全功能綜合模擬人


Laerdal
SimMan™
Universal Patient Simulator
Highly realistic training patient monitor
Link box
PC is optional
Remote controls

Laerdal SimMan™
Universal Patient Simulator

Laerdal
helping save lives

*1940, **Laerdal is dedicated to helping save lives with training and therapeutic products in resuscitation and emergency care.***

Laerdal SimMan™
Universal Patient Simulator

Laerdal
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爲何要發展綜合模擬病人??

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To Err Is Human

Building a Safer Health System

Linda T. Kohn, Janet M. Corrigan, and
Molla S. Donaldson, *Editors*

Committee on Quality of Health Care in America

INSTITUTE OF MEDICINE

NATIONAL ACADEMY PRESS
Washington, D.C.

臨床報告指出有100,000人的死亡是由於醫療事故

Executive Summary

The knowledgeable health reporter for the Boston Globe, Betsy Lehman, died from an overdose during chemotherapy. Willie King had the wrong leg amputated. Ben Kolb was eight years old when he died during "minor" surgery due to a drug mix-up.[1]

These horrific cases that make the headlines are just the tip of the iceberg. Two large studies, one conducted in Colorado and Utah and the other in New York, found that adverse events occurred in 2.9 and 3.7 percent of hospitalizations, respectively.[2] In Colorado and Utah hospitals, 8.8 percent of adverse events led to death, as compared with 13.6 percent in New York hospitals. In both of these studies, over half of these adverse events resulted from medical errors and could have been prevented.

When extrapolated to the over 33.6 million admissions to U.S. hospitals in 1997, the results of the study in Colorado and Utah imply that at least 44,000 Americans die each year as a result of medical errors.[3] The results of the New York Study suggest the number may be as high as 98,000.[4] Even when using the lower estimate, deaths due to medical errors exceed the number attributable to the 8th leading cause of death.[5] More people die in a given year as a result of medical errors than from motor vehicle accidents (43,458), breast cancer (42,297), or AIDS (16,516).[6]

Total national costs (lost income, lost household production, disability and

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To Err Is Human

Building a Safer Health System

比其他高危行業, 如航空業落后10年

careless. People must still be vigilant and held responsible for their actions. But when an error occurs, blaming an individual does little to make the system safer and prevent someone else from committing the same error.

Health care is a decade or more behind other high-risk industries in its attention to ensuring basic safety. Aviation has focused extensively on building safe systems and has been doing so since World War II. Between 1990 and 1994, the U.S. airline fatality rate was less than one-third the rate experienced in mid century.[16] In 1998, there were no deaths in the United States in commercial aviation. In health care, preventable injuries from care have been estimated to affect between three to four percent of hospital patients.[17] Although health care may never achieve aviation's impressive record, there is clearly room for improvement.

To err is human, but errors can be prevented. Safety is a critical first step in improving quality of care. The Harvard Medical Practice Study, a seminal research study on this issue, was published almost ten years ago; other studies have [illegible] its findings. Yet few tangible actions to improve patient saf[illegible]


SAS
Flight Acade

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To Err Is Human

Building a Safer Health System

專家認為醫療單位應設立模擬訓練小組

Train in Teams Those Who Are Expected to Work in Teams

People work together in small groups throughout health care, whether in a multispecialty group practice, in interdisciplinary teams assembled for the care of a specific clinical condition (e.g., teams that care for children with congenital problems, oncology teams, end-of-life care), in operating rooms, and in ICUs. However, members of the team are typically trained in separate disciplines and educational programs. They may not appreciate each other's strengths or recognize weaknesses except in crises, and they may not have been trained together to use new or well-established technologies.

The Committee believes that health care organizations should establish team training programs for personnel in critical care areas (e.g., the emergency department, intensive care unit, operating room) using proven methods such as the crew resource management techniques employed in aviation, including simulation. People make fewer errors when they work in teams. When processes are planned and standardized, each member knows his or her responsibilities as

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To Err Is Human

Building a Safer Health System

模擬訓練能提高整體的安全水平

C

Use Simulations Whenever Possible

As described under Principle 4, health care organizations and teaching institutions should participate in the development and use of simulation for training novice practitioners, problem solving, and crisis management, especially when new and potentially hazardous procedures and equipment are introduced. Crew resource management techniques, combined with simulation, have substantially improved aviation safety and can be modified for health care use. Early successful experience in emergency department and operating room use indicates they should be more widely applied.[44]

As noted, health care—particularly in dynamic setting such as operating rooms and emergency departments—involves tightly coupled systems. For this reason, crew resource management can be very valuable in reducing (though probably not eliminating) error. For such programs to achieve their potential, however, requires a thorough understanding of the nature of team interactions, the etiology and frequency of errors, and the cultures of each organization into which they are introduced.

Editor's choice

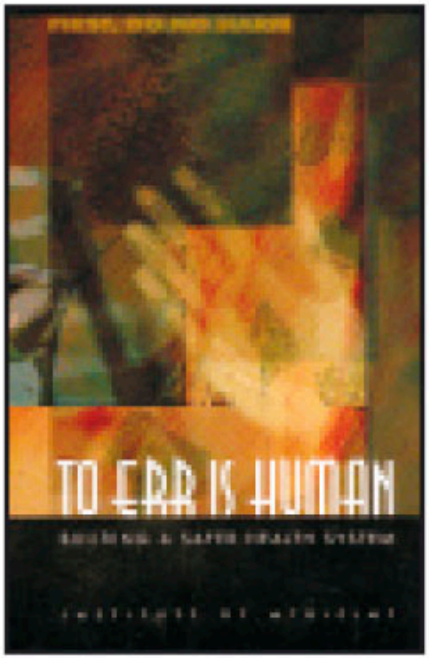
Facing up to medical error

Won't it be a terrible downer to have a whole issue devoted to medical error? Aren't doctors in Britain taking enough of a beating as it is? Are you really going to put a picture of a plane crash on the cover of the *BMJ*? These are reasonable questions, but we have no doubt that we are right to devote most of this *BMJ* to medical error and patient safety. It's essential that doctors, patients, and politicians worldwide grasp the scale of the problem. That is the first step on the long road to reducing errors in health care to the same low levels seen in other high risk enterprises—like aviation.

The debate in the United States has been kick started by a report from the Institute of Medicine (p 725). Roughly 100 000 Americans a year die from preventable errors in hospitals. The annual toll exceeds the combined number of deaths and injuries from motor and air crashes, suicides, falls, poisonings, and drownings (p 759). We have these data because of a major study undertaken in the United States in the 1980s. The one comparable study from another country, Australia, produced even higher rates of error (p 774). The *BMJ* argued 10 years ago that Britain needed a similar study and was roundly criticised by the president of a medical royal college for drawing the attention of the mass media to medical error.

Laerdal SimMan™ Universal Patient Simulator

An Important Part of the Solution



Use Simulations Whenever Possible

...Crew resource management techniques, combined with simulation, have substantially improved aviation safety and can

“把握使用模擬培訓的機遇”

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“把需要合作的隊員來一起培訓成團隊”

VOLUME XXVII NUMBE
May 20

The American Journal of Anesthesiology

Continuing Education in Anesthesia and Perioperative Medici

The Official Journal of

Association of Anesthesia Clinical Directors

Society for Office Based Anesthesia

Dynamic Simulation: A New Tool for Difficult Airway Training of Professional Healthcare Providers

John J. Schaefer III, MD, and Rene' M. Gonzalez, MD

ABSTRACT

A promising new modality is highly realistic, hands-on dynamic simulation. In this manuscript, the authors describe: 1) the fundamental components of an airway management training program and how simulation can be integrated into this, 2) their experience using simulator-based airway training for teaching anesthesiology residents difficult airway management, and 3) their experience using simulator-based airway training for teaching paramedics.

(Am J Anesthesiol. 2000:27 [4]:232–242)

The management of the difficult airway has long been recognized as one of the most important and challenging tasks facing acute-care health providers. The kinetics are fast, the necessary psychomotor skills are complex, and the consequences are enormous.[1]

There have been tremendous advances in the field of airway management in the last few decades. Great progress has been made in the armamentarium of equipment and techniques available to the clinician. Excellent protocols, such as the American Society of Anesthesiologists' Algorithm for the Management of the Difficult Airway[2] have been developed, providing a coherent cognitive framework for approaching the various types of airway scenarios encountered in clinical practice. The body of knowledge on the subject of difficult airway management has also expanded greatly, as evidenced by the number of textbooks and articles in the recent literature.

One might argue that there remain at least two more unfinished pieces to the puzzle of difficult airway management. The first is how to teach this body of factual knowledge, judgment and complex psychomotor skill sets. The traditional teaching methods, such as real patients, volunteers, cadavers, animals, anatomic models and static mannequins all have significant shortcomings. The second remaining educational challenge is how to even attempt to measure that our students have learned these didactic, psychomotor and judgment skills.

A promising new modality is highly realistic, hands-on dynamic simulation. In this manuscript, the authors describe: 1) the fundamental components of an airway management training program and how simulation can be integrated into this, 2) their experience using simulator-based airway training for teaching anesthesiology residents difficult airway management, and 3) their experience using simulator-based airway training for teaching paramedics.

THE COMPONENT PARTS OF ESTABLISHING CLINICAL COMPETENCY IN AIRWAY MANAGEMENT

The fundamental component parts of establishing clinical competency in airway management training for either prehospital or hospital-based professionals can be

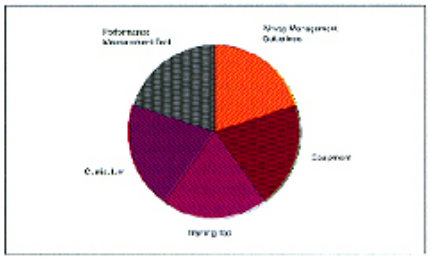

Figure 1. Fundamental components of an airway management training program

Dr. Schaefer is Assistant Professor, Department of Anesthesiology and Critical Care Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania.
Dr. Gonzalez is Associate Professor, St. Luke's Health Network, Bethlehem, Pennsylvania.

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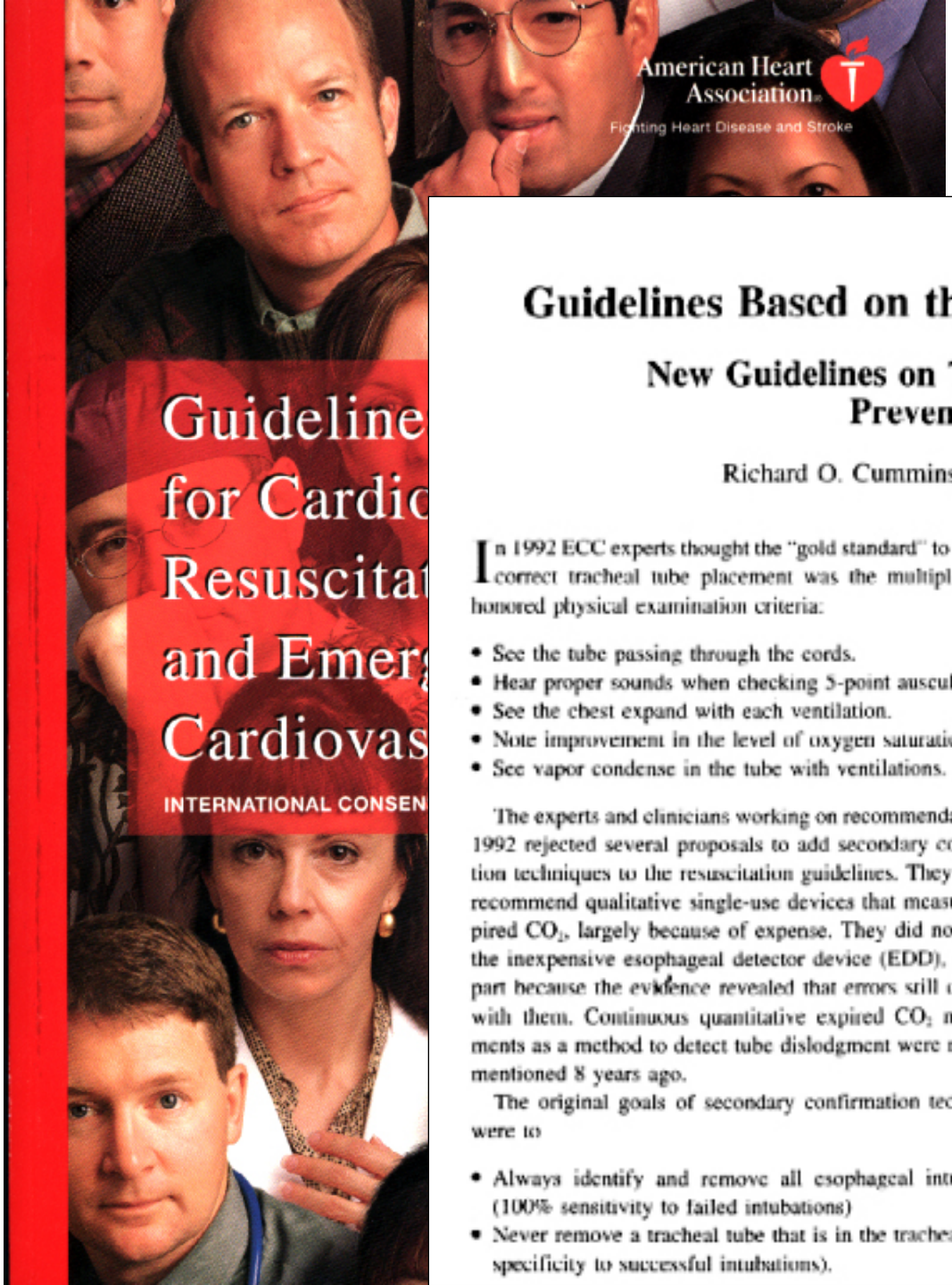


安全第一

Guidelines Based on the Principle "First, Do No Harm"

New Guidelines on Tracheal Tube Confirmation and Prevention of Dislodgment

Richard O. Cummins, MD; Mary Fran Hazinski, RN, MSN

In 1992 ECC experts thought the "gold standard" to confirm correct tracheal tube placement was the multiple, time-honored physical examination criteria:

- See the tube passing through the cords.
- Hear proper sounds when checking 5-point auscultation.
- See the chest expand with each ventilation.
- Note improvement in the level of oxygen saturation.
- See vapor condense in the tube with ventilations.

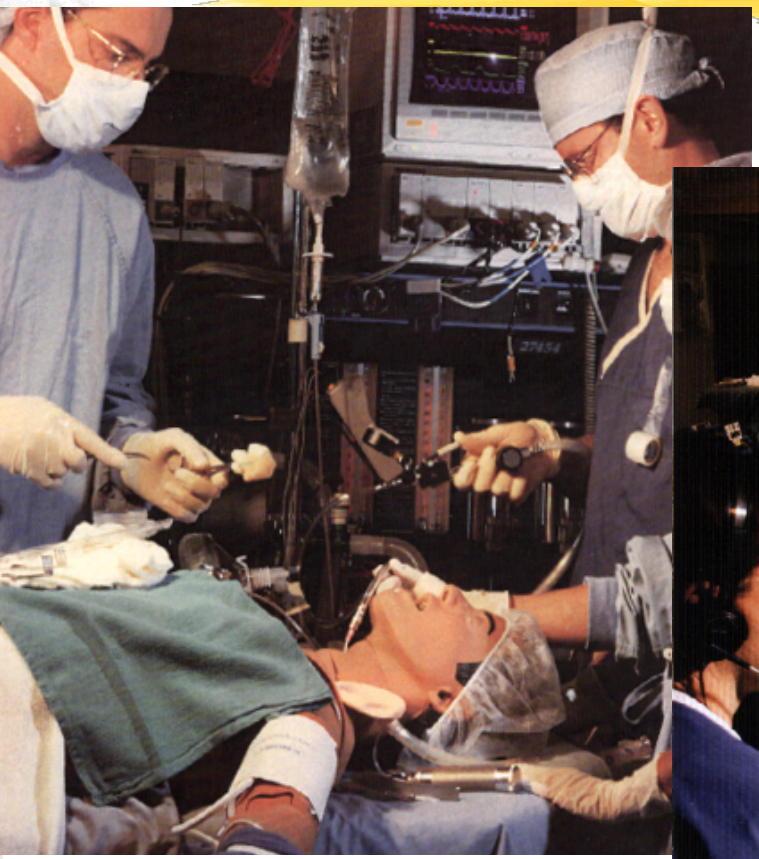
The experts and clinicians working on recommendations in 1992 rejected several proposals to add secondary confirmation techniques to the resuscitation guidelines. They did not recommend qualitative single-use devices that measured expired CO_2, largely because of expense. They did not accept the inexpensive esophageal detector device (EDD), in large part because the evidence revealed that errors still occurred with them. Continuous quantitative expired CO_2 measurements as a method to detect tube dislodgment were not even mentioned 8 years ago.

The original goals of secondary confirmation techniques were to

- Always identify and remove all esophageal intubations (100% sensitivity to failed intubations)
- Never remove a tracheal tube that is in the trachea (100% specificity to successful intubations).

Between 1992 and 2000, however, an increasing body of information about high rates of errors in medicine began to accumulate.[1–3] Resuscitation leaders became concerned that patients under their care were experiencing undetected esophageal intubation and undetected tracheal tube dislodgment at a frequency far higher than commonly recognized. The "evidence" that raised these suspicions was indirect and retrospective. Esophageal intubation and tube dislodgment are perceived to be uncommon events. This frequency is so low that a single practitioner may never be involved personally with such an event. In many locations quality assurance committees review these episodes if they learn about them. Quality assurance records, however, are sealed and not available for discovery.

Teachers and practitioners in residency training programs in anesthesiology, emergency medicine, and paramedic programs at academic medical centers hear about and know of these problems locally, often because they were the professionals who discovered the out-of-place tube.[4] This experience in teaching and training programs leads to widespread suspicion that the true rate of misplaced or dislodged tracheal tubes is much higher than ever suspected.[5–10] These complications are extremely serious—if unrecognized they inevitably result in death or severe neurological injury. Most importantly, these are preventable tragedies that devastate families and friends and cut short many young lives.



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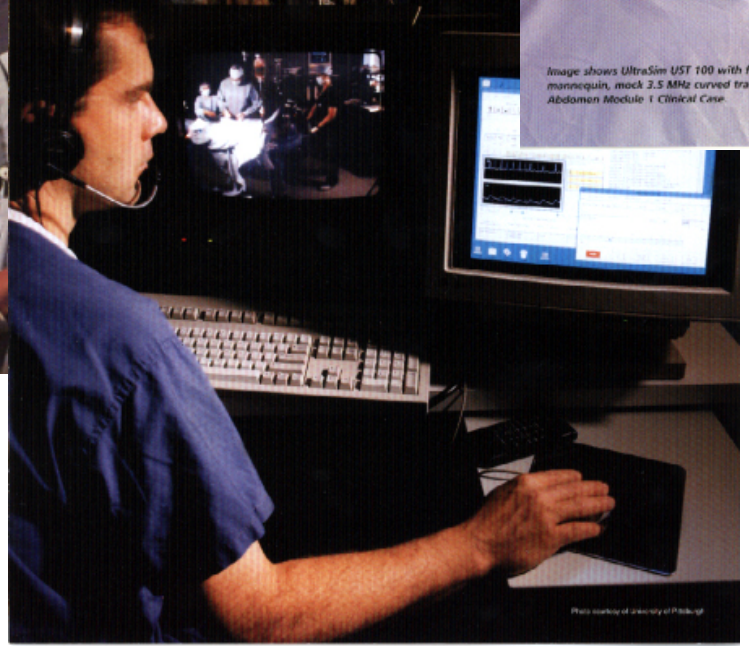

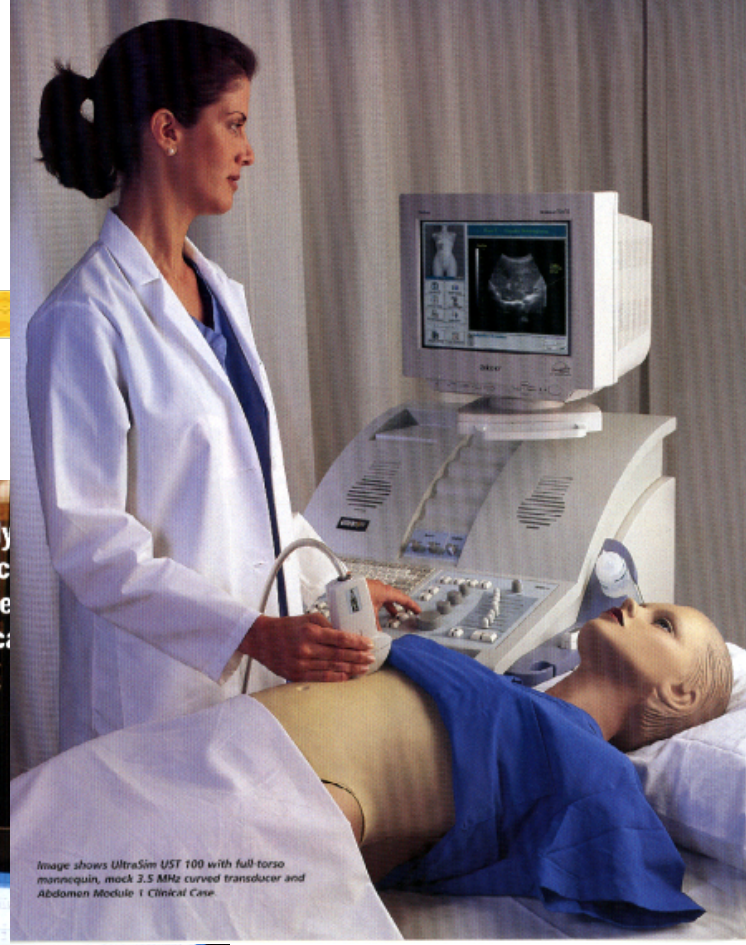

Image shows UltraSim UST 100 with full-torso mannequin, mock 3.5 MHz curved transducer and Abdomen Module 1 Clinical Case

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Pitt : School of Med.

Pitt : Anes / CCM

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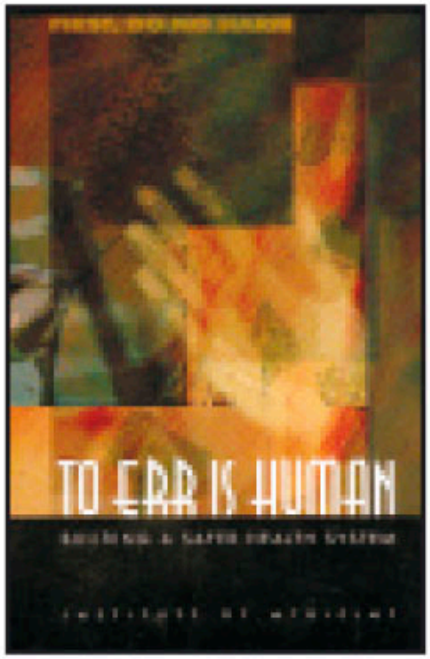
An Important Part of the Solution



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...Crew resource management techniques, combined with simulation, have substantially improved aviation safety and can be modified for health care use." (p.179)

"把握使用模擬培訓的機遇"

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"把需要合作的隊員來一起培訓成團隊"

模擬培訓

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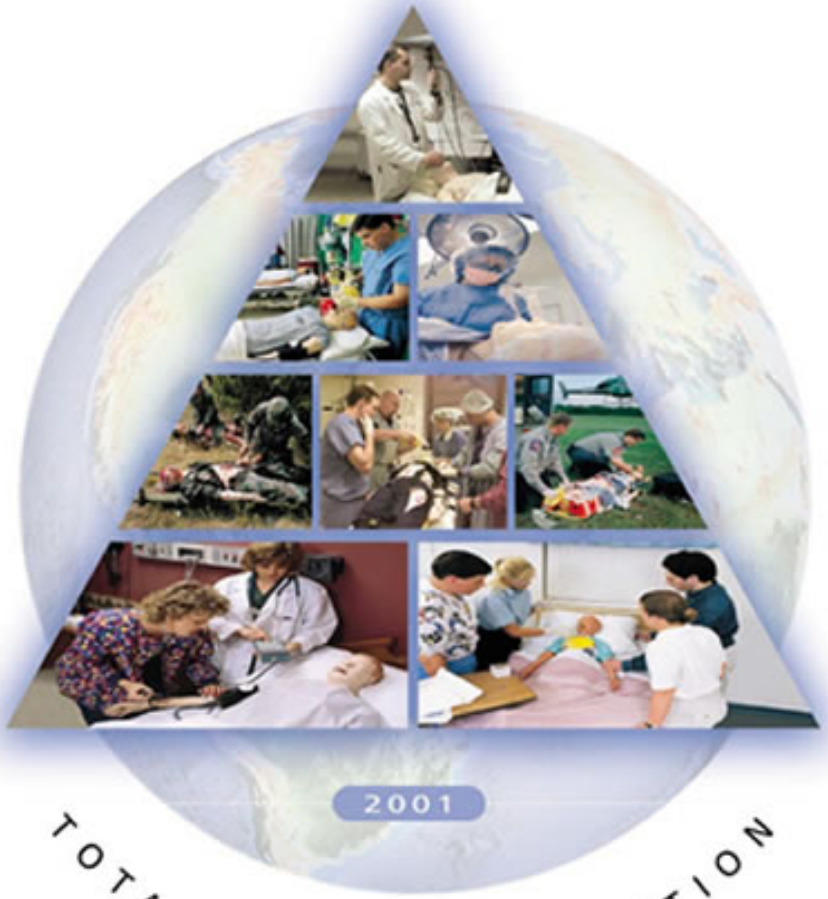
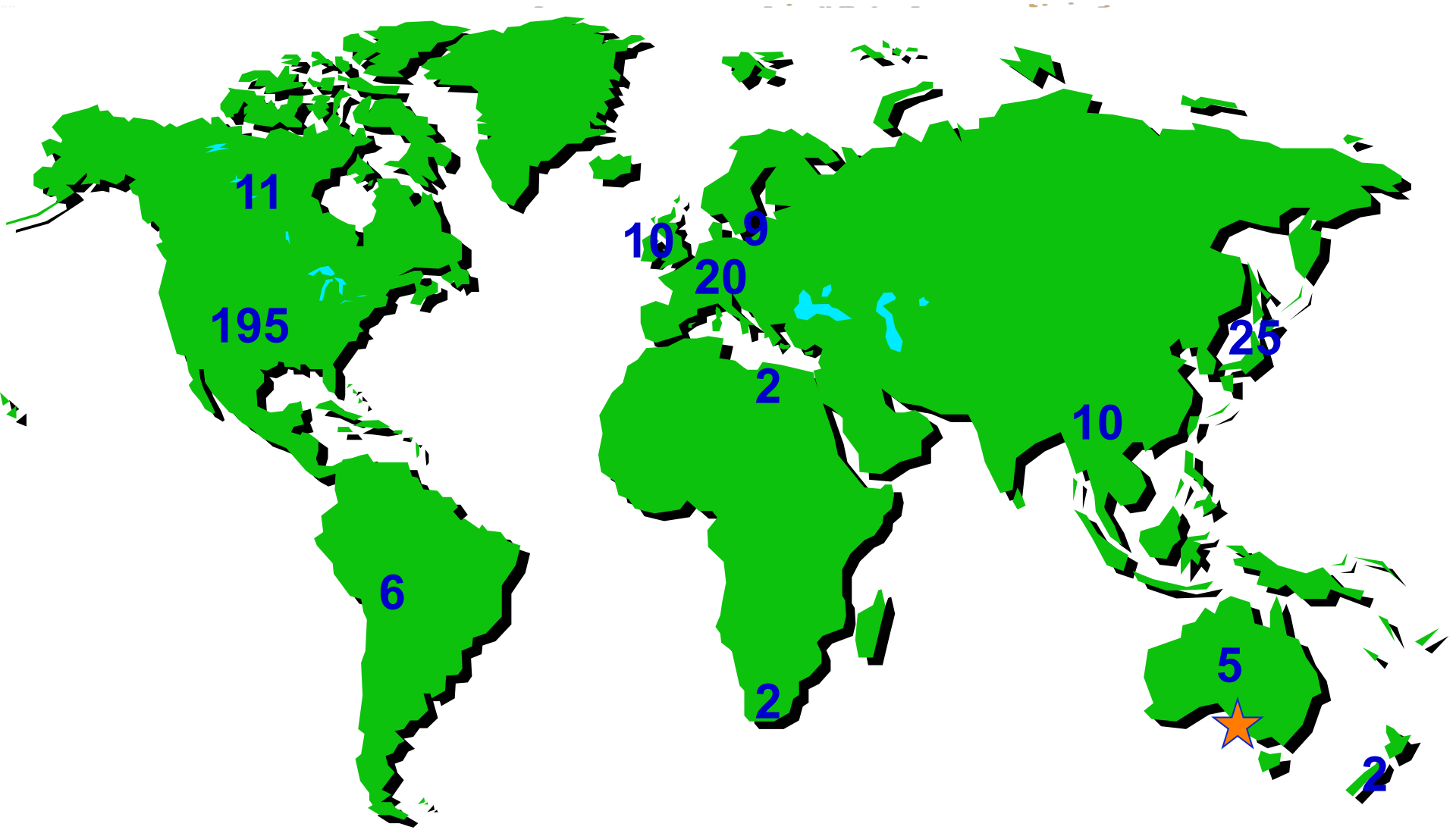


Worldwide Simulation centres

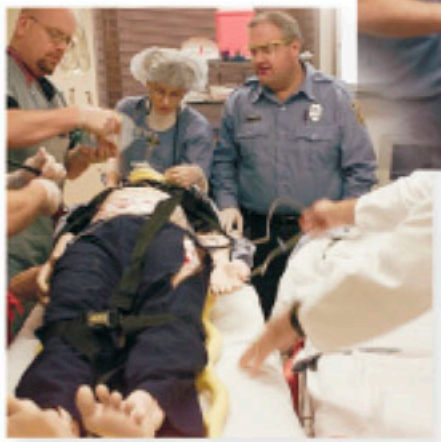


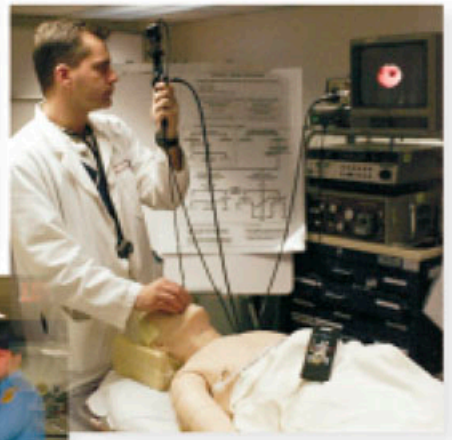
何謂模擬?

危機資源管理訓練

- *溝通*
- *領導*
- *協調*
- *指派命令*
- *收集和分析信息*
- *優先次序*

模擬教學是未來的方向





Laerdal SimMan™
Universal Patient Simulator

優點?

- 最有效的學習方法
- 能模擬迫真的病情
- 容許出錯
- 病人毫無危險
- 可反覆練習

SimMan AND AirMan

Laerdal SimMan™ Universal Patient Simulator

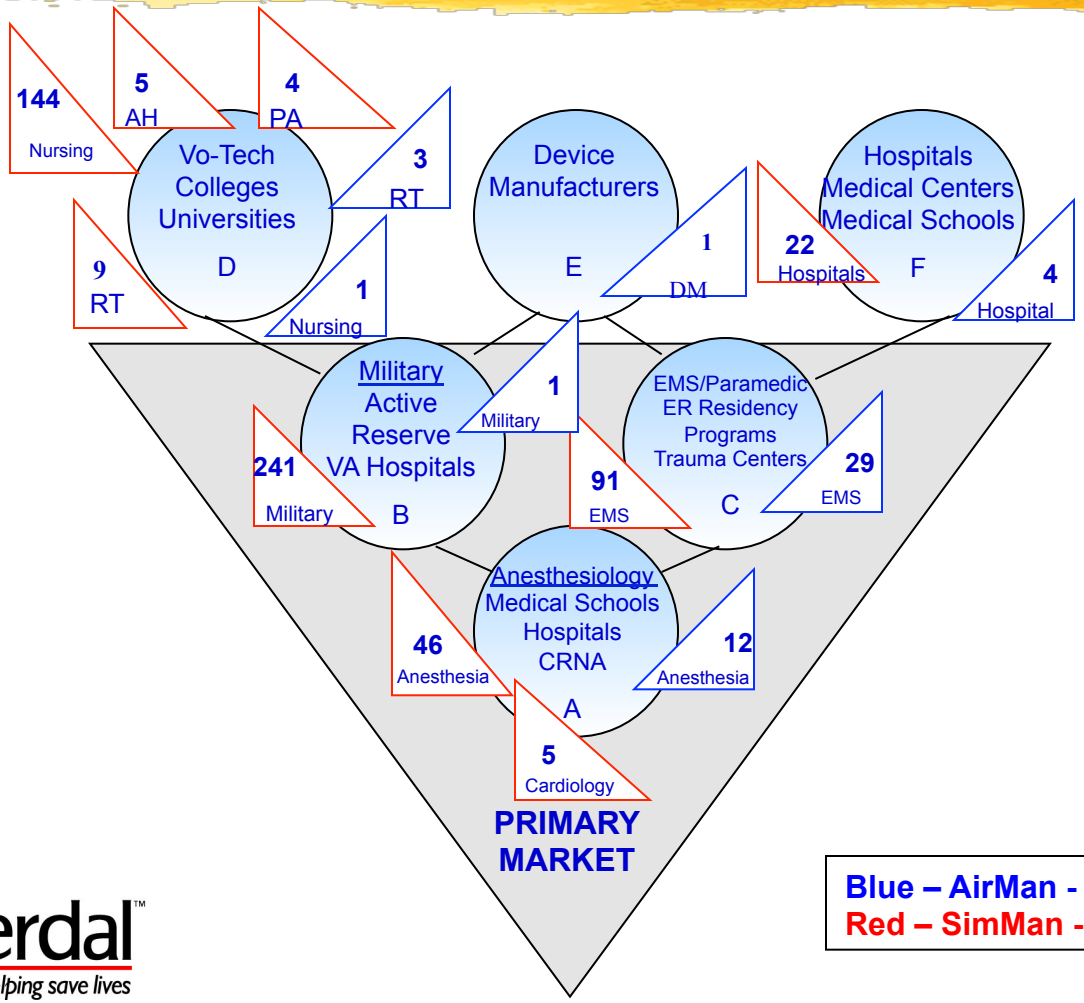
新一代的模擬訓練裝置

- 經濟實惠，操作成本低
- 簡易操作，使用方便
- 便於攜帶，可作搬運訓練
- 靈活使用，功能變化多

所以能夠加促模擬訓練的運用

全球已有736用戶

Laerdal SimMan™
Universal Patient Simulator



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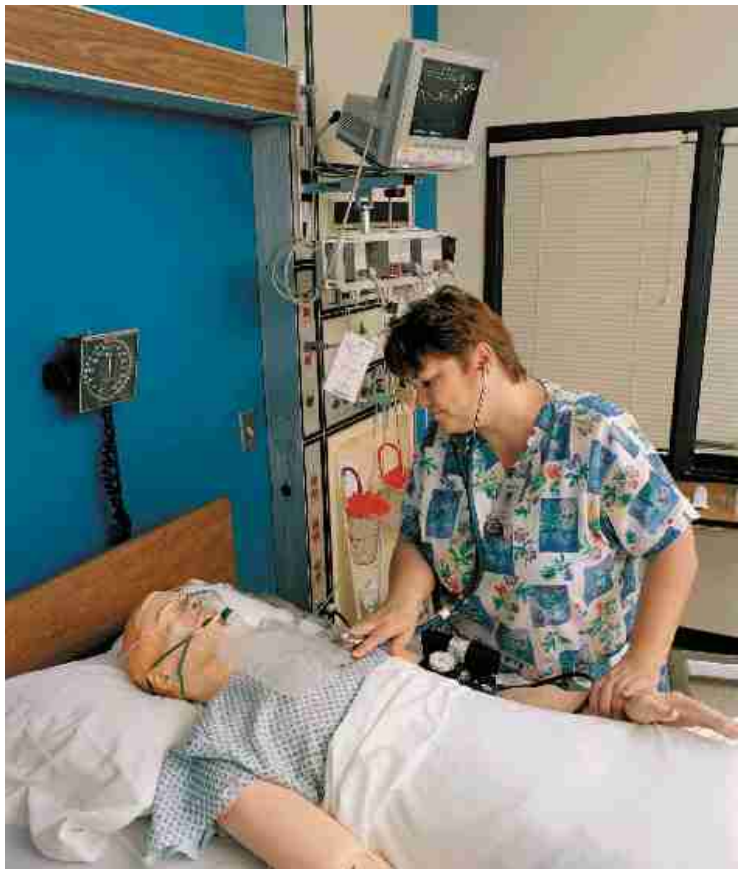
helping save lives

Blue – AirMan - 51
Red – SimMan - 567

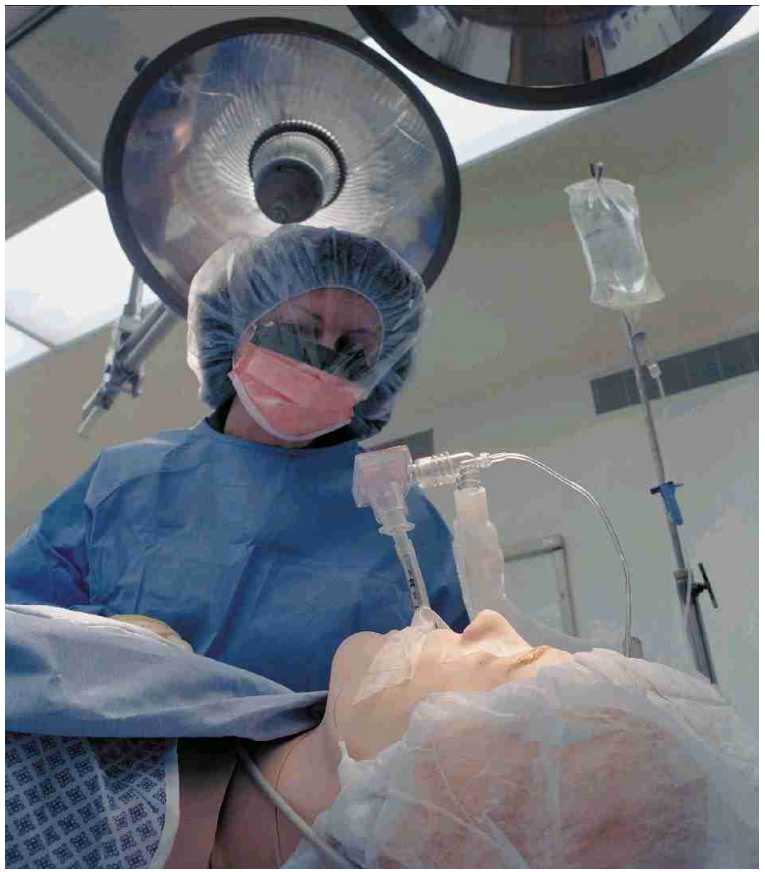
應用

- 臨床醫學
- 急診醫學
- ICU



應用

- 麻醉
- 护理



應用

- 院前急救
- 病人搬運

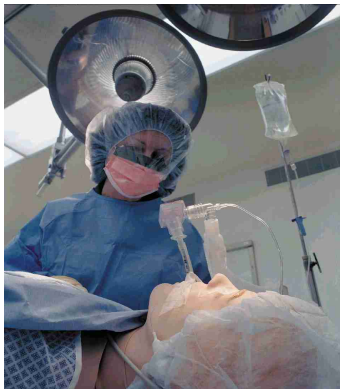
綜合培訓

院前

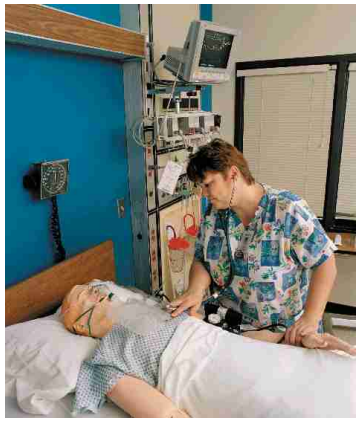
運送

急診室

OT



ICU
病房

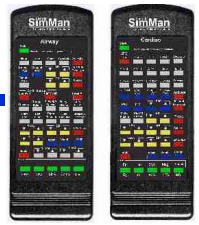


系統的解決方法

Laerdal SimMan™ Universal Patient Simulator

- 迅速設定
- 容易使用
- 堅固耐用
- 便於攜帶
  - 作為一個系統
- 易於運送
  - 作為一個病者

安裝簡易



病者模擬訓練裝置

Laerdal SimMan™ Universal Patient Simulator

- 氣道及頸椎控制 ✓
- 呼吸及通氣 ✓
- 循環及放血操控 ✓
- **D** - Disability: AVPU ✓

SimMan Universal Patient Simulator

File Edit Patient Monitor Options Help

Scenarios | Frame time: | Patient time: | **Trends** | View | Help

Monitor Controls

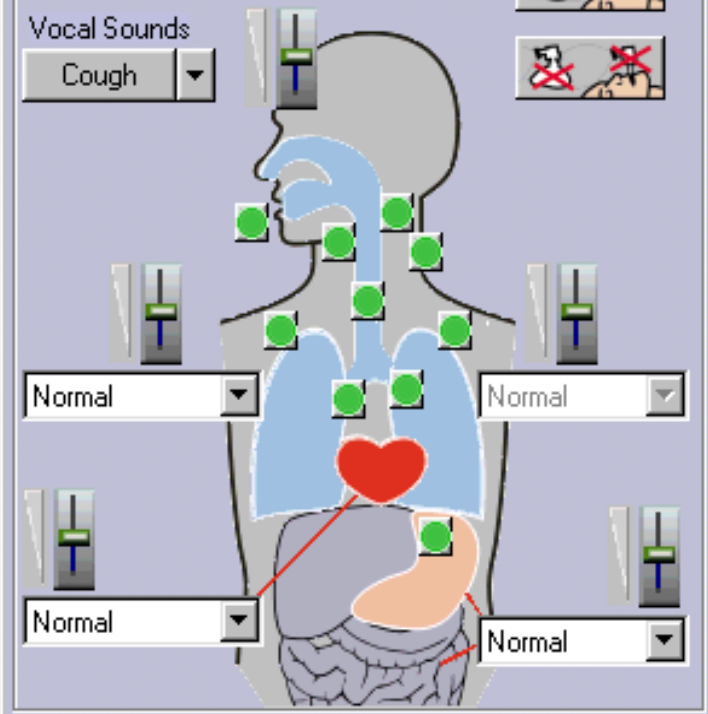
CO_2 kPa: 4.5 | SpO_2 %: 98 | Temp. °C: 37.2

Airway and Auscultation Controls

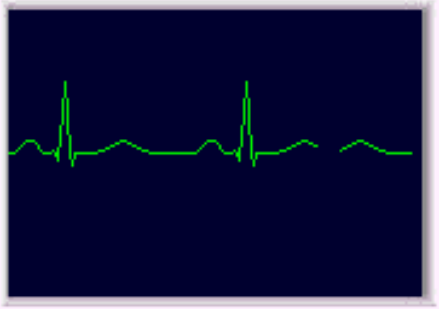
Breathing Rate: 10 | Apnea | Reset All

CO2 Exhaled

Vocal Sounds: Cough



Cardiac Controls



Running Rhythm: A: Sinus | 80

Muscular | 50/60 Hz | Extrasyst. Rate (/min): 10

Waiting Rhythm

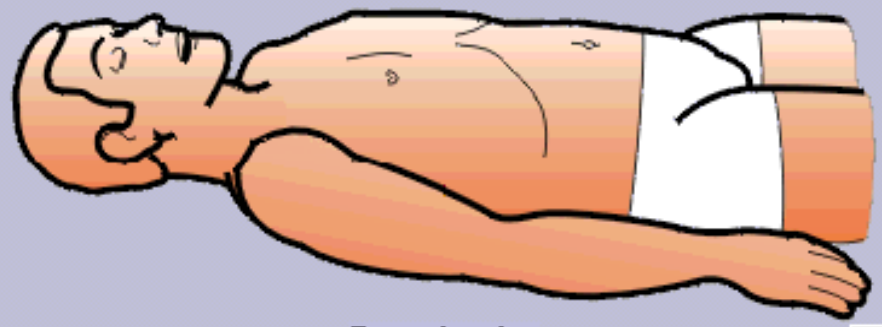
Wait->Run Activate | Wait⇌Run Paroxysmal | Manual Extrasyst.

BP: 120 / 80 | EMD/PEA | Gap

Threshold (mA): 80

Register Events

ABC Action | Miscellaneous | Medication | Edit



SimMan™

Event logging 0:00:15

氣道及頸椎

- 頸椎固定

氣道及頸椎

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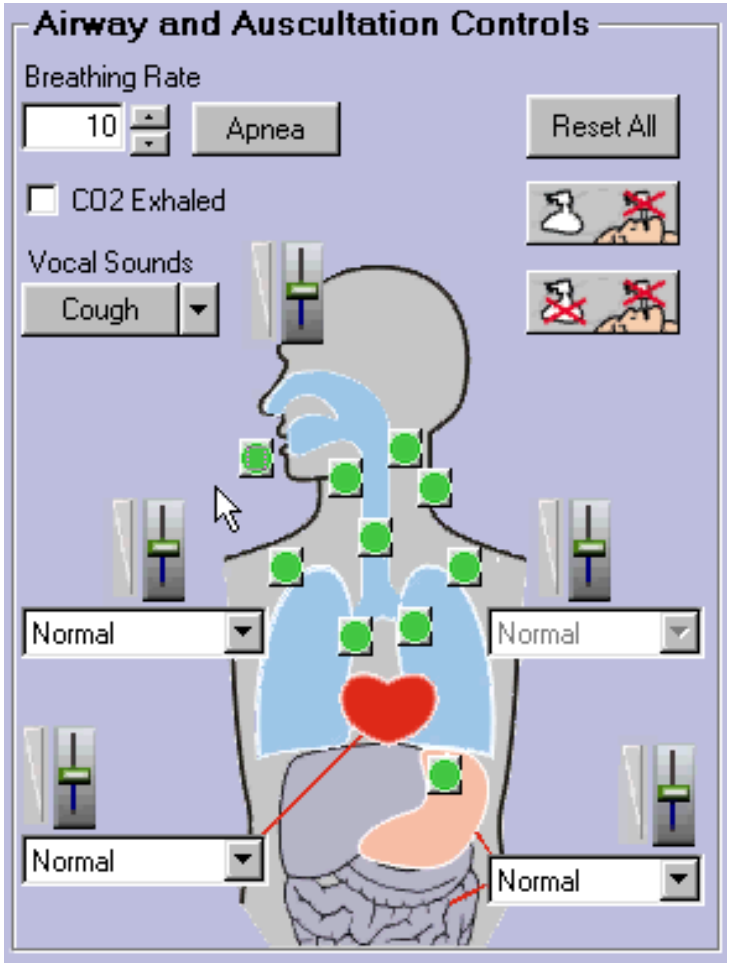
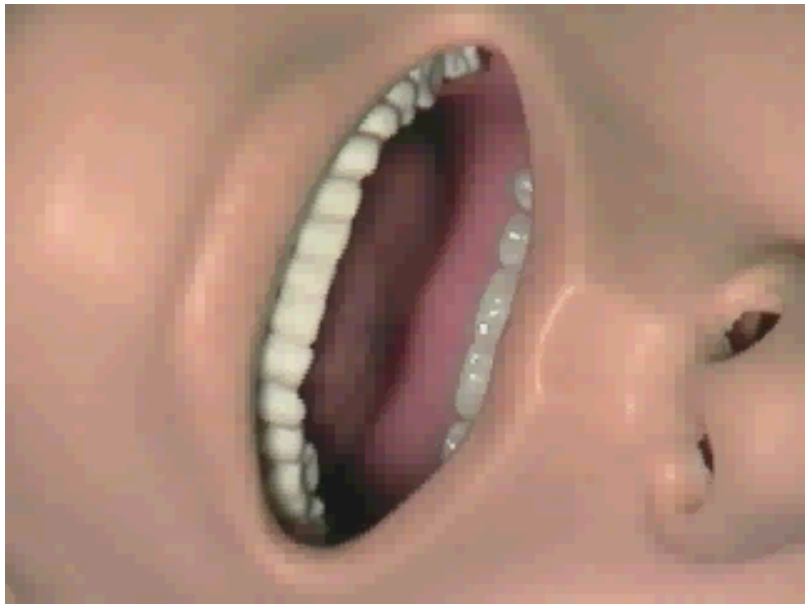


氣道及頸椎

- 牙關緊閉

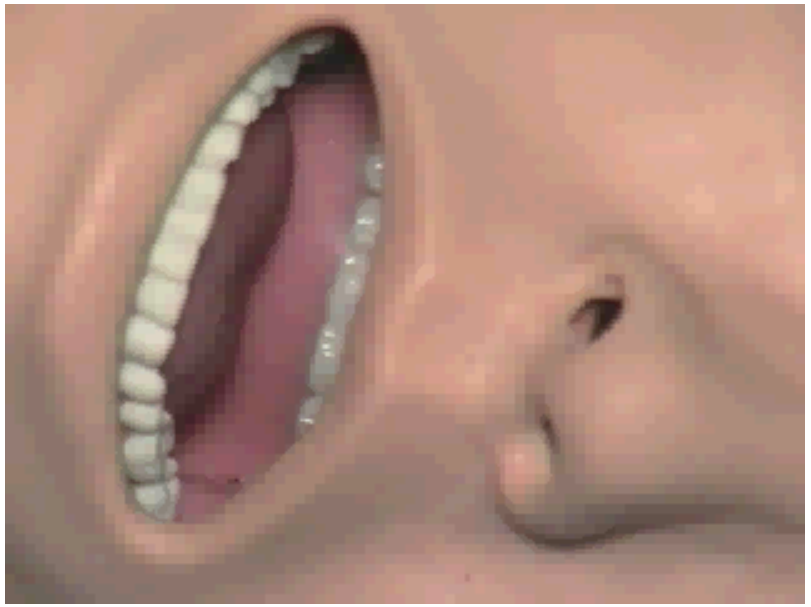
氣道及頸椎

- 舌水腫



氣道及頸椎

- 咽部水腫



氣道及頸椎

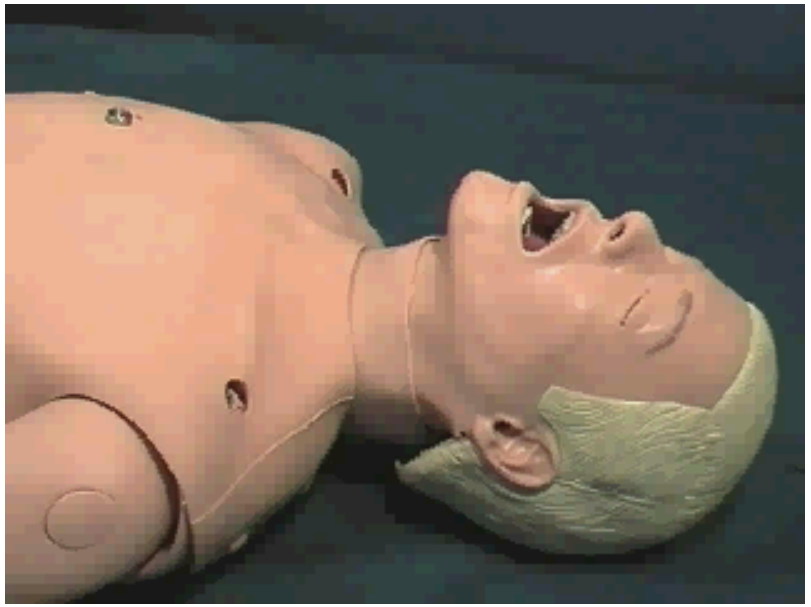
- 減少頸部位置的移動

氣道及頸椎

- 喉痙攣

氣道及頸椎

- 環珅膜穿刺
- 氣管切開

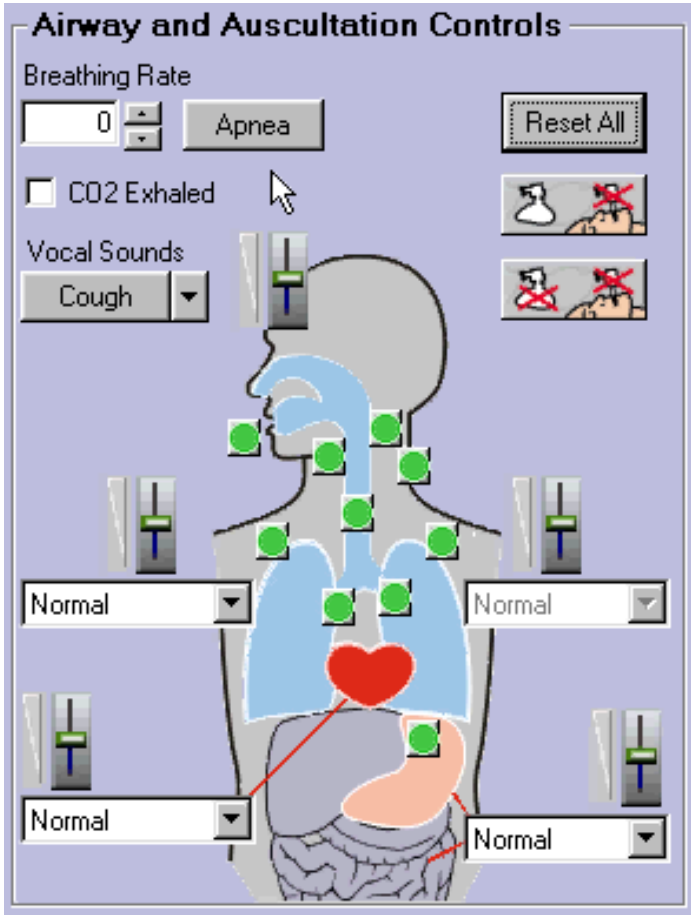


氣道及頸椎

- 困難氣道管理原始記錄:
  - **ET-Tube**
  - **LMA**
  - **Combitube**
  - 光導氣管管芯

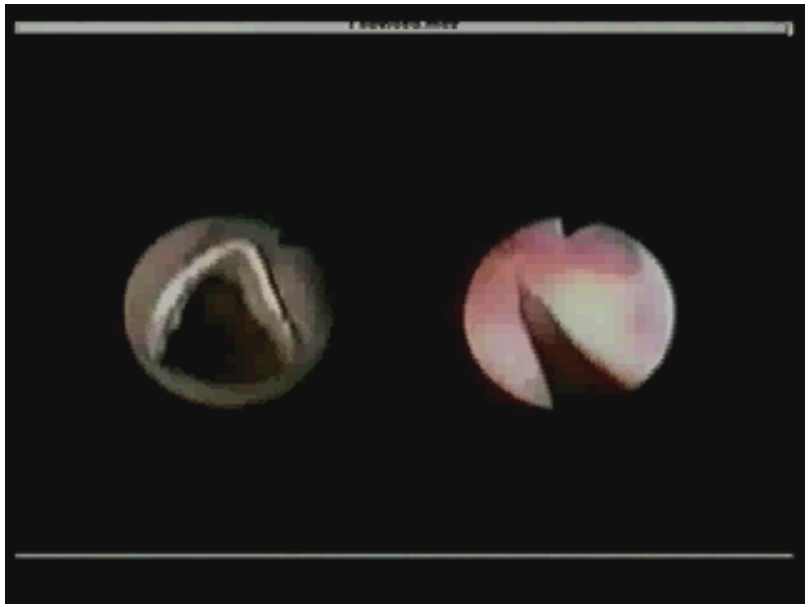
氣道及頸椎

- 不能以管插入
  - 能夠通氣
- 不能以管插入
  - 不能通氣



氣道及頸椎

- 支氣管鏡檢法



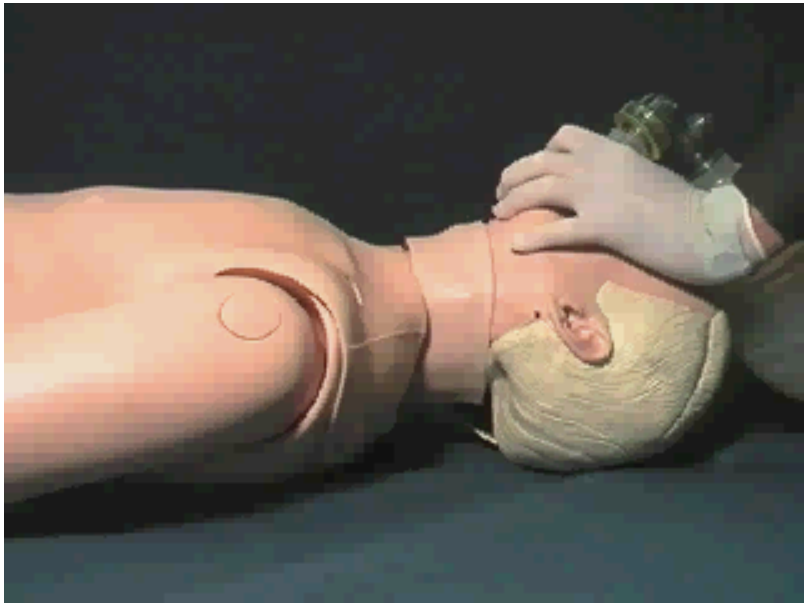
呼吸

Laerdal SimMan™ Universal Patient Simulator

- 自然呼吸

呼吸

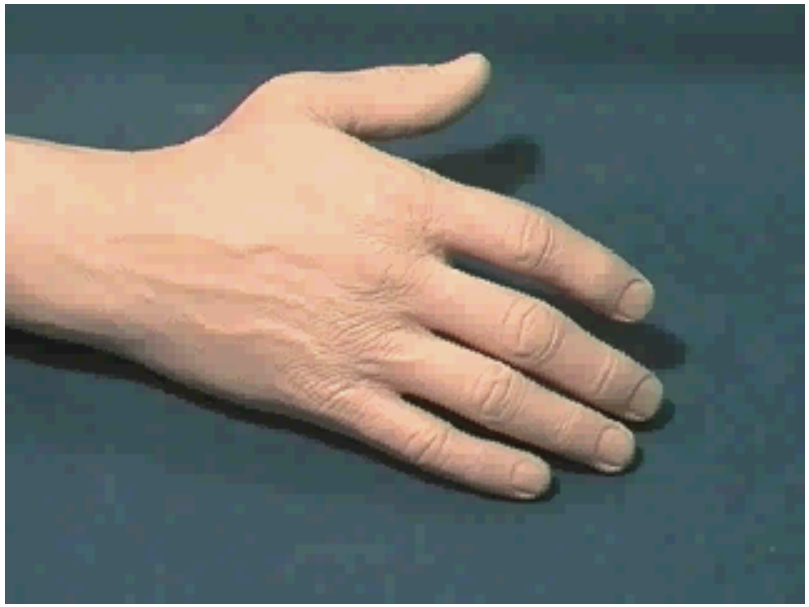
- 復甦器/呼吸面罩通氣



呼吸

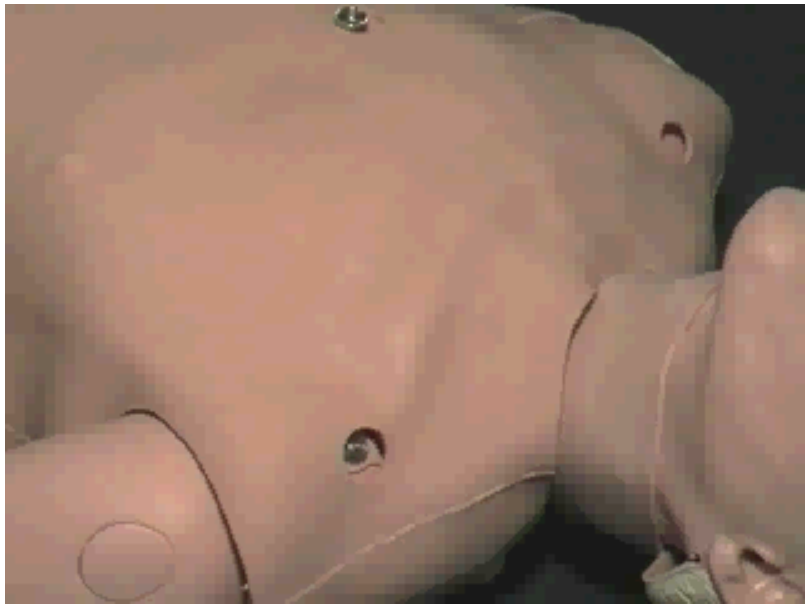
Laerdal SimMan™ Universal Patient Simulator

- **SpO2**



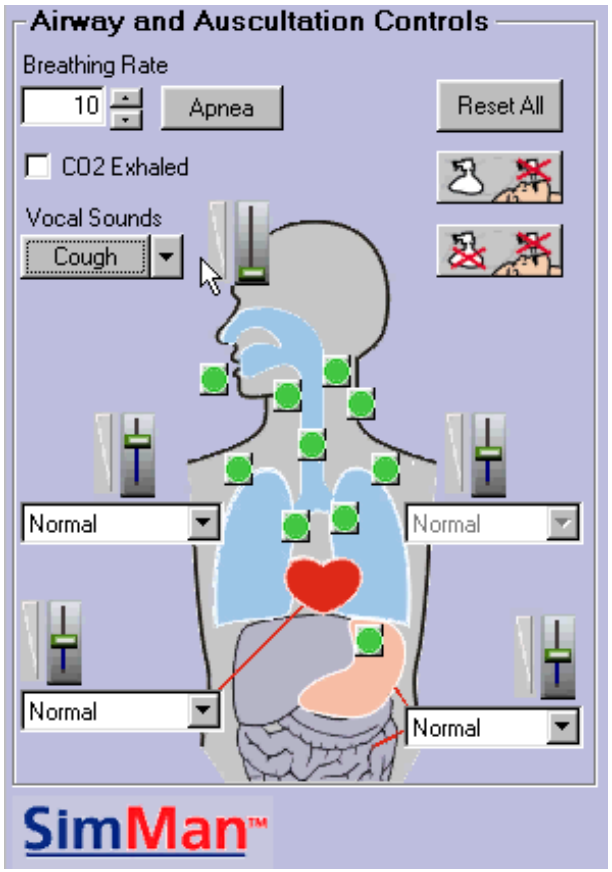
呼吸

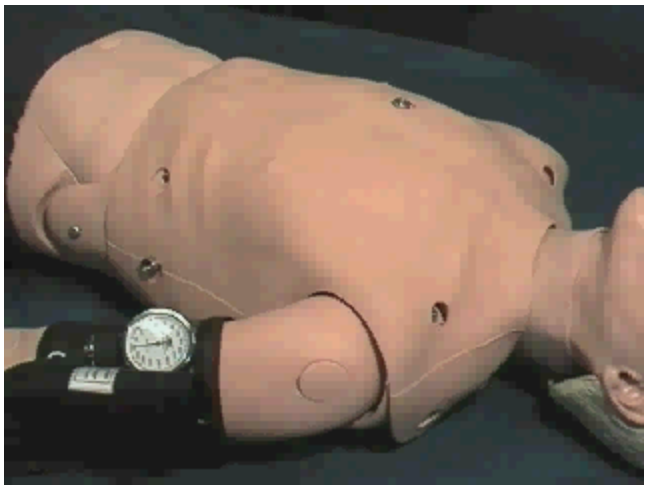
- 張力性氣胸



听診

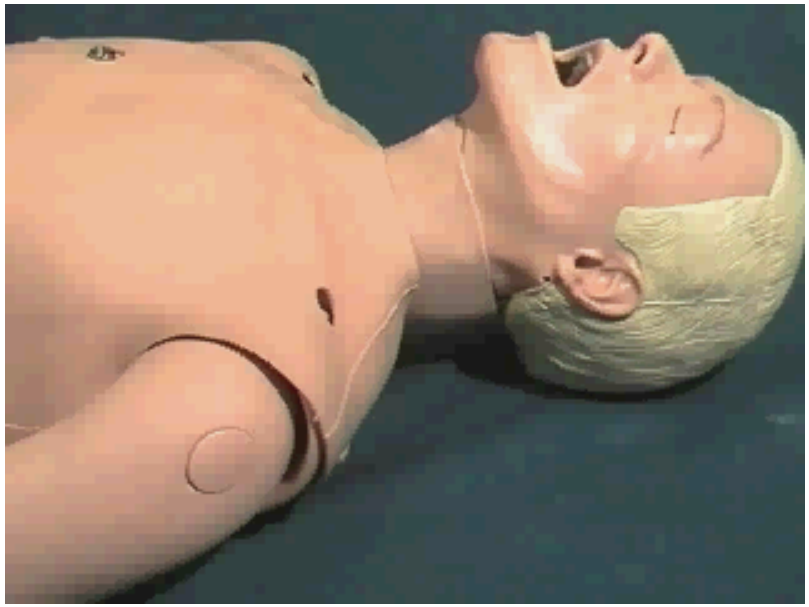
Laerdal SimMan™ Universal Patient Simulator





脈搏

- 脈搏檢查
  - 頸動脈
  - 臂
  - 橈骨
  - 股骨

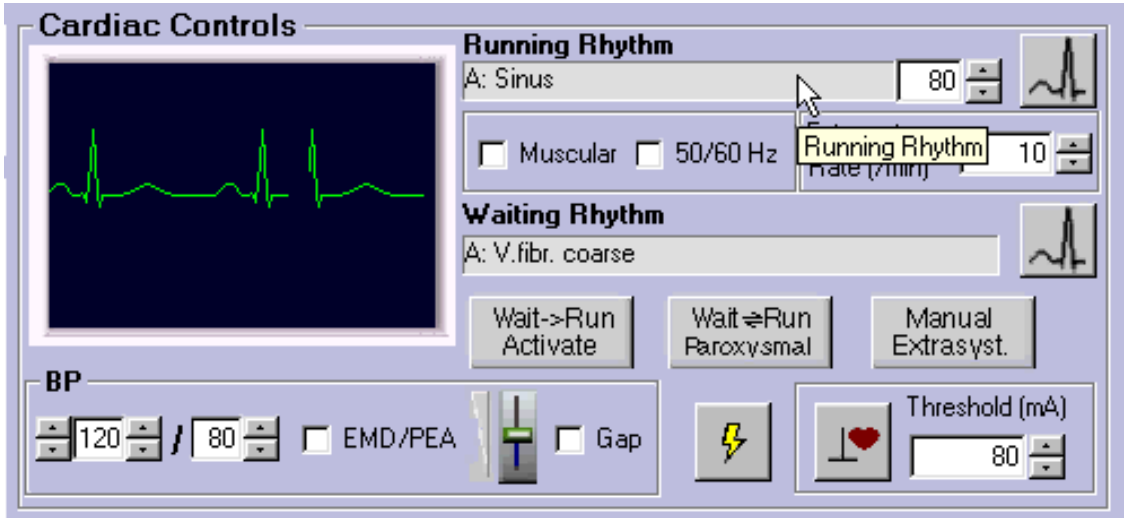


循環

- 胸外擠壓

循環

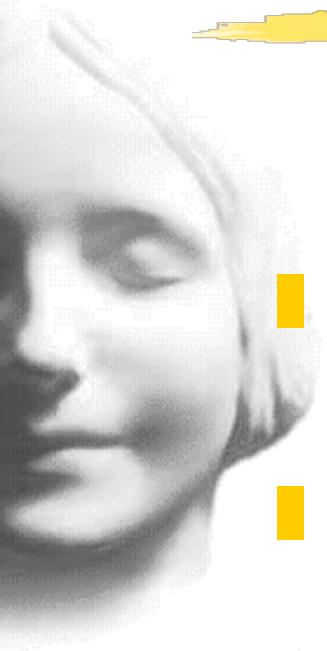
Laerdal SimMan™ Universal Patient Simulator



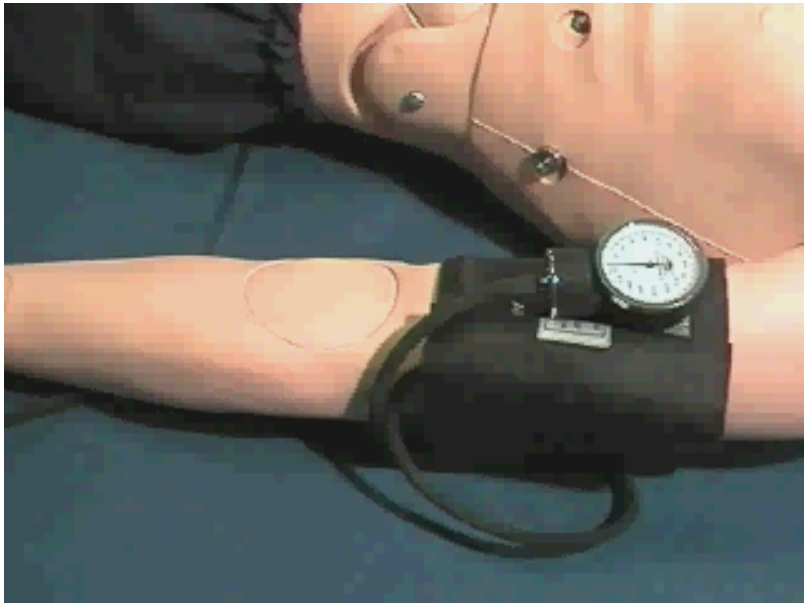
- **ECG - 2500+ combinations**
- **Artifacts - EMD/PEA**
- **不同QRS-types**

循環

Laerdal SimMan™ Universal Patient Simulator



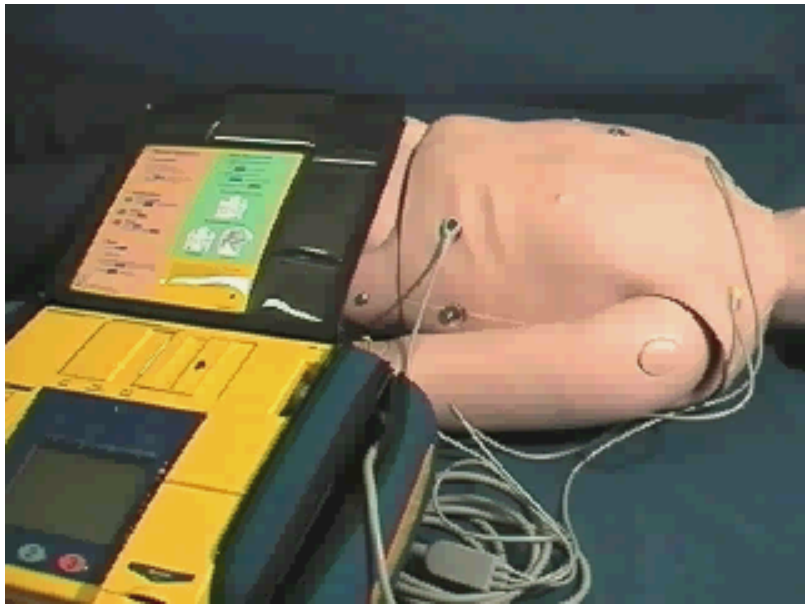
- 可調節血壓 (**NIBP**)
- 可調節科羅特科夫音
- 聽診間隙



循環

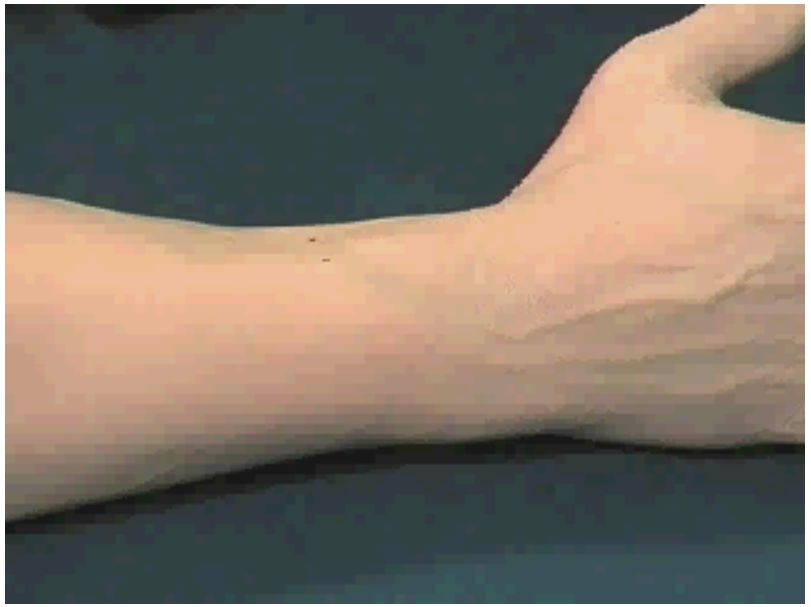
Laerdal SimMan™ Universal Patient Simulator

- 監控
- 除顫
- 體外起搏



循環

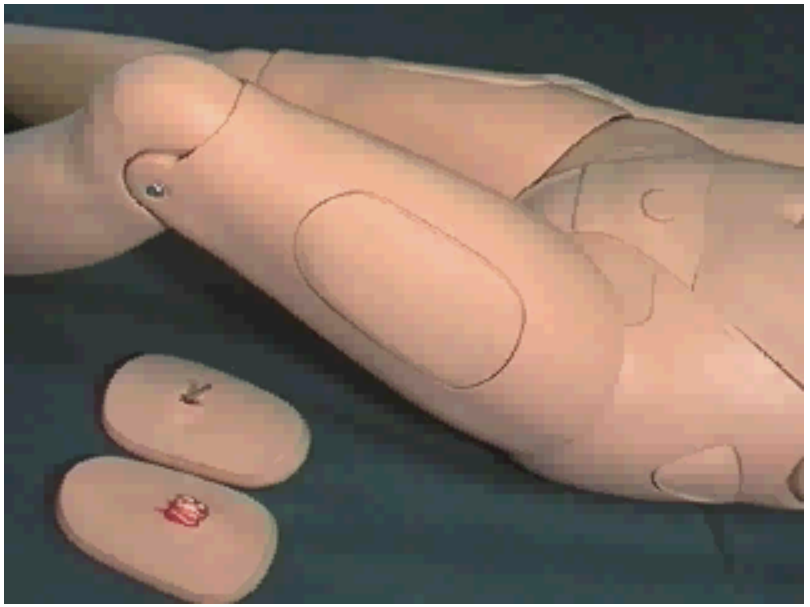
- 靜脈插管法
- 藥物治療
- **Infusion**



循環

Laerdal SimMan™ Universal Patient Simulator

- 損傷調節系統



D - Disability / AVPU

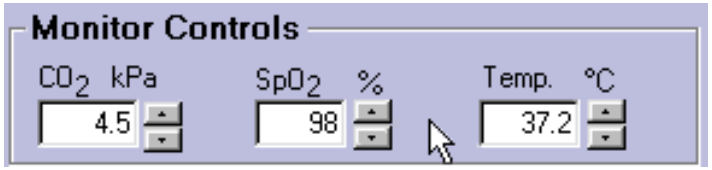
- 他是否有警覺?
- 他對我的聲音是否有反應?
- 他對痛楚是否有反應?
- 他是否沒有反應？

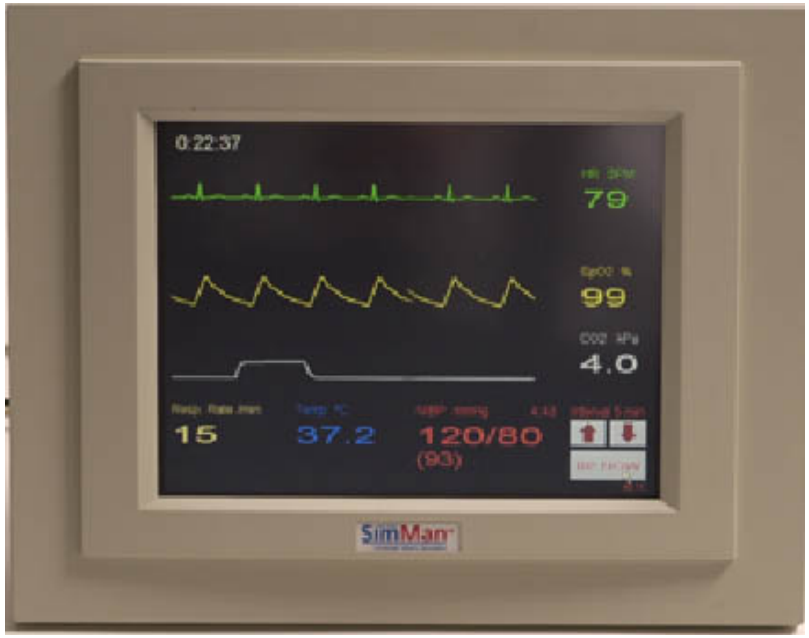
- 聲音反應
- 呻吟
- 嘔吐聲

病患者監察器

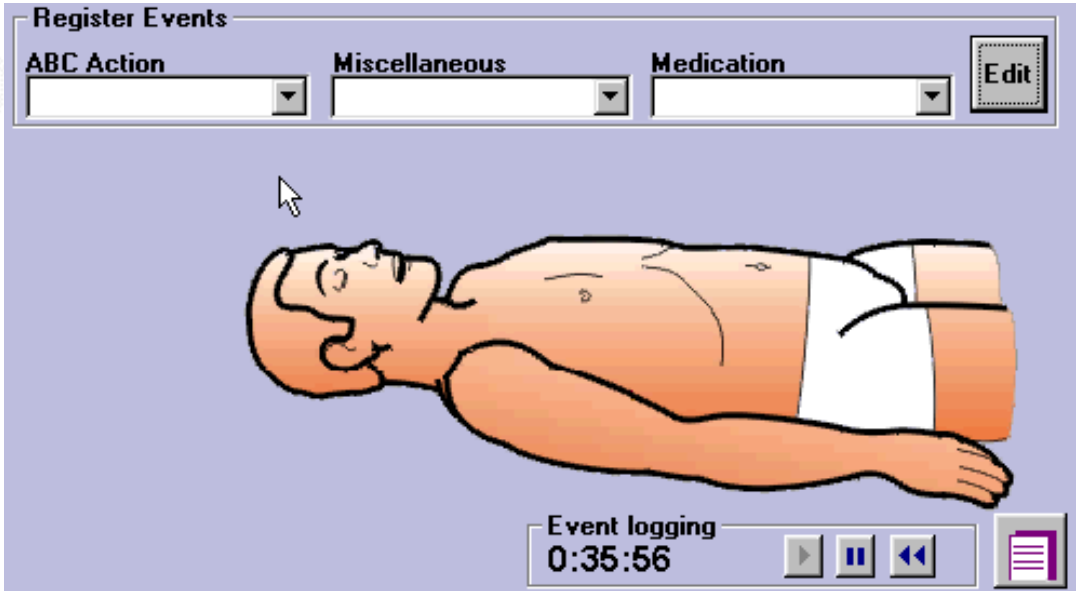
Laerdal SimMan™ Universal Patient Simulator

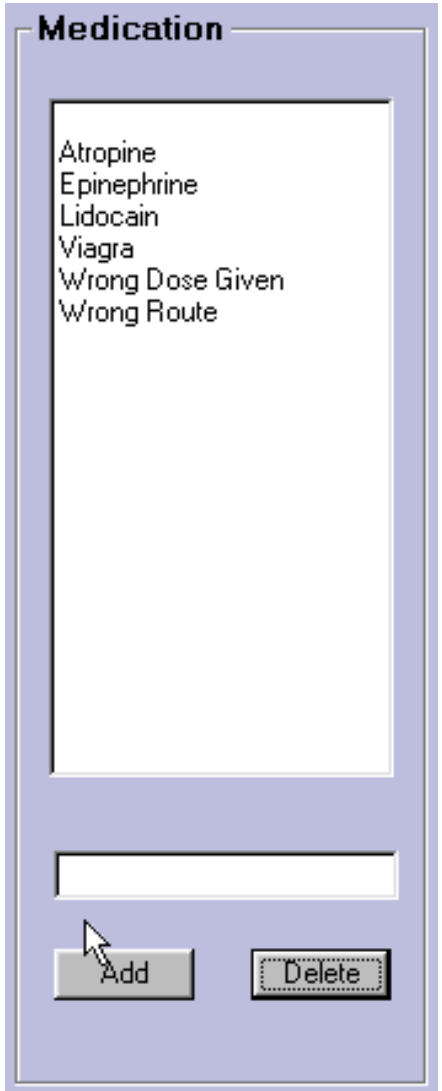
- ECG + 心跳率
- SpO2
- CO2
- 呼吸頻率
- 體溫
- 血壓- touch screen





控制


Register Events
ABC Action
Miscellaneous
Medication
Edit
Event logging
0:35:56


Medication
Atropine
Epinephrine
Lidocain
Viagra
Wrong Dose Given
Wrong Route
Add
Delete

報告

Laerdal SimMan™ Universal Patient Simulator

Students: Eric B

Filename: Training_001.html

Date: 2000.10.19

Comments: Laerdal Marketing

Event Log:

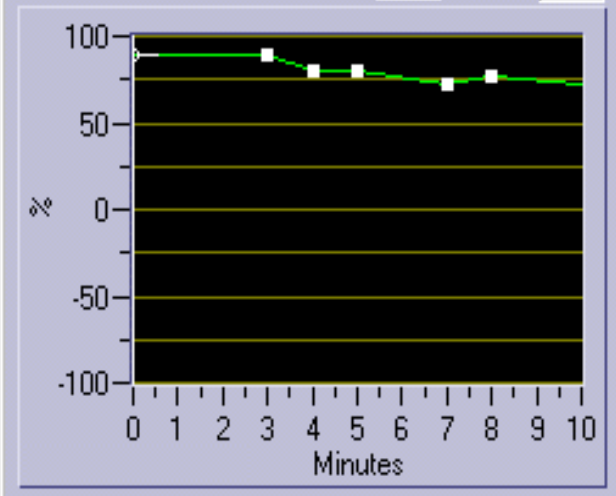
0:00:02	Restart	A: Sinus 80
		BP: 120/80
		Extrasyst.Rate: 10
		Defib. enabled
		Pacing enabled: 80 mA
0:00:03	CO2 Exhalation	Off
0:00:07	Breathing Rate	10
0:00:07	SpO2	98 %
0:00:07	Temp.	37,2 °C
0:00:10	CO2	4,5 kPa
0:00:18	Breathing Rate	0
0:00:18	Vocal Sound	Cough
0:00:29	ABC action	Intubation
0:00:41	Breathing Rate	10
0:01:12	Pause	

Edit Trends - [Default]

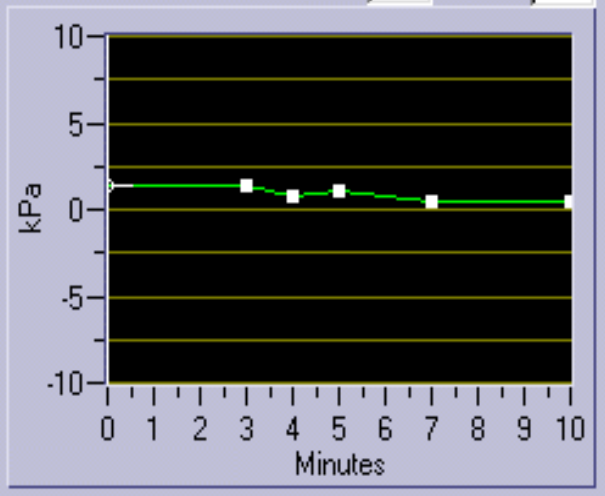
Representation

Absolute Values | Relative Values

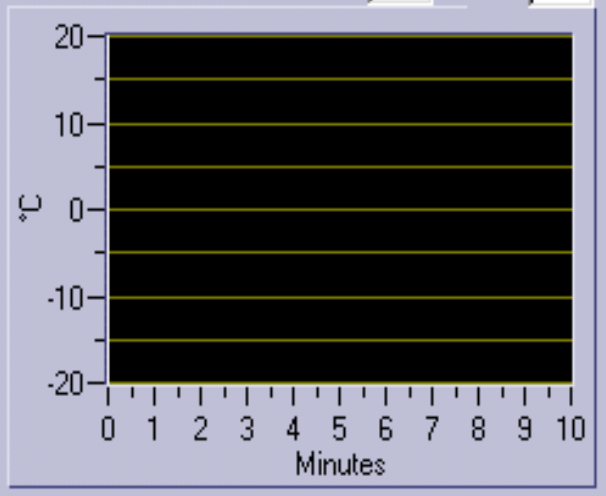
SpO2 Trend Min: 0 Max: 100



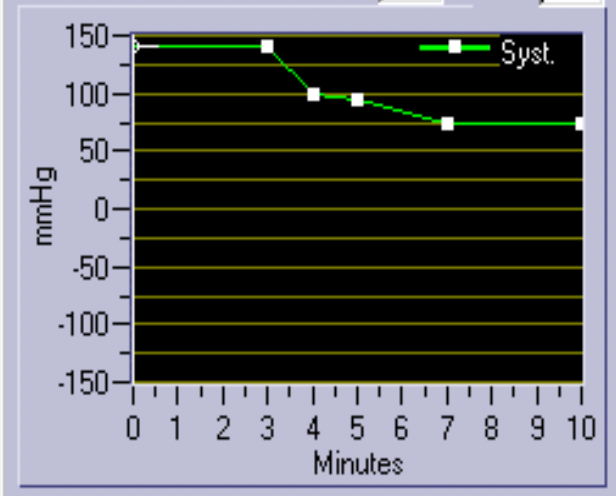
CO2 Trend Min: 0.0 Max: 20.0



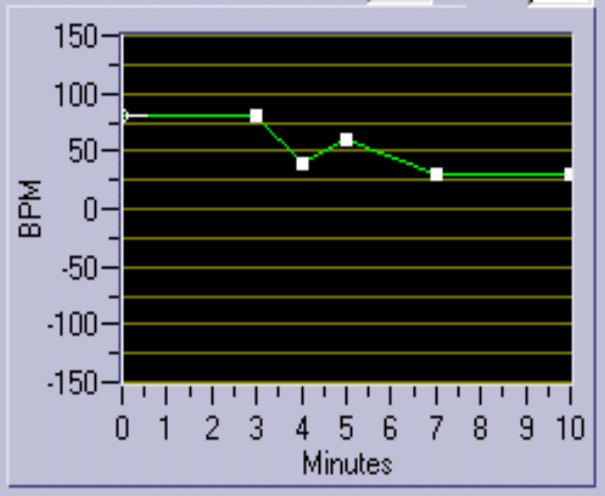
Temperature Trend Min: 25 Max: 45



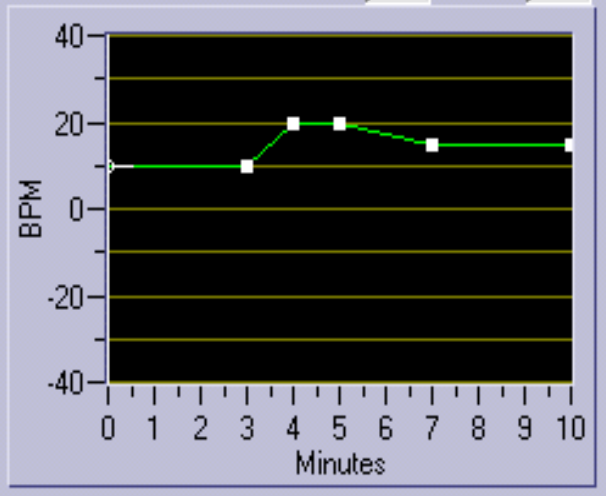
Blood Pressure Trend Min: 0 Max: 230



Heart Rate Trend Min: 0 Max: 200



Breathing Rate Trend Min: 0 Max: 40

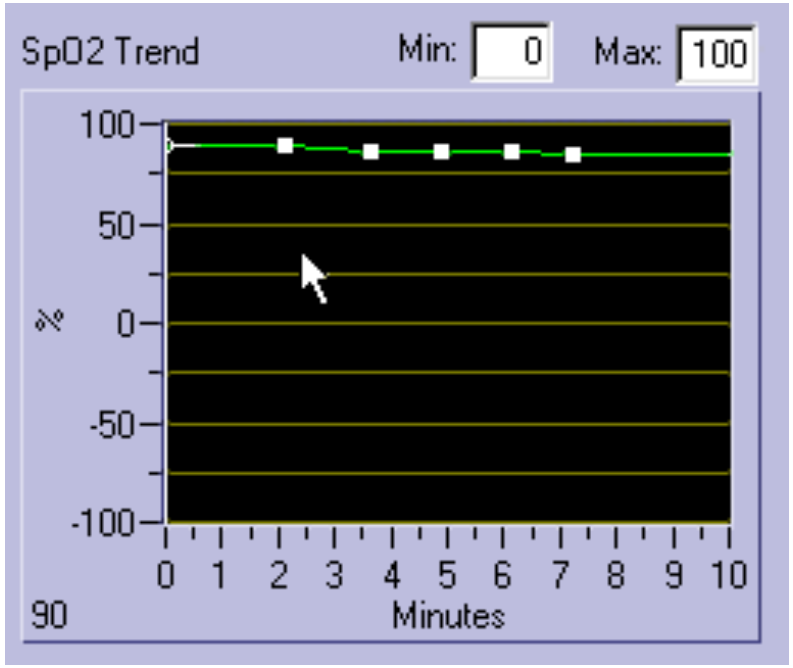


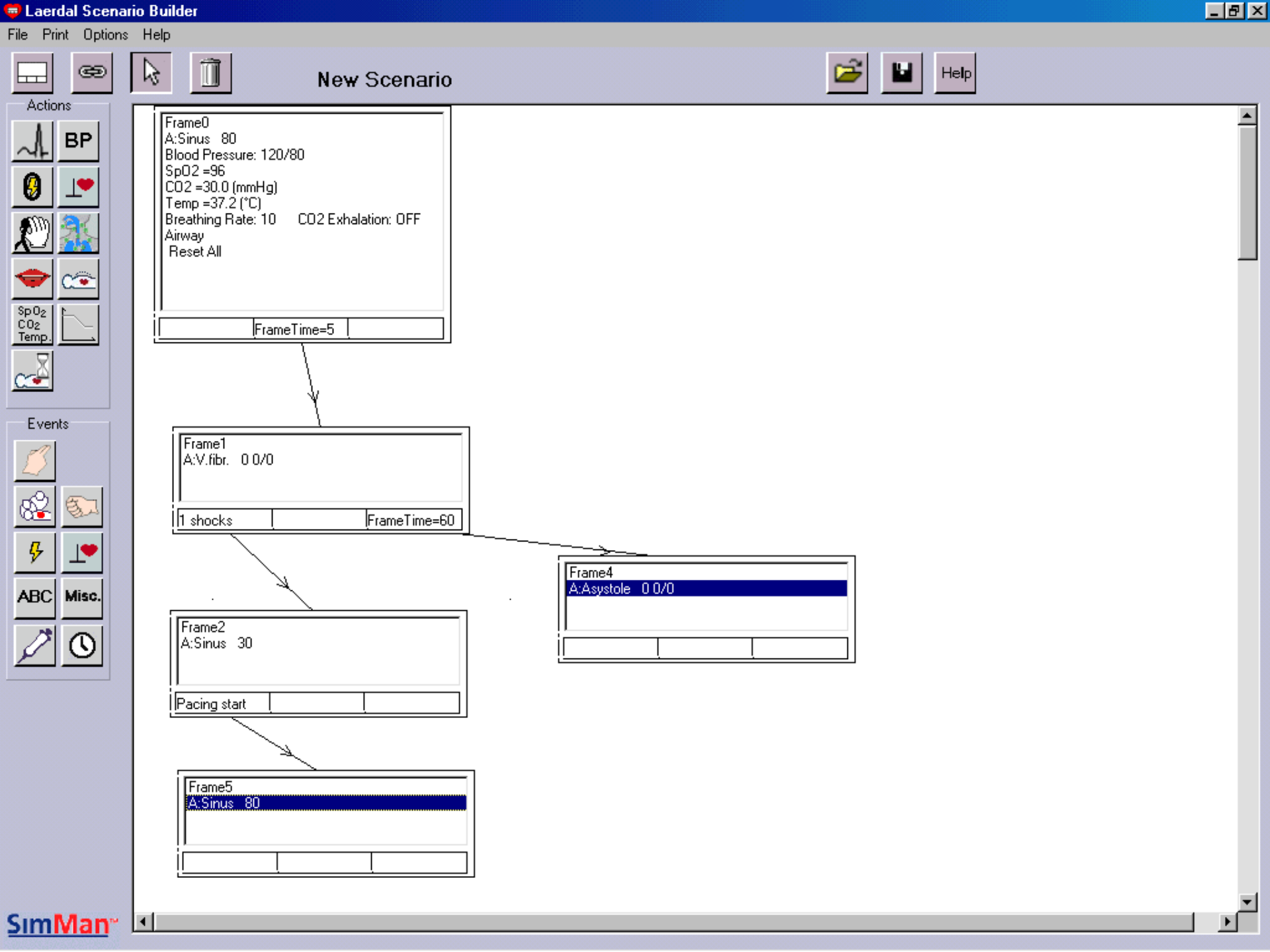
Edit Diastolic

Close

生命体征趨勢圖

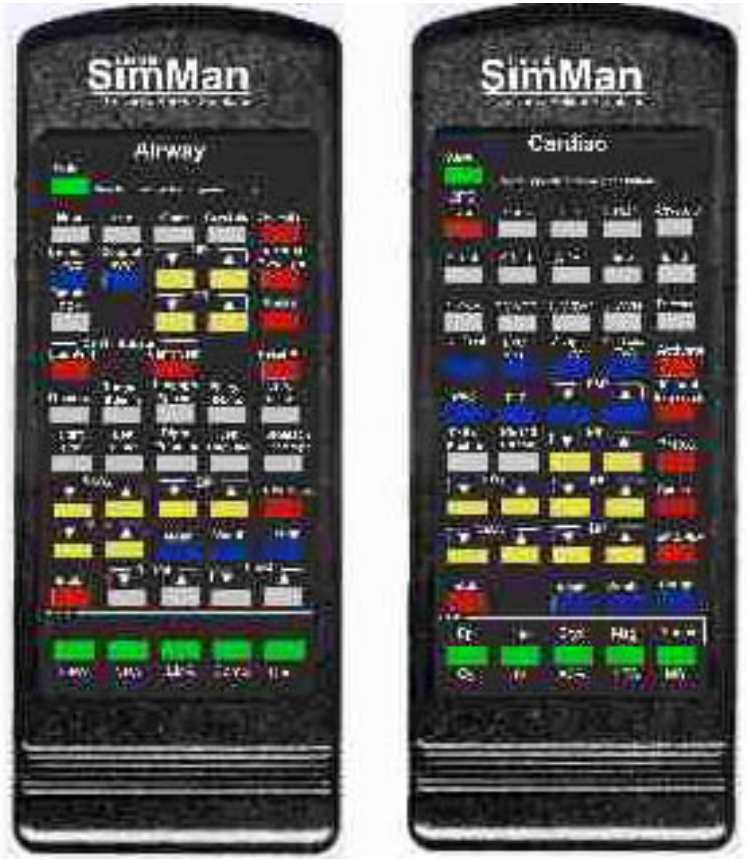
- **Sp02**
- **CO2**
- 有創/无創血壓
- 體溫
- 心跳率
- 呼吸率




Laerdal Scenario Builder
File
Print
Options
Help
New Scenario
Help
Actions
BP
SpO2
CO2
Temp.
Events
ABC
Misc.
Frame0
A:Sinus 80
Blood Pressure: 120/80
SpO2 =96
CO2 =30.0 (mmHg)
Temp =37.2 (°C)
Breathing Rate: 10
CO2 Exhalation: OFF
Airway
Reset All
FrameTime=5
Frame1
A:V.fibr. 0 0/0
1 shocks
FrameTime=60
Frame4
A:Asystole 0 0/0
Frame2
A:Sinus 30
Pacing start
Frame5
A:Sinus 80
SimMan

搖 控 器

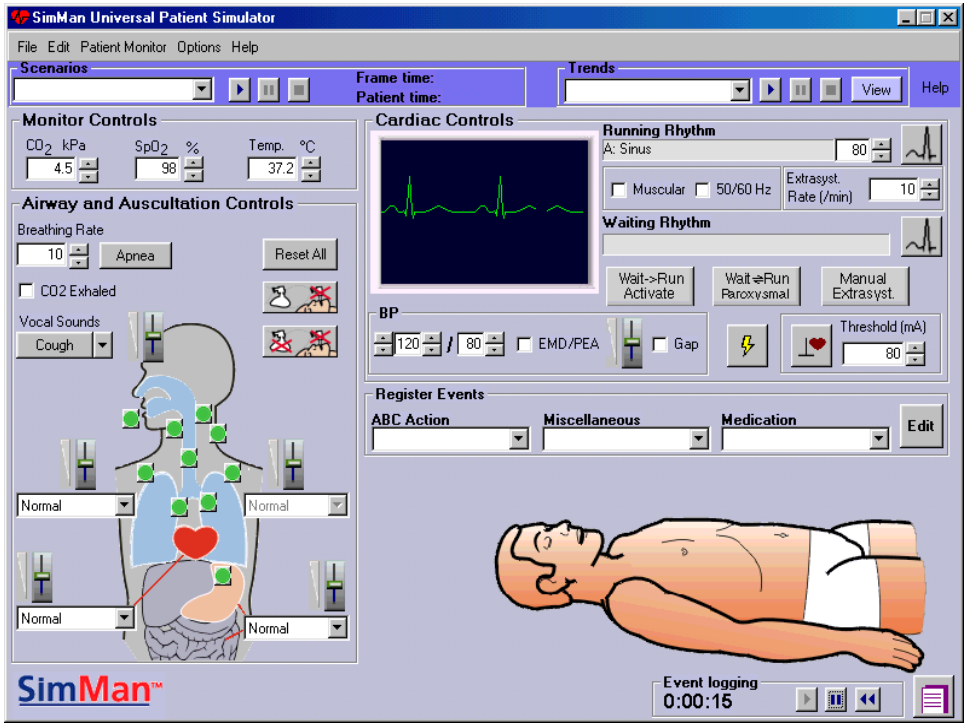
- 迅速設定
- 容易使用
  - 單一指導器
  - 滑鼠及/或 搖控



電腦控制

- 奔騰或相同級數
- **128 Mb** 記憶體
- 視窗 95 / 98 / 2000 / NT

- 一頁
- **Drop downs**
- 搖控
- 滑鼠
- 能夠被忽視



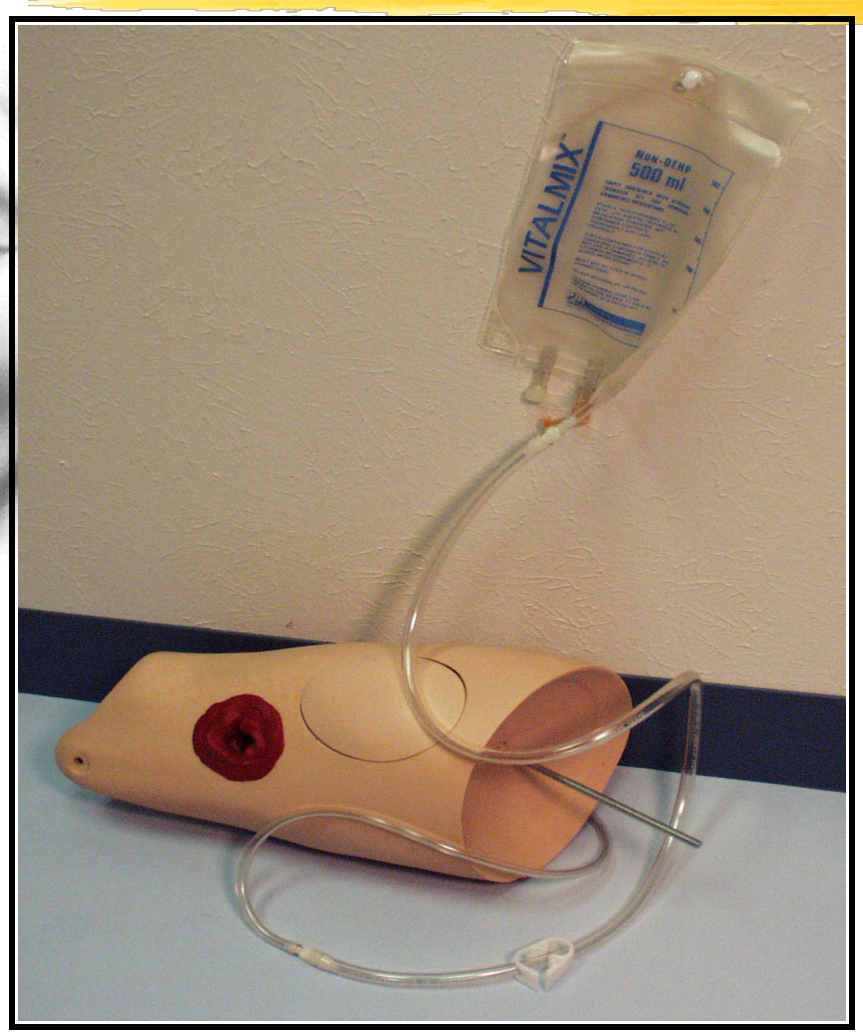
壓縮泵

- 主要操控器
- **Air outlet**
  - 人體模型
  - 噴射通器
  - **CO2** 瓶

創傷組合

Laerdal SimMan™ Universal Patient Simulator

腿部止血培訓

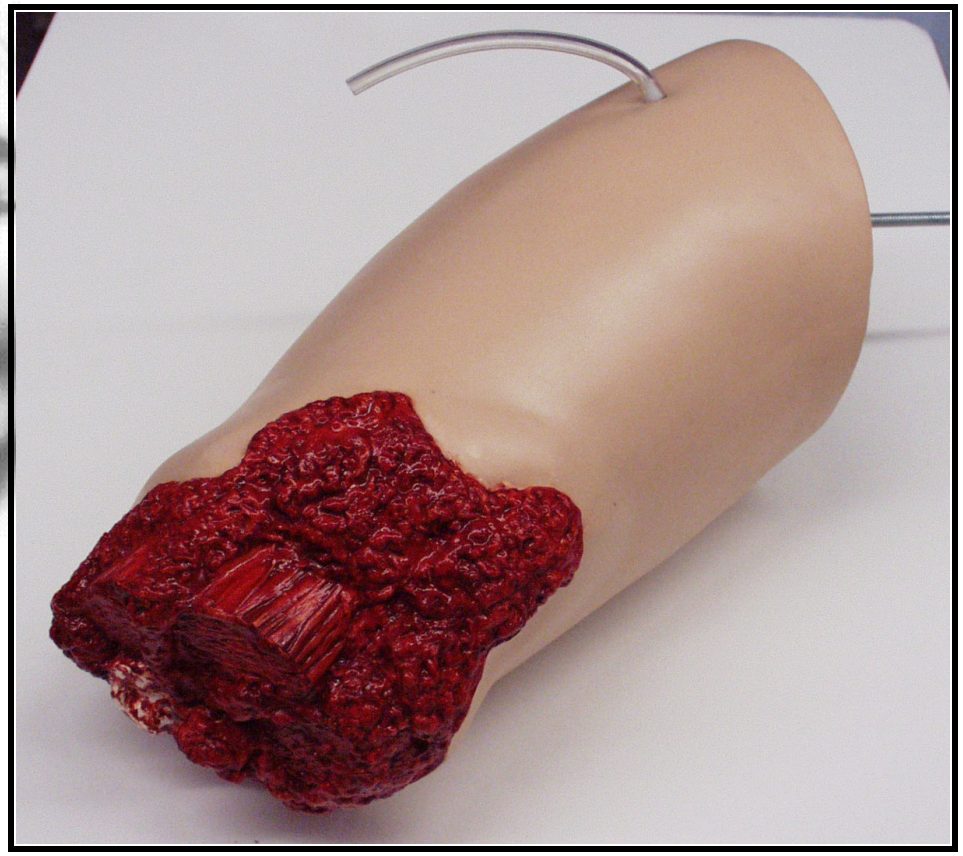


Bleeding Control leg.

腿部止血培訓

Amputated Arm Module

腿部止血培訓

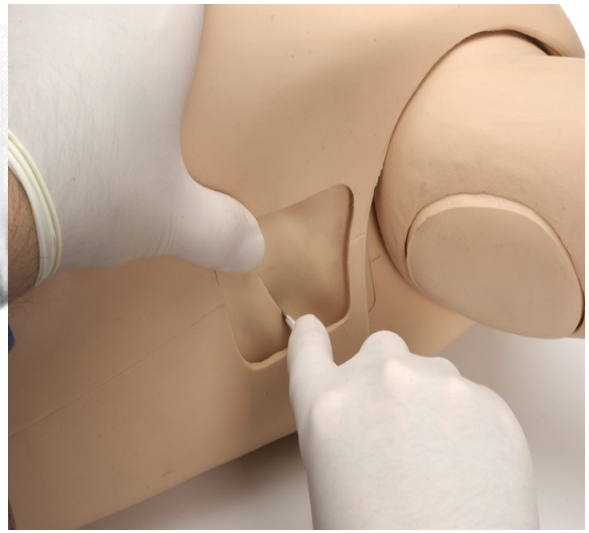


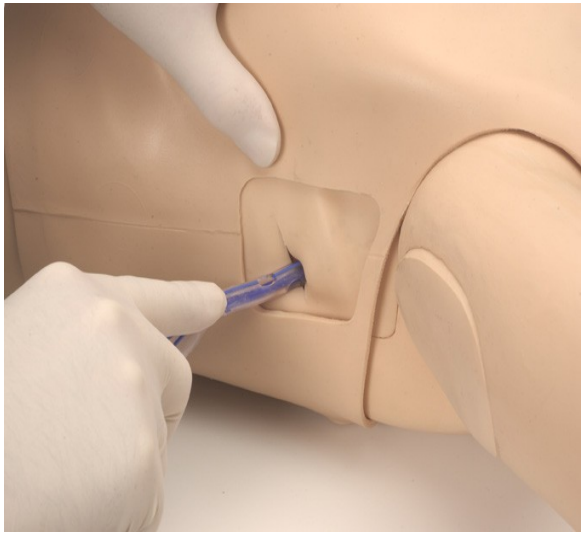
Amputated Leg Module

护理組合

Laerdal SimMan™ Universal Patient Simulator

胸腔引流





便易攜帶

Laerdal SimMan™ Universal Patient Simulator

- **Manikin is transportable whilst operating**
  - **Regulator unit**
  - **Power source**
  - **Carry bag**

Control Room

Laerdal SimMan™
Universal Patient Simulator

Debriefing

Laerdal SimMan™
Universal Patient Simulator

Standard Setting

Laerdal SimMan™
Universal Patient Simulator

Building Scenario

- Confirm teaching goals can be achieved using simulation
- Develop scenario, acquire equipment needed and prepare associated materials
- Test and validate the simulation

Laerdal SimMan™
Universal Patient Simulator

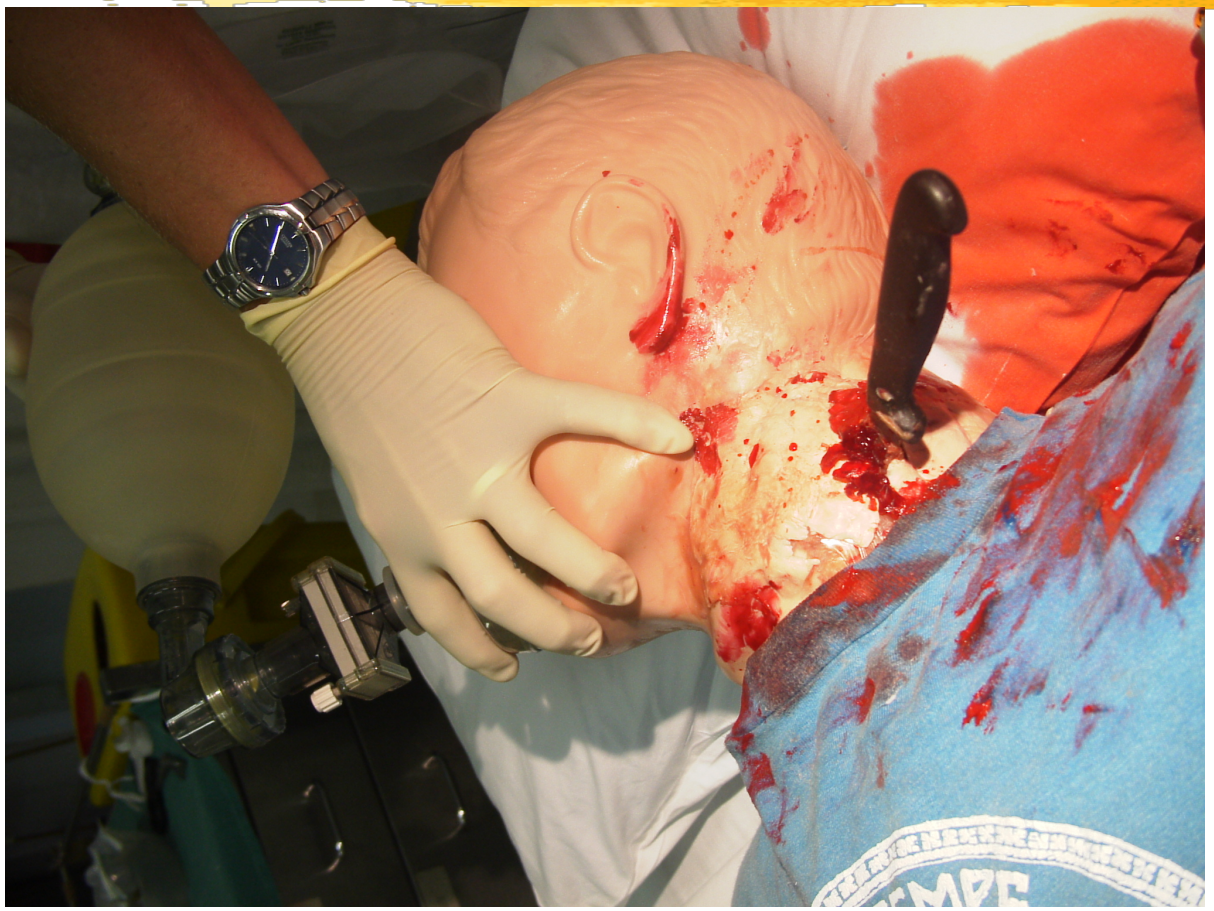
Southern Health Simulation Centre
Monash Medical Centre, Melbourne

Laerdal SimMan™ Universal Patient Simulator

SimMan has been used successfully in all sorts of scenarios.

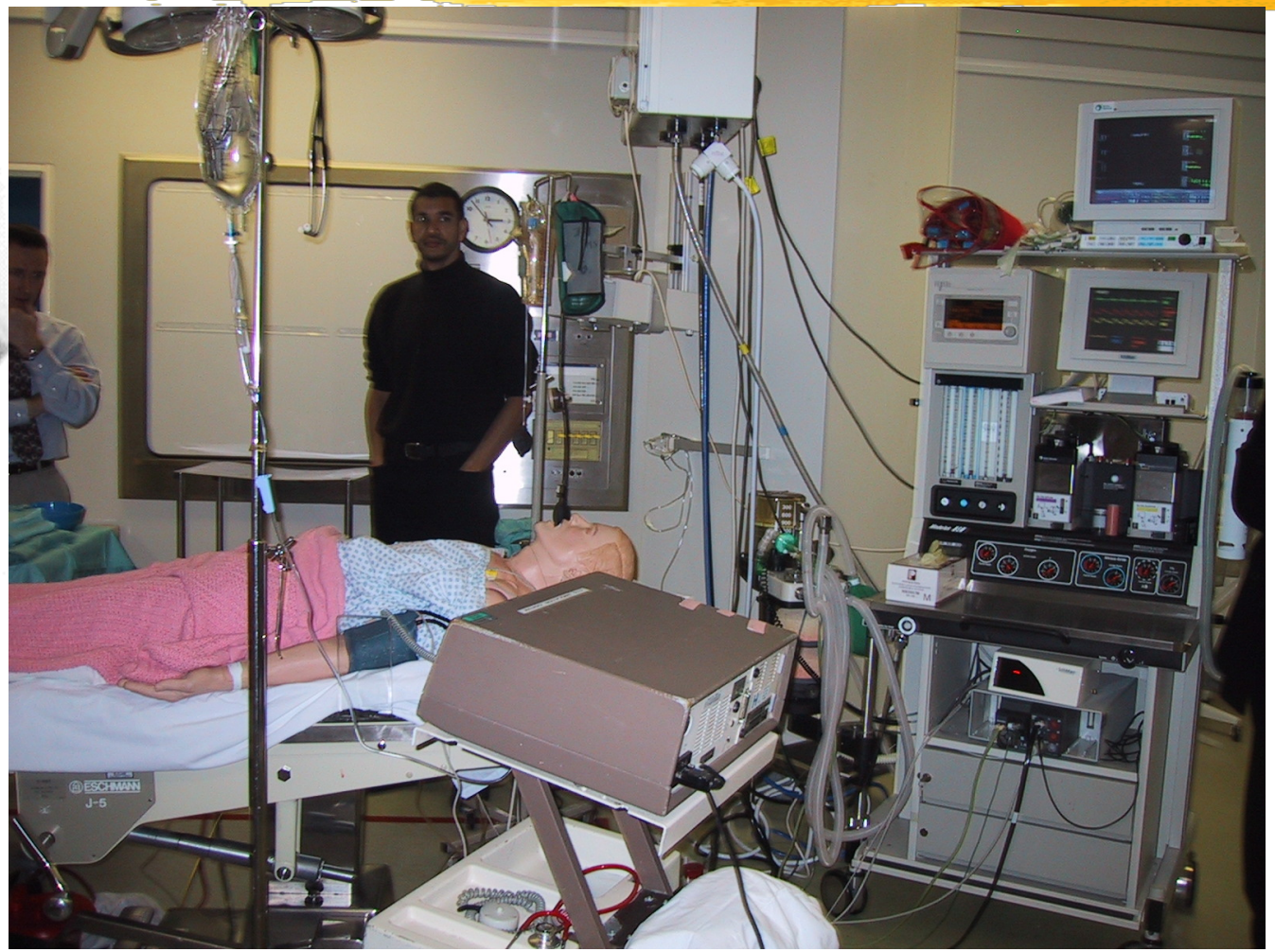
Sydney Medical Simulation Centre

Laerdal SimMan™
Universal Patient Simulator



London Simulation Centre

Laerdal SimMan™
Universal Patient Simulator



Singapore Civil Defense Force

Laerdal SimMan™ Universal Patient Simulator

INTENSIVE CARE ENVIRONMENT

Laerdal SimMan™ Universal Patient Simulator

Training with SimMan for different team of doctors

INTENSIVE CARE ENVIRONMENT

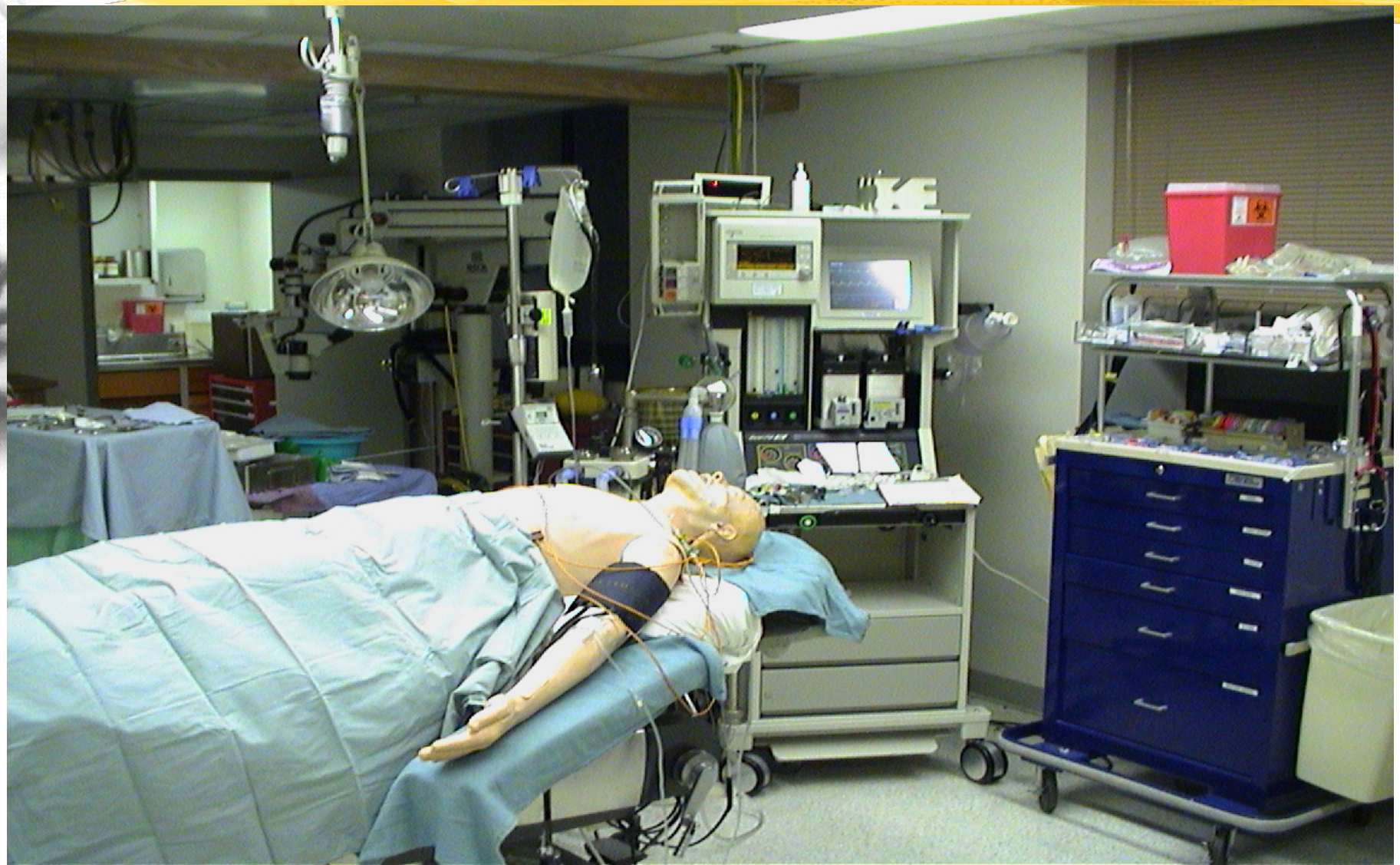
Laerdal SimMan™
Universal Patient Simulator

INTENSIVE CARE ENVIRONMENT

Laerdal SimMan™ Universal Patient Simulator

Training with SimMan for different team of doctors

2000-Anaesthesia Crisis Resource Management (ACRM)



SimMan at IMC Japan

Laerdal SimMan™
Universal Patient Simulator

Laerdal SimMan™
Universal Patient Simulator

SimMan at SDF med School

SimMan & Dr.Schaefer at NMS Chiba Hokusoh HP

Laerdal SimMan™ Universal Patient Simulator

JTEC course

SimMan inER

"BRINGING SIMULATION TO LIFE"

SimMan and AirMan

SimMan at the National Taiwan University Hospital II

Features implement

National Taiwan University Hospital III

Laerdal SimMan™ Universal Patient Simulator

Features implement

National Taiwan University Hospital

Laerdal SimMan™ Universal Patient Simulator

Features implement

USA Military Base

SimMan on Fort Sam – 134

SimMan in the 91W- 122

Laboratory

Laerdal SimMan™
Universal Patient Simulator

TRUE PORTABILITY

Laerdal SimMan™
Universal Patient Simulator

The patient, Mr. SimMan,
collapsed at the stairs.

The patient, Mr. SimMan,
being attended to.

TRUE PORTABILITY

Laerdal SimMan™ Universal Patient Simulator

"A rolling school"

Training instructor Morten Wagelie in Norwegian Air Ambulance Education.

Use of SimMan for training of Ambulance crew in Norway.

Obvious advantage: Training in actual confined space

SimMan

Laerdal
SimMan™
Universal Patient Simulator