K 2. What the Future Holds for Simulation in Health Care

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In general, those working on the development and use of simulation in health care share a common Vision of a future revolution in health care organization, with simulation as a key enabling technique. Simulation is seen broadly as: "A **technique** – not a technology – to provide guided experiences, often immersive in nature, that evoke or replicate sufficient aspects of the real world for a variety of purposes, to replace or amplify real experiences." This definition encompasses a wide variety of experiential activities. The lecture will articulate that Vision, establishing a comprehensive framework for describing simulation applications. I will describe possible future histories – from the vantage point of 2025 – of how this Vision was or was not be achieved, in order to illustrate issues concerning the road ahead for simulation in health care. Although presented to some degree with reference to the economic, professional, and regulatory structure of the United States, the issues are similar throughout the world.
The main points of this presentation will be:

- The Vision for Using Simulation in a New Model of Health Care Delivery
- Eleven or more "Spectra" or "Dimensions" of Applications of Simulation:

- Purpose/goal of simulation
- Unit of participation
- Clinical domain(s)
- Discipline(s) of health care personnel
- Experience level(s) of participants
- Knowledge, skill, or behavior addressed
- Age group of patient being simulated
- Technologies and techniques
- Site of simulation activity
- Extent of direct participation
- Feedback/teaching methods used

- Integrating Simulation into the Fabric of Health Care
- Considerations of Cost, Benefit, Impact
- Two Alternative "Retrospective" Histories of the Future
- What the Real Future Might Hold

M 1. Patient Safety and Team Training: Bridging Cultural Borders

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Based largely on analogies with industries such as aviation, there has been a surge of interest over the last 12 years on improving safety in health care by providing special training for teams. The aviation analogue that has been the model for many of these approaches is Crew Resource Management (CRM) training. This approach focuses on behavioral or "non-technical" skills such as leadership, communication, and distribution of workload. Many approaches to team training in health care are currently in use. They vary across a variety of "spectra" or "dimensions" including: unit of participation; teaching modalities used; feedback provided; as well as across the medical domains included.

Culture can be summarized as *"Shared values (what is important) and beliefs (how things work) that interact with an organization's structures and control systems to produce behavioral norms (the way we do things around here)"*. There are a number of cultural identities whose borders may be faced while doing team training in various settings. These include:

- Gender
- National culture of place of birth, or place of work (if different)
- Professional roles and identities associated with different types of clinical personnel (e.g. executives vs. clinicians; doctors vs. nurses; internists vs. surgeons)
- Specific work unit
- The hospital

Despite the presence of other cultural influences, it is likely that the three strongest cultural influences for team training in health care will be professional role, work-unit, and hospital. In applying curricula and approaches developed in one country to another country national culture may be an important factor, although it is probable that the professional roles dictated by the nation's health care system will play a bigger role than stereotyped overall national culture. Various aspects of team training will be reviewed in terms of how they address different components of the complex cultural picture.

M 2. Enhancing Safety Culture by international cooperation

Thomas Eckered
Proment Ltd.

The implementation of **“new advancements in medical simulation for the benefit of increased patient safety”** does not necessarily mean that all patients will be safer. Why? Because Safety Culture might need enhancement.

"Safety Culture is that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, safety issues receive the attention warranted by their significance.”

This definition emphasises that Safety Culture relates to both organisations and individuals and depends on people’s attitudes as well as the organisational structure.

“Safety Culture” should not be confused with “Safety Management”. As said above “Safety Culture” can be defined as an *assembly of characteristics and attitudes*. Safety Management, on the other hand is essentially *a control system*, like most management systems. The Safety Management system has defined parameters, which it seeks to maintain, it monitors a process, and utilises feedback to take corrective actions.

How can Safety Culture be enhanced? It is nothing that you can buy complete from a consultant or a specialist supplier. There is support available, however, and that is from your colleagues and peers. In this respect your international colleagues and peers will be of special value. They are not blind on the same eye as you are, the have other useful experiences than you, they have made other mistakes and learnt from them, they will notice you attitudes and behaviour, and they will pose those awful but friendly questions that are normally not posed at your workplace.

International cooperation in the form of formal and informal peer reviews has long been in other “industries” and has been extremely useful for enhancing Safety Culture.

N 1. Evidence Base Concerning CRM-Oriented Mannequin-based Simulation Training

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There has long been an interest in assessing the validity and impact of simulation-based training. Those espousing "evidence-based" medicine would argue that only those interventions that have been fully proven to be effective, efficacious, and have a substantial cost-benefit ratio should be pursued. Surely, to have its full impact, simulation training would need to demonstrate such evidence in well-conducted and well-controlled trials. Many groups have been performing a variety of assessments of simulation using diverse techniques, with data from surveys, interviews, and collected anecdotes from participants. Some studies have investigated the impact of simulation training on performance in the simulator; others have attempted to assess transfer of training to real-world care. Although some of these experiments have or will show benefits to simulation training, none is likely to produce a truly definitive result in any domain. Experiments have been plagued by a number of pitfalls including: difficulty defining performance metrics (especially for complex multi-personnel simulations), aggregating over time, confounding by limited experience of participants in the simulation environment, selection bias of participants, and underpowered designs assessing only single-shot simulation experiences. Determining the impact of simulation training on patient outcome may be impossible due to multiple confounding factors and logistical difficulty. Evidence equivalent to randomized controlled trials for the utility of simulation training may never be achievable. Evidence at this level has never been demonstrated for simulation in any other industry, including for military or commercial aviation. I will review the status of these issues and suggest strategies for the health care simulation community to pursue.

O 1. Prospective Memory in Anaesthesia: First Results from a Pilot Study using a Patient Simulator

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Background and Goal

A specific *human factor* relevant in anaesthesia and intensive care, previously not studied in medicine was explored: Prospective Memory (PM) failures – the missed execution of previously formed intentions[1]. The goal was to investigate factors influencing PM in a simulator setting[2].

Materials and Methods

Ten scenarios in a medical student's course (ACRM-type) were prepared to contain one to five PM tasks (total 73). PM tasks were classified according to their formation (condition) as internal (following the scenario story), external (additional to the scenario, not within its logic) or educational (advices). The course was conducted four times. After each of the 40 scenarios participants rated their subjective importance of the PM task during the scenario. The dependent variable was the number of executed vs. "forgotten" intentions.

Results and Discussion

The Figure shows how many of the 73 intentions were executed in each condition. Altogether 80% of the "important" and 64% of the "unimportant" tasks were executed. 71% of the internal, 67% of the external and 79% of the educational tasks were executed. χ^2 –Tests for "importance" and "task-type" did not yield significant dependencies. The pattern of the results seems plausible: more important than unimportant tasks were executed and in a training setting educational tasks were executed more often than internal and external tasks.

Conclusion

The simulator setting provides good possibilities to study a specific human factor like PM-related failures. This could also be used to elucidate possible mechanisms in the evolution of critical incidents and the development and evaluation of countermeasures.

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Acknowledgements

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O 2. Differences in the Coordination Processes of High and Low Performing Teams during Simulated Anesthetic Crises

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Background and Goal

In various domains high performing crews have been described to adapt their coordination processes to the situational requirements. In anaesthesia, the structure and process of crew coordination related to high performance during crisis situations have not yet been investigated. A pilot study was conducted to determine if there are differences in the coordination processes of high and low performing crews during a simulated anesthetic crisis.

Materials and methods

In a previous study, we rated the technical performance of anesthesia crews during simulated MH scenarios from ACRM1 courses. In this study, the coordination processes of the three highest (mean score 24,7 out of 25) and the three lowest performing crews (mean score 13 out of 25) were recorded using a predefined set of observation categories (Table 1). We compared the high and low performing crews based on the relative frequencies of the various coordination activities.

Table 1: Structure of the observation system for coordination processes

Content	Number of categories	Who executes the coordination activity?					Anesthesia crew to…		
		HS	FR	S	RN	O	S	RN	O
Information management	12	✓	✓	✓	✓	✓	✓	✓	✓
Task management	12	✓	✓	✓	✓	✓	✓	✓	✓
Coord. via work environment	3	✓	✓	-	-	-	-	-	-
Metacoordination	1	✓	✓	-	-	-	-	-	-
Clinical work process	3	✓	✓	-	-	-	-	-	-
Other communication	3	-	-	-	-	-	-	-	-
Other	3	-	-	-	-	-	-	-	-

HS=Hot Seat; FR=First Responder; S=Surgical Crew; RN=Nursing Crew; O=Other (e.g. Pharmacy)

Results and Discussion

During the actual crisis, the observed crews spent an average of 70% of the time on coordination activities, 67.5% on the clinical work process, and 0.5% on other communication (38% of parallel activity). As shown in Figure 1 several differences can be noted in the coordination processes of high and low performing crews. Higher performing crews seem to have a more centralized coordination structure, i.e. less coordination (especially outside the anesthesia crew) is performed by the first responder.

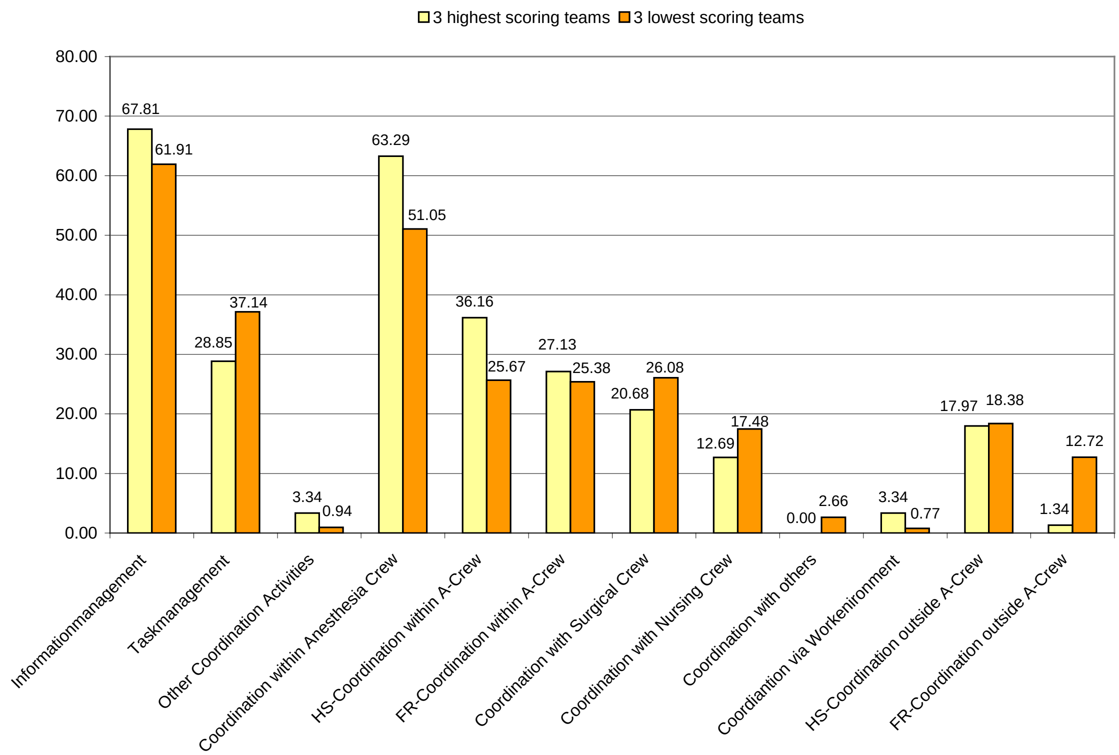

Figure 1: Comparison of coordination activities of high and low performing crews (Percentages of coordination activities).

Conclusions

In this pilot study, we have shown that there are differences in the coordination processes of high and low performing anesthesia crews during crisis situations in a simulator setting. Based on these results a more comprehensive analysis including a qualitative description of coordination processes might help in the development of specific coordination training to further improve performance.

Acknowledgements

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O3. Debriefing in Anaesthesia Crisis Resource Management Training

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Background & goal

Anaesthesia crisis resource management (ACRM) courses highlight seven non-technical skills believed to aid crisis avoidance and resolution (ACRM Key Points). Courses expose candidates to a number of simulated crisis scenarios, followed by facilitated debriefing; both are videotaped. We are part-way through a mixed-method evaluation of ACRM training[1], including structured observation to increase understanding of the complex interactions involved in debriefing, aiming to identify good practice and issues that could be the focus of facilitator development workshops.

Materials & methods

Detailed records are made from videotapes of debriefings, viewed 3 times to extract data on key points covered and linkage; facilitator behaviours and an interval-based log of activity.

Results & discussion

35 debriefs have been coded, yielding 1092 data intervals and 452 topic segments. Debriefings usually have 2 facilitators (range 1-4) and 4 trainees per course (range 2-5). Mean duration is 31 minutes (range 16-50 minutes). Illustrative video clips are used in 23 of the 35 debriefs. The 5 most frequently addressed topics are: communication (84 segments), technical matters (54), know your environment (50), take a leadership role (44), utilise all available resources (34). Attention is paid to all other ACRM Points and to linking events in the simulator with experience in practice.

Conclusions

Discussion of communication skills dominates debriefings. Some attention to technical matters appears to be necessary to permit discussion of non-technical issues. Less attention is paid to Key Points ‘call for help early enough’ and ‘allocate attention wisely and use all available information’. The causes and impact of this distribution of emphasis is worthy of further attention.

Reference

1 Berridge EJ (2003) Evaluating Anaesthesia Crisis Resource Management Training: processes and outcomes. SESAM, London 2003

Funding

Research Advisory Board: Special Trustees of St Bartholomew’s Hospital

O 4. LAPAROSCOPIC SKILLS ACQUIRED IN VIRTUAL ENVIRONMENT CAN BE TRANSFERRED TO THE OPERATING ROOM: RANDOMIZED TRIAL

Teodor P. Grantcharov MD, PhD

Objectives

The study was carried out to demonstrate the impact of VR surgical simulation on improvement of psychomotor skills relevant for the performance of laparoscopic cholecystectomy.

Design

Sixteen surgical trainees performed a laparoscopic cholecystectomy on patients in the operating room (OR). The participants were then randomized to receive VR training (10 repetitions of all 6 tasks on the Minimally Invasive Surgical Trainer - Virtual Reality (MIST-VR) (group A) or no training (group B). Subsequently, all subjects performed a new laparoscopic cholecystectomy in the OR. Both operative procedures were recorded on videotapes and assessed by two independent and double-blinded observers using predefined objective criteria.

Main outcome measures

Time, error score, and economy of movements score assessed during the laparoscopic procedure in the OR.

Results

No differences in baseline assessments were found between the two groups (t-test, $p>0.5$). Surgeons, who received VR training performed laparoscopic cholecystectomy significantly faster than the control group (independent samples t test, $p=0.02$). Furthermore, the VR trained group made significantly greater improvement in their error- (t test, $p=0.003$) and economy of movement scores (t test, $p=0.003$).

Conclusions

Surgeons who received VR simulator training made significantly greater improvement in their performance in the OR compared with those in the control group. Thus, VR surgical simulation is a valid tool for training of laparoscopic psychomotor skills and could be implemented in the surgical training programmes.

O 5. Effect of visual-spatial ability on total performance score in image guided simulation training

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Introduction

Wanzel and colleagues (2002) show that junior surgical residents with high visual-spatial scores, assessed by mental rotation test, perform better in completing and learning a spatial-complex surgical procedure than those with low scores. Our aim was to investigate if students with higher scores in visual-spatial tests would perform better in the Procedicus KSA simulator, than those with low scores.

Method

54 medical students participated by completing a one-hour session in the KSA instrument navigation procedure. The task was to probe 10 spheres randomly interspaced throughout a virtual upper abdomen. The students also completed the revised Mental Rotation Test (MRT) in two forms: MRT-A and MRT-C. 25 medical students also completed the BasIQ intelligence test, which generates a "pure" measure of spatial ability.

Results

Significant Pearson's correlations were obtained between total score in the KSA, MRT-C (r=.375, p=.005) and MRT-A (r=.301, p=.027). BasIQ spatial scores also correlated with total score (r=.555, p=.004). There were no significant correlations between the general intelligence score (*g* factor) and total performance score (r=.282, p=.172).

Discussion

Our findings suggest that spatial ability is important to possess in order to accomplish the task of instrument navigation in the Procedicus KSA simulator. Spatial ability, assessed by MRT-A and MRT- C as well as BasIQ might help to identify trainees who could benefit from additional simulator training of instrument navigation.

Refereces

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Conflict of interest statement

None declared.

O 6. "Virtual reality colonoscopy simulation: A compulsory practice for the future colonoscopist?"

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Introduction

For all medical procedures a learning curve can be anticipated during which complication rates are increased. Developments in the field of endoscopic procedures have been impressing during recent years, and there is an emerging trend that the number of procedures is increasing in parallel with technological developments. In addition, the introduction of screening programs for colorectal cancer will also increase the amount of procedures needed. Recent developments in the field of medical simulation seem promising concerning the possibility to train-out undesirable parts of the learning curve outside the OR.

Aim

To investigate if training in the AccuTouch® flexible endoscopy simulator improves the early learning curve in colonoscopic education.

Method

12 endoscopic trainees, 10 surgeons and two medical gastroenterologists, all with experience in gastroscopy but with no specific colonoscopic experience, were randomly assigned to either simulator training or a control group. They all received the same theoretical study package and the training group were trained in the AccuTouch® colonoscopy simulator until a predefined expert level of performance was reached. All trainees performed their ten first individual colonoscopies described in detail in a separate protocol.

Results

Trainees in the simulator-trained group performed significantly better (p=0,0011) and managed to reach caecum in 52% of their cases (19% in the control group) and were 4.53 times more likely to succeed, as compared to the controls. Additionally, procedure time was significantly shorter and patient discomfort lower in the hands of the simulator trained group.

Conclusion

Skills acquired in the AccuTouch® simulator transfer well into the clinical colonoscopic environment. The results of this trial clearly support the plan to integrate simulator training into endoscopic education curricula.

O 7. ”There is a difference in performance level in diagnostic coronary angiography in the VIST simulator between experienced PCI surgeons and cardiologists in training?”

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Background and goal

Every year 28000 coronary angiographies and 12000 PCI (percutaneous coronary intervention) are performed in Sweden. However, these methods are connected with morbidity and mortality. Cardiologists in training have until now been taught how to perform interventions in real patients. The VIST simulator is a realistic cardiovascular interventional tool to practice medicine in a safe environment. Before this simulator can be incorporated in the training curriculum for cardiologists it has to be validated and tested for sensitivity.

Material and methods

10 experienced physicians (>1000 PCI) in a reference group to determine expert level in diagnostic procedure and 10 cardiologists in training with little or no experience in cardiac catheterisation was recruited. A team of experienced invasive cardiologists determined quality parameters for a safe and accurate procedure. The participants were presented for a short training session to get used to the VIST simulator and immediately thereafter they performed the diagnostic procedure in 5 different anatomies.

Results and discussion

The preliminary results show that the “experts” performed significantly better in most of the parameters measured: time catheter introduction – coronary ostium $p<0,05$, amount of contrast consumed $p<0,05$, fluoroscopy time $p<0,05$, total time $p<0,05$ and number of errors $p<0,05$. We could not show a significant difference between the groups regarding number of used catheters and number of cineloops but there was a tendency to a better result in the expert group. Experienced PCI surgeons performed significantly better in a simulated vascular interventional environment than cardiologist in training although the two groups had the same exposure for simulation prior to the study. This concludes that the VIST simulator is a tool to distinguish between an expert and a novel level in the training of interventional cardiologists. We are currently running a randomised study to investigate if acquired skills in a simulated environment transfer to real angiographic environment and if the learning curve for vascular interventions are shortened and flattened.

O 8. Visio-spatial testing and computer experience influence the performance of virtual endoscopy.

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Background

Advanced medical simulators have been introduced to facilitate surgical and endoscopic training and thereby improving patient safety. Residents trained in a laparoscopic simulator MIST do laparoscopic cholecystectomy better and faster than a control group without simulator training. Little has been reported whether factors like gender, computer experience and visio-spatial tests can predict the performance in a medical simulator. Our aim was to investigate whether such factors may influence the performance of simulated gastrocopy.

Methods

Seventeen medical students were asked about computer and gaming experiences. Prior to the virtual endoscopy they performed the visio-spatial test Picsor, which aquires the ability of the tested person to create a 3-D image from a 2-D presentation. Each student performed one gastroscopy (level 1 case 1) in the GI-mentor II, Simbionix® and several variables related to performance were registred.

Results

Percent of time spent with clear view in the endoscope correlated well with the performance in the Picsor test ($r=0,56$, $p<0.001$). Efficiency of screening also correlated with Picsor ($r=0,23$, $p<0.05$). In students with computer gaming experience the efficiency of screening increased ($33.6 \pm 3.1\%$ vs. $22.6 \pm 2.8\%$ $p<0.05$) and the duration of the examination decreased by 1.5 min ($p<0.05$). A similar trend was seen in men compared to women.

Conclusion

The visio-spatial test Picsor predicts the results in the endoscopic simulator GI-mentor II. 2-D image experience, as in computer games, also seems to influence the outcome.

O 9. The Status of Human Simulation Training in Emergency Medicine Residency Programs

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OBJECTIVES
The objective of this study was to describe the availability and current use of high-fidelity mannequin based simulation (HFMB) in emergency medicine (EM) training programs in the United States.

METHODS
A survey instrument was used to collect data on the status of human simulation training at the 126 approved EM residencies and the 30 accredited osteopathic EM residencies. The survey instrument consisted of 12 multiple choice and short answer questions. This study received IRB exempt status through the University of New Mexico. The program responses were collected and reported in terms of numerical totals and percentage of total respondents.

RESULTS
114 out of 156 programs completed the survey for a response rate of 73%. There are 54 (47%) EM training programs with HFMB simulators at their institution, 38 (33%) EM training programs with access to these HFMB simulators, and 33 (29%) EM training programs that are having EM residents use HFMB simulators. Anesthesiology departments manage the HFMB simulator alone at 19 (17%) responding institutions. Medical schools alone manage 10 (9%) simulators. EM departments manage the HFMB simulator alone at 9 (8%) institutions, cooperatively with anesthesia at 3 (3%) institutions or hospitals at 2 (2%) institutions. EM residents are using HFMB simulation every 1-2 weeks at 3 (8%) programs, every 1-4 months at 16 (42%) programs, yearly at 9 (24%) programs, and not regularly used at 10 (26%). The simulation curriculum is described as “No formal curriculum” or “Initial Development” at 60% of programs.

CONCLUSIONS
HFMB simulation technology has not been completely adopted by EM training programs even when it is available. The majority of HFMB simulators are being managed by departments of anesthesiology, medical schools and EM departments. Most EM training programs are using HFMB simulation less often than every month and curriculum development in EM training is still in the early phases.

O 10. Bridging the cultural boarders between medical staff and engineers

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The Department of Biomedical Engineering at Karolinska University Hospital identified a problem. Technicians and engineers that carry out maintenance and repair on surgical and anaesthesia equipment lacked knowledge in how Anaesthesiologists uses the anaesthesia workstation, including ventilator, capnograph and patient monitoring system.
How the equipment is used depends on what kind of surgery is performed and how the patient responds to the treatment during surgery.

A group of biomedical engineers, nurses and doctors found out that simulator training could be used to increase knowledge and as a benefit of this, an opportunity to teach medicine and anatomy at the same time arises.

The benefit of using advanced medical simulators in bridging borders between medical staff and technicians / engineers at hospitals, is used at the Centre for Advanced Medical Simulation at Karolinska University Hospital Huddinge. The engineers train doctors and nurses in, among other things, patient safety and legislation and safe use of medical equipment. In return, the engineers and technicians at the hospital are educated in for example, how to use anaesthetic and surgical equipment. This course also includes anatomic lectures. We believe that cooperation between the biomedical personnel and the users of high-tech medical equipments and systems is one of the best ways to increase patient safety. This cross-disciplinary course is in progress and evaluation of the programme is in progress.

A degree project was carried out at the Department of Biomedical Engineering at Karolinska University Hospital. The project involved producing a proposal for a different design in presenting the parameters in a patient monitoring system. The proposal implemented pointer instruments that could facilitate the ability of the nursing staff to observe rapid changes and to faster obtain an overview of the patient vital signs. An evaluation of the developed interface was carried out at the Centre for Advanced Medical Simulation at Karolinska University Hospital. During the evaluation doctors and nurses was given the opportunity to use a traditional view from a patient monitoring system and the new developed interface. The evaluation showed that nursing staff has difficulties in accepting a new appearance of the graphical user interface. This was found to depend on them being used to a traditional graphical user interface. The degree project showed that pointer instruments as a complement to traditional graphical user interfaces can be an alternative in the future.

This degree project illustrates an interesting area of use for the Centre for Advanced Medical Simulation. Biomedical Companies and developers of medical equipment can interact with engineers, doctors and nurses and evaluate new products in a safe environment at the Centre. In this way the bridges and the cultural boarders between medical staff and engineers can be torn down. It could be easier for the Biomedical Companies to introduce new medical equipment if the medical staffs have a bigger part in the development of the product.

Patient safety can be improved if the medical staff can train whit new medical equipment on the patient simulator at the Centre for Advanced Medical Simulation. In this way the doctors and nurses don't have to use new and unknown equipment on the patient.

"Ett förslag till införande av visarinstrument i grafiska användargränssnitt i patientövervakningssystem inom anestesi."
10 + 10 p examensarbete, vt 2002. Martin Enequist och Lars-Gunnar Andersson. Handledare: Carl-Johan Wallin

O 11. Improvement of a mobile "Simulation Stretcher", a compact all-in-one type of simulator set to develop on-site or mobile simulation training courses

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Background and Goal

To improve patient safety, the needs for simulation training courses are growing. Not all simulation centers always have enough staff to fulfill these needs. The key to overcome the problem depends on reducing the burden on the instructors. We are trying to develop a mobile "Simulation Stretcher", a compact all-in-one type simulator designed to make an "on-site" simulation training course easier.

Materials and methods

We used a mid-fidelity simulator (Laerdal SimMan®) for our on-site, hands-on simulation training program. Wall air units or a portable air source provided the air to run the simulator. Control of the simulator was effected using a notebook computer with a wireless LAN unit. Instructors could control the simulator using a remote tablet PC. A portable internal battery-powered monitor as used in clinical practice was employed for mobile simulation, which could not, however, show all the parameters which come as standard with the original simulation monitor. For on-site training courses where an AC power source is available, we therefore used the original simulation monitor. In our third generation "Simulation Stretcher", we attached the original simulation monitor directly to the "Simulation Stretcher" to make it an "all in one" simulation set.

Results and Discussion

We used a mobile "Simulation Stretcher" for the newly developed "on-site simulation courses". On-site simulation using a mobile "Simulation Stretcher" is an effective educational method which can easily reproduce real environments. On site simulation can be implemented at a very low cost, because existing local equipment can be utilized obviating the need for purchasing any new equipment. Setting up the on-site simulation using our mobile "Simulation Stretcher" is easy and reduces the burden on the instructors.

Conclusion

As a way of developing on-site simulation training courses, the "Simulation Stretcher" will contribute to reducing the teaching burden on instructors.

O 12. Mobile Simulation – points to consider

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Background and Goal

Simulation has become a precious tool in medical education and training of technical skills as well as the so called non-technical skills (CRM)[1-3]. It is known that activities in the simulator environment and in operating theatres are highly comparable[4]. With the recently developed mobile simulators local high quality training has become possible in nearly every environment.

Materials and Methods

15 members of a local A&E department in Northern Italy participated in a CRM-type training on a mobile simulator (SimMan Ver.2.1, Laerdal). To achieve a highly realistic situation the simulator was mounted in an ambulance. The simulator was controlled from the cockpit of the ambulance in order to achieve a control room training situation. The scenarios were video recorded and shown simultaneously on a screen in front of the ambulance for the non-active trainees. With these digital records highly effective video assisted debriefing of the scenarios was possible afterwards.

Results and Discussion

At the end of the course trainees were asked to describe their impressions and experiences. All of the trainees were enthusiastic about the possibility to train in the real environment they are used to with existing teams who work together in daily routine as well. Nevertheless nearly all participants experienced some discomfort being watched by their colleagues. Pictures of the set-up will be shown on the poster.

For the instructors on the other hand it was uncommon to work in an unknown atmosphere. They were not familiar with local structures and specific routines. Training in unknown environments needs good briefing for the instructors.

Conclusion

There seems to be a huge potential for realistic scenario-based mobile simulator trainings when used wisely and with care.

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O 13. Evaluation of an Elective Anesthesia Resident Rotation in Simulation-based Crisis Resource Management

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Background

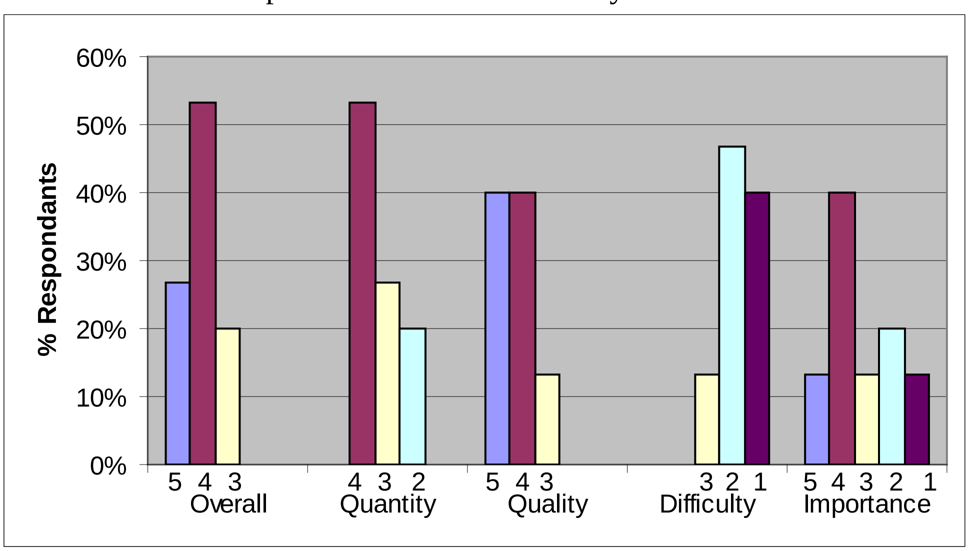
The Center for Medical Simulation, an affiliate of the Harvard Anaesthesia Department, offers a one-month elective rotation in simulation-based crisis resource management to 3rd year residents. During their rotation, residents are asked to participate in conducting crisis management courses, develop new scenarios, read the crisis management literature, and develop an evening program for their peers among other tasks (see: http://www.harvardmedsim.org/rotation/Checklist.htm). To evaluate the effectiveness of this program, the participating residents were asked to self-report on their experience.

Methods

Anesthesia residents who completed the elective rotation were asked to rank order the past five months' rotations (5 to 1 with five being the highest rank) in five categories: overall enjoyment, quantity learned, quality of the learning experience, difficulty of the rotation, and expected importance to future practice. In addition, they were asked a series of questions to elaborate on their responses.

Results

Fourteen of the resident completed the evaluation survey.



Many of the written comments expressed a desire to be involved with more scenarios and sessions during the month.

Conclusions/Discussion

Compared to other rotations that they had recently completed, the residents were very highly satisfied with their experience. 80% enjoyed the experience more than the average rotation of their past five. The majority reported that they had learned more and more than 80% felt that the quality of the learning experience was greater than the average rotation of the past five. All felt that the rotation was relatively easy. The participants were decidedly mixed as to whether they thought spending the month studying crisis management would be relatively important to their careers. This evaluation has stimulated us to consider adding duties and scenario sessions beyond those already scheduled.

O 14. Training multiprofessional trauma teams in Norwegian hospitals using video recorded simulations

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Background and Goal

Safe and effecient trauma treatment is a challenging responsibility for most Norwegian hospitals, and low caseloads give trauma teams little experience. We developed a structured one-day multiprofessional training course to improve team performance. The focus was on communication, co-operation and leadership during treatment of severely injured patients. Training was arranged locally at each hospital.

Material and Methods

28 hospitals had one or more training courses with: introduction to team work, common understanding of treatment priorities, communication skills and threats to efficient communication, repetition of treatment principles. Two simulations in the hospitals' own emergency room for each of two trauma teams followed the theory. The video-recorded simulations were based on case stories, and a low-fidelity mannequin served as patient. Participants completed a questionnaire before and after the training, and the trauma teams answered a new questionnaire six months later.

Results and Discussion

2,860 team members participated in the courses; of which 1,225 took part in the simulation. Communication and leadership were the most common difficulties reported during the participants' last live trauma team experience. Immediately after training the mean score for personal outcome was 7.93 (95% CI 7.86-8.00) on a 10 cm visual analogue scale, and for satisfied expectations 8.02 (95% CI 7.95-8.08). Nurses scored outcomes significantly higher than doctors. Six months later 78% (95% CI 74-82%) considered that the training had given them experience in handling of multitrauma victims that they would not have gained otherwise.

Conclusions

This local team training approach was feasible and appreciated by the participants, who found it to test teamwork ability more than specific technical skills, as intended. It offers a unique opportunity to practice infrequent and demanding challenges. The wide request for this training in Norway supports the conclusion.

O 15. Advanced bioterrorism triage algorithm:
Handling the critical first encounter with victims of terror attacks

Italo Subbarao, DO MBA, Christopher Johnson, DO, William Bond, MD FACEP

INTRO

History has shown us that biological and chemical agents, radiation dispersal devices, and suicide bombings have been effective weapons. In today's world, terrorists threaten the continued use of these weapons of mass destruction. In response, numerous courses have been developed to increase awareness of individual agents and their treatments. However, no training or educational material currently exists that focuses on the crucial first encounter with victims of an attack. Until now.

After reviewing history and literature, as well as unpublished data, we created a new triage algorithm and developed an Advanced Bioterrorism Triage Card and Course to guide emergency physicians, medical command, triage nurses, and EMS response teams (i.e. anyone who has first contact with victims) to handle the critical first minutes of a bioterrorism attack. This includes using initial symptoms to appropriately triage victims to isolation, decontamination, or dirty resuscitation areas. The goals are threefold: to maximize recognition of a victim of a terror agent and triage appropriately minimizing secondary contamination, maximize recognition of agents and their antidotes, and educate principles of dirty resuscitation.

METHODOLOGY

Our Advanced Bioterrorism Triage Algorithm is directed towards known and unknown, stable and unstable, victims of terror attacks. Using this new Algorithm, a take-home pocket card and a one day course were designed, including a pre- and post-test. The course begins with a one hour lecture covering Fundamentals of Bioterrorism followed by 6 small group stations: biological, chemical, cyanide vs. nerve agents, dirty resuscitation, radiation dispersal devices and suicide bombings, and decontamination. For 40 minutes, groups at each station use either high fidelity simulation or video vignettes with brief lectures that reinforce and exemplify the card algorithms. The test contains 12 video vignettes with 3-4 specific questions per vignette. The test period is one hour and covers adult and pediatric victims of terror threat agents in three specific settings: medical command, emergency department, and dirty resuscitation.

RESULTS

Twenty-eight people completed the pre- and post-test. The average pre-test score was 59.4 (+/- 12) and the average post-test score was 84 (+/- 8). The p value was less than 0.05. The results show a significant gain in knowledge achieved directly through course participation, demonstrating the algorithm's effectiveness.

CONCLUSION

Our Advanced Bioterrorism Triage Card and Course is an effective and essential means of educating those who will be the first to interact with casualties of terror attacks. We are currently conducting an inter-rater reliability study to further validate our algorithms, as well as continued pre- and post-testing at our and other institutions to demonstrate effectiveness.

O 16. STUDENT REACTION TO COGNITIVE TRAINING IN DECISION MAKING

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Background and goal

In order to safely apply declarative knowledge into a complex procedure a strategy for the cognitive process of decision-making is a prerequisite. In other areas performing high safety procedures decision making is emphasized. Conducting general anaesthesia is a complex procedure applying knowledge of physiology, pharmacology, anatomy, and local technical and personal resources. To be able to perform this complex procedure a novice must receive training in decision-making to achieve task skill.

Materials and Methods

Fourth year medical students (n = 37) received basic team training using a human patient simulator during a half-day course. In groups of three to four, students had a one-hour introduction in the decision-loop: observation - assessing - decision - action - re-evaluation. Each student conducted general anaesthesia to a simulated patient under the close guidance of an instructor, step-wise emphasising the decision loop during each step of the procedure. Student reaction to training was assessed by a questionnaire using a 10-point Likert scale.

Results and Discussion

1. Do you believe the patient simulator has a role in medical teaching? 8.6 (1.2). Have the scenarios increased: 2. your clinical knowledge? 7.8 (1.6), 3. your practical skills? 8.0 (1.5), 4. understanding of complex medical procedures? 6.4 (2.1). Should today's subject be best covered by: 5. a lecture format? 4.0 (2.6) 6. bedside teaching? 5.1 (2.4), 7. to read a book? 3.6 (2.3), 8. a problem based approach? 3.6 (2.4), 9. human patient simulation? 8.6 (1.4) ($P < 0.001$, Kruskal-Wallis One way ANOVA, 9 significantly different from 5, 6, 7 and 8 by Dunn's test).

Conclusion

Students were very positive to cognitive training of the decision-loop. They regarded full-scale human patient simulation as an outstanding learning method for this training.

O 17. Proposed terminology for educational acute care simulators

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Background and Goal

Specific terminology is needed to accurately describe educational simulators used to train and assess students and professionals in acute care medicine. We have the following objections against terminology borrowed from other fields of simulation: "high fidelity" is subjective and does not distinguish between physical and functional fidelity. "Part task trainer" refers to the use of a simulator rather than to characteristics of the device itself; a full-body simulator can be used to train a specific task, part of a more complete mission. "Training device" is a useful generic term, but lacks specificity.

Methods

We propose to categorize simulators according to two main components of the device: trainee interface and simulation engine. The trainee interface can be categorized according to decreasing levels of abstraction of presentation; in the present technological implementations: screen-based, partial-body, and full-body. The simulation engine is the component of a simulator that provides reactivity to actions by the trainee. It can be categorized according to increasing levels of automaticity; in the present technological implementations: instructor-controlled (no simulation engine), script-driven, and model-driven.

Results and Discussion

We designate simulators by the lowest level of abstraction present in the trainee interface and the highest level of automaticity present in the simulation engine. For example, the Anesthesia Simulator 2002 (www.anesoft.com) would be a screen-based, model-driven simulator, SimMan (www.laerdal.com) a full-body, script-driven simulator, and the Human Patient Simulator (www.meti.com) a full-body, model-driven simulator. The proposed terminology does not apply to virtual reality simulators and to non-reactive skills lab equipment.

Conclusion

We proposed terminology for educational acute care simulators based on degrees of abstraction of the trainee interface and automaticity of the simulation engine.

O 18. Systematic approach to specification of acute care training programs, simulators, and physiologic models: neonatal electrophysiology example

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Background and Goal

Provide a framework for design and validation of training programs, simulators and models in acute care.

Methods

Farmer et al. (1) present a systematic approach for specification of educational simulators for military applications. Training needs analysis (TNA) considers target learners and results in an explicit set of training objectives. Training program design (TPD) looks at how training objectives can be addressed and results in a set of program requirements. Training media specification (TMS) translates program requirements into functional simulator requirements. We applied a limited TNA-TPD-TMS to electrophysiological aspects of neonatal resuscitation.

Results and Discussion

TNA: the primary target audience for neonatal resuscitation consists of residents in pediatrics. Considered categories of training objectives are: 1. timely and accurate recognition of dynamic rhythm changes in the ECG indicative of potentially life threatening conditions, 2. understanding of underlying electrophysiology, 3. selection of appropriate therapeutic and diagnostic interventions. TPD: an instructor provides interactive computer based demonstrations, inviting trainees to diagnose conditions and propose interventions, and uses dynamically changing visual representations of underlying physiology. TMS, trainee interface: real-time presentation of neonatal ECG including specific rhythm changes and visualization of action potential, conduction, and lead location dependency. TMS, instructor interface: ability to change physiologic parameters and observe effects on the ECG. TMS, simulation engine: a model of relevant aspects of electrophysiology. A prototype simulator will be demonstrated at the conference.

Conclusion

The systematic approach for specification of training programs and simulators presented by Farmer et al. can be applied in acute care.

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O 19. Evaluation of a new virtual reality task trainer for interventional cardiology

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Background and Goals

Computer based training for medical education is not a new idea[i,ii,iii]. During the last years an increasing number of computer based devices, which are able to train manual skills had been developed[4,5]. Different medical fields are involved[iv,v,vi,vii]. In Cardiology the virtual reality interventional coronary angiography seems to become an important tool[viii,ix]. The virtual reality coronary angiography simulator "CATHI" (*Cath*eter *I*nstruction System, Mannheim, Germany) simulates coronary arteries with implemented vessel lesions in a virtual patient[x,xi]. Like similar systems the software model runs on a common pc system, which is linked with the mechanical device for manual training[8,9]. Experienced Cardiologists are known to use less x-ray and less contrast agent when performing a real coronary angiography[xii,xiii]. These and other parameters are measured in CATHI during a virtual reality intervention. This study shows that training with the CATHI device creates a knowledge- and skillbase in performing coronary angiography, which is measured in a decreasing rate of x-ray and contrast agent usage.

Materials and Methods

During the first phase, 12 medical students performed 30 interventions on 10 different coronary arteries. An intervention contains the diagnosis and detection of the stenosis, navigation and positioning of the guidewire and at the end the dilatation of it. Measured parameters were the x-ray duration, contrast agent consumption, duration of the whole intervention and the length of the complete wire movement. The students were trained theoretically and practically before the first, the 10th and after the 30th intervention by an experienced cardiologist individually, containing suggestions for optimization of the procedure.

Results and Discussion

After 30 interventions we detected a 31% decrease of the x-ray duration, a 25% decrease of contrast agent usage, 29% decrease of intervention time and 36% decrease of the guidewire movement. We also found a clear improvement of the manual skills directly after the individual training.

Conclusion

The CATHI system mediates manual skills for the usage of guidewire and guiding-catheters. At least in the virtual environment special techniques can be improved, which, if not trained, potentially can contribute to the harm of real patients. Further comparative studies with experienced cardiologists will show if the CATHI system is able to discriminate between beginners and experienced interventional cardiologists.

O 20. The Respiratory Compliance of Patient Simulators

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Background
A reasonable expectation of the respiratory characteristics of patient simulators is that their total respiratory compliance (TRC) should approximate that of a supine, unconscious subject. This is important in order to minimise the chance of diagnosing a respiratory problem where none exists, as well as facilitating the detection of conditions where TRC varies from normal. The TRC of anaesthetised subjects has been extensively investigated. It has been shown that static TRC falls from a normal awake value of 100 – 130 mL/cmH_2O to around 85 mL/cmH_2O in the supine, anaesthetised subject [1].

Methods
We determined the average static TRC of three commercially available patient simulators: the Meti Human Patient Simulator (HPS), the Meti Emergency Care Simulator (ECS) and the Laerdal SimMan. The average TRC for each simulator was obtained by taking the mean of several measurements where tidal volumes were varied in the range from 200 to 1000 mL. Where TRC varied significantly from the published physiological range, methods for adjusting the TRC of the manikins were investigated.

Results
The average static TRC values obtained were 79 mL/cmH_2O for the HPS, 55 mL/cmH_2O for the ECS and 30 mL/cmH_2O for the SimMan. An additional feature was available on the HPS whereby the TRC and airway resistance could be varied across a range of values.
By making a simple mechanical addition to the ECS and SimMan manikins, it was found that their TRC could be adjusted to within the expected physiological range.

Conclusion
To provide acceptable performance during intermittent positive pressure ventilation, patient simulators should have TRC within the expected physiological range. We have identified deficiencies in the TRC modeling of some commercially available patient simulators. In order to improve the fidelity of the respiratory system of such simulators, a simple mechanical addition has been proposed.

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O 21. METI Airway Development Process

Nigel Parker, Director of Engineering

Two years ago METI initiated the development of an advanced airway in response the poor anatomy and functionality of the currently available mannequin airways. The objectives were to: enhance airway anatomical reality and functionality; create a sealed airway for bag-valve-mask ventilatio; and, support the application of supraglottic airway devices—such as the LMAs and the combitube.

We hypothesized that we could achieve those design goals by using CT data from a real patient. Partnering with users at Queen's University in Northern Ireland, METI adopted proven systems engineering processes from the aerospace and DoD simulation industries. The use of Spiral Engineering processes was critical as it allowed METI engineers to develop the airway by integrating periodic clinical assessments that drove realtime refinements to the design.

While the final product is a sophisticated airway which can be both easy and difficult to intubate while supporting most major airway management devices, the most significant lesson learned is in the process of medical simulation development. METI has established that without tight integration of the Science of Simulation, Systems Engineering, and Clinical Assessment, patient simulations will not meet the medical educators' future needs for simulation validity and fidelity.

Acknowledgement
Nigel Parker is Director of Engineering, METI, Sarasota, Fl, USA

O 22. Web-SP – a generic web-based interactive patient simulation system

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Background and Goal

Software-based patient case simulation systems (SCSS) have during the recent years been introduced in medical education to allow students to “meet” more cases than normally available. However, three major problems exist with most SCSS today: They are expensive to develop, experienced multimedia developers are needed and teachers/clinicians can not develop and adjust cases to fit their own specific educational needs. The Web-SP project tries to solve these problems, but still allow very realistic and highly-interactive simulations of clinical cases, delivered and edited via the Web.

Results and Discussion

Most important case simulation features are available, including patient interview, physical examination, labs, diagnosis & differentials, therapy and feedback. All functions are freely chosen by the user and are available at any time, except the detailed feedback, which only is displayed when the user has submitted a diagnosis and therapy proposal. The teachers have access to a detailed interaction log, for de-briefing and other discussions with the students. The teacher uses a web-based built-in authoring tool to create/edit the cases. Web-SP has so far been installed at three universities and is under implementation at a number of international universities.

Conclusion

The versatility of Web-SP allows development of simulations that can be used for independent self-directed learning, group interaction, assessment purposes, or a combination thereof. Web-SP can emulate a problem-based learning environment to assist students in becoming active, independent learners and problem solvers. Web-SP case simulations can be adapted for multiple learning levels and can therefore be implemented throughout a medical curriculum, residency program, or continuing education.

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http://websp.lime.ki.se/publications

Acknowledgements including financial support

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O 23. Simulation – a Model for Reduction of Error

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Background and goal

Iatrogenic harm is an important and highly publicised problem in healthcare, the significance of which has been equated with the road toll[1-4]. Anaesthesia is comparatively safe. Current estimates suggest that mortality due to anaesthesia alone is in around 1/200,000, although preventable morbidity is considerably higher.[5] But errors do still occur and public expectations have increased in parallel with the decrease in risk.
With improved safety, adverse events occur at a frequency too low to feasibly demonstrate benefit from an intervention. Indeed the only large, randomised study of pulse oximetry failed to demonstrate an outcome benefit, despite including 20 000 patients. [6]
Simulators have been used to assess anaesthesia practice and technology,[7-10] and their use in training is well established[11-15]. It is likely that comparable errors will be committed in the simulator and clinical environments. However, fidelity is important if observations in the simulator are to be extrapolated to clinical practice.
This is part of a project [3, 4, 7, 16] whose underlying hypothesis is that harm from human error in anaesthesia can be reduced through systematic analysis of its causes and targeted interventions. This study aimed to develop a simulator model for error which could be used to test safety interventions.

Methods

A random sample of 10 anaesthetists took part in two HPS scenarios designed to promote a high error rate. Errors were identified using a combination of observation, computerised record of infusion rates and physiological data, collection of used ampoules, videoanalysis, record review and participant interview.

Results and discussion

Errors were identified and classified in collaboration with participants. Initial results show a mean of 5.95 errors per anaesthetic of 5.95 (SD 1.88).
Conclusion
This model elicits reproducible errors at a sufficiently high rate to test the effectiveness of and intervention designed to improve safety.

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O 24. Simulation-based performance assessment: is it acceptable to trainees?

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Background and goals

Simulation-based assessment (SBA) may be useful, but its acceptability to anaesthesia trainees remains untested. An assessment should be perceived as credible, have a positive influence on learning, and assist examinees identify gaps in learning through self-assessment and feedback. [1-3] [4]. We investigated examinees' perspectives on SBA in terms of acceptability, credibility, effect on learning and self assessment.

Methods

Twenty anaesthesia trainees participated in three simulated emergencies then completed a questionnaire seeking their opinion on the assessment, and their own assessment of their performance. Four independent faculty rated videoed performances. Order of scenarios and rating was randomised.

Results and Discussion

Most trainees felt SBA provided a good measure of their ability to manage the event in real life. Realism rated highly. Ratings and written responses showed trainees learnt a good deal from the assessment process. Self-assessed and externally rated scores correlated well, with 77% of scores falling within one rating point on the five-point scale. Those the examiners scored low tended to overrate their performance, and higher scorers higher to underrate their performance. This relationship is demonstrated in an inverse correlation between the median examiners score and the difference between the self assessed score and the median examiners score (rho - 0.614, $p < 0.0001$, Spearman rank correlation). This is consistent with the literature on self assessment. [4] Trainees saw SBA as a potentially good measure of their clinical performance and found the process valuable. Self-assessment could be enhanced by informing trainees of performance criteria and expected standards.

Conclusion

SBA appears to be acceptable and credible to anaesthesia trainees, supporting face-validity. It is a valued learning experience and could promote skills in self-assessment.

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O 25. Assessing and Enhancing Clinical Competency

Norbert Werner, Clinical Educator-Paramedic

Many EMS managers expend time, energy and money assessing the competency of their staff in day-to-day operational issues. However, how much time and energy is spent assessing the clinical competency of their staff? Are there cost-effective approaches in accomplishing this task? How do we assess our staff in a proactive and positive manner? How do we receive “buy in” from staff, removing the fear of punitive action and negative feedback?
In 2003, the Edmonton EMS Clinical Education Branch developed a successful program to address the issue of assessing and enhancing clinical competency of their frontline staff. Continuing education with the use of simulation, and experiential learning is the foundation of this program. After attending this session, you will have a better understanding of Edmonton’s initiative and receive several practical and innovative tools that can be used in your service. Norbert Werner, one of Edmonton’s clinical educators and the coordinator of this program, will facilitate/host this session.

O 26. Errors in Airway Management during Simulated Pediatric Medical Emergencies

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Background
Survival of children following in-hospital cardiopulmonary arrest is poor. The Pediatric Utstein Task Force stated "the best measure of quality of resuscitation may, in fact, be derived from evaluating the number of children with isolated respiratory compromise that does not evolve into cardiac or respiratory arrest".[1] Delays or omission of essential airway maneuvers may negatively impact clinical outcomes.

Goal
To measure the frequency with which important airway maneuvers are performed during simulated in-hospital cardiopulmonary arrests, commonly called mock codes.

Materials and Methods
Prospective observational, descriptive study on in-patient children's wards. Over a 40 month period, 34 surprise mock codes were performed on mannequins. Each pre-scripted scenario included: respiratory distress or insufficiency, respiratory arrest or cardiopulmonary arrest. The mock codes involved nurses as first responders and pediatric residents as members of the Code Team. Outcome measures included percent of scenarios where the health care team performed specific airway maneuvers.

Results and Discussion
The first responder assessed "Airway and Breathing" in $\leq$ 30 seconds of finding the "patient" in only 9/34 scenarios (26%). A team member applied O_2 in $\leq$ 60 seconds in just 10/34 scenarios (29.4%). In 15/34 (44%) of scenarios suction was set up. Cricoid pressure was applied during bag-mask-ventilation in only 3/34 scenarios (9%). Someone listened for breath sounds to confirm endotracheal tube placement after intubation attempts in every scenario, while end tidal CO_2 was checked in only 19/34 (56%) of scenarios. In addition, analysis revealed frequent problems with bag-mask-ventilation technique, rendering ventilation efforts ineffective.

Conclusion
Important airway maneuvers were frequently delayed or omitted during in-hospital pediatric mock codes, providing a target for educational interventions to improve resuscitation efforts and outcomes.

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O 27. CO-EDUCATION IN EMERGENCY MEDICINE FOR MEDICAL STUDENTS AND PARAMEDICS; CONTROLLING THE AIRWAY

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Background and Goal

Medical students have recently focused attention on the inadequate amount of emergency medical education in medical schools in Finland. Diminishing resources in educational funds have also forced us to find new ways in education. Prehospital emergency medicine is team-work from the field to the hospital and therefore it is important also for physicians to understand the work of paramedics. To improve the chain-of-survival a ten-week course in emergency medicine combining medical students (N=18) of the University of Helsinki and paramedics (N=8) of the ARCADA Polytechnic was designed. The course consisted of three parts: acute illness in childhood and in adults advanced cardiac life support and trauma life support. The course adhered to the recommendations of the American Heart Association and the American College of Surgeons. The curriculum also included a two-day practical training at the National Emergency Services College in Kuopio, and one 24-hour shift in a physician- or paramedic staffed ambulance.

Methods

Evaluation of airway management was done before and after the course. The interventions were evaluated as successful or unsuccessful. Laerdal® intubation manikin was used in evaluations.

Results

	Paramedics			**Medical Students**			**Paramedics vs. Medical Students ****	
	Before	After	P*	Before	After	P*	Before	After
Opening of the airway	100%	100%	1.00	89%	93%	1.00	1.00	1.00
Bag valve mask ventilation	100%	100%	1.00	50%	100%	0.031	0.023	1.00
Preparing for endotracheal intubation	100%	100%	1.00	83%	53%	0.180	0.529	0.114
Successful completing of endotracheal intubation	88%	100%	1.00	67%	87%	0.290	0.132	1.00
Confirmation of proper tube placement	100%	100%	1.00	67%	80%	1.00	0.375	0.539

P* = Chi Squire Test
P** = McNemar test

Conclusion

Paramedic training seems to give slightly better skills for airway management than physician training. More attention has to be focused on hands-on skills during education of medical students. The course was successful in improving the airway management skills for the medical students.

O 28. Simulation Training and Clinical Practice in the Introduction of New Techniques in Anaesthesiology (Laryngeal Tube – LT and ProSeal Laryngeal Mask – PLMA).

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Introduction
Manikin exercises are a part of training when introducing new techniques to clinical practice. It is interesting to see how the simulation results relate to real-life situations.

Aim of the study
To evaluate repetitiveness of results observed on the manikin and in reality (LT & PLMA).

Methodology
Step 1. Manikin training in introduction of LT and PLMA (30 anaesthesiologists – AN.) finished by general anaesthesia simulation. We compared ease of introduction and ventilation efficacy.
Step 2. Simulation of need for fast airway patency restoration - LT and PLMA were provided, while we observed the choices of trained staff.
Step 3. Use of LT and PLMA during general anaesthesia (30 PLMA, 30 LT). We observed the number of insertion attempts, the need for additional manoeuvres and ventilation efficacy during controlled & spontaneous respiration.

Results
Step 1
28/30 AN inserted LT correctly at 1st, 2/30 at 2nd attempt.
20/30 AN inserted PLMA correctly at 1st, 7/30 at 2nd and 3/30 at the 3rd attempt.
Step 2
18/30 AN chose PLMA for emergency.
Step 3
15/30 AN inserted LT correctly at 1st and 15/30 at 2nd attempt.
28/30 AN inserted PLMA correctly at 1st and 2/30 at 2nd attempt.
In 26/30 LT and in 11/30 PLMA insertions additional manoeuvres were necessary.
In 30/30 LT pts. and 11/30 PLMA pts. air leaks were observed.
Controlled ventilation was non-problematic in 30/30 PLMA pts. and in 22/30 LT pts.
Spontaneous ventilation was adequate in 30/30 PLMA pts. and in 12/30 LT pts. (8/30 pts. required tube removal).

Conclusions
1. On the manikin LT insertion was easier than PLMA insertion.
2. In clinical practice, insertion was easier and less leaks were observed with the PLMA.
3. Spontaneous ventilation during general anaesthesia is easy through the PLMA, but can be difficult through the LT.
4. Clinical conditions create situations, which cannot be pre-arranged on the simulator, i.e. the manikin may not be considered to be a copy of real-life conditions.

P 1. Cross-professional trauma team simulations: Do team leaders and team members agree on leadership performance?

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Background and Goal

Cross-professional simulation is regarded an important way of training trauma teams. During a period of 3 years we have conducted a survey among team members after a one-day simulation course in Norwegian hospitals. Dealing with issues such as leadership, co-operation, and communication the course is influenced by ideas drawn from crew resource management (CRM) [1]. Our current aim is to report how the team leaders perceive their own leadership compared to how they are judged by their team members.

Material and Methods

100 cross-professional teams from 28 hospitals have participated in two different standardized trauma simulation sessions (N=200). Each team includes one designated leader (surgeon) and a varying number of members. Following each simulation the team discuss own performance in an oral debrief session. However, prior to these discussions, each member individually reports (perceived) performance based on a questionnaire containing a set of eight items on a 100 mm visual analog scale (VAS). We are currently measuring the degree of agreement of performance between the score of the leader and the rest of the team, including both case 1 and 2 (first and second simulation). As we cannot simply look at the mean and SD based on all the team leaders and members across sessions, we will look into the difference in each session between the mean (and standard deviation) of the team members and its leader.

Results and Discussion

Our findings will be based on 1946 submitted questionnaire forms.
As to the question of 'degree of disagreement', the results are still in "analysis mode", and we are sorry that we cannot submit more for the time being.

Conclusions

References

1. Helmreich, R. L., Merritt, A. C., & Wilhelm, J. A. (1999). The Evolution of Crew Resource Management Training in Commercial Aviation. *International Journal of Aviation Psychology, 9*(1), 19-32.

P 2. Is students' age a factor in the acquisition of skills and knowledge from scenario-based simulation training?

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Background and Goal

A large amount of data was collected as part of a project[1] funded by the British Heart Foundation (project Edcomm/Oct98/9d) to investigate the effect of simulation training in nursing education. In view of the wide range of age of entrance into nursing education a subset of that data is used to investigate whether age is a significant factor when using simulation training tools.

Material and Methods

Forty nine 2nd year DipHE nursing students were tested on basic skills and the use of technological equipment using an identical 15-station OSCE pre and post-exposure to simulation training. This consisted of two half-day sessions in which students observed 6 ward-based scenarios related to acute nursing care skills and participated in another 2 scenarios. Of the original OSCE, only 10 stations are used for this analysis as they related specifically to skills/equipment to which students were exposed during the simulation sessions.

Results and Discussion

Students' age ranged from 20 to 46 years old. A statistical analysis of age against improvement in OSCE performance was performed using cross-tabulation tables and correlation. Analysis of the data shows no significant relationship between age and improved performance.

Conclusion

In a similar way as with clinical experience[2], no statistically significant effect of the students' age on their improvement in OSCE performance could be identified. Thus, it appears that simulation training is appropriate for students within the age range normally recruited in pre-registration nursing programmes.

References

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P 3. TRANSPORT VENTILATION – HOW IMPORTANT IS CAPNOGRAPHY?

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Background and goal

Anaesthetists are frequently required to transfer ventilated patients safely between departments or hospitals. Although the use of a capnograph is recommended, this monitor is often not available for short transfers. We elected to examine the ability of anaesthetists of varying experience to ventilate a standardised simulated patient to a desired $PaCO_2$ using a calibrated transport ventilator in the absence of capnography or arterial blood gas estimation.

Materials and method

11 anaesthetists intubated and ventilated a 70kg fit head injured patient (METI HPS) with initially normal blood gas parameters for 20 minutes using a Sabre ATV transport ventilator but without further access to capnography or further blood gas estimations. Adequacy of ventilation was confirmed by continuous gas analysis of the manikin's lungs and after 20 minutes the subjects were asked to describe the ventilator settings and estimate final $PaCO_2$.

Results and discussion

All anaesthetists estimated a final of $PaCO_2$ <36mmHg. Awareness of principal ventilator settings was good but only 55% ventilated to an AAGBI [1] recommended range of 30-34mmHg. Examination of the 20-minute trends revealed that 27% were able to maintain $PaCO_2$ within ideal parameters for a 10-minute period.

Conclusion

Anaesthetists are not reliably able to ventilate to AAGBI guidelines without the aid of continuous capnography.

Reference

[1] Recommendations for the transfer of patients with acute head injuries to neurosurgical units. December 1996. The Neuroanaesthesia Society & Association of Anaesthetists of GB & Ireland.

Acknowledgement

Sabre Medical provided the ventilator used in this project

P 4. Making EEG output on human patient simulator

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Background and Goal

Full scale mannequin based human patient simulator(METI-HPS) had been used widely in the clinical educational participation program of students, and in the advanced clinical event handling program of the residents in our university. In these practice, the EEG has been become one of most important vitals because the hypnosis level can be evaluated by EEG measuring of the bi-spectral index(BIS) or the state, response entropy(SE and RE),and their appropriate handling is count as the achievement score. Vital signs are generated by METI-HPS and they have real-like simulated wave forms, which can be connected directly to the monitor electrodes, but EEG is excluded in our version-five software.
We have made the HPS to be able to simulate EEG analog wave form output by using computer generated numerical EEG model, which can vary the index of approximate and both of spectral and amplitude Shanon's entropies, and Lempel-Ziv complexity score continuously by changing computational parameters.

Materials and Methods

We had used two numerical models, one is an autoregressive data set and the other is a stochastic data set. In the deterministic data set, simple trigonometric function was used as complete autoregressive and a random generated noise was added as to constitute the increase of the non-autoregressive ratio. In the stochastic data set, the logistic function which bifurcates several times and finally become in a chaotic state was used and level of bifurcation and initial value are used to control the complexity.
These data sets are converted to analog signals via a digital to analog converter and output from the electrode attached in the forehead of the mannequin.

Results and Discussion

Both model successfully generated many different levels of entropy indexes and those of complexity levels. The EEG was generated in analog wave form, hence the monitors in which the internal algorithms were undisclosed, such as BIS, SE, RE could be used without using special interface units.

Conclusion(s)

It is concluded that our developed simulated EEG output can be used in the training of the management of appropriate hypnotic level.

P 5. Simulation of cardiovascular physiology and pathology with CorVascSim: A PC software for advanced education and research

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Background and Goal

The rapid development of computer technology makes simulation of cardiovascular physiology and pathology possible. The current work presents a scientifically based cardiovascular model, with a self-explanatory interface.

Material and Methods

An electrical analogue of the cardiovascular system including resistances, capacitances and inductances was constructed. The contractile function of the cardiac atria and ventricles are represented by time-varying elastances. Valvular function, pericardial volume, ventricular interaction and intrathoracic pressure are represented by constants and functions, which can interact. Pressures, flows and volumes are recalculated every millisecond and presented on-line as numerical and high-resolution graphics.

Results and Discussion

The validity of the simulation models is based on the references (1-4). The software makes it possible to illustrate a great diversity of circulatory pathological findings including systolic and diastolic heart failure, valve diseases, pericardial effusion, arteriosclerosis and effects of changes in intrathoracic pressure. The model is being used to educate doctors and nurses in cardiac surgery, cardiac anaesthesia, and cardiology, but its pedagogical value remains to be validated.

Conclusion

Simulation of cardiac physiology and pathology provides a new way to study the heart. Results from simulations can be used in education as well as in interpretation of clinical invasive monitoring, echocardiography and experimental research.

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Acknowledgements including financial support
The author has received a grant from the department of Learning, Informatics, Management and Ethics, the Karolinska Institute, Stockholm, Sweden.

P 6. A touch of added realism: Preparation of your patient simulator for urinary catheterisation

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Background and Goal

Putting students through medical simulation experiences provides them with some valuable insight into the real world of clinical practice in a safe environment. High fidelity simulation[1] is not only obtained thanks to a patient simulator but also according to its surrounding environment. To help trainees suspend disbelief all details must be considered in advance. The aim of this abstract is to present a minor modification made to a patient simulator regarding urinary catheterisation.

Material and Methods

Most patient simulators have a canulation arm with two tubes coming out. Once primed with simulated blood, one end can be clamped and the other extended with a tube joined to a T-piece connector to link the urinary catheter and the urine drainage bag. The tube can be hidden under the side of the manikin's chest skin. As students inject fluids it gradually fills the drainage bag, hence giving a fluid output.

Results and Discussion

This process enables collection of fluids injected in the patient in a hidden way at the same time as producing a fluid output. Hence trainees are not questioning the presence of an unexpected collection bag at the bedside. The drainage bag can contain undiluted colorant to appropriately dye the fluids into urine. If not dyed trainees should be warned that the colour of the urine will be that of the fluids they are injecting.

Conclusion

The use of medical simulation is still rapidly increasing[2] and it is important that users share their expertise in designing scenarios and in improving simulation tools for the benefits of the trainees, and ultimately, for improved patient care. This simple modification is safe, inexpensive, and makes the simulation more realistic.

References

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P 7. A touch of added realism: Preparation of your patient simulator for internal haemorrhage

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Background and Goal
To help trainees act as themselves during a scenario-based simulation session adequate preparation of the patient simulator is required. The aim of this abstract is to present a minor modification made to a simulator used in a scenario that includes an internally haemorrhaging post-operative patient with a clean bandaged wound and a vacuum drain in place.

Material and Methods
The vacuum drain needs to be slightly modified to operate correctly. Its tubing is shortened and the one way valve assembly is discarded before insertion into the mannequin's abdomen, under the bandage. A long extension plastic tube is affixed to the vacuum drain tube using a connector. This extension tube is then fed through the abdomen of the mannequin, and out via the posterior slot along with and strapped to the mannequins pneumatic lines. The tube then runs to the control room where a large syringe primed with simulated blood can then be connected to progressively start the haemorrhage at the appropriate time during the scenario. For large volume haemorrhage the vacuum indicator needs to be pierced to allow air escape.

Results and Discussion
In the example addressed a vacuum wound drain manufactured by Medinorm AG was used, although any similar type of drain can be modified to fulfil requirements. This setup could be applied to any desired wound site, such as on the thorax, hip or thigh. It enables the operators to simulate an internal post-operative haemorrhage in a fairly realistic manner. If a scenario does not require the wound drain, the bottle can easy be disconnected and the tubing stored in the mannequin's abdomen.

Conclusion
The more advanced a scenario is, the longer it normally takes to prepare the mannequin and the environment. However this setup enables rapid changes between scenarios and the tubing can be left attached permanently to be reused, as it can be hidden. Participants exposed to scenarios using this setup found it very realistic.

P 8. Using Task Analysis to Design a Cricoid Pressure Trainer

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Background and Goal

Cricoid pressure (CP) is an important clinical skill used in resuscitation and anaesthesia (ref). 'On-the-job' training presents an unacceptable risk because failure can lead to severe adverse outcome including brain damage or death. The goal of this project was to improve CP training.

Materials and Methods

The quality of CP and the problems associated with poor performance were researched. Features of the ideal Cricoid Pressure Trainer (CPT) were identified by task analysis.

Results

Applying insufficient force makes CP ineffective but too much force or force in the wrong direction increases difficulty of airway management. Task analysis revealed key elements of CP:

- Accurate location of the cricoid cartilage
- Force applied to the cricoid cartilage is directly backwards
- Applied force is at least 20N but not more than 40N
- Force is applied and released when appropriate

A CPT must indicate these elements and be 'portable', 'reliable', 'inexpensive', 'simple to use' and 'can be used for practising teamwork aspects of airway management' to the key element list above to create a concept of the ideal simulator for teaching CP. Study of simulators from the US and Europe marketed for training in resuscitation and/or anaesthesia (n=17) revealed that none had the features necessary to learn effective CP.

Discussion

Poor cricoid pressure technique has been implicated in adverse patient outcome. Task analysis revealed important deficiencies in airway care simulators and indicated what was needed in the ideal CPT.

Conclusion

Task analysis is useful when choosing simulators to teach medical procedures. A CPT that satisfies all CP training needs has now been developed.

Reference

Resuscitation 46 (2000) 29-71. Part 3: Adult Basic Life Support

Acknowledgement

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P 9. EVALUATION OF A RATING SCALE IN ASSESSMENT OF PERFORMANCE OF ACUTE CARE PROVIDERS WITH A HUMAN PATIENT SIMULATOR

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Background

There is an increasing interest in using high fidelity simulation for evaluating clinical performance. Human patient simulator offers the opportunity to evaluate not only what physicians know, but what physicians do in a clinical setting. We have developed a global rating scale for assessment clinical performance of intensive care physicians in emergency event with a human patient simulator (1). We show parameters regarding validity, reliability and internal consistency (2).

Methods

Three experienced instructors on simulation and human factors developed a list of task for management of emergency situations for intensive care physicians. The list of task was categorized into four groups: airway management, ventilation, circulation management and behaviours. 22 items were scored on a five point rating scale. Instructors independently rated each item when the scenario was finished. There were rated 7 scenarios performed by 22 critical care physicians during 3 different courses at the Santander Simulation Centre.

Two ways ANOVA was used to analyze the results. One way to assess the inter-rater reliability and other way to assess the subject performance. To assess the intra-rater reliability was used the Intraclass Correlation Coefficient (0 invalid and 1 complete).

Results

High internal consistency was found for 19 of 22 items (ICC >0,60). The overall performance for the 3 raters was very significative p<0,001 for 21 items which indicates a very good agreement between raters.

Conclusions

Our rating scale to assess acute care physicians with a human patient simulator shows a good inter-rater reliability for evaluation of crisis management.

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P 10. Simulation for medical undergraduates: effective for learning, acceptable for assessment.

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Background and goals

Acquisition by medical undergraduates of clinical skills, can be problematic[1]. Simulation-based medical education (SBME) may be an effective and ethical solution. [2, 3].
We investigated the effectiveness of SBME by measuring improved performance and self-identifed learning, and evaluated students' perspectives of the use of simulators for assessment.

Methods

Medical students in their 4th and 6th years attended a simulation workshop on circulatory collapse. They were videotaped in teams in three baseline scenarios which were subsequently repeated, each team acting as its own control.
Students completed an end of course questionnaire. Using both rating scales and checklists, scenarios were rated by 2 independent assessors in a blinded, randomised model.

Results and Discussion

Seventy-one students attended. Students identified important learning points, confirming previous results [4]. Advantages of SBME over alternatives included learning from experience, active engagement, relevance, committing to decisions, practising skills, stimulus to learn more, putting theory into practice, and learning in a realistic context and time frame.
Students saw simulation as a credible and relevant assessment, 91% agreeing it should be included in their examinations.
Each team scored higher in the repeat scenarios. This reached statistical significance in Scenario 1 ($p<.01$). Checklist scores improved, and key actions were performed earlier, reaching statistical significance for some items.
Scores for all 6th yr teams exceeded 4th yrs and were statistically significant for three of six comparisons.

Conclusion

SBME is effective and valued by students. This study supports simulation based assessment of medical students as an acceptable and valid process.

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Acknowledgements
Funding was received from the Centre for Advancement of Teaching and Learning at the University of Otago. We would like to thank Margaret Couper who so ably played the part of the nurse during the workshops, and Gabrielle Davie, biostatistician, who contributed to the analysis.

P 11. Low tech simulation for trauma teams with simple mannequin or live model? Preliminary result from cross-over comparison

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Background and Goal
We have trained more than 70 trauma teams in two thirds of all Norwegian hospitals during the last 7 years. So far, we have used each hospital's simple CPR-mannequin as a simulated patient. One of the possible disadvantages of this approach is lack of realistic visual, audible and tactile input to the trainees. We wanted to assess the trainees' evaluation of using a live model instead of a mannequin.

Material and Methods
Two hospitals received a standard BEST team training courses (1,2). During the simulations two teams at each hospital simulated twice; one with mannequin and one with live model in random order. The case stories for training were standardised, with the first case being relatively simple, and the second case more challenging. Individual evaluations were collected via a questionnaire after each simulation with 100 mm visual analogue scales.

Results and Discussion
Four trauma teams participated, resulting in 81 questionnaires. When comparing answers after mannequin training to live model training no significant differences were found in the following dimensions: personal outcome (78.7 vs. 79.9), difficult to imagine as real patient (44.8 vs. 49.0), general educational experience from the case (74.0 vs. 71.6).
After the first simulation, the educational experience with mannequin was rated significantly higher than with live model (78.0 vs. 64.5). After the second simulation the respondents had no significant overall preference for mannequin vs. model, although the team that had live model in the second simulation evaluated this significantly higher than mannequin (48.8 vs. 73.7).

Conclusions
Our preliminary results indicate that the training object is not crucial for the outcome, when training teams in co-operation, communication and leadership is the primary goal.

References
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P 12. The use of High Fidelity Patient Simulation and the Introduction of New Anaesthesia Delivery Systems.

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Background and Goal
New anaesthesia delivery systems are becoming increasingly complex. Equipment is involved in a large proportion of intra-operative anaesthesia problems. Current methods of introducing equipment into clinical practice have not been studied. We designed a prospective study to investigate a method of introducing new anaesthesia equipment.

Materials and Methods
Fifteen anaesthetic trainees were randomised to either a standard introduction (45-60 minute in-service from Drager representative) to a Drager Fabius GS anaesthesia delivery machine (group one), or this introduction plus simulated clinical use of the new machine in a high fidelity patient simulator (group two). A questionnaire examined opinions on the new equipment. Participants were tested with two simulated crises using the Drager Fabius GS. In scenario A, the HPS developed severe bronchospasm after induction of anaesthesia and tracheal intubation. Times from intubation to recognition of bronchospasm and initiation of treatment were recorded. Scenario B was an intubated patient on a CT scanning bed with an ICU nurse manually ventilating by self-inflating bag. A Mapleson F circuit was connected to the common gas outlet from a previous paediatric case and the anaesthetist handing over the case removed this in the presence of the study participant but failed to return the fresh gas flow to the circle breathing system. The times from completion of the hand over to the adequate F_iO_2, minute volume and anaesthetic vapour were recorded.

Results and Discussion
Registrars randomised to group two resolved crises faster with better performance scores. Questionnaire responses showed that both groups were unable to assess their safety to use the new equipment. The use of patient simulation allowed us to detect design features that were common sources of error.

Conclusion
Patient simulation could be used to test the safety of practitioners using new complex equipment without patient risk.

P 13. Is the St John Ambulance on-line Crash Course WORTHWHILE?

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Background and Goal

There are no published data on the efficacy of online first aid or resuscitation learning programs in Australia. Our goal is to compare the knowledge and first aid skills of subjects who have undertaken the St John Ambulance On-line Crash Course, with those who have no first aid training.

Materials and Methods

We evaluated first aid knowledge and basic life support (BLS) skills of two groups of students. The control group (n=11) had received no first aid training of any type and the test group (n=12) had undertaken and passed the St John Ambulance on-line "Crash Course". This course is purely theoretical. BLS skills were assessed using standardised patients and manikins. Knowledge was assessed by MCQ.

Results and Discussion

There were significant differences (Mann-Whitney U test) in the performance of the MCQ test between the group who completed the course and the group who did not complete the course ($P = 0.036$). There were no significant differences in the performance of any other practical tasks between the 2 groups. We conclude from this that the on-line course significantly improved course participant's knowledge of BLS, but not their ability to perform. Studies show that clinical ability does not correlate with MCQ success (1, 2) and that a combination of teaching techniques achieves better results (3). Therefore, the efficacy of on-line training might be increased if used with other learning techniques e.g. simulation.

Conclusion

We conclude that on-line first aid courses may be useful for knowledge acquisition but that they do not confer any benefit in performance of BLS skills.

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P 14. Cross-professional trauma team simulations: Increased performance after repeated sessions?

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Background and Goal

Cross-professional simulation is an important way of training trauma teams. During 3 years we have conducted a survey among team members after a one-day simulation course in Norwegian hospitals. The focus is mainly ”non-technical”: leadership, co-operation, and communication. The course can thus be viewed as an attempt to apply ideas from crew resource management (CRM), an approach well known within the aviation industry [1]. The course model includes two different cases, and the question relates to whether one can find indications of increased performance from the first to the second session.

Material and Methods

100 cross-professional teams from 28 hospitals have participated in two standardised trauma simulation sessions. Each team includes one leader (surgeon) and a varying number of members. Following each session, the leader and all members individually reported (perceived) performance on a questionnaire (100 mm VAS). The scores on two items were compared after the two sessions. Effects of profession will be analysed.

Results and Discussion

What is your impression on leadership? (worst = 0, best = 100)
After the first simulation: Mean = 65,80, SD = 21,41
After the second simulation: Mean = 74,74, SD = 17,11

What is your impression of the total team performance?
After the first simulation: Mean = 62,09, SD = 17,60
After the second simulation: Mean = 71,24, SD = 17,28

Conclusions

There was an increase in scores from the first to the second session. The second simulation case was the most demanding. Despite this, the results indicate that the participants generally were more satisfied after the second session. Regardless this being an effect of getting acquainted with the rules of the game, or an actual increase in team performance, it seems to be a good idea to train each team more than once.

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P 15. Trauma Team Training: Simulation based training in trauma care with emphasis on the importance of teamwork

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Background
The treatment of multitraumatised patients demands a co-ordinated effort of the trauma team. A multidisciplinary course was developed with the aim of training teams to co-ordinate and optimise the assessment and treatment of the severely injured patient in the emergency room, with the emphasise on teamwork, communication, and leadership. The effect of this training was assessed by an evaluation form, and the participant's self-evaluation of their performance as team members.

Goal
The main purpose was to compare their ratings after the first and second simulation scenario and debriefing.

Method
Since 2002, 16 multidisciplinary trauma teams have received a full – day simulation based Trauma Team Training (TTT) course based on lectures, educational videos, practical skill stations and 2 scenarios in the full-scale simulator conducted in the real emergency room. The patient is a moulaged paramedic. Each teams performance was video recorded and used in the debriefing following each simulation, focusing on teamwork, communication, and leadership. Each participant completed an evaluation form. Furthermore`, the participants accepted to evaluate the teams performances' as well as their own performance after the 1st and the 2nd scenario. Aspects such as leadership, communication, co-operation, the team leaders ability to listen, the tone of voice etc. were evaluated on a Likert scale.
Results**:** 97% of the participants stated that the training would have a positive effect on their behaviour in future trauma teams.
The participants' self-evaluations of their performance after the 1st and 2nd debriefing indicate an improvement in leadership, communication and co-operation. After the 1st and 2nd scenario 69% and 99% of the participants rated leadership as very good or good, respectively. The corresponding numbers for co-operation are 83% and 100%, respectively. It is also noteworthy that all teamleaders after the second scenario evaluated these aspects of competence as very good or good.

Conclusion
The training was extremely well received by the participants and from their self evaluations training have improved their behaviour as well as other aspects of competence, such as leadership, communication and co-operation.

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P 16. Evaluation of anaesthesia practical program incorporated with patient simulation for medical students.

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Backgrounds and goal

Our previous practical program for students rotating through anaesthesia had not included patient simulation until three years ago. In those days, when students watched anaesthesia induction, they never give their glance at the patient monitor, even if they understand the anaesthetics for the induction and a sequence of the procedure. Only that student was concerned about is the skill of anaesthesiologist. We thought that, as for the practice of anesthesia, that program was not effective. So, we have incorporated patient simulation to teach the comprehensive clinical anaesthesia including the usage of anaesthetic apparatus at the first anaesthesia rotation. The goal of the present study is to assess how our program is effective for anaesthesia education.

Materials and Methods

After obtained informed consents, medical students taking an initial practical program of anaesthesia at Shimane University enrolled into the study. At the beginning of the program, we explained the usage and necessity of patient monitoring system during anesthesia using high fidelity patient simulator (HPS). After a few lectures about anesthesia and practical airway management using airway-training devices, we taught the standard anaesthesia induction and maintenance using HPS. Scenario simulation including some crisis during anesthesia such as hypoxemia and ischemic events was followed. We asked the questionnaires before and after this workshop. We also assessed students' attitude during simulation.

Results and discussions

Seventy-four students replied to the questionnaires. Totally thirty percentage of anaesthesia practical program was spent on simulation training. The analysis of students' questionnaire showed that they strongly believed that simulation workshop should be necessary before bedside training. They were also very satisfied with our program and seemed to have a confidence about their acquired knowledge and basic skills. Instructors were satisfied with student's attitude during simulation practice and found that student concentrated their attention on patients' physiological changes during real anaesthesia.

Conclusions

We concluded that patient simulation during clinical anesthesia workshop was very useful and interested medical students in anaesthesia very much.

P 17. Usefulness of simulation for learning about new pharmacological agents in medicine.

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Background and goals

Realistic simulation is a rapidly expanding field in health care. It is being used for different objectives(1), like for improving management of complex and dynamic situations involving high cognitive demands. Gaining of teamwork coordination, like situations that take place in anesthesia or Intensive Care Units. Acquisition of clinical knowledge and the development of communication skills of medical practitioners. Training of first-aid measures for different health care providers, like CPR or VRE protocols. Practicing for training in the management of the aftermath of medical errors and evaluating acute care skills by recreating high fidelity crisis simulations among others.

Also it is being introduced in the academic field as power teaching tool(2), used for teaching pharmacology and physiology, training medical students on first-aid measures, CPR and VRE programs. Recently, simulation based protocols has been introduced in order to evaluate medical student performance.

Medicine is a rapidly expanding field, with increasing medical technology and new pharmacological agents that make difficult for physicians in practice to gain proficiency with new devices, procedures or drugs. Recently remifentanil was introduced in clinical practice as new selective u-opioid agonist with an extremely rapid short duration of action.

Due this novel features train new users prior to its use in patients could be desirable, also is gain in confidence for new applications or anesthetic techniques. In this regard, human simulators can play an important role because they offer a unique learning opportunity without risk to real patients(3).

This report describes a simulator-based learning program developed to gain proficiency in the use of the new opiod remifentanil and analyzes the results of a survey completed for the participants after training on simulation.

Methods and Results

Between January and December 2003 we held 8 courses (64 participants) about the clinical use of remifentanil. The schedule of the five hours course included a brief introduction to set the objectives of the course, a short course of remifentanil´s pharmacokinetics and four different sessions of clinical applications of remifentanil on general surgery, orthopedics and trauma, neurosurgery, pediatrics. Each session included specific protocols, a clinical scenario and a debriefing session.

All participants filled in a questionnaire at the end of the course (rating scale 1 to 5; 1 minimum, 5 maximum). The main results are show in table 1.

Table 1. Course questionnaire results.

Do you think the course is interesting ?	4.34 +/- 0.66
Has the course been useful for your job ?	4.28 +/- 0.66
Do you think the schedule is suitable ?	3.91 +/- 0.78
Did you feel comfortable ?	4.65 +/- 0.47

Did you feel tired ? 2.25 +/- 1.05
Were the objectives of the course clear for you ? 4.41 +/- 0.67
Have these objectives been achieved ? 4.17 +/- 0.72
Was the short pharmacokinetic course useful for you ? 4.70 +/- 0.49
Did the scenarios seem realistic ? 4.03 +/- 1.07
Was the debriefing session well addressed ? 3.98 +/- 0.80

Discussion and conclusion

These initials findings suggest that simulator based training for the use of new pharmacological drugs is considered useful for the clinical setting.

The participants considered the simulator a realistic scenario, that led to improve the pharmacologic knowledge and gain confidence in the use of the new drug.

Although the main objectives of the participants were clear and mainly achieved, the schedule and debriefing sessions should be modified in the future.

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P 18. Mixed professions training initial care together in full scale simulation

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Background and goal

Medical emergency efforts have some inherent serious difficulties. A human life is at stake, depending on correct desicions and actions within minutes. The people gathered to help, belong to different professions, and may not have ever met before.Without simulation training, it is hard to get first hand experience of such situations before actually trying hands on, in real life.
That so many patients survive, and get correct treatment in these hurried and unforseen situations is facilitated by the shared knowledge and unspoken agreements of the medical team members, that is, the shared culture of health care professionals.
By our training we seek to further develop and define that culture, to benefit the patients.

Material and methods

We teach one day courses where groups of trainees, doctors and nurses mixed, repeatedly practise initial emergency care in a full scale simulated environment including a human patient simulator.
Each trainee gets several training sessions during the day, and after each session there follows an analysis of the actions of the team and its members, sometimes with the aid of video recordings.
Before and after the sessions a few simple and important points are stressed :
The leadership must be defined promptly, to avoid discoordination of efforts.
If possible up to 60 sec should be used for background information.
There should be an attempt to contact the patient.
A primary survey of the patient should be completed within about 1 minute in a manner harmonizing with principles of ATLS and TNCC. <u>A</u>irway <u>B</u>reathing <u>C</u>irculation <u>D</u>isability and <u>E</u>xposure are checked and any obvious problem in one point gets initial treatment before the survey continues.
Thereafter calling for help should be considered, as experience shows that calling for more help easily is forgotten or postponed in cases where tragedy results
While waiting for help, a secondary, more thorough survey of the patient with continued therapeutic measures is undertaken.
The team members are not allowed to commit any major faults during the session, that might threathen patient security, If that happens, the session is interrupped, and after corrective instructions restarted

Results and discussion

As instructors, we see the speed and accuracy of point 1-5 described above increase dramatically during one day of training, as every trainee gets to try again in one scenario after the other. The course is also avaluated with a questionnaire where the students rate their course along a 10 grade Lickert scale. The mean overall rating was 9,6!

Conclusion

The above described method seems to be of value to participants and to speed up initial emergency care.

P 19. EDUCATIONAL MEDICINE – PATIENT SAFETY – TEAMWORKEVALUATION OF THE TRAINEE NURSES LEARNINGPROCESS IN A COMPUTERIZED ENVIRONMENT – THE HUMAN PATIENT SIMULATORB.

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Background

The two year Trainee Programme for newly graduated nurses at KUS Huddinge includes almost all departments. During the programme the nurses are offered to choose four different wards for their rotation. The nurses participating in the programme spend approximately 20 % of the working hours for further training and education. 50 % of this time is based in the general Trainee Programme and the other 50 % is linked to the current rotation.The Trainee Programme starts with two weeks of introduction at KUS Huddinge. During the introduction all nurses are educated in Coronary and Pulmonary Resuscitation (CPR) using a manual doll. On their first rotation the nurses are prepared for various cases of emergency through lectures and opportunities to practice how to act in various emergency situations. The training includes a full-day practice with a human patient simulator in a realistic environment. A possible scenario can be anaphylaxis or septic shock.The objective for the practice of the nurses are:

- to secure their clinical and practical ability in a realistic environment
- to deal with patients in different emergency situations
- to practice working in interdisciplinary teams in an emergency situation
- to receive individual feedback on how to handle own stress in an emergency situation

Method

During the year 2003 thirty nurses have participated at thirteen different occations. A survey will be conducted during the spring of 2004 to all participants in order to evaluate whether the purposes are fulfilled or notQuestionnaire:

- Have the one day-training with the simulator-doll increased the nurses clinical expertise and accuracy?
- Are the nurses more aware of their individual reactions in emergency situations?
- What are the outcomes of team practice?
- Have the nurses understanding of the importance of leadership and communication within a ward-team increased?
- Does the simulator-doll function as a link between the clinical and the educational setting?
- Have the nurses achieved increased experience, to improve their ability in patient care?

W 5. Using Laerdal SimMan for teaching about pneumothorax and chest drains: modifications you can make.

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Background and Goal

Laerdal SimMan has been used at Wellington since 2001 for clinical training. One attribute is its portability with training carried out in clinical areas (e.g. in a stationary helicopter). Another is its ease of use so that the clinical instructor can use the software to run simple skills training scenarios. In several areas of training, the training needs did not match what the mannequin could deliver. For example, training of intensive care staff for fixed wing and helicopter patient transport required simulation of unilateral chest movements during spontaneous breathing for a pneumothorax scenario. Cardiothoracic unit nurses required training in management of chest drains that also required unilateral chest movement during spontaneous breathing and with appropriate swinging or bubbling of the chest drain. The goal was to make simple modifications to SimMan that overcome these deficiencies.

Materials and Methods

This workshop will demonstrate how simple modifications of SimMan with the addition of pneumatically controlled valves (VL/0-3-PK-3x2, Festo, Germany), tubing connectors and bladder can be used to generate unilateral chest movement consistent with pneumothorax. In addition, a modified wound drainage device (Snyder Hemovac, Zimmer, USA) placed in the chest can be connected to chest drain and demonstrate swinging and bubbling consistent with expected clinical changes.

Results and Discussion: These are simple modification to improve and expand training capabilities of Laerdal SimMan.

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