reality patients with the goal of replicating patient care scenarios in a realistic environment for the purposes of feedback and assessment."

Gaba DM. The future vision of simulation in health care. Qual Saf Health Care. 2004;13:2–10.

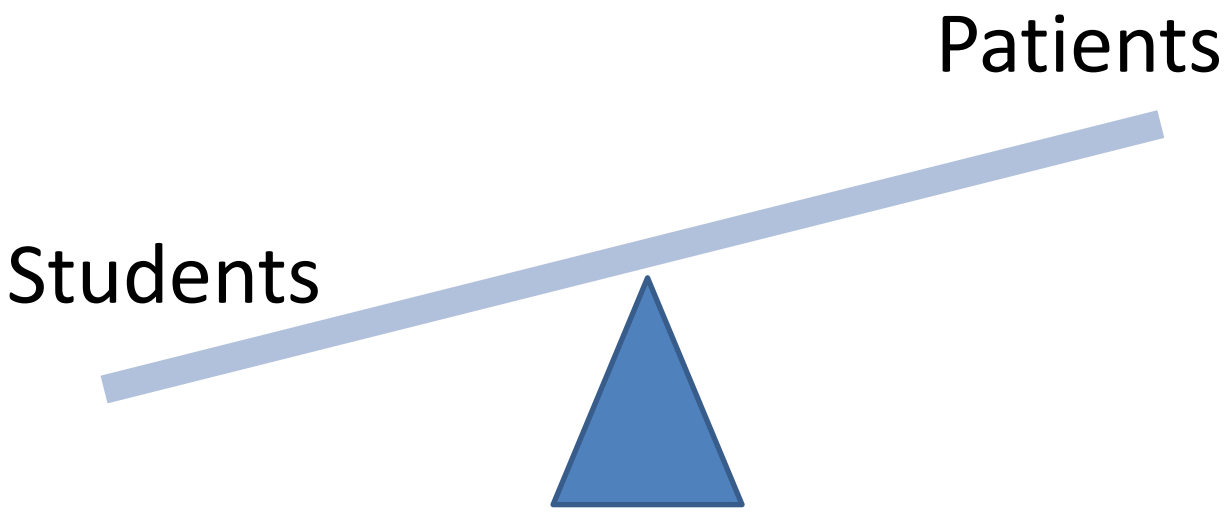
Why simulate?

Why simulate?

Why simulate?

Why simulate?

Healthcare teaching dichotomy



Healthcare teaching dichotomy

Students

- Increasing number of students
- Constant need for update
- Increase concern with patient safety issues

Patients

- Less receptive to students
  - 50% allowed their presence
  - ~35% allowed examination or clinical interview

Okuda Y et al. The utility of simulation in medical education: what is the evidence? Mt Sinai J Med. 2009 Aug;76(4):330-43.

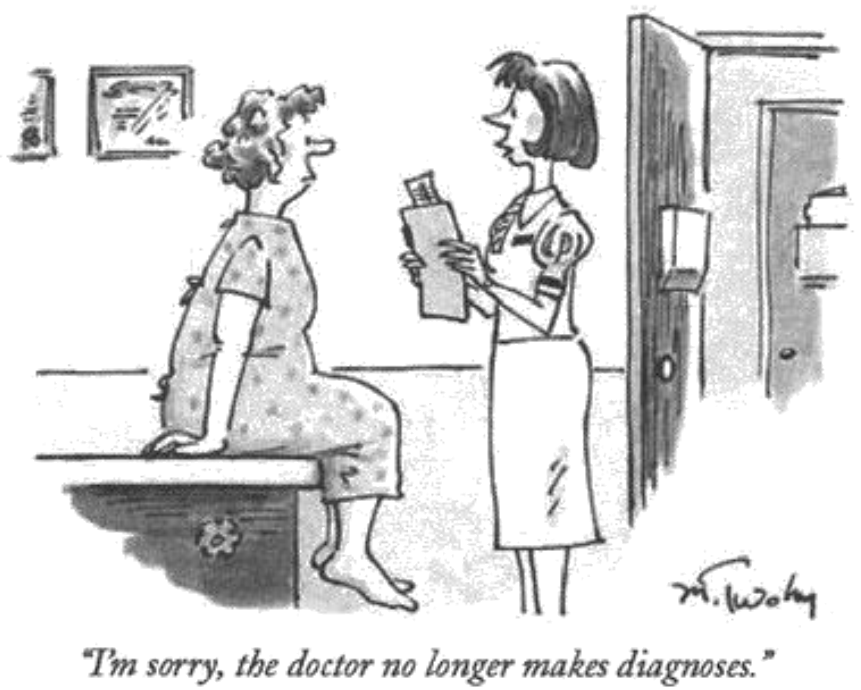
Healthcare teaching dichotomy

Dissociation between classroom learning and the clinical environment:

- Technical skills
- Soft skills

Inadequate training in:

- Anamneses
- Physical examination
- Diagnosis and decision making
- Critical/Emergency situations



"I'm sorry, the doctor no longer makes diagnoses."

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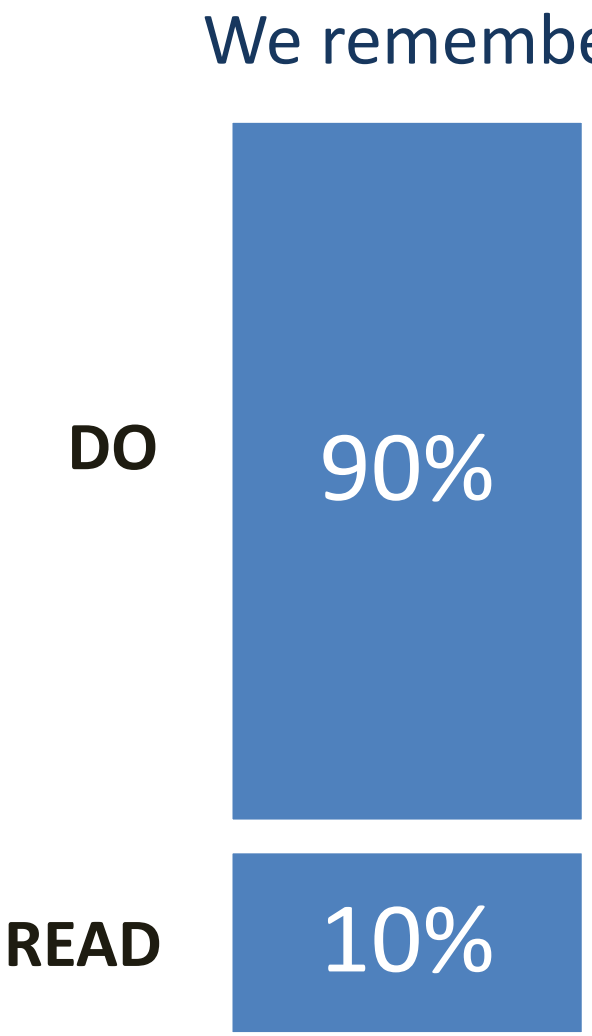
Critical/Emergency situations

- High risk to patient
- Complex interventions
- Multidisciplinary teams
- Time as a key-factor
- Debilitated patients
- Rare situations

Why simulate?



Why simulate?

- Patient safety is a premise
- Patient higher expectations
- Technology push
- ‘See one, do one, teach one’ is no longer acceptable

What are the **benefits**?

What are the **benefits**?

- Realistic, interactive, safe and controlled environments

What are the **benefits**?

- Individual or team-training

What are the **benefits**?

- Focused on the trainee, adapted to the training needs

What are the **benefits**?

- Acquisition of competencies through practice

What are the **benefits**?

- Acquisition/training of soft skills

What are the **benefits**?

- **WITHOUT risk to real patients**

What are the **benefits**?

Instructor

- Focus on teaching
- Controlled environment
- Immediate feedback
- Objective and structured evaluations

Trainee

- Experiential learning
- Repetition
- Permission to make mistakes
- Soft skills training

Patient

- Confidence in the healthcare professional
- Better quality of the healthcare systems
- Patient safety culture
- Medical error prevention

What are the **benefits**?

Outcomes – Educational impact

Obstetric emergencies course – healthcare professionals

Pre-Post test study with a sample of 114 obstetricians and midwives.

Results:

- Both Obstetricians and Midwives reported an increase in knowledge and technical skills
- Midwifes self-perceived knowledge and technical skills before the course were lower than those of Obstetricians, but no significant differences were observed after the course.

Sá Couto C et al. Multiprofessional training of obstetrical emergencies: impact of a high-fidelity simulation course on technical and non-technical skills. In: Book of Abstracts, 17th annual meeting of SESAM, Granada, Spain, 2011.

What are the **benefits**?

Outcomes – Clinical impact

Shoulder dystocia training – healthcare professionals

Retrospective, observational study comparing the management and neonatal outcome of births complicated by shoulder dystocia before and after the introduction of shoulder dystocia training.

Results:

- Significant clinical management improve: e.g. use of MacRoberts manouver increased from 29.3% to 87.4%.
- There was a significant reduction in neonatal injury at birth after shoulder dystocia: from 9.3% to 2.3%.

Draycott T et al. Improving neonatal outcome through practical shoulder dystocia training. Obstet Gynecol 2008;112:14-20.

How do we **simulate**?

How do we simulate?

How do we **simulate**?

Patient-actors (standardized patients)

How do we simulate?

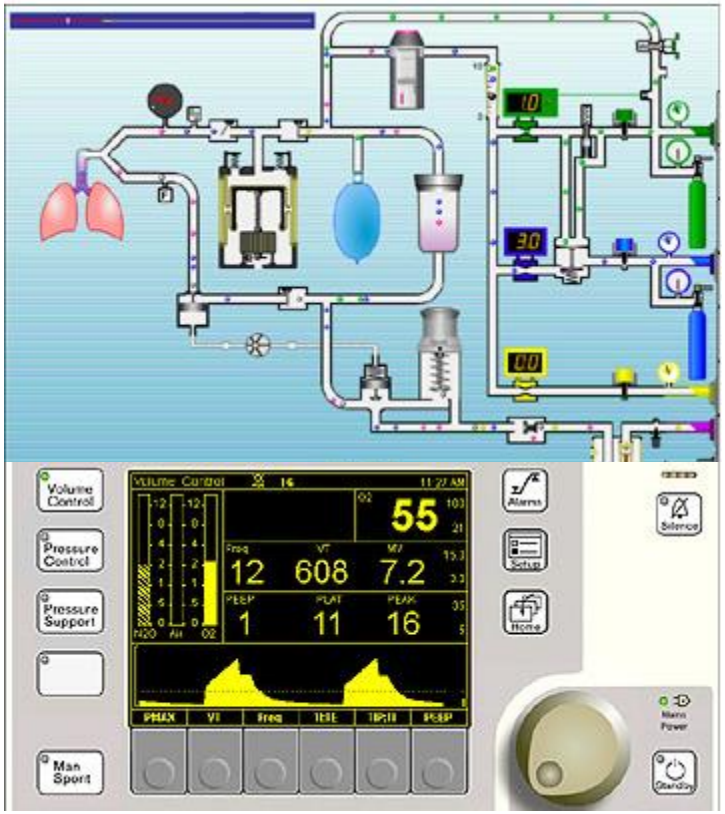
Part-task trainers

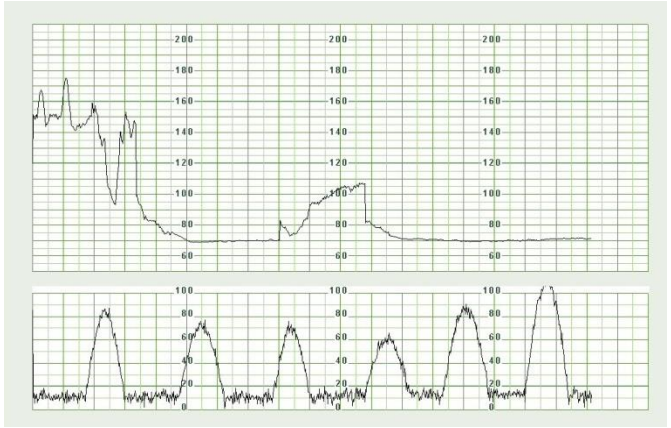
How do we simulate?

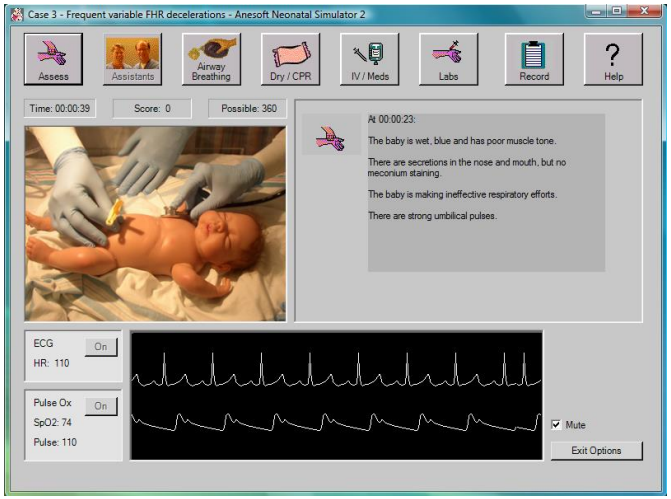
Complex-task trainers

How do we **simulate**?

Simulation software

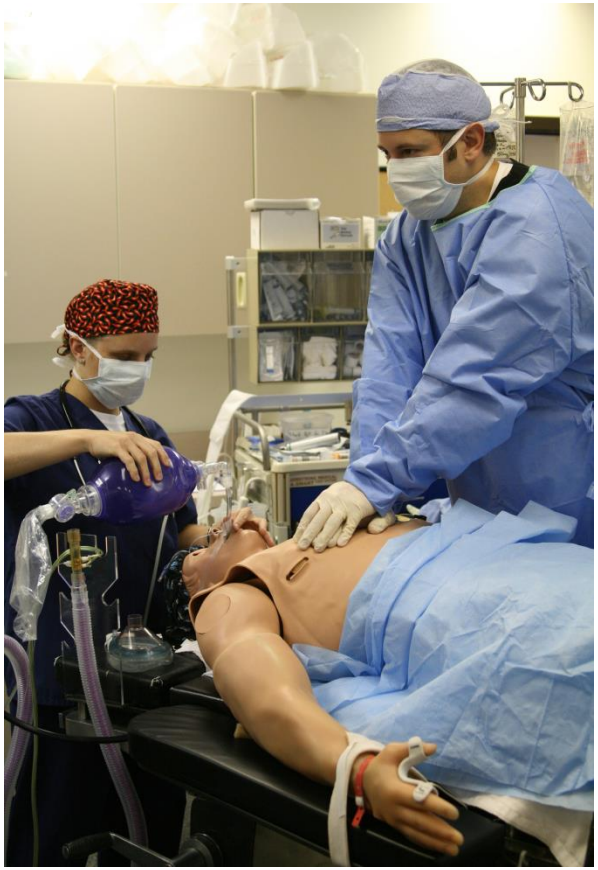






How do we simulate?

Patient simulators



How do we simulate?

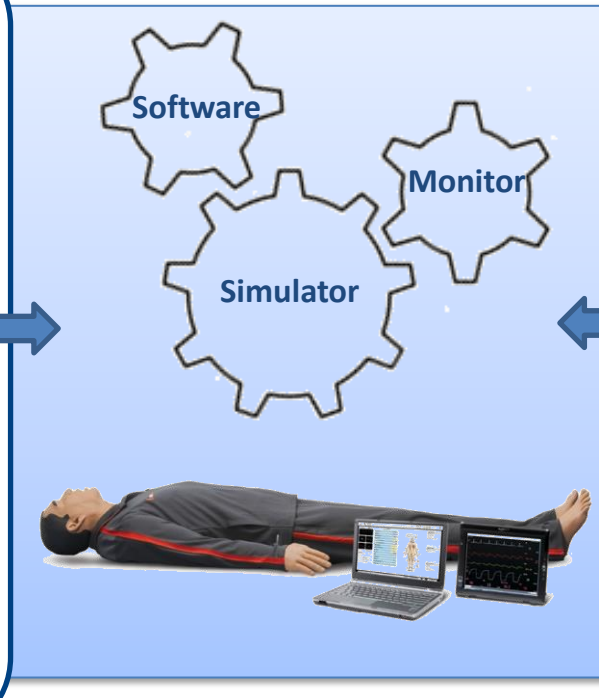
Patient simulators

How do we **simulate**?

(patient simulators)

Instructor

- Initialization
- Control
- Simulator status
- Feedback
- …

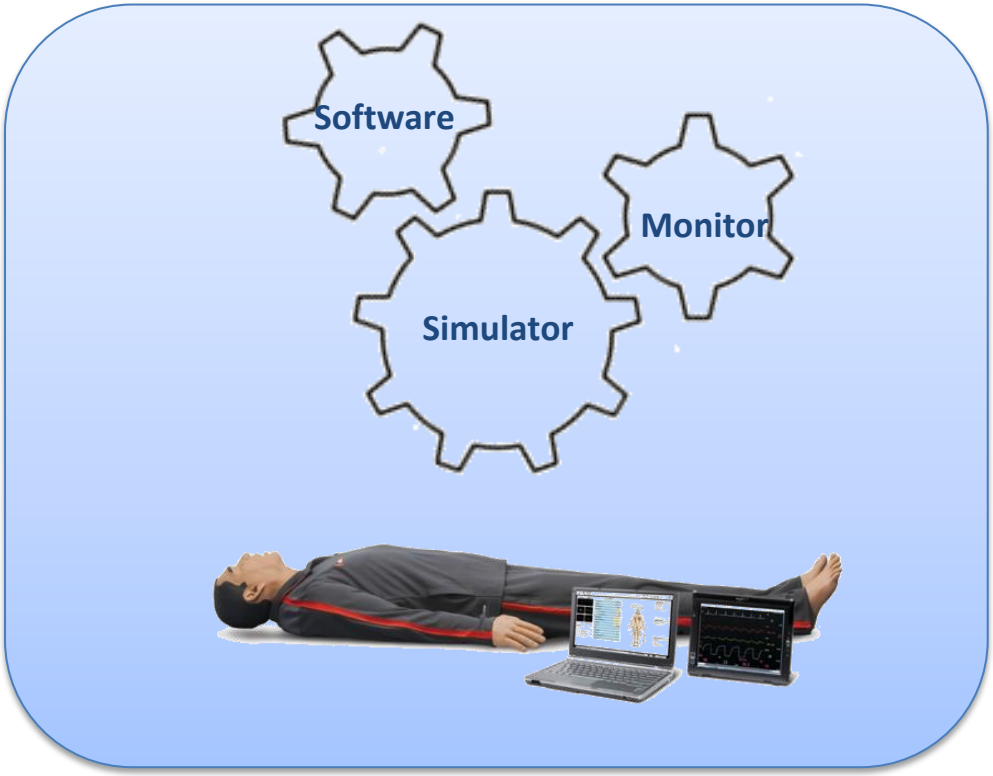


Trainee

- Clinical signals
- Physical signs
- Therapeutic interventions
- …

How do we **simulate**?

(patient simulators)



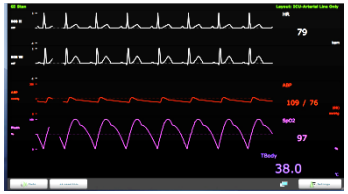
How do we **simulate**?

(patient simulators)

Simulator

Instructor

Software



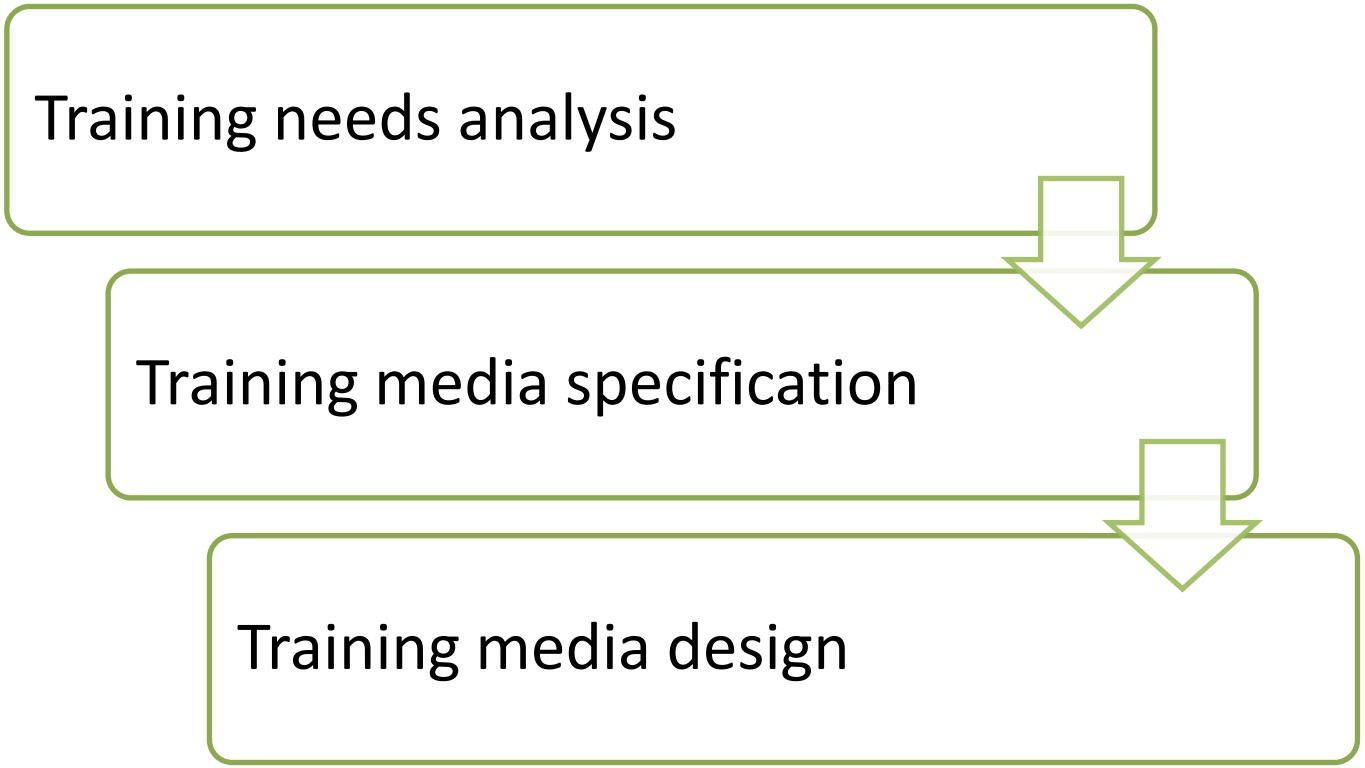
Trainee

Monitor

MEDICAL INFORMATICS AND SIMULATION?

What if I need a new simulator?

What if I need a **new simulator**?



Example: DeFib – Manual defibrillator simulator

DeFib – Manual defibrillator simulator

Training needs ANALYSIS

- Cardiac resuscitation training includes delivery of electrical defibrillation and/or cardioversion therapy for malignant cardiac arrhythmias.

- Use of defibrillation equipment with the capacity to deliver electrical energy during simulation promotes trainee device familiarization, enhances fidelity, and encourages realistic interaction with the manikin.

DeFib – Manual defibrillator simulator

Training needs ANALYSIS

However, there are some disadvantages:

- Cannot be used in standardized patients or low-fidelity manikins
- Expensive
- It is not risk free[1]

[1]Turban JW, Peters DP, Berg BW. Live defibrillation in simulation-based medical education--a survey of simulation center practices and attitudes. Simul Healthc. 2010 Feb;5(1):24-7.

DeFib – Manual defibrillator simulator

Training needs ANALYSIS

- Device familiarization
- Correct use (rhythm identification)
- Safe use (one paddle at a time, stand clear, etc)

Additional needs:

- Realistic equipment
- Use in low fidelity simulators or standardized patients
- Use in-hospital or pre-hospital environment

DeFib – Manual defibrillator simulator

Training media SPECIFICATION

Specifications established by:

- Observation of a real defibrillator in use
- Opinions of trained users

DeFib – Manual defibrillator simulator

Training media SPECIFICATION

- Mimic a manual defibrillator and cardioverter
- Emulated monitoring of selected vital signs (ECG e SaO2)
- Simulation of 6 cardiac rhthyms:
  - sinus,
  - atrial flutter ,
  - atrial fibrillation,
  - ventricular tachycardia,
  - ventricular fibrillation, and
  - asystole

DeFib – Manual defibrillator simulator

Training media SPECIFICATION

- Realistic physical interface with touchscreen selection of the synchronization (cardioversion), charge levels, monitored signals, etc
- Inclusion of audible signals associated with charging, charged and discharge
- Paddles with control buttons for charging and discharge
- Remote manipulation of the monitored signals

DeFib – Manual defibrillator simulator

Training media DESIGN

Hardware

DeFib – Manual defibrillator simulator

Training media DESIGN

Hardware: Tablet +

DeFib – Manual defibrillator simulator

Training media DESIGN

Hardware: Tablet + Electronic board

DeFib – Manual defibrillator simulator

Training media DESIGN

Hardware: Tablet + Electronic board + Paddles

DeFib – Manual defibrillator simulator

Training media DESIGN

Hardware: Tablet + Electronic board + Paddles + NumPad

DeFib – Manual defibrillator simulator

Training media DESIGN

Hardware: Tablet + Electronic board + Paddles + NumPad

Software: VisualBasic (Microsoft)

- Sets the scenario through instructor-interface
- Controls the user-interface
- Receives information from paddles
- Receives information from NumPad

KEY POINTS

KEY POINTS

- Current challenges in teaching, learning and assessment of health professionals require innovative and sustainable pedagogical approaches
- Several studies point to an improvement in the technical skills and non-technical skills after attending training activities based on simulation, with both educational and clinical impact
- Biomedical simulation is becoming a key component of education and training of health professionals and should be applied transversally and multidisciplinary
- Medical informatics may play an important role on developing and evaluation of simulation equipment

SPSim'15

III Congresso da Sociedade Portuguesa de Simulação Aplicada às Ciências da Saúde

PROMOVENDO A EXCELÊNCIA NO ENSINO E TREINO BIOMÉDICO

19-21 FEV, 2015 ▪ FMUP | PORTO | PORTUGAL

DESTINATÁRIOS

Profissionais de saúde, docentes, investigadores e estudantes com interesse na simulação biomédica

DATAS

Cursos pré-congresso: ***19 de fevereiro***
Congresso: ***20 e 21 de fevereiro***

LOCAL

Centro de Investigação Médica
Faculdade de Medicina da Universidade do Porto
Rua Doutor Plácido da Costa, 4200-450 Porto, Portugal

PRAZOS

Submissão de resumos: ***15 de dezembro de 2014***
Notificação de aceitação: ***31 de dezembro de 2014***
Inscrição com desconto: ***15 de janeiro de 2015***

INSCRIÇÕES E INFORMAÇÕES

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