SESAM 2003

Free Papers – Session One

Thursday 3 April, 1545 - 1700

Chair: Marcus Rall

1. **Medical Simulator Training Based on Goal Orientation and Learning Psychology Principles**
Carl-Johan Wallin
Centre for Advanced Medical Simulation, Huddinge University Hospital, Stockholm Sweden
Jan Hedegard,
Psychologist, MMIC, Norwich, England

2. **Simulation Training for the Introduction of New, Potentially ife-Saving Devices – The ProSeal Laryngeal Mask and the Laryngeal Tube compared on a mannikin.**
Ozadzinska J, Misiak M, Czaplinska M, Jarosz J, Symonides M
Simulation Centre, Department of Anaesthesiology, The Maria Slodowska-Curie Memorial Cancer Centre and Institute of Oncology, Warsaw, Poland

3. **Evaluating Anaesthesia Crisis Resource Management Training: processes and outcomes**
Emma-Jane Berridge
Researcher, Health Care Education Development Unit, City University, London

4. **Cathl – A new training concept in interventional cardiology**
Kornmesser U, Hesser J
Institute for Computational Medicine, University Mannheim, Germany
Coburger J, Voelker W
University Hospital, Würzburg, Germany
Schütz M, Mönk S
Clinic of Anaesthesiology, Simulation Centre, University Hospital Mainz, Germany

5. **Quality assurance for medical staff during airline transport – a new training concept**
Beyer C, Mönk S, Grass C, Vollmer J, Schütz M, ***Heinrichs W***
Clinic of Anaesthesiology, Simulation Centre, University Hospital Mainz, Germany

6. **Obstetric "Fire Drills" Survey**
T Blackburn, C Sadler
Barts and The London Medical Simulation Centre
St Bartholomew's Hospital, London

7. **Computer driven voice control for METI HPS Version 6**
Jochen Vollmer, Stefan Mönk, Claudio Weck, Wolfgang Heinrichs
Simulationszentrum der Klinik fur Anasthesiologie, Klinikum der Johannes Gutenburg-Universitat, Mainz

SESAM 2003

Free Papers – Session Two

Saturday 5 April, 1045 - 1145

Chair: Alison Budd

1. **Effects of Debriefing on Technical Performance in Novice Anaesthetists**
   Frances Forrest
   Bristol Medical Simulation Centre

2. **The present condition and the future of a full-scale patient simulator in Japan; The result of the questionnaire for universities in Japan**
   Yoshiroh Kaminoh, Ryu Okatani, Akira Aoki, Chikara Tashiro
   Hyogo College of Medicine, Nishinomiya City, Japan

3. **Stress Events and Cognitive Performance in Simulated Anaesthesia Crisis management**
   Christian Grass, Christian Beyer, Michael Schütz, Stefan Mönk, Stein-Erik Greter, Rudiger Maier, Wolfgang Heinrichs
   Clinic of Anaesthesiology, Simulation Centre, University Hospital Mainz, Germany

4. **Simulator Training: ContentStructure and Instructional Techniques**
   Jan Hedegard
   Psychologist – Human Factors Consultant, Norwich, England

5. **Simulation for the International Space Station: A Model for Cosmonauts on the Human patient Simulator**
   Mönk S, Vollmer J, Helou L, Schafer M, Heinrichs W
   Clinic of Anaesthesiology, Simulation Centre, University Hospital Mainz, Germany

6. ***Validation of simulators in endoscopic surgical training***
   Li Felländer-Tsai, Pär Ström, Ann Kjellin, Lars Särnå, Kai Mäkinen, Ericka Johnson, Leif Hedman, ***Torsten Wredmark***
   Centre for Surgical Sciences, Karolinska Institutet and Huddinge University, Tema Teknik Linkoping University and University of Ume↓

Evaluating Anaesthesia Crisis Resource Management Training: processes and outcomes

Emma-Jane Berridge, Researcher
Health Care Education Development Unit, City University

This is a work in progress report from a two-year research project at Barts and The London Medical Simulation Centre, London, UK.

The project focuses on Anaesthesia Crisis Resource Management (ACRM) courses in a medical simulation centre. The focus of ACRM training is on behavioural (non-technical) skills that are believed to aid crisis avoidance and resolution (ACRM 'Key Points'). Courses involve participation in scenarios that allow trainees to practise management of rare but life-threatening emergencies, followed by debriefing sessions with trained facilitators. The training scenarios are videotaped, in order to aid learning in the debriefing session.

While ACRM and other human factors courses feature increasingly in anaesthetists' training, the evidence-base is still developing. The current project attempts to evaluate ACRM training in terms of process and outcomes.

The research has two strands: evaluation of the impact of ACRM training, using a modified form of 360-degree appraisal alongside interviews with trainees; and evaluation of the facilitation of debriefing, using structured observation of videotaped debriefing sessions.

360-degree and interview strand
This concerns two outcomes of ACRM training: changed behaviour or attitude. It also explores trainees' experiences of learning in the simulation centre. It involves a novel application of the methodology of 360-degree appraisal, designed to detect differences over time rather than establish absolute levels of performance. Participating trainees identify 15 colleagues (in four categories: anaesthetic colleagues, surgical team, theatre nurses, operating department practitioners-ODPs). These colleagues complete a questionnaire rating of the trainee's performance in relation to the ACRM key points on two occasions, 12 weeks apart. Participating trainees also self-rate, 12 weeks apart. To date, we have developed and piloted the research instrument. Main data collection is now underway.

The quantitative rating is complemented by qualitative data from semi-structured interviews with trainees, before ACRM training, immediately following, and six months following ACRM.

Debrief video strand
Debriefing is key to learning from simulated scenarios. Tapes of ACRM debriefing from May 2000 onwards are available for analysis from courses where all participants gave consent for the research analysis (n>200). A structured observation schedule has been developed from detailed analysis of a small number of randomly selected tapes. This focuses on: ACRM Key Points (distribution of emphasis across & within different scenarios); facilitator strategies and behaviours; inter-facilitator interaction; dynamics of particular circumstances (e.g. defensive or unusually quiet trainee). The main phase of analysis of a cross-section of tapes is now ongoing. Debriefing sessions last approximately 30 minutes; observation of these sessions typically takes two to three hours. As a quality check, a proportion of tapes are additionally coded by an independent researcher.

Together, the two strands of the project will ultimately inform development of simulation scenarios, facilitator training and course development.

Funding: This project is funded by the Joint Research Board of The Special Trustees of St Bartholomew's Hospital. Grant Holders: Dr Della Freeth, Dr Richard Langford, Dr Chris Sadler, Dr Anne Gregg.

Quality assurance for medical staff during airline transport – a new training concept.

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Airborne patient transport will gain more importance with increasing distances as well as concentration of specialized diagnostic or therapeutic facilities in certain spots, e. g. university hospitals. Literature emphasizes the key role of competent medical personnel beside the organisational background.

Except for the German Interdisciplinary Society in Intensive Care (DIVI) recommendations there are no obligatory educational standards regarding the exceptional circumstances during airborne medical transport so far. Therefore the accompanying medical staff`s abilities are largely determined by internal standards of the actual airborne ambulance service or airline. Furthermore, the offered training options are now of a purely theoretical nature as yet.

In cooperation with the largest german air ambulance service, ADAC, and Lufthansa Flight Training (LFT) we have developed a new training concept intended for accompanying physicians and paramedics. It prepares for the special requirements needed and consists of theoretical aspects and - even more important – simulator-assisted training adapted to the special logistics in flight.

Our training program offers the following components:

A 1.5 day basic training provides management capabilities for stretcher transport of non mechanically ventilated patients.

The theoretical part deals with an introduction to our human patient simulator (HPS), crisis resource management, as well as organisational and legal aspects. Additional priorities are flight physiology, BCLS and ACLS. Using case reports, participants get to develop the complete procedure of air transport. Another „hands on“ station introduces to the medical emergency equipment on board.

Exercise takes place in the cabin simulators of LFT. The trainees have to treat various medical emergencies in HPS under realistic flight conditions, especially to deal with the confined space on board. Every scenario consists of a briefing, the case itself, and a debriefing supervised by an instructor experienced in this type of education. In advance, participants get an insight in the specific emergency procedures of airlines, where, in addition to the possible medical problems, potentially upcoming emergencies concerning the plane (rapid decompression, fire on board, how to handle emergency exits) are addressed.

To get a better understanding of possible problems of handicapped persons equipped with a cast and crutches during air travel, trainees can gather their own experience in the moving cabin simulator.

The advanced training based on these basics lasts another 1,5 days and sets its main focus on mechanically ventilated intensive care patients in the patient transport compartment (PTC). This course focuses on modern ventilation concepts, differentiated medical therapy and new sedation concepts as well as ACLS under altered pathophysiological conditions during flight.

Technical requirements as well as possible legal confrontations (e. g. laws concerning opioid possession and transport) are discussed. An introduction to an original PTC set up in a Boeing 747 cabin simulator, follows. Several scenarios are treated using the HPS in the PTC.

An internet platform for exchanging experience and frequent questions completes the program.

In progress is a regular expert meeting involving emergency physicians and intensivists together with experts of the ADAC and LFT.

Simulator-Based Learning for Obstetric Anaesthesia

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Introduction: Simulation based training has been shown to be an effective tool[1]. The Obstetric Anaesthetic Training in the Simulator (OATS) Course has been developed as a training course for Year 1 SpRs and senior SHOs. This one-day course challenges candidates with a variety of obstetric based high fidelity clinical scenarios, exploring knowledge and clinical abilities. Each scenario is followed by a debriefing involving group discussion and constructive feedback led by the course facilitators. The impact of the first five courses has been evaluated.

Method: Questionnaires were completed at the beginning and end of the OATS course. Candidates were asked to assess on a scale of 1 (not at all confident) to 10 (very confident) *"How confident are you in your ability to manage the following range of obstetric anaesthesia problems?"* In addition, they were asked *"Will today's course assist you in your daily practice?"* scoring 1 (not at all) to 10 (very much so). Data were evaluated using Wilcoxon signed ranks test (significance $p<0.01$).

Results: Data were collected from 29 candidates attending 5 OATS courses. Mean anaesthetic experience was 35 months (SD 11 months). Data = median (IQR).

	Pre-course	**Post-course**	
Site CSE	9 (7-10)	9 (8-10)	p<0.01
Maternal arrest	7 (5-7)	7 (7-8)	p<0.01
Failed intubation	7 (6-8)	8 (7-9)	p<0.01
Dural puncture	8 (6-9)	9 (8-10)	p<0.01
Haemorrhage	7 (6-8)	8 (7-9)	p<0.01
Post-natal PDPH	8 (7-9)	9 (7-9)	p<0.005
Eclamptic fit	7 (5-8)	8 (7-9)	p<0.0005
Total spinal	7 (5-8)	9 (8-9)	p<0.0005
P E	5 (4-7)	7 (7-8)	p<0.0005
A F E	5 (4-7)	7 (6-8)	p<0.0005

"Will today's course help you in your daily practice?"

Median (IQR) = 9 (8-10)

Conclusion: Attendance at the OATS course significantly improves trainees' confidence in their ability to manage a number of serious obstetric anaesthetic crises. In addition, trainees believe the course is helpful in their daily clinical practice. However, it is acknowledged that competence and performance does not necessarily follow confidence.

References:

Forrest F et al. Use of a high-fidelity simulator to develop testing of the technical performance of novice anaesthetists, Br. J. Anaesth. 2002 88: 338-344.

Obstetric "Fire Drills" Survey

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St Bartholomew's Hospital, London

Introduction:
The C.E.M.D.s have recommended that all obstetric units should organise regular "fire drills" for cases of massive haemorrhage[1]. The D.O.H. recognises that medical simulation centres may have a role in such training to "expose staff to risk situations with no actual patients involved"[2]. This survey was compiled to ascertain the level of implementation; experiences with location and staffing; the attitudes of anaesthetists towards them and the potential role for medical simulation centres.

Method:
OAA approved questionnaire sent to the lead consultant obstetric anaesthetist of all UK units.

Results:
Questionnaires were posted to 260 units and 203 completed forms were returned (78% response). Only 92 units (45%) had run "fire drills": of these, 61% had run less than 3 in the last year. Haemorrhage was the commonest scenario used (at 84% of units). Additional drills included maternal cardiac arrest (39%), collapse (33%) and convulsions (32%). All units except one, involving midwives alone, ran multi-disciplinary scenarios. At most units drills were run on labour ward (82%) or in obstetric theatre (33%). Although only 5% of units used simulation centres, 59% of respondents felt they would be suitable. At 29% of units protocols had changed as a result of running the drills.
111 units (55%) had not run "fire drills". The most frequently cited reasons were "no time" (37%), "no funding" (30%), "no staff" (19%), "don't know" (15%) and "not worth the effort" (5%). Nevertheless, 49% of these units stated that they were intending to introduce them soon. 93% and 74% of the "fire drill" and "non fire drill" groups respectively agreed that other multidisciplinary training exercises would be of value to their units.

Conclusions:
This survey suggests that just under half of UK obstetric units have implemented "fire drills" for critical situations. Only 18% of all units have run more than 2 drills in the past year. The commonest reason for not implementing drills was lack of resources. The majority of anaesthetists appear to appreciate the value of multi-disciplinary team training. Whilst the clinical environment may be the most appropriate location for "fire drills", fitting this in with daily duties on a busy labour ward is proving difficult for many units. Where available, simulation centres may offer an alternative location for multidisciplinary training.

References:
1. Confidential Enquiry into Maternal Deaths in the United Kingdom 1994-1996 and 1997-1999
2. Building a Safer NHS for Patients. Department of Health 2001

Validation of simulators in endoscopic surgical training

Li Felländer-Tsai, Pär Ström, Ann Kjellin, Lars Särnå, Kai Mäkinen, Ericka Johnson[2], Leif Hedman[3], Torsten Wredmark

Speaker: Torsten Wredmark
Centre for Surgical Sciences, division of Orthopaedics, Karolinska Institutet and Huddinge University Hospital
Centre for advanced medical simulation

[2] Tema Teknik Linköping University, [3] Department of Psychology, University of Umeå

Introduction: Human error is ubiquitous and inevitable. The rationale for involving in advanced medical simulation is improved patient safety. Much of the focus in today's health care lies in the development of new technology. Man-machine interaction is complex and sets new demands on education. Pedagogical standards in medicine must now move from "know how" to "show how". Here simulators have clear benefits since performance can always be measured. Much of our previous and present research focuses on construct validation and knowledge transfer in endoscopic surgery. Surgical simulators will gradually be implemented in surgical training and must therefore be validated.
Methods: Twenty-six medical students and 28 specialists in endoscopic surgery were included in the study, Seven task test in the Procedicus MIST (Minimal invasive surgical trainer) and the instrument navigation test in the Procedicus KSA (Key surgical activities) was performed. Statistical analysis was performed with t-test and correlation analysis.
Results: Specialists in endoscopic surgery performed better in both the Procedicus MIST and the Procedicus KSA compared to medical students..
Discussion: The results from this study indicate that the Procedicus KSA simulator has face validity for surgical endoscopic training, which has also been shown in previous studies. Development of assessment models for the study of transfer from VR to OR are under development in order to study construct validity. Further validation studies will be crucial for the justification of the implementation of simulation in a broader range in medical education and health care.

Evaluation of the Care of Critically Ill Patients (COCIP) course.
A nurse orientated, simulation based course

Judith Stedeford, FRCA, Sally Wilson, RN, Frances Forrest, FRCA
Bristol Medical Simulation Centre

Background
In 2000, we developed a three-day course designed to teach D and E grade nurses how to recognise and treat critically ill patients on the general ward. Between February 2000 and April 2002 we ran eleven of these three-day courses at Bristol Medical Simulation Centre (BMSC) teaching a total of 111 nurses from the United Bristol Healthcare Trust.

The aim of the course was to improve nurses' skills in assessment and initial treatment of sick or deteriorating patient s on the general medical and surgical wards. Using a combination of mini-lectures, workshops and simulator based patients, nurses were taught about assessment of the respiratory, cardiovascular and renal systems. For completion a short section on pain management was included on the last teaching day.

Assessment of learning
Course participants were asked to complete a pre and post course test. T-test analysis of the scores showed statistically significant improvement ($p<0.001$) with questions on oxygen therapy and assessment of acutely ill patients improving the most.
Candidates were approached at 6 weeks and 6 months after the course to complete two further questionnaires.
At six weeks 93% of respondents (43% return rate) felt their expectations had been met by the course and they felt more confident in caring for acutely ill patients. At six months these themes were still apparent.

Assessment of the course
All BMSC courses are assessed on content and presentation using a 5 point score (maximum of 5). Collated scores for each of the three days are shown in Table 1. Participants were not asked directly how the use of the simulator enhanced the course, but it was commonly stated that the simulator based patients were most beneficial and helped in logical assessment of the acutely ill patient.

Table 1:

	No of attendees	Mean scores for content	Mean scores for presentation
Respiratory Day	111	4.41	4.52
Cardiac Day	111	4.51	4.69
Renal Day	111	4.72	4.46

The final poster will contain
1) programme of course
2) example of course test

Does debriefing novice anaesthetists after simulator practice improve technical performance in the first three months of training?

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Consultant Anaesthetist

S Grimes FRCA [1,2]
Consultant Anaesthetist

K. Postlethwaite MA, D Phil [3]
Senior Lecturer in Education

Background:
Previously we developed and validated a scoring system to track the technical performance of six novice anaesthetists in the simulation suite during their first three months of training [3].

Method:
Using a different group of six novice anaesthetists the study was repeated with one difference. After the first three visits (weeks 1,2 and 4) novices were debriefed on their performance.

Results:
Novice scores improved significantly over the twelve week period ($p<0.001$ rater1 and rater2). Using rater 2's data the technical scores of this and the previous novice study were compared. The standard error of the mean for technical scores in week 1 suggested novices were from similar populations ($0.317<p<0.5$). Non-paired, two tailed t-tests comparing scores from the two studies at each visit showed significant differences ($p<0.05$) in scores at week 4 ($p = 0.03$) and week 8 ($p= 0.04$), but no significant difference at weeks 1, 2 and 12.

Conclusions:
Debriefing novices after simulator performance in the first weeks of training accelerated learning of technical skills but did not lead to better technical performance at the end of a three month study period.

Keywords:
Performance, anaesthesia, simulators, debriefing

SIMULATOR TRAINING: CONTENT STRUCTURE AND INSTRUCTIONAL TECHNIQUES.

- Some examples of practical application and their methodological background

Jan Hedegard, Psychologist - Human Factors Consultant, Norwich.

OBJECTIVE.

The objective of this paper is both to discuss methods of structuring simulator training content and to describe a sample of instructional techniques which could be used during simulator training involving any type of trainees

BACKGROUND.

The efficiency of simulator training depends to a large extent on the overall training structure including how the content is presented to the trainees before a simulator session as well as the instructional techniques used by the instructor during such a session. When initially developing the necessary leading training structure and instructional principles for its simulator training, a newly established simulator training organisation could derive or directly transfer invaluable recommendations and hints from learning psychology findings. The content structure could be determined by applying the principal order for knowledge acquisition, understanding and practical exercise of the training content which was researched and propounded forward by inter alia B S Bloom already in the early 1950´s. It remains valid today.

Learning psychology research results also provides cues how to act as an instructor during simulator sessions. As the purpose of simulator training is principally to establish fruitful behaviour or behaviour patterns to be applied in specific situations, the simulator instructor’s task is to teach the trainee to identify in which situation a certain behaviour should be applied and how to correctly carry out this behaviour. The speed and accuracy of learning is highly influenced by the instructor’s way of reinforcing correct responses and dealing with incorrect responses from the trainee. Detailed recommendations on how to do this could be derived form learning psychology and human information processing models.

CONTENT.

It is proposed that the speech be divided into three parts:

i) Overall training structure method.
   A practical method for structuring of training content, based on B S Bloom´s taxonomy of training goals, will be described. A practical example, taken from trauma sessions using a patient simulator will be given.
ii) A sample of instructional technique principles.
   Two principles for how to act as an instructor during a simulator session will be explained:
   - "When learning a completely new behaviour, the trainee should only practise this new behaviour and no other behaviour". This means that the instructor should intervene when the trainee is deviating from the correct behaviour.
   - "The correct behaviour should be immediately practised after an incorrect behaviour has been carried out by the trainee". According to this principle the instructor should clarify the correct behaviour together with the trainee and then, if possible, return to the point in the scenario where the trainee acted wrongly and let the trainee practice the correct behaviour.

   A practical example, taken from cockpit or control room situations, of both these principles will be described
iii) Time for questions from the audience.

The present condition and the future of a full-scale patient simulator in Japan: The result of the questionnaire for universities in Japan

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Introduction: The educational system of medicine in Japan is being improved quickly. It is expected that medical students and residents can received effective education by the educational program using a full-scale patient simulator (FPS). 24 anaesthesia departments own 25 FPS (14 METI HPS, 2 METI PHS, 6 CEA MedSim, and 3 Laerdal SimMan) in Japan, and it is expected that the number of FPS increase further. However, there are problems, such as human and economical resources, in use of FPS, and the opportunity to exchange information mutually is also restricted. We conducted the questionnaire survey about the present condition of the educational program using FPS, and the future view. **Method:** The questionnaire was sent to anaesthesia department of 80 medical schools in Japan by mailing, and replies were collected by mailing. There are a total of 45 questions in a questionnaire. The institution that owns FPS replies to 33 questions among these, and the institution that does not own FPS replies 31 questions. **Results and Discussion:** The reply has been sent from 61 out of 80 schools (recovery rate is 76%). 14 out of 24 schools, which own FPS, sent the replay. Although the recovery rate from the institution that owns FPS was 58%, that from the institution that does not own were 84%. Such a high recovery rate relates with the high concern about the educational program using FPS. However, the human and economical resources of the institution that owns FPS are unsatisfying. 50% can get the maintenance expense of FPS from university. There is no institution with the full-time staff for maintenance and management of FPS. Only one person can start and operate FPS in 4 institutions, and no one can make patient and write scenario in 3 institutions. In six institutions, FPS is installed in the room that aims at FPS installation, but five institutions use FPS in a part of room for other purpose. Consequently, there is extremely little use time of FPS; 50% of institutions use FPS less than 3 hours per week. Most of institutions indicated that lack of human and economical l resources is the factor, which obstructs use of FPS. Nevertheless, all of the institution agreed that the use of FPS in medical education is useful. It was agreed that the workshop about the usage of FPS is required. Moreover, there were many opinions that the information about the situation of FPS use and scenario written in other institutions is useful. **Conclusion:** Although the expectation for the education using FPS in Japan is high, it is hard to say that FPS is used effectively. Human and economical resources for maintaining and managing FPS need to be secured, and the usage of FPS and the information about management of an educational program need to be provided.

CathI - A new training concept in interventional cardiology

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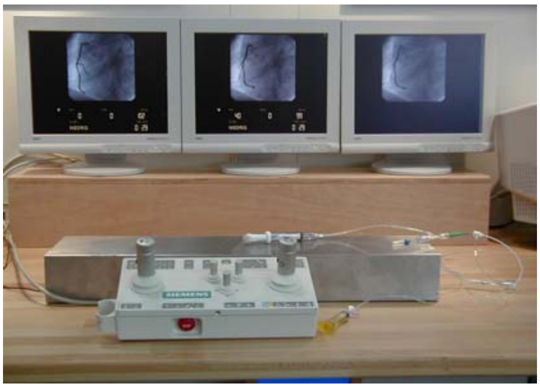
[3]Clinic of Anaesthesiology, Simulation Centre, University Hospital Mainz, Germany

This paper describes a training system that allows the simulation of coronary interventions. Training systems gain increasing interest due to their improving ability to simulate the reality of the interventions. Presently, most simulation systems concentrate on a specific task without considering possible physiological reactions. Within the last few years several simulation systems for coronary interventions have been developed. These are VIST[1], ICard[2], and SimSuite[3]. They allow training the navigation of catheters and guide wires under X-ray, the injection of contrast agent, and the inflation of the balloon in a stenosis. The aim is to learn the hand-eye-coordination to reduce the amount contrast agent, radiation dose and the intervention time[4][5].
CathI (Catheter Instruction System) provides a realistic-as-possible training of an intervention in the catheter laboratory. Therefore, real-life instruments like original guide wires, catheters, syringes, pressure pumps, control instruments for X-ray are used. Furthermore, the display of the monitors, the force-feedback of the catheters and the guide wires are mimicking real-life conditions. This allows us to extend the lerner-group from beginners to experienced cardiologists who can train the management of complications.



For beginners one major difficulty of the PTCA is the personal development of a a mental 3D coronary model based on X-ray projections of the beating heart. A Having this model in mind the navigation of catheters or guide wires through the blood vessels are greatly simplified.
Furthermore, the radiation dose and the injected contrast volume should be minimized The efficient and economical control of the C-arm positions so that an optimal view both for diagnosis and therapy can be obtained in minimal time.. For example, a beginner requires roughly four times as much dose and 30% more contrast agent compared to an experienced cardiologist.
We are currently evaluating the system in the cardiological department of the universityc linic in Würzburg and the simulation center at the clinic of anaesthesiology at the university clinic in Mainz. There, we register the individual learning curves, compare them to those of individuals learning directly "at the table" and evaluate the performance using animal models.

[1] Mentice Medical Simulation, Sweden
[2] Wang Y.P, Chui A.Y.C, Cai Y.Y., Lim H.L., Mak K.H.: ICard: An Interventional Cardiology Simulator for Percutaneous Coronary Revascularisation, Computer Assisted Radiology and Surgery (CARS 1998), Tokoyo, June 24-27 1998
[3] Medical Simulation Corporation, USA
[4] Dawson L.S., Cotin S., Meglan D. Shaffer D.W., Ferrell M.A.: Designing a Computer-Based Simulator for InterventionalCariology Training, Catheterization and Cardiovascular Interventions 51 (2000), p. 522-527
[5] Klein L.W.: Computerized Patient Simulation to Train the Next Generation of Interventional Cardiologists: Can Virtual Reality Take the Place of Real Life? Catheterization and Cardiovascular Interventsions 51 (2000), p. 528

Simulation for the International Space Station: A Model for Cosmonauts on the Human Patient Simulator

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Introduction

Zero gravity or microgravity produces physiological changes in cosmonauts which have to be taken into consideration when planning space travel. The existence of a permanently manned space station as well as the plans for a journey to Mars and the fact that the selection of future cosmonauts may be based less on reasons of personal fitness than up until today cause a new focus on space medicine. This includes physiological modelling as well as planning for medical emergencies.

Problem

The human organism is not only subject to low gravity conditions during space flight but also to high acceleration and other conditions during launch, flight and deorbit. While conditions vary between flight phases they remain relatively constant during these phases. Little experience exists how these conditions influence medical treatment and which treatment modalities exist at all during space flight. In addition to that it is not even clear for which situations the crews should prepare and what equipment should be taken along on a space journey. Since the medical knowledge and experience in cosmonauts is often solely based on limited emergency training it may be necessary to use telemedicine to support decision making and treatment aboard spacecraft.

Method

The Human Patient Simulator is a suitable tool for the preparation for space flight: It incorporates physiological models which may be accessed in enough details to allow simulation of changes during space flight. Moreover its physical representation of the human body allows the use of real medical equipment to practice the actual tasks necessary to diagnose and treat aboard a spacecraft.

As a first step of a programme to use HPS to support space medicine we defined typical physiological changes and typical flight situations and typical medical conditions in order to plan for medical needs aboard.

Result

From literature data we derived a possible healthy cosmonaut, the major changes in physiology being cephalad volume shift, reduction of intravasal volume and peripheral vasodilation.

Typical flight phases were defined and the physiological changes during these phases applied to the virtual cosmonaut in the form of scenarios:

1. Preflight
2. Lift off
3. Orbital entry
4. Short term space flight
5. Long term space flight
6. Extravehicular activity
7. Re-entry
8. Postflight

Discussion

HPS' physiological models are suitable to represent cosmonauts. The hardware may be used as a cosmonaut substitute to simulate medical activity aboard. The physiological modelling is limited due to the lack of long term adaptation mechanisms in the HPS. In training areas of limited space it may be better to use the Emergency Care Simulator which combines physiological modelling with less hardware requirements in comparison to HPS. Both devices should play a role in the medical training of space crews and as a planning tool for future journeys.

The concept of Crew Resource Management which is well established in aeronautics and is beginning to be so in emergency medicine and other medical fields makes patient simulation even better suited for medical training for space flight.

STRESS EVENTS AND COGNITIVE PERFORMANCE IN SIMULATED ANESTHESIA CISIS MANAGEMENT

Christian Grass, Christian Beyer, Michael Schütz, Stefan Mönk, Stein-Erik Greter, Rüdiger Maier, Wolfgang Heinrichs

1. Introduction:

We examined the effects of the complex scenario „Malignant Hyperpyrexia“ as a psychphysiological stress event in participants of „Crisis Ressource Management“ (CRM) simulator courses.

2. Method:

We used the METI HPS running software version 5.0 for the scenario and an OSA 3.0 (MediTECH Electronic GmbH) testing device. Data were gained during regular CRM courses. The psychophysiological method of assessing the order threshold (OT) was used to examine cognitive performance. Data were achieved both, prior to and after the standardized scenarios were held. A loss of mental capability is reflected by an increase in the OT compared to baseline values.

3. Results:

10 participants (m = 8, f =2) were evaluated. The average age was 38 y. The OT prior to the scenario was 106.5 (SEM ± 64.7) and 107.5 (SEM ± 35.3). The total time to run the first test was 353.10 (SEM ± 64.7) sec. The second test, after the scenario, averaged at 305.9 (SEM ± 54.7) sec. Participants needed 353.10 (SEM ± 64.7) sec for the first test and 305.90 (SEM ± 54.7) sec for the second test.

4. Discussion:

The randomised group of participants was homogenous, so that there can be considered no influence of the age on the OT. There was no significant change on the OT before and after test. As a conclusion we postulate that participants were on the same level concerning the capability of cognitive performance before and after the scenario, based on the measurement of the OT. But participants solved the test after the scenario considerably faster. This could show that anaesthetists are able to manage a critical incident without a loss of quality of their reactions or fatigue. A critical incident does not influence the concentration of the anaesthetist significantly in this setting.

Simulation Training for the Introduction of New, Potentially Life-Saving Devices - The ProSeal Laryngeal Mask and the Laryngeal Tube Compared on a Mannikin

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Introduction: Due to the registration of two new devices designed for easy airway maintenance, even by untrained personnel, we have designed a method scenario to allow for thorough analysis of the equipment at the only Simulation Training Centre in Poland. The analysis was designed to verify the assets reported by manufacturers in direct practice and covered general training, simple comparison of the devices and choice of equipment at hand under stress.

Aim: We performed a 3-step study on a manikin to compare the use of the ProSeal laryngeal mask (LM) and the LT laryngeal tube (LT).

Material & Methods: Step 1 consisted of training in the use of the LT and the LM. Training in LT covered 75 persons (12 doctors, 63 nurses). Training in LM covered 43 persons (19 doctors, 24 nurses). Step 2 consisted of comparing the easiness of insertion of the LT and the LM – the trainees drew lots to decide which device was inserted first and which second, and then completed a questionnaire - altogether 34 persons were trained. Step 3 consisted of a prepared scenario – life-threatening apnea i.e. call for immediate airway maintenance. The trainee entered the room and found no laryngoscope nor intra-tracheal tube – the apparently most obvious solution. The offered choice of equipment was Ambu-bag with face-mask, oro-pharyngeal tube, LT, ProSeal LM and intubating laryngeal mask. Altogether 34 persons covered this step.

Results: Step 1: training in LT - 70/75 persons (93%) were successful at first go, 5/75 (7%) at second go. In 69/75 cases (91%) the localisation was confirmed fiberoptically, in the remaining 6/75 (9%) cases the tube allowed for adequate ventilation although its position was not exact; training in LM - 27/43 persons (63%) were successful at first go, 10/43 (23%) at second go, 5/43 (12%) at third go, 1 person could not place the mask properly in 5 attempts. Fiberoptic localisation revealed the mask to be correctly placed in 41/43 (95%) cases.
Step 2: 18 (52%) persons pointed to the LT as easier, 14 (41%) – to the LM, 2 persons pointed to no difference. 28 persons stated that with the LM the circuit is safer (no leaks), while only 14 persons maintained that the LT was equally leak-proof.
Step 3: 21 (61%) persons reached for the ProSeal LM as first choice, 16 placed it correctly on first attempt. 13 persons chose the LT –7 (53%) placed it correctly on first attempt and 4 at the second attempt, although they were not sure whether ventilation was adequate (non-discernible chest movement).

Conclusions: Although most people claimed to find the LT as easier to use yet in a life-threatening situation scenario 61% of trainees chose the ProSeal LM and only 39% chose the Laryngeal Tube. We assume that this is brought on by less confidence as to the efficacy of ventilation and fear of possible regurgitation. However, it is also possible that the LT tube, being so different in appearance from all the well-known devices, calls for more practice before it gains popularity.

Computer driven voice control for METI HPS Version 6

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Motivation

While running a scenario, the operator is very busy. He has to control the Human Patient Simulator (HPS) Software, supervise the mannequin's reaction, ensure that all drugs are entered to the system in the correct dose, communicate with the trainees via the telephone in different roles and usually also makes the patient speak through the wireless microphone-receiver unit that is part of the METI system.

In the case the operator being a male person, he cannot speak very convincingly like a woman in an obstetric scenario or sound like a 5 year old child when using the pediatric mannequin.

On the other side the communication through the patient's voice depends to a high degree on the scenario and the type of patient but only to a far lesser extent on the trainee . A certain set of phrases is always applicable to certain OR situations or certain medical problems. A piece of software can mimic real communication by application of simple communication patterns and predefined phrases[1].

Method

We present a Voice Control application for Mac OS X that allows to transmit recorded phrases to the patient's voice. The software can be configured in such a way that it gives the possibility to define sets of phrases for a certain scenario specifically and arrange them on the user interface. These phrases then can be transmitted to the patient's voice by clicking a button in the application. We illustrate this on two scenarios and their set of possible phrases.

Results

The Voice Control software takes one stressful task away from the simulator's operator. Even though the software does not react automatically during the communication with the trainee, letting the patient speak by just clicking a button in the software is easier than to actually use a microphone and a well chosen set of phrases allows to react in all situations.
Using previously recorded phrases facilitates the patient to speak like a child, a woman or a man whenever it is applicable
The software can be run simultaneously to METI Version 6 and it integrates well into the working environment.

MEDICAL SIMULATOR TRAINING BASED ON GOAL ORIENTATION AND LEARNING PSYCHOLOGY PRINCIPLES.

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BACKGROUND

The purpose of medical simulator training is to establish appropriate action patterns to be carried out in specific situations. In order to fulfil this purpose the trainee must acquire knowledge and understanding regarding identification of critical situations, content and effects of appropriate action patterns, and the link between a specific situation and its corresponding appropriate action pattern. To be able to teach, practice and evaluate these three aspects the instructor has to explicitly define appropriate action pattern content and the connection to its applicable situation, also a qualitative requirement for performance feedback to trainees during the training. This definition is done by constructing training goals for all situations included in the intended training programme. These goals work as guidelines to the simulator instructor what to teach and at the same time enable the trainees to understand and focus on relevant action pattern details. From basic learning psychology principles we have derived the following medical simulator training procedures. When first introduced to a new behaviour to be applied to a certain situation the trainee should only practice this behaviour and no other behaviour until the new behaviour is thoroughly established. This means that the instructor should intervene and stop the scenario when the trainee is deviating from this new behaviour, point out the deviation as well as remind the trainee of the new behaviour and then let the trainee practice the new behaviour in a correct way. When a new behaviour is well established, i.e. fully understood and has been continuously carried out correctly by the trainee, the instructor could defer pointing out a deviation until after the scenario has ended.

METHOD

After briefing on medical simulation a lecture on the medical procedures to be covered during the session is given. Four to seven high priority training goals are presented and "correct behaviour", i.e. appropriate action pattern, is defined. All other behaviour is labelled as "incorrect". A psychological contract between the trainees and the instructor how to give and receive performance feedback is agreed. Prior to the scenario start practical information about the scenario as well as its purpose is given. During the course of the scenario the instructor will stop the scenario if a trainee is deviating from the correct behaviour as defined by the high priority training goals stated for each scenario. The trainee is asked by the instructor to describe the correct behaviour and, after the trainee has done so, the scenario is "rewound" to just before the deviation and started up again from this point. When the scenario is finished trainees and instructors evaluate separately trainee performance against the high priority goals and how this performance could be improved. During the feedback session a spokesman for the trainees presents their conclusions and the instructor will then give supplementary views. Finally, a maximum of three main feedback points are emphasised by the instructor. Immediately hereafter the next scenario takes place. Six or more scenarios, including feedback sessions are performed during a one-day eight hour course.

CONCLUSIONS

Simulator training based on goal orientation and learning psychology principles is characterised by a high degree of trainee involvement in the training which improves trainee motivation and learning potential. Clear and detailed training goals facilitate identification of training content and focus. The systematic and structured feedback method allows for efficient evaluation of behaviour improvements. As a result of these advantages more scenarios, i.e. more training, could be carried out in comparison to a traditional and less structured simulator training lay-out.

Ref: *Anderssen JR: The Architecture of Cognition.*