



## Development of a Surgical Simulation Curriculum on a Limited Budget. How can we survive with Minimal Resources?

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### Editorial

With increasing focus on safety in today's Medicine, surgical trainees have limited time and exposure to the operating room [1]. Furthermore, residents are required to demonstrate competency and proficiency prior to participating in patient care including operations. This has led to the development of simulation skill centers that can be used for both training and assessment of competency of surgical trainees. In this paper, we focus on simulation skill development team based training to enhance the learning experience of surgical trainees as well as determining the necessary budget needed to establish a long-lasting organized educational system. This requires inspection of the multiple characteristics required to create an outstanding program. Goals include development of a cost effective simulation curriculum for all levels of surgical training. Designing low-budget models that address all essential aspects of surgery education. Creation of team based training clinical scenarios that allow participants to correlate simulated situations with real life clinical scenarios. Simulation skill system is a way in which residents and fellows are exposed to clinical situations prior to encountering them. The Food and Drug Administration has supported the role of simulation over many years [2]. Simulation skill systems used in other fields such aviation, military training and other medical subspecialties have shown beneficial outcomes and are well established practices during training. Cardiopulmonary resuscitation is a great example of a simulation skill system that has significantly changed the practice of ACLS as well as increased positive results in patients. Other well established simulation skill models include laparoscopic surgery and orthopedics surgery [3]. A recent study demonstrated a positive impact of simulation skill models and the application of learned skills in the operating room. Performance in knee arthroscopy was evaluated in 2 different groups, one exposed to simulated skill training and another group that was not exposed. Motion analysis performed in the operating room and objective test identified the efficacy and amount of hand movements as well as the utilization of single movements to accomplish the goal of interest [4].

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For a simulation skill development team based training system we propose an animal tissue, cadaveric, and dry model that is cost-effective and attainable even on a fixed budget. Benefits of a team based oriented training program ensures more experienced trainees to educate incoming ones, further sub-dividing the learning phases into basic skills, advances procedures and team based training (ACS Surgical Curriculum). Ideally, in order to have a satisfactory start, variables that need to be taken into consideration include:

1. Developing a curriculum that is adequate for each PGY level as well as pre-determined skill expectations to advance further to the next level.
2. Starting with the most basic tasks and skills and increment the complexity in a personalized but uniform pace.
3. Allow self-practice time that helps individual trainees to work on specific weaknesses identified during team based training.
4. Developing specific short and long term goals that can be accomplished with pre-determined budget and timeframe. This provides enough repetition and feedback for learners.
5. Development of checklists and objective test that can better measure both knowledge and

skills.

6. Development of a system that can carry on with excellence overtime requires significant dedication and preparation. One of the major limitations for maintenance of simulation skills development system is financial. Henry proposed an annual cost for animal tissue \$ 11,894, cadaveric models \$ 72,050, and dry models \$ 26,352. This budget does not include the cost of simulators. In order to reduce the cost and increase the productivity of the program some of the following should be taken into consideration:

**Identification and training of instructors:** Including engagement of an expert in the field, using PGY- IV and V as instructors, understanding and mastering of the critical steps in the different skills taught, clear goals and expectations.

**Development of evaluation tools:** Different levels of training require different assessment tools. Student evaluations that include formative criteria, improvement performance and learning pitfalls. Also summative criteria to determine competency and theoretical knowledge. Skills improvement that allow more practice and exercise. Development of new areas of interest and recognition of needs to be addresses and studied.

**Instructor lectures and student presentations:** To reinforce teaching points inside and outside the lab, to answer questions or topics not mentioned during training. Discussion of experiences and possible suggestions.

**Instructors debrief:** To identify trainees' deficiencies that may require more lab training and possible measures to improve the current simulation model being used.

**Graduate learners to practice acquired skills in a higher level of context:** To combine clinical scenarios where learned skills can be performed. This helps trainees to stay engaged, test the ability to apply medical knowledge and acquired skills under a clinical setting, allowing further analyzing results from simulation skill learning models versus other techniques.

**Repetition:** Practice is the key to performance. Objective tests should be used to assess exposure and repetition needs in individual trainees.

**Use of free resources:** Re-use of equipment that does not violate safety regulations. Use of donated equipment by company representatives such sutures and staplers. Use of expired sutures and supplies that would not be used otherwise. Use of clinical cases seems in real life scenarios to recreate simulations. Use of interesting imaging studies such CT scans, MRIs and X-rays to educate and develop management and care if such scenarios.

**Perseverance:** Great performers spend great amount of time behind the scenes improving skills and learning more. Motivate other participants to develop an environment of healthy competition in which everyone is pushed to move forward and be prepared for more challenging cases.

**Learning points:** In order to create a long-lasting and efficient simulation skill system, it is important to understand the amount of resources available to be able to develop a system that it is self-sustained based on team training in which trainees become the trainers as they develop their surgical knowledge and skills. Also, it is very important to develop a comprehensive evaluation system that allows educators to assess the progress and development of residents.

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