Case study

Making Simulation Training Available to More

DIMS - Danish Institute for Medical Simulation

Copenhagen, Denmark

By: Ellen Thomseth, Laerdal Medical

This case study is one, in a series of seven, describing various aspects of European simulation centers. The document was developed in collaboration with and approved by DIMS.

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DIMS IN SHORT
Danish Institute for Medical Simulation (DIMS) was established in 2001. The sophisticated institute is located in clinical environments at the top floor of the University Hospital of Herlev in Greater Copenhagen, where the spacious facilities occupy 2800 sq meters. DIMS designs and delivers anesthesiologists’ specialist training and simulation training for physicians and residents, anesthesia and intensive care nurses, medical and nursing students, along with other healthcare professionals. Postgraduate personnel is the largest participating group, and special courses for anesthesiologists and interns are currently predominating (40% of the 6000 individuals trained in 2007 were interns). The majority of course participants come from the Capital Region which comprises eight different hospitals. Further, DIMS facilitates national courses for anesthetists and delivers local, national, and international Train-The-Trainer courses for instructors in medical simulation. The institute collaborates with Center for Clinical Education (CEKU), Rigshospitalet in Copenhagen, and actively participates in national and international simulation networks. DIMS acts as a national knowledge center for new centers in Denmark.

Profile
Simulation training is provided for all sectors in the chain of survival.

Floor plan

Activity

Website: http://www.herlevhospital.dk/menu/Afdelinger/Dansk+Institut+for+Medicinsk+Simulation
WHY SIMULATION WAS IMPLEMENTED

The incentive to establish the Danish Institute for Medical Simulation (DIMS) has been to improve the quality of patient care and to increase patient safety, by conducting research and developing new training methods for physicians and nurses. These activities are carried out in close collaboration with the university, scientific and political bodies, and commercial companies.¹

ORGANIZATIONAL MODEL

DIMS has educational responsibilities for the Capital Region of Denmark. The basic funding comes from this region and the center reports to the Herlev University Hospital board of directors on daily matters. A full-time employed anaesthesiologist and Master in Medical Education heads the institute. The majority of instructors are healthcare professionals from the Capital Region itself; however, the center also makes use of instructors from other regions and foreign nations.

Staff competency levels
All instructors have a medical background. A three-day formal simulation-training course is a minimum requirement to exercise instructor responsibilities at the center. Debriefing is highly emphasized and thus an essential part of the instructor course. The medical simulation centers DIMS, Barts (London), and TuPASS (Germany) developed level 1, and collaborate on developing levels 2 and 3 of the Train-The-Trainer course.

For additional information: http://www.EUsim.org/

Staffing
Director
4 secretaries
1 patient safety expert
1 technical engineer
2 floor managers

In-house Instructors:
3 MDs (full-time)
2 MDs (part-time)
4 specialized nurses (full-time)
1 specialized nurse (part-time)
3 nurses (part-time)
2 PhD students
1 paramedic
1 psychologist
25 medical students (assisting part-time)

Associated Instructors:
200 MDs (largest group)
Nurses
EMS personnel

Facilities
DIMS is equipped with 13 full-scale simulation rooms, 5 control rooms, 7 debriefing rooms, and 3 classrooms. Scenarios can be run independently in all rooms.

Curriculum
DIMS develops and controls the course curriculum, and the institute shares acquired knowledge and experience with other simulation centers. The scenarios are developed to comply with selected learning objectives and identified educational needs of each participating group.

FINANCIAL MODEL

DIMS is owned and primarily funded by the Capital Region of Denmark (fig 1). The budget covers daily management and investments. Salaries for affiliated instructors are included in the course fees. The health authorities fund the simulation courses conducted for personnel from the Capital Region in addition to other mandatory courses. Clientele from other regions and countries pay per course delivered to them. Simulation training provided for the public sector is delivered at cost price, whereas training for corporate clientele is set at a somewhat higher fee. Hence, external clientele generate some additional funding. Private funds are allocated to research activities.

Figure 1. Funding.

BENEFITS OF MODEL

• Facilities: The opportunity to run scenarios in several rooms simultaneously provides both flexibility and efficiency. Large groups may have the plenum session together before being divided into smaller groups for the simulation/debrief sessions.

• Meeting Educational Needs: By involving domain experts from relevant specialties and subspecialties in developing the simulation courses, DIMS ensures that the core clientele’s educational needs are met. This arrangement also benefits the various clinical departments, as instructors get to apply the experience gained at DIMS to their daily clinical practice (such as the debriefing structure). It is considered a tremendous benefit that the instructors have a diversified medical background.

• External Clientele: Simulation courses for external clientele generate some additional funding.
• Location: Because DIMS is part of the Herlev hospital premises, Herlev employees need not travel away from their workplace to train. Participants from elsewhere have, on the other hand, the benefit that training away from the workplace hinders disruption and ameliorates focus. DIMS also facilitates in-situ training for trauma teams and other clientele requesting training taking place at their own workplace.

CHALLENGES WITH MODEL
• Funding: Research activity is dependent upon private funding.

DEMOGRAPHICS OF CLIENTELE

Professionals

<table>
<thead>
<tr>
<th>Physicians</th>
<th>Nurses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesiologists</td>
<td>Anesthesia</td>
</tr>
<tr>
<td>Cardiologists</td>
<td>Emergency care</td>
</tr>
<tr>
<td>Emergency Physicians</td>
<td>Intensive care</td>
</tr>
<tr>
<td>Endocrinologists</td>
<td>Operating Room</td>
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<tr>
<td>General Practitioners</td>
<td>Pediatric</td>
</tr>
<tr>
<td>Gynecologists</td>
<td>Radiology</td>
</tr>
<tr>
<td>Intensivists</td>
<td>Ward nurses</td>
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<tr>
<td>Internists</td>
<td></td>
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<tr>
<td>Nephrologists</td>
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<tr>
<td>Neurologists</td>
<td></td>
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<tr>
<td>Orthopedists</td>
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<tr>
<td>Pediatricists</td>
<td></td>
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<tr>
<td>Pulmonologists</td>
<td></td>
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<tr>
<td>Surgeons</td>
<td></td>
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<tr>
<td>EMS</td>
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<tr>
<td>Air ambulance (rescuers)</td>
<td></td>
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<tr>
<td>Ambulance personnel</td>
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<tr>
<td>Casualty clinic personnel</td>
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<tr>
<td>Paramedics</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Instructors in medical simulation (Train-The-Trainer courses)</td>
<td></td>
</tr>
</tbody>
</table>

Postgraduates

• MDs specializing in anaesthesia
• RNs specializing in anaesthesia
• Anaesthesia post-graduate program
• Cardiology
• Intensive care

Undergraduates

Medical students: 6th year
Nursing students

External Clientele

<table>
<thead>
<tr>
<th>Equipment industry</th>
<th>Simulation industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmaceutical industry</td>
<td>ICT R&amp;D</td>
</tr>
</tbody>
</table>

EDUCATIONAL ACTIVITIES

The Circle of Learning (fig 2) reflects the continuing process of attaining, maintaining, and enhancing clinical competence. DIMS facilitates knowledge acquisition (by lectures and computer simulation), skills proficiency (by different methods, including computer simulation), and full-scale simulation. Clientele that benefit from computer simulation (MicroSim) are physicians specializing in anesthesia, medical students in the 12th semester, and EMS personnel.

Underway

eLearning will be supplementing the traditional lectures and textbooks for knowledge acquisition, as one assumes the simulation training will prove more effective when participants increase their theoretical knowledge beforehand. eLearning will also be applied for knowledge assessment regarding air management and team training.

TRAINING SOLUTION

The training equipment currently includes:

1 SimMan 3G
8 SimMan
3 SimBaby
1 SimNewB
6 AVS
8 PCs with MicroSim
4 Resusci Anne Skills Station
3 ALS simulators
Skill trainers and manikins

Figure 2. The Circle of Learning reflects the continuing process of attaining, enhancing, and maintaining clinical competencies.
Case Study from LAERDAL

METHODOLOGY

Simulation Training in Teams

**Preparation:** Participants prepare for the simulation training by attending subject related lectures (same day), by studying relevant literature, and by the use of computer simulation (MicroSim). Topics for the scenarios are often announced to newly graduated physicians one month ahead, whereas experienced clientele are mostly briefed on the topics of the scenarios in the theater immediately prior the simulation session.

**Brief:** A 30-minute lecture on medical simulation and debriefing is provided. A plenum session on communication skills, collaboration, and other team work skills is often part of the course. Communication skills and priority of tasks are the most common learning objectives for the simulation training. Particular emphasis with regards to teamwork is given to the following: a clear understanding of the various roles, a visible team leader, a closed communication loop (with an address and response). The participants are advised to phrase certain learning objectives for the course day and later reflect on whether the learning outcomes met the objectives that were set. The participants are subsequently divided into smaller groups and then allocated to the various simulation rooms, where they are assigned the different roles in each simulation scenario. Thereafter the participants are introduced to the layout of the theater and the simulation equipment, with special focus on the manikin’s various features.

**Validity:** DIMS emphasizes validity to a medium degree. The desired degree of realism will vary and depend on the participant’s level of abstraction and the focused learning objectives. Novice individuals tend to require a higher degree of realism to maximize the learning outcome of the simulation training.

**Interactive approach:** The instructors pay close attention to the teams’ performance and will provide clues or change the pace of the scenarios, when teams are experiencing difficulties. Scenarios may temporarily be stopped if participants need help in moving forward. If guidance does not solve the problem, the issue is discussed before the scenario is restarted.

**Scenarios:** All scenarios are self-made.

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**Most frequently used scenarios**

- Acute, critical illness
- Cardiac arrest
- Chest pain
- Coma
- Debriefing post critical incident
- Difficult airway / Intubation
- Ethical aspects in relation to patient death
- Hemorrhage – peri op / post op
- Hemorrhaging shock
- Myocardial infarction
- Obstetric
- Pediatrics – neonatal resuscitation
- Pulmonary disease
- Respiration – impaired
- Respiratory arrest
- Trauma

**Debriefing**

**Emphasis:** High. 1-2 instructors facilitate the debriefing in a separate room after the scenario is completed. The debriefing is conducted in a structured manner, using description and analysis, followed by an application phase. The participants are guided through the occurring events in a sequential order, accompanied by questions related to the events that took place. The facilitators encourage a dialogue and an exchange of opinions in order to emphasize focused issues, such as communication skills. Video clips illustrate crucial points the facilitators wish to point out, such as fixation errors (getting stuck in one line of thinking, failure to step back and regain overview, rethinking the issue and try alternative ways to solve a problem. The phenomenon frequently occurs under high pressure). Parallels are drawn to the participants’ daily clinical practice, and after identifying the learning outcomes that were gained from the simulation training, the participants are challenged to translate the new knowledge into enhanced clinical behavior in their daily work. Focus points to improve performance during future simulation scenarios is another topic for discussion.

**Applied Tools**

- Notes taken during ongoing simulation
- Video clips recorded during ongoing simulation
- Collaboration operator/instructor

DIMS’ objective setting is to improve the quality of patient care by providing new training methods for healthcare personnel. As DIMS provides simulation training to a wide range of healthcare personnel, the educational context will vary according to the different needs and priorities of each group. In order to accommodate a diversified group of
clientele, the institute focuses both teamwork competency and dexterity at medical skills during the facilitated training. Communication, interaction, and leadership are all highly focused aspects of the full-scale simulation training and the debrief sessions are lengthy, personalized, and instructor-led.

Focus
- Team performance during full-scale simulation
- Individual performance
- Instructor training

WHAT MAKES GOOD SIMULATION PROGRAMS
Issenberg et al² reviewed and synthesized existing evidence in educational science that addressed the following question: What are the features and uses of high-fidelity medical simulations that lead to most effective learning?

Issenberg argued, that the weight of the best available evidence suggests that high-fidelity medical simulations facilitate learning, when training is conducted under the “right conditions.”

The right conditions include
- Feedback is provided during the learning experience
- Learners engage in repetitive practice
- Simulation is integrated into the normal training schedule
- Learners practice with increasing levels of difficulty
- Simulation training is adapted to multiple learning strategies
- A wide variety of clinical conditions are provided
- Learning on the simulator occurs in a controlled environment
- Individualized learning and team learning are provided
- Learning outcomes are clearly defined
- Ensures the simulator is a valid tool

Figure 3. The bars indicate to what degree DIMS delivers on each of the right conditions - as assessed by the simulation center on a 4 - point Likert scale (4 = highest).

RESEARCH ACTIVITY
DIMS conducts the following research projects related to patient safety:
- PhD projects:
  - Identification and treatment of the critically ill patient
  - Development, integration, validation of learning program for resuscitation
  - Adverse events in relation to action plan for increased patient safety
  - Development, integration, validation of model for improved reporting in connection with patient transfers
- Simulation as a method/tool to identify challenges related to team work
- Teamwork in connection with women in labor (identification of the importance of human and organizational factors).
- Implementation of interactive learning methods in the national anesthesiology specialist education
- Implementation of competency assessment in specialist training
- Rush and interruptions
- Safe patient transfer
- Debriefing (essential factors, effects on learning and learning transfer etc.)
- CRM (implementation of team training in the organization, cost effective methods etc.)
PUBLICATIONS

Ph.D. projects

Ph.D. projects conducted in cooperation with DIMS
2. Rosenstock C. Difficult airway management. 2006

OSVAL II reports
5. Andersen Kj. Færdigheder i ledelse, samarbejde og kommunikation i turnusuddannelsen. 2004
6. Andersen SN. Danske medicinstuderendes forventninger og bekymringer i relation til deres fremtidige virke. 2004
9. Christensen UJ. Microsimulators in medical education. 2001

Master in Medical Education

Publications, peer-reviewed
2. Doris Østergaard, Anne Lippert, Charlotte Ringsted. Specialposifikke kurser i anæstesiologi, For Dansk Selskab for Anæstesi og Intensiv Medicin i Ugeskr: Læger 2008; 170(12-13)
5. Andersen, Kj, Østergaard HT. Færdigheder i ledelse, samarbejde og kommunikation i turnusuddannelsen. Ugeskrift for Læger 2006
13. Østergaard HT, Østergaard D, Lippert A. Focus on team training skills in Medical Education in Denmark. Quality in Safety in Health Care 2004:13:Suppl91-95
16. Lippert A, Nielsen MS, Østergaard D. Medicinsk simulation i anæstesiologi. Ugeskrift for Læger 2004;166:1102
30. Lindekaer AL, Jacobsen J, Andersen G, Laub M, Jensen PF. Treatment of

Other publications

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1. DIMS website: http://www.herlevhospital.dk/menu/Afdelinger/Dansk +Institut+for+Medicinsk+Simulation/n+English/

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