Clinical question.

**FA-2101A**: What is the effectiveness of using simulated patients in First Aid training?

In First Aid Training (P), does the use of simulated patient (I) when compared with a theoretical course (C) improve the participant effectiveness (O)?

Is this question addressing an intervention/therapy, prognosis or diagnosis? INTERVENTION

State if this is a proposed new topic or revision of existing worksheet: NEW TOPIC

Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet?

NO INDUSTRIAL CONFLICT OF INTEREST

POTENTIAL INTELLECTUAL CONFLICT OF INTEREST: Coordinator of the European Reference Centre for First Aid Education, National Medical Advisor of the French Red Cross, Member of the board of the French Resuscitation Council, Co-chair of the BLS-AED working group of ERC.

Search strategy (including electronic databases searched).

Articles published in the last 10 years: clinical trials, meta-analysis, practice guidelines, randomized controlled trial, in English – Spanish – French

Pub med: MESH words “Patient simulation” [MESH], (229)

or keywords “Laerdal Simman Manikin” (10) or Laedal Manikin (90) or Megacode (12) or simulation-based training [MESH] (20)

Then adding: “First Aid” [MESH] or “Cardiac Arrest” [MESH] and Patient Simulation [Keywords], (18)

Then adding: “First Aid” [MESH] and Patient Simulation [Keywords], (4)

And hand search (6)

Google Scholar search with expression

Cochrane Library search with same keywords (1)

Ovid MEDLINE (1)

EMBASE search with same keywords

• State inclusion and exclusion criteria

Studies about the simulation in the field of first aid training have been considered, even if they use simulated patients (humans) or manikins. Due to the weak quantity of existing studies in this field, some studies using the techniques of simulation in the field of BLS, ALS, and ATLS, trainings pedagogically close to first aid training have been included, as well as in the field of health professional training.

Total Number of articles analyzed: 468

Articles have been excluded in case of expert opinion based, if it is a review article or if the study has no control group (ie. concern the use of simulated patient without any comparison with another pedagogical technique) or if it is out topic.

436 excluded articles:

- Expert Opinion based
- Same study and same population of another study
- Review article
- No control group
- Out topic: 299

• Number of articles/sources meeting criteria for further review: 32
## Summary of evidence

### Evidence Supporting Clinical Question

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<tbody>
<tr>
<td></td>
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<td>(Farah, Stiner et al. 2007)BE</td>
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<tr>
<td><strong>Level of evidence</strong></td>
<td><strong>Outcomes</strong> – Please define outcomes for this question, place them after letters below and use letters to identify studies which evaluate this outcome</td>
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<tr>
<td></td>
<td>A = Improvement of confidence level</td>
<td>C = Respect of the protocol</td>
<td>E = Improvement of crisis management skills</td>
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<tr>
<td></td>
<td>B = Improvement of clinical or physical skills</td>
<td>D = Improvement of knowledge</td>
<td>Italics = Animal studies</td>
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</table>

### Evidence Neutral to Clinical question

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<tbody>
<tr>
<td></td>
<td>(Knudson, Khaw et al. 2008)B, (Lee, Im et al. 2008)B</td>
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</table>

**Outcomes** – Please define outcomes for this question, place them after letters below and use letters to identify studies which evaluate this outcome.
Outcomes – Please use the same outcomes as defined for the Evidence Supporting table above

**Evidence Opposing Clinical Question**

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<tr>
<th>Level of evidence</th>
<th>Outcomes – Please use the same outcomes as defined for the Evidence Supporting table above</th>
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<tbody>
<tr>
<td>Good</td>
<td>(Carter, Wesley et al. 2005)A (Schwartz, Fernandez et al. 2007)B</td>
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<tr>
<td>Fair</td>
<td></td>
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<tr>
<td>Poor</td>
<td>(Deladisma, Cohen et al. 2007)B</td>
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Outcomes – Please use the same outcomes as defined for the Evidence Supporting table above

**REVIEWER’S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:** (please include implementation considerations including at a minimum training, environment and availability:

Simulation tools and approaches used in first aid, basic life support, simulation-based medical and paramedical education, are variable in their form with different tools used:

2 types of simulation are more adapted for first aid and basic life support (but are also used in advanced life support and medical education):

- Part-task simulators: Tools of simulation like manikins that can represent a part of the body (as the head and the thorax for the training of airway management)
- Simulated or standardized patients: Actors with various competences (real actors, instructor or other students who have been prepared to play the victims (simulated patient) or to play family members or staff member (simulated persons)).

2 types of simulation are used for advanced first aid / advanced life support and medical education:

- Computer screen-based simulators
- Human patient simulators, instructor driven or model driven: manikins more or less sophisticated which can be added to a power station of management (computer); this permits simulation of live signs, diseases, emergencies that the student can meet in real life. Currently, numerous models exist, which allows training with more or less realism (or accuracy) in resuscitation techniques. The control may be determined directly by the trainer or by the computer itself.

Mostly, the literature supports the use of simulated tools and takes into account good human training studies (13 studies from which 21 supporting – LOE1 or LOE2). For a direct comparison between the training with simulated patients and the classical training, not enough data are available in the first aid domain except in ATLS (Lee, Pardo et al. 2003; Ali, Adam et al. 2007; Cherry, Williams et al. 2007; Knudson, Khaw et al. 2008) and ACLS (Kurrek, Devitt et al. 1998; Wayne, Butter et al. 2005; Lee, Im et al. 2008).

These studies suggest that a performance-oriented approach to ACLS and ATLS training may be a viable option.

Good evidence (Ali, Adam et al. 2007; Cherry, Williams et al. 2007; Knudson, Khaw et al. 2008) exists and demonstrates that these simulations produce identical or better outcomes than either traditional lecture-based or clinical-based learning. Computer-based simulation differs from task and skill simulation and full-scale simulation. Actually the computer interactivity could be enhance to facilitate higher level learning (Deladisma, Cohen et al. 2007)

Computer-based simulation must be targeted in the future as an important research area.
Evidence of increased skills/performance (Domuracki et al 2009, 346 LOE 2; Perkins et al 2005 LOE 3; Schneider et al 1995, 129) and retention (Wayne et al 2005, 210; Farah et al 2007, 529 LOE 5) after simulation experiences can be found in the literature. The addition of simulation training after traditional medical education programs increases participant skill as well (Wang et al 2008, 1651 LOE 2; Dayal et al 2009, 155 LOE 2). Simulation drills designed to increase emergency preparedness improve participant confidence and decrease anxiety (Toback et al 2006, 425 LOE 4).

Teaching methods that accompany simulation appear to play an important role its success. A study examining the addition of simulation to a case-based learning program found no significant difference in outcomes of student performance (Schwartz et al 2007, 130). Simulation-based training was found to be superior to problem-based learning for the acquisition of critical assessment and management skills (Steadman et al 2006, 151). It is believed that student-centered instruction accompanying simulation may provide improvements in learning.

ACLS training using simulation is an effective training method for initial patient management skills. Studies (Kurrek, Devitt et al. 1998; Wayne, Butter et al. 2005) have demonstrated that an intensive, personalized teaching session using a computerized, scenario-based simulator is effective. These studies have demonstrated an increase in the initial patient management competences and in the transfer of skills in real patient care.

Human patient simulation is consistent with cognitive learning theory because it is interactive, it builds on prior knowledge and relates to real clinical problems. Active participation in realistic clinical simulations may promote students skills and increase their level of comfort with technology. So the patient becomes the focus of care. Simulation is frequently used to evaluate competence outcomes in nurse and paramedics. Probably it could be extended in first aid programs. Finally, recent literature (Wayne, Butter et al. 2005; Steadman, Coates et al. 2006; Ahlberg, Enochsson et al. 2007) describes the use of human patient simulation to acquire and maintain clinical competence for students. Simulations during training are generally well appreciated by faculty and students (Carter, Wesley et al. 2005).

Benefits of simulation technology include: Improve surgical techniques, enhance assessment and decision-making skills, increase retention of knowledge related to procedures, cancel any risk for the patient, allow to present complex problems to all students, and permit to stop actions and replay or to evaluate the performance.

We can list the benefits of simulating scenarios in education as:
• Learning in a risk-free environment.
• Interactive learning.
• Repeated practice of skills.
• Immediate faculty or tutor feedback.

Simulating scenarios are the only method, apart from reality for the training of teams (put in practice of the procedures, team techniques…).
Citation List


LOE: 2
Quality: Fair
Direction of support: Neutral
Comments: Study concerning medical simulation in pediatric training for severe childhood illness


LOE: 1
Quality: Good
Direction of support: Supporting
Comments: Study concerning medical simulation with high fidelity simulator


LOE: 1
Quality: Good
Direction of support: Supporting
Comments: This study concerns ATLS with simulated trauma patient models and demonstrates the improvement of the skills and knowledge of the participants after using this type of simulator.


LOE: 2
Quality: Good
Direction of support: Opposing
Comments: This study concerning health professional (surgery student) support the interest of didactical lectures compare with standardized patient interaction.


LOE: 1
Quality: Good
Direction of support: Neutral
Comments: This lecture demonstrates that simulation vs MCQE permit to acquire the same level of performance, but students in ATLS prefer to use simulators.

LOE: 1  
Quality: Good  
Direction of support: Supporting  
Comments: This study concerning health professional using high-fidelity human patient simulation and demonstrates his efficiency in the crisis simulation management.


LOE: 2  
Quality: Poor  
Direction of support: Supporting  
Comments: This study concerning medical students who received or not to received simulation training for vaginal delivery maneuvers on a mannequin simulator.


LOE: 2  
Quality: Poor  
Direction of support: Opposing  
Comments: This study concerning health professional (medical student) support the interest of the non verbal communication with standardized patient vs virtual patient.


LOE: 2  
Quality: Good  
Direction of support: Supporting  
Comments: This study concerning simulation training for the performance of cricoid pressure on a simulator supports the improvement of the performance of cricoid pressure in the clinical setting.


BACKGROUND: Saving life demands only two hands and some basic knowledge. A qualified person can open airways, resuscitate, massage a heart and call for help. A person with cardio-pulmonary resuscitation (CPR) training can sustain an ailing person's heart and brain for a short time. However, knowledge of CPR guidelines and skills is not enough; medical and nursing practitioners must practice and train regularly to hone those skills. Western Galilee Hospital has developed simulator programs for surprise CPR training exercises in all hospital departments and units. OBJECTIVE: To use surprise drills in order to improve the quality of resuscitation and CPR methods. MATERIALS AND METHODS: ACLS (Advanced cardiac life support) instructors use a computerized simulation mannequin (SIM 4000). Two to three surprise drills are conducted in the hospital each week. At the end of each drill, a final report is given to the department head and a staff meeting is held to discuss the drill results. Between the years 2003-2005, 131 drills were carried out in 30 different departments of Western Galilee Hospital. Nine criteria are measured and scored in the drill: reaction time, ABC
principles, calling the doctor, CPR knowledge, CPR skills, resuscitation management, staff work, resuscitation chart, and defibrillator management. Drills are compared with previous drills performed in the same department, and with drills conducted in other departments. Data is analyzed using Anova, Kruskal-Wallis, independent t-test and Spearman correlation coefficient test. RESULTS: Improvement was found in the results of the drills held from 2003-2005, mainly in the medical departments as compared with the surgical departments and ambulatory clinics. The average score in 2005 was 77.2 (p = 0.001), compared with 74 (p = 0.012) in 2004, and 59 (p < 0.001) in 2003. Improved criteria included: calling the doctor, staff work, CPR knowledge, and defibrillator (p < 0.05). CONCLUSIONS: It is our belief that surprise resuscitation drills are the key to improve functioning during actual emergency resuscitation, both on a departmental and a general hospital level.

LOE: 5  
Quality: Fair  
Direction of support: Opposing  
Comments: This study concerning ACLS (Advanced cardiac life support) instructors using a computerized simulation mannequin and support improvement of emergency resuscitation management.


LOE: 2  
Quality: Good  
Direction of support: Neutral  
Comments: This study concerning health professional (surgery students) support the interest of the simulated patient during training which give the best crisis management skills.


LOE: 4  
Quality: Poor  
Direction of support: Supporting  
Comments: This study demonstrates that simulation-based training significantly improves performance of students.


LOE: 2  
Quality: Fair  
Direction of support: Supporting  
Comments: This study demonstrates, at fair level, the interest of the simulator environment of the ACLS training.

Quality: Good
Direction of support: Neutral
Comments: This study demonstrates no difference between the traditional lectures and the scenario-base performance oriented team instruction both used in ACLS training.


LOE: 2
Quality: Good
Direction of support: Supporting
Comments: This study compare high level simulation with low level simulation, and demonstrate that high level simulation gives better results.


LOE: 4
Quality: Poor
Direction of support: Neutral
Comments: This poor quality study demonstrates no difference of knowledge at the end of the disaster exercise, between students which followed a simulation training with simulated patient and students which did not received this training.


LOE: 4
Quality: Fair
Direction of support: Supporting
Comments: This fair quality study which evaluate the stress-eliciting capacity of two variations of a simulated cardiac arrest situation demonstrates significant pre-post increases in pulse rate, systolic blood pressure, and self-reported anxiety.


LOE: 1
Quality: Good
Direction of support: Supporting
Comments: this study demonstrates the interest and efficiency of a computer-controlled patient simulator


LOE: 2
Quality: Good
Direction of support: Supporting  
Comments: This study demonstrates the interest of the full-mission simulation training vs other simulation as the part task simulators.


LOE: 3  
Quality: Poor  
Direction of support: Supporting  
Comments: This study demonstrates that CPREzy was associated with significant improvements in ECC performance.


LOE: 1  
Quality: Good  
Direction of support: Supporting  
Comments: This study demonstrates that the live simulated "patient" and manikin improved the cognitive and psychomotor skills of medical students.


LOE: 3  
Quality: Fair  
Direction of support: Supporting  
Comments: This study just demonstrates that admission nor discharge rates differed significantly before and after the training.


LOE: 2  
Quality: Good  
Direction of support: Opposing  
Comments: This study just demonstrates that HPS training offers no advantage to CBL as measured by medical student performance on a chest pain objective structured clinical examination.


LOE: 1  
Quality: Good  
Direction of support: Neutral  
Comments: This lecture demonstrates the interest of the High fidelity medical simulation but does not measures the increase of the cognitive level of the students.

LOE: 2
Quality: Fair
Direction of support: Supporting
Comments: This lecture demonstrates the interest of the Pediatric procedural sedations conducted by simulator-trained nonanesthesiologists and underline in fact the interest of the simulation during training of health professionals.


LOE: 2
Quality: Fair
Direction of support: Supporting
Comments: This blind study demonstrates the superiority of simulation-based learning compared to problem-based learning for the acquisition of critical assessment and management skills.


LOE: 4
Quality: Poor
Direction of support: Supporting
Comments: This poor study support the recommendation that mock codes should be performed in the pediatric primary care setting to improve practitioner confidence and decrease practitioner anxiety.


OBJECTIVE: To evaluate the teaching effects of emergency care simulator (ECS) combined with problem-based learning (PBL) in teaching of cardiopulmonary resuscitation (CPR).

METHODS: 42 medical students were randomly divided into 2 equal groups, control group receiving PBL and training of specific operation such as artificial respiration, external cardiac compression, tracheal intubation, and defibrillation, and ECS group receiving ECS training in addition. Then test was given to record the scores in artificial respiration. A questionnaire survey was conducted to collect the feedback.

RESULTS: There were no significant differences in the scores of artificial respiration, external cardiac compression, tracheal intubation, and defibrillation between the 2 groups (all P > 0.05). There were significant differences between the Control group and the ECS group (P < 0.05). The percentages of students with enhanced emergency awareness, emergency skill, team spirit and cooperative effort, with improved analytic skill in clinical setting and in amalgamating the theoretic learning with textbook knowledge and clinical practice were all higher in the ECS group than in the control group (all P < 0.05). More than 86% of the students considered that there was significant difference between these two groups.

CONCLUSION: Using ECS combined with PBL in teaching CPR technique directly involves the medical students in "emergency practice", resolving of "all sorts of problems", enhancing emergency awareness, and emergency skill. It can improve teaching quality significantly that is in accordance with the development of modern medicine.

LOE: 2
Quality: Poor
Direction of support: Supporting
Comments: This poor study demonstrates that using ECS combined with PBL in teaching CPR technique directly involves the medical students in "emergency practice".


LOE: 1
Quality: Good
Direction of support: Supporting
Comments: This study demonstrates the efficiency of simulator training concerning internal medicine residents.


Quality: Good
Direction of support: Supporting
Comments: This study concerning medical students' drug administration skills demonstrates the interest of simulated scenario only as a online module.


LOE: 2
Quality: Fair
Direction of support: Supporting
Comments: This study concerning paramedics students demonstrarates that the use of an automated voice advisory manikin system improve the immediate skills performance of paramedic students.