SIMS Medical Center – A Virtual Hospital @ STCC
Simulation Technician Training Manual

Introduction

The purpose of this manual is to provide a resource for individuals who have been asked to operate computer based, full sized patient simulators in a health care setting. It is not possible to read a single source of material and then perform successful patient simulation. This manual must be used as just one part of a comprehensive hands-on learning experience. The best way to learn patient simulation is to literally do patient simulation. Much of the material contained in this manual is based upon personal experiences and is not intended to be the sole authority for patient simulation, but rather a guide from which a new Sim Tech can build expertise.

What does a Simulation Technician do?

In general, a Patient Simulation Technician is responsible for all technical aspects of simulation. The Sim Tech is not responsible for developing a patient simulation experience, but should be included in the development process to ensure that all technical aspects are possible and managed properly. Some specific basic skills required of the Sim Tech are:

- Demonstrate understanding of a variety of patient simulators by using them in a range of clinical situations and by performing maintenance on them.
- Demonstrate ability to troubleshoot hardware, software and audio-visual problems.
- Use audio-visual equipment to chronicle simulation events and for debriefing purposes.
- Use an environmental checklist necessary for managing patient simulation events.
- Develop a plan for managing resources necessary for implementation of patient simulation events.
- Implement policies and procedures necessary for managing a patient simulation center.

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What is Patient Simulation?

Almost everyone has heard about the use of flight simulators in the aviation industry. Early flight simulators were tiny and at times only partial versions of a real plane. These simulators have developed into highly sophisticated environments that mimic almost every aspect of flying a plane. I have been told by a pilot that uses flight simulators that it feels so real, he breaks out into a sweat during a multiple event emergency. The aviator, as the user, has his/her disbelief suspended. It is real.

www.hf.faa.gov/.../Training/Training019.htm

Photo 1.
Pilots training in a "full" aircraft simulator under night conditions.

Patient simulation aspires to become as "real" as the best aircraft flight simulators. At this point though, there are many issues surrounding the inability of current patient models to emulate a real patient. For example, there is not one full size patient simulator that allows for taking the "patient's" temperature, a skill commonly used by many health care providers. There are patient simulators, completely computer based, that provide near realistic reactions from patients, except, there is no physical body. It is our belief that having a physical body on which to perform procedures is a necessity.

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The patient simulation covered in this manual is specific to full size, human like, physically present patient simulators. Some have referred to this type of simulator as "dummies." Not true. A manikin, dummy or task trainer do not provide the total experience required for human patient simulation.

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Photo 2.
Examples of task trainers. These items are useful to introduce concepts and provide hands-on practice for a single skill. They do not react to a procedure nor carry on a conversation with the care giver. While still useful, we encourage moving students from task trainers to full patient simulation when possible

Task trainers are very useful when a student is learning a very specific skill, such as placing a needle in an arm to withdraw blood, or to inject a drug. However, performing phlebotomy requires many more skills that just placing a needle correctly in an arm. Some phlebotomy task trainers do allow for a broader experience, such as rolling veins, or tourniquet placement. A full patient simulator can provide an environment where the student can perform all the skills associated with performing phlebotomy. Patient communication, documentation, patient safety, aseptic technique, selection of proper blood tubes and handling of biohazards are also skills applied during routine phlebotomy.

The theory behind patient simulation should be that a student will more easily transfer learning to the workplace when that student learns a skill in context, that is, within an environment similar to that where the skill will be applied. The idea is that training in a realistic environment will allow the student

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to adapt to the work place with less orientation and fewer mistakes. The job of the Sim Tech is to facilitate this process by finding a way to make the learning experience as similar as possible to the actual work environment.

As mentioned before, patient simulation is far from being "real." That presents a challenge to the Sim Tech in finding methods that bring the level of reality to the point where the student is fully engaged in the experience. In other words, the student treats the simulator as though it were a real patient. Fortunately, in most instances, it is not necessary for the simulator to be exactly like a real patient for the student to benefit from the learning experience.

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Photo 3

This is an example of a pretty realistic patient environment. All the equipment and supplies needed for most procedures are available. In this case, the environment compensates for the lack of a fully realistic human patient simulator.

How do you create the proper environment?

There are two major approaches to creating the proper environment for patient simulation. The first approach is to allow whatever equipment and facilities you have drive the type and level of patient simulation you provide to students. This approach is equipment driven and depends heavily on what type of patient simulator you happen to own. There is a very good chance that you have one patient simulator and it was purchased based solely upon available funds. The patient simulation experience is created from the equipment "up" and has the Sim Tech asking, "What can I do with this particular patient simulator?"

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It would seem that a second, better approach would be to select the equipment and environment based upon the learning objectives required of the student (also called the "user"). The Sim Tech is asking, "What does the user need to learn or demonstrate and what do I need to make that happen?" This method does require, at times, substantial funding, but more often than not, a fairly inexpensive patient simulator can meet most, if not all, the learning objectives. Looking back at the example of phlebotomy, think about which approach would be more effective in helping the student reach educational objectives. If you take the "equipment-based" approach, the student might use a task trainer to demonstrate needle insertion, needle safety and aseptic skills, to name a few. Using the "educational objective" approach would have the same student introducing themselves to the patient, checking the patient identification, explaining the procedure to the patient, obtaining patient permission for the procedure, helping the patient to relax, having the patient refuse use of the preferred limb, and refusing the procedure, to name a few. What does this mean to the Sim Tech?

Using the "educational objective" approach requires that the Sim Tech be an active participant in the development of the simulation experience. Staying with the phlebotomy example above, think about what you would need to know to create the proper environment. Look at the table below for some examples.

Educational Objective / Competency	**The Sim Tech might ask……**
Student introduces self to patient.	Do you want the patient to "speak?"
	What do you want the patient to say?
	How do you want the patient to "act?"
Student identifies patient according to protocol	What information should be on the bracelet?
	On which arm do you want the ID bracelet?

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There are many more questions that the Sim Tech will need answered before knowing what simulator to use as well as supplies and the actual setting for the simulation. One of the most common errors for a Sim Tech is not asking enough questions. The second is not getting sufficient clarification on the exact expectations of the people creating the learning objectives / competencies.

Using the phlebotomy example provided above, list the questions you would ask to determine what simulator, supplies and environment you will need to reach the educational objectives / competencies. Use the answer table provided below to complete the table. . Write in your responses in the right hand column.

Educational Objective / Competency	**The Sim Tech might ask……**
Student introduces self to patient.	Do you want the patient to "speak?" What do you want the patient to say? How do you want the patient to "act?"
Student identifies patient according to protocol	What type of ID band should be on the patient? What information should be included? On which arm do you want the ID bracelet?
Student demonstrates aseptic technique	
Student responds appropriately to patient refusing use of preferred arm.	
Student follows protocol for patient fainting.	

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Patient Events and Patient Scenarios

Patient events are more than single task training. As mentioned before, teaching a student how to inject a drug into say, an "arm trainer" is a task. One or more skills can be learned or demonstrated by the user. A patient event would be administering a drug: including patient communication, documentation, preparing the dose, selection and preparation of the site, getting patient permission, watching for reactions, etc. An entire skill set is learned or demonstrated by the student during the "event."

A patient scenario may be seen as a "series of events limited by time." In other words, we create a "start" and a "finish" to the interactions between the patient and our students. The number of events that will be included will most likely be driven by the number of learning objectives the student must demonstrate and will, in turn, impact the length of time for the scenario. As an example, a cardiac arrest can be a short lived experience (no pun intended) and may be considered a single "event."

On the other hand, a more lengthy interaction with the patient for wound management (1 event) that includes a cardiac arrest (2nd event) and drug reaction (3rd event) will involve more competencies and rises to the level of a patient scenario, not just a single event. *Two or more patient events form a patient scenario.* The more events, the more competencies the student must learn or demonstrate.

Managing patient events are usually not too difficult, but there is every chance that the people you work with will want various complex patient scenarios on a frequent basis. That means a lot of planning and a lot of resource management. A very good approach to being prepared for the complex

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scenarios is to have an adequate infrastructure. In other words, create a basic environment that can be modified as needed.

In the box below, describe the differences between a patient event and a patient scenario.

Number and Types of Patient Simulators:

At this time, the simulation public has a limited variety of patient simulators available to meet our educational objectives. SIMS Medical Center™ uses METI, Laerdal, and Gaumard full patient simulators. There are adult males and females, ethnic males and females, pediatric and infants. In all probability no one simulator will meet all your needs and, therefore, it is necessary to have a variety of "patients" on hand. A Laerdal Vital-Sim may allow some nursing or medical assisting students to meet educational objectives, while the METI HPS system may be needed for respiratory therapy or medical students. The Sim Tech must work with the instructors to determine the number and level of patient simulators to have on hand to meet the required educational objectives. For example, if you have 100 first year nursing students that need to be "checked off" on determining vital signs, you will need at least four to five simulators ready to run at the same time for over a period of days or even weeks. The number of

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patient simulators needed to provide experiences to a large number of students is a capacity issue.

Meanwhile, you may also need to provide senior level nursing students with much more complex scenarios that require a higher level simulator. This need describes a patient simulation level issue. For each situation, you will need to work out how many students will be allowed to work with each patient and the time limit. During heavy use periods, requiring scheduling of scenarios is imperative. Instructors who want simulation for many students at the same time and at different complexity levels present both a capacity and level challenge to you, the Sim Tech. Managing your time becomes critical, since you may be the only person who knows how to set up and break down a simulation experience. Running multiple scenarios at the same time means you cannot stay in one spot. You must be able to float between rooms and address any technical issue that arises so students do not miss an educational opportunity.

 **SIMS Medical Center™**	**Photo 4** Items for the tool kit. Electrical tape, small needle nose pliers, Phillips and flat head screw drivers both regular and small. Spare batteries – sizes to fit all equipment used. Small flashlight.

Meticulous preparation for simulation is required. We will address this in more detail later, but simulation cannot be successful without careful planning. During simulation you will find that a “kit” containing spare batteries and

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small tools for quick repair is necessary. Quick thinking and action on your part may "save the day" for simulation.

In addition to having a variety of patient simulators, you should also have "spares." Purchase of patient simulators may have to be limited due to funding, but there will be times when it is more cost efficient to buy a spare than to shut down operations. Equipment eventually needs repair, which is yet another reason to have a spare, versatile patient in the storage room.

Most companies will provide a "spec" sheet, that is, a list all the functions and features of a particular model of patient simulator. Specification sheets for current simulators are located in the appendix of this manual or as a part of the manual supplied by the manufacturer. Become familiar with major features as soon as possible. When a simulator is upgraded, be sure to obtain a new specification sheet. If one is not available, make your own additions and deletions on the current spec sheet and file in the back of this manual.

A faculty member tells you that she wants to have her students examine a patient for a subclavian steal. First, make sure you know what that means and what it takes for diagnosis. For now, accept the fact that a blood pressure has to be taken on both arms. Which patient will meet this educational objective? Take a minute to look at the spec sheets for your answer.

In the space below describe how you might select a particular patient simulator for a scenario.

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How do Patient Simulators Work?

The big difference between a task trainer and a patient simulator is that the simulator can react with the student-user. That fact raises the question, "How do patient simulators work?" Each of our simulators has common components. There must be an input device for the operator, a computer of some variety, a control box or link box and an ouput device. The control box and computer may be one in the same for some model simulators.

The **input device** used by the operator can communicate with the simulator. This device allows the operator to change the condition of the patient. An input device is the keyboard and mouse attached to a computer that has company create software installed to run the simulator. Another input device is the hand held control. It may be wireless or hard wired. The hand held unit communicates directly with a link box in the case of the Laerdal Sim-Man or to a stand alone control box as in the case of the Laerdal Vital-Sim line of simulators.

Side Bar
In early experiments with patient simulation we found that having the input device in the same room as the patient created problems. Whenever the mouse was clicked to change a setting, students would know that something was about to change in the patient's condition. Having the operator speak for the patient also proved difficult since it was at times easier to hear the operator speaking than the patient. Room noise was picked up by the operator's microphone and sent through the patient system. Students were tempted to peek around the curtain or divider to ask a question of the instructor, even though the intent was for the student to act on their own. All in all, not a good experience.

When the input device is connected to a **computer**, the purpose is to allow the operator to manipulate the software to determine the condition of the patient. Use the mouse to click on the factor that needs to be changed, such as heart rate, EKG patterns, respiration rate, lung and heart sounds, to name just a

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few. All of these factors will be shown on the computer monitor by way of a graphic display. Both the METI and Laerdal Sim-Man have software that can be programmed by the operator. We have left that up to the faculty to determine if a patient should be programmed or "run on the fly." To date, the "on the fly" or **real-time operation** has been preferred. Programming trends is fairly simple on the Laerdal Sim-Man and the Gaumard HAL patients. **Trends** are used to alter a set of factors over a period of time. For instance, instructors may want a patient's temperature to increase three degrees over two hours. That can be programmed with the software and the temperature will change on its own. You need not adjust further. **Programming** an entire scenario involves understanding many of the possible patient reactions based upon many possible student interventions. A highly experienced operator with a medical background is usually best suited for patient programming. Real-time operation involves the use of a script that has been created by faculty. It is based on educational objectives and has a time line to indicate when specific patient factors need to be changed. The advantage of real-time operation is that unexpected behaviors or interventions by students can be reacted to immediately. The operator, in general, knows from the script what to say and how to react. If the operator feels it appropriate, he/she can also prompt the student with a simple question or not. It depends on the educational objectives. If you are the operator, be sure to check with the instructor for how much ad lib is appropriate.

The hand held input devices communicate directly with the control box, also called the link box. The hand held input device cannot be programmed, but may provide trending. The newest Laerdal Sim-Man has a Blue Tooth PDA-like unit that does communicate with the computer for operation of the patient. We suspect that all our patients will eventually use that type of technology, but for now, most hand held units communicate with the link or control box. Vital-Sim hand held input devices have software built-in, a small key pad and an LCD

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display. The small key pad is used to manipulate the software shown on the display. As you enter the desired factors, the information is sent to the control or link box either through wireless technology or by way of a cable.

All the hand held input devices depend on batteries for power. You should know the battery type, size and have the correct number required handy during any operation. Remember to always observe polarity. Once the settings are made on the hand held input device, the control or link box will have received that information and stored it in the link box memory. Even if the power should fail on the hand held input device, the information in the link or control box will remain. That means the batteries can be changed while the simulation continues.

Side Bar
Since the hand held units are wireless, you can keep the unit in your pocket, and when needed, turn away from the students and make the needed adjustment. This is particularly useful when used within the same room as the patient or during transportation of a patient from one care unit to another or perhaps to X-ray. Please make every effort to keep students from seeing changes being made to the condition of the patient.

To this point we have talked about input devices, a computer or control box and now need to think about the output devices. For a patient simulator to be reactive, the patient needs to provide feedback to the operator and the user / student. When the operator makes a change, some indication is needed to know that the change took place. Usually, that means the display highlights a factor or a number changes on the computer screen. If the user / student takes a carotid pulse, the Laerdal software display will show a body on the screen and fingers touching the area of the carotid. The computer also makes a note of that fact in a log. **The log** lists everything changed by the operator and actions by the user / student along a timeline. The operator can also use the computer keyboard to make notations directly into the log.

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A display with numbers or graphics is not always the best indicator that the patient has responded as intended by the operator. Sometimes you have to leave the control room and check for chest excursions (rise) or that pulse has truly changed. The METI HPS and the Laerdal Sim-Man simulators have patient vital signs display monitors. The display monitors show over a dozen indicators of the patient's condition and are located in the room with the patient.

The **output device is the patient** and if available, the patient vital signs monitor. When the operator pushes a button on the input device, the computer or control box sends an appropriate signal to the patient and something changes. If heart rate is increased, the patient's heart sounds will change and the number of beats per minute will change on the vital signs display screen located near the patient. If the heart rate sound is turned on, you will hear the rate increase over the room AV system. Hearing the heart rate "beep" tells you the vital signs display monitor and control box are on and working.

How are Patient Simulators Connected to the Control Room?

Three of four current patient care units in SIMS Medical Center™ now have separate control rooms. METI and Laerdal Sim-Man patients can easily be operated from a separate control room. Cables have been run from the control area up into the ceiling and then down again to the patient link or other control boxes. Should you need to run additional wires or, for some reason, be up in the ceiling, be sure to take care with removal of ceiling tiles. Wearing a mask is strongly encouraged since loose material and ceiling tile fibers may become air born. Never use a ladder without a "spotter," someone to hold the ladder steady and assist you should you fall. Always follow the warnings posted on the ladder. If a fire "pillow" is removed for any reason, it must be replaced before returning to operational status.

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 **SIMS Medical Center™**	**Photo 5** Acute Care control room closet housing two air compressors for Sim-Man patients and to the left, a small compressor to provide simulated Oxygen and medical air. A spare compressor is to the far right. The patient compressors used to be located in the care area. Removing them to the control room closet reduced a great deal of noise.

The Laerdal Vital-Sim line of patient simulators come with a wireless remote control. Each hand held remote control produces an RF (radio frequency) signal that is received by a control box that is connected by a cable to the patient. If you are in the same room, the RF signal works well, however, with a separate control room we decided to hard wire the hand held remote control directly to the control box. That eliminated the potential problem of losing the signal because of a concrete wall between control and the patient and also prevents the same response for two or more Vital-Sim patients. It is possible to push "cough" on the hand held remote and get all Vital-Sim patients in one room to all cough at the same time. An interesting effect, but to date not considered as a part of any educational objective.

The new Laerdal Sim-Man comes with its own computer, a hand held wireless unit (looks like a PDA) and is operated in the same room as the patient. We are now in the process of working with Laerdal to adapt this newer patient so it can be operated from a separate room. The computer that "runs" the simulator

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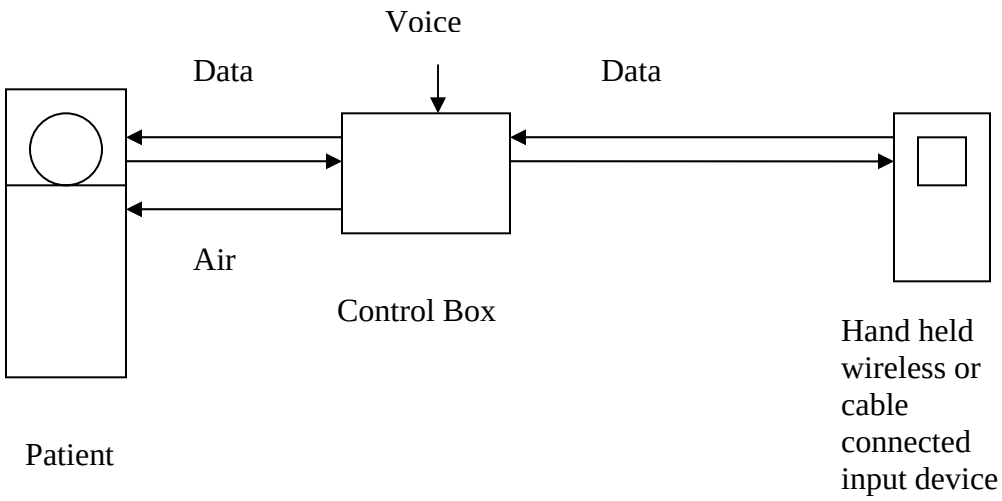
is taking up space in the patient area and is in the way of care equipment. This is a prime example of how the Sim Tech must adapt to new technology.

Schematic Diagram of a Vital-Sim Set up



Basic Care, an eight bed patient unit does not have a separate control room for simulation. Most of the time, this space is used with task trainers or non-computer based manikins. When a simulation is requested in Basic Care, the appropriate patient is moved from storage onto a hospital bed. A portable control unit is moved in behind the partition or placed in the adjacent room. Each portable control unit has a video monitor, sound system, recording device and patient simulator controls. The most commonly used beds in Basic Care have video cameras mounted in the ceiling. A single camera has proven to be adequate for these short, very basic scenarios. The portable control unit can also be used as a back up in case the standard controls fail.

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Critical Care is a two bed unit that houses a METI HPS full size adult male or a full size pediatric male. The METI unit is complex and is not portable. There is a computer that communicated with a "rack" which houses electronic boards, electrical components and mechanical devices. The HPS patient is a physiologic based simulator. That means the operator changes say, SPO2 and the patient will automatically respond to that change. Drugs – simulated – can be injected into the patient. A sensor detects the type of drug, amount and rate, then the computer has the patient react accordingly. This patient can be killed with an overdose. The adult male has to be disconnected before the pediatric patient can be used. Be sure to follow all manufacturer instructions. The second bed usually holds a Laerdal Sim-Man patient. Both adult patients can be placed on ventilators. Critical Care is used extensively by Respiratory Therapy students so you will work closely with Respiratory faculty to determine their needs.

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Photo 6

A simple portable control unit. This unit can be wheeled into almost any room in the School of Health. It has even been used in the Dental Assisting Program so students could prove their emergency situation skills. When a wall or solid partition is not available to separate the control unit from the patient, a portable, office style partition has been used.

Audio-Visual equipment Use

Audio-Visual (AV) equipment is required in patient scenarios for several purposes. One use of an AV system is to allow the instructors to observe in real time what the students are doing during the scenario. Operators and instructors

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can monitor what is happening in the control room. Should a faculty member feel it appropriate, they can enter the patient area to offer assistance. Operators also use the AV system to see when to change patient condition, react, or speak as the patient. The standard is three cameras per bed to allow for viewing of all actions. One camera is at the head of the bed, a second directly over the bed and a third mounted on the ceiling near the foot of the bed, but aimed toward the patient's head. Each camera view can be displayed one at a time, on a monitor in the control room by using a simple switching system. The Trauma AV system can display all three camera views at the same time on one display monitor. It will take you a little practice to know which camera view is best for recording any segment during a scenario.

A second use of an AV system allows Instructors to use the recorded simulation for a comprehensive debriefing session with students. It is not always possible to see everything a student does or does not do during the actual scenario. Recording each scenario is standard. Most control room units use inexpensive VHS tape decks at this time, but at least one room, Trauma, has been switched to a digital recording system. Instructors and students watch the recording and talk about what went well, what could have been done better and what they learned. The Sim Tech will also want to review these recordings to see if there are improvements to be made in equipment, availability of supplies and other technical issues that might arise during any given scenario. A recording of the scenario is highly desirable even if the operator is located in the same room as the patient.

Should a separate control room be used to operate a patient simulation, it is imperative that some type of AV system be installed. Without an adequate AV system, the operator will be unable to create realistic patient interaction with the

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user. It would be like "flying blind," not being able to see what is happening and what you should do.

Recording a patient event or scenario can be as easy as using a hand held "camcorder" (camcorder is short for Camera and Recorder.) As the Sim Tech you may be asked to record the event or scenario by literally holding the camera in your hand or on your shoulder for the duration of the simulation. The advantage to this method is that you can keep moving into a new position so all the action can be captured. Many camcorders have sensitive microphones and internal devices to increase the chance of a "steady" image. Even a novice can usually get adequate images. Still, only if you have a steady hand and some experience should you attempt the hand or shoulder method. Instead, find the best location for a tripod to hold the camcorder and lock it into position. You are now free to operate the patient, but there is a very good chance that someone will walk in front of the camera or worse yet, tip it over. There is a better method.

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Photo 7

Early attempt at using a "camcorder to tape a patient scenario. The patient simulator is located just on the other side of the partition. The angle of the camera was adequate for almost all the action. The sensitive built-in microphone worked well, until students turned away from the camera.

If you have a facility dedicated to simulation, purchase an AV system that can be wall or ceiling mounted. AV systems mounted on walls and in ceilings have several advantages. There are no cables on the floor, there is little chance

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of the system getting damaged from moving objects, and they produce movement free imaging. On the other hand, unless you a have sufficient number of cameras, some action may not be captured. To eliminate that problem, some Sim Techs install cameras that can be steered through a remote control device. That type of system usually allows for a zoom feature and auto focusing. We have used two remote control cameras and eventually removed them from our AV system. Many visiting instructors use our facility and we found having them deal with camera position and zoom was just too complicated. The technology became a distraction from the real purpose of being there, teaching students. We eventually removed the high-end, high cost cameras and replaced them with an inexpensive security style camera system that included built-in microphones. The camera units are small, easy to install, and are powered through a cable attached from the monitor to the camera. The sound quality is not as good as we would like, but for many purposes this type of AV system works fine.

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Photo 8

The two smaller monitors are connected each to one remote control camera. The larger single monitor on top is a security style camera system. All three units could be switched to a single recorder so that all action was recorded. Unfortunately, this combination system proved to be distracting and was later removed.

Better sound quality can be achieved by installing a separate audio system. During a scenario in a SIMS Medical Center™ Trauma Room, it was

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very difficult to hear what users were saying when they moved from the patient to the work station or to grab supplies off various carts. To capture the conversation, no matter what the relationship to cameras with built-in microphones, a second set of ceiling mounted microphone were installed. The volume for each of the two microphones can be adjusted in the separate control room next door. Once optimum sound levels are obtained, you will want to mark the sound level on the amplifier in some fashion. Other operators, unfamiliar with the equipment, may be tempted to turn knobs in some futile attempt to remedy a problem. There have been many times when almost all controls have been adjusted and before we used a marking system, it could take some time to re-set all the controls.

SIMS Medical Center™

Photo 9

A mid level audio-video system that allows four remote color cameras to be recorded at the same time. Each camera can also be viewed full screen. A separate audio system, also with four microphone capacity is added to the video system in a single case. Note the VHS, CD, and DVD recorders. Cost of this system was about $6,000.

Systems are available that cost over $40,000. We are not sure that is necessary for daily operations.

A critical skill that must be mastered by any health care provider is communication with the patient. The level of communication must be determined before the scenario begins. The Laerdal, METI, and Gaumard

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patient simulators have "built-in" voices that may be activated through the computer or wireless hand control. All of these simulator models provide limited responses, such as "No," "Doc, this really hurts," and similar sounds. These sounds are audio files that have been pre-recorded and can be activated through the computer's software or in some cases, through a hand held remote control. For many scenarios, limited patient response meets the learning objective. A simple example of only needing limited sound is the patient who does not need to speak at all, but instead simply moan, or cough. If there is no need for the patient to speak at all, you can still adjust heart, lung, blood pressure, and sometimes bowel sounds through the computer software. Volume of each sound can also be adjusted. The student using a stethoscope for the first time may need a little extra volume until more experience is gained.

There are times though, when the instructor will want the patient to be more interactive and therefore, respond more fully. To achieve this goal, you will need to have a two way audio system and a video system. Having only an audio system will not provide the amount of feedback you need to have the patient react appropriately. When you act as the patient's voice, you may want to say "OUCH! That hurt!" when the student sticks a needle in your (the patient's) thigh. There are two methods for creating an interactive patient voice.

In the space below, list at least two reasons why an AV system is useful in patient simulation.

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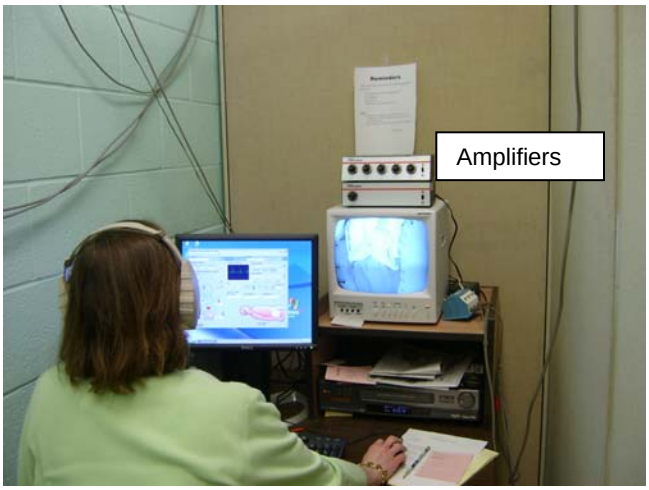
The Laerdal Sim-Man can be hard wired, that is, connected to the patient simulator from the computer by way of an audio cable. If this method is used, the microphone you use to speak for the patient is plugged into the same computer that has the Laerdal Sim-Man software. The cable from the computer audio output runs over whatever distance it takes to reach the Laerdal link box audio input. You may need an adapter to connect to the link box. Radio Shack has been a reliable source for adapters. Another cable is connected to the link box and runs to the patient. This cable carries all information between the link box and the patient, including voice. A small speaker near the top of the patient's head allows you to hear the voice. Once all connections are made, go to the simulation software, "Tools" drop down menu and click on "Microphone control." When that menu pops up, click on "activate" and carefully adjust the volume controls. There are two. One control is for microphone input and a second for output. Keep the microphone input at about half volume and the output close to maximum level. This may help reduce control room noise from coming out of your patient in the next room.



SIMS Medical Center™

Photo 10

Example of a simple system that allows the operator to see and hear what is happening in the scenario room and also to speak for the patient. Note headphones. They also have a microphone attached. The small silver boxes on top of the camera monitor are amplifiers to enhance the patient's voice and the camera system built-in microphones.

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The METI HPS patient uses a wireless microphone and receiver system to allow the operator to speak for the patient. A hand held microphone is connected to a battery powered transmitter. A receiver in the room with the patient is connected to an audio input that sends the signal to a small speaker in the patient's head. The receiver may be battery powered or plugged into a wall outlet.

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Photo 11

Laerdal Vital-Sim control box (white) with wireless receiver (gray) and wireless microphone transmitter in foreground. Note small microphone. The microphone should be cupped in your hand for better sound quality. Use your normal volume of voice.

Troubleshooting Equipment

There is a famous STAR TREK episode where Captain Kirk has to explain to a crew member that you first have to know how and why things work the way they do before you can make it work for you. In the scene the crew member had to troubleshoot a technical problem to once again save the Enterprise. The Captain knew why things worked they way they do and was able to disarm the other ship, making the universe once again safe. When there is a faculty member waiting for the simulation to "take off" you may feel a great deal of pressure. Fall back on the simple. The most common problems are dead batteries, poor connections (electrical and air), and incorrect settings of controls. Sometimes a software program with "lock up," but that can usually be remedied by restarting

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the system. Relax, check the batteries, then the connections, the wiring and controls. Most likely, you will find the problem. If not, you may have to switch patients and try again. Rarely have we encountered a problem that we could not remedy and keep pretty much on schedule. Meticulous preparation is the key.

One morning just after making a cup of tea and sitting down for my first meeting of the day, a faculty member came to the door and said that I was needed in SIMS. The instructors could not get a portable control unit to work. When I tried the headphones, I found that they had a loose wire and assumed that was the real problem. Even after changing to a spare set of headphones, the sound level was just not where it had to be. There was only a faint sound of the patient speaking. I thought it must be the microphone, and sure enough, the battery was low so we replaced it. Still, the sound level was just not right and the instructor could hear my speaking for the patient, but I could still not hear the patient through the headphones. After re-wiring the audio connections to the VHS recorder and then to the external speaker, the sound still did not work. Eventually, an instructor asked, “What happened to her (the patient’s) hair?” I asked what hair and immediately realized that the portable control unit had two cameras plugged into the video system. We were watching the wrong patient. The patient we were watching on the AV system was in a different room. The lesson here is to first think of the obvious, then go back to how things work. As a new Sim Tech, you should diagram each control unit so you can be reminded how everything is connected. Go to the trouble spot and follow the connections back to the electronics. Make sure the controls are set properly. Remember that it was mentioned before that you should mark the controls since “visitors” tend to change the settings at will. The same day, we found five batteries dead in various wireless microphones. No one had checked them before the multiple site scenarios began. You must assume that people using simulation will not remember to turn off anything. Go behind them and check every switch.

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Go to any control unit and diagram the audio-visual, computer, and support compressor connections. Use the space below.

Using Environmental Check Lists

Two components comprise the environment: the actual facility in which the simulation is to take place and all equipment needed for a realistic simulation. An environmental check list is designed to help everyone involved with a scenario know that all is ready to begin operation. Even a simple scenario should be prepped with a check list to compare the educational objectives and environmental needs to ensure the best educational experience is provided. The environment is the setting for the scenario including everything needed for operation. If the instructors are teaching how to handle a cardiac arrest, there are certain items that must be present in the environment. For example, a crash cart with appropriate drugs, a defibrillator, appropriate sized pads, oxygen, backboard, and placement of patient. This type of scenario might take place in any of the patient care units or during transport or while in surgery or the X-ray

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department. Each location will change the environmental check list. Also included on the environmental check list is the appearance of the patient. The instructor must indicate to you whether the patient is male or female, ethnicity, young, old, with wounds, etc. Since many scenarios are repeated, the environmental check list becomes even more important in planning. It is much easier to repeat an event or scenario than to begin from scratch. Even then, another, perhaps somewhat similar scenario may provide the basis for the beginning of a new environmental checklist.

Think of the environmental check list as the pre-flight list that pilots use. Every system is tested, including back ups, before the pilots tell flight control they are ready for take off. The same is true for each scenario. Below is just a partial list of items that should be tested and checked off before a scenario begins. Use the same check list to make sure that all aspects of the scenario have been returned to "pre-flight" status. A complete example is in the appendix.

Section	**Indicator**	**Status**
Operational		
- Computer	Software operational	Yes
- Voice communications	Computer voice	Yes
- Data communications	Patient reacts	Yes
- Air compressor	Chest rise	Yes

The above items are only examples, but should give you an idea of what is contained in an environmental check list. The actual scenario script can be separate, but it is a good idea to attach to your environmental list for future use. *Use the following scenario to develop an environmental check list. Make your list on an Excel spreadsheet and turn in to the Director of Clinical Education for review.*

A Dental Assisting faculty member wants her students to experience what it is like to handle several medical emergencies. She has decided that a cardiac

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issue and an allergic reaction will work nicely. She would like a patient set up in the Dental Assisting Lab in a dental chair. A female in street clothes who can talk to her students. Age does not matter. The faculty member will take care of all the medical, dental supplies. You only need to provide the patient. The session, as a rule, needs to be recorded. Make a detailed environmental check list.

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Managing Resources

The environmental check list is a useful tool to help you manage resources. It includes three sections. The first is the operational section and deals with all connections required for operation of the patient simulator. This section is pretty much standard and requires only a "check" to indicate all is ready. Do note if something had to be repaired before it became operational. Other sections depend on the scenario and may require an explanation to indicate status before the scenario begins. The second section is for the patient, such as location, type of bed, and number of and level of patients needed. Be sure to indicate if faculty members have requested burns, wounds or other special effect patient parts. If hair and make up are requested, find out what color and length of hair is desired and also what type of make up is expected.

SIMS Medical Center™

Photo 12

A patient brought to the Trauma Room with a steering wheel bruise across the chest from a car accident. Layers of powder based make up were applied to give "depth" and appropriate colors to the bruised area. NEVER use grease based make up on any patient.

A third section is specific for the particular scenario requested and details the equipment and supplies needed to support the scenario. Supply lists can be very long and may be attached as a separate sheet. Attach the scenario script as well and file the whole document for future reference. An example is located in the back of this manual, but may be modified as needed.

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As you understand now, providing multiple scenarios on a daily basis will require management of simulators, equipment, supplies, space and time. Use of the environmental check list will help you determine current needs and predict future resource needs. That includes budgeting for and timely ordering of materials and typical repairs. Be sure to look for trends, such as patient skin needing replacement more often than expected. That could mean ordering replacement skin more often (also a budget issue) or it could mean that someone is slipping in a big bore needle when only small gauge are to be used for blood work.

Side Bar
Special effects include body parts, inserts, layovers and heavy make up. Each of these items requires time to create. A simple burn insert on a leg does not take long, but the next scenario may not require the same burn, so it will have to be removed and placed back in the proper storage bin in 315. On the other hand, a Vital-Sim Nursing Anne patient in need of the pelvic fundus model could take up to an hour or more to install.

Before the environmental check list is compiled, the scenario must be scheduled. SIMS Medical Center™ uses a Group Wise Calendar to manage scheduling of patient events. Any faculty member may send a request form to you, the Sim Tech. You are then to first clarify, if needed, what the faculty member is actually asking to be done. You then check the calendar to see if the space, simulator, equipment, and supplies are available. Supplies may need to be ordered. If this is a repeat scenario, pull the previous environmental check list (at times only the script may have survived.) Make sure you understand exactly what is needed before scheduling a scenario on the calendar. Should a faculty member request something that is just not possible, see the Director of Clinical Education or the Dean for further assistance. The request may require a brain storming session to see if the request simply cannot be honored.

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Managing supplies has proven to be a difficult task. There is a Central Supply, Room 309 with limited access where all common supplies are kept. Re-ordering supplies is linked to the environmental checklist and schedule. You need to keep an eye on the amount of each item used and when getting low (based upon the schedule) complete a purchase order request and submit to the Dean's office for ordering. Bear in mind that some supplies may take well over a month to request, process, actually order and arrive back at SIMS Medical. That is why it is very important to keep in touch with faculty to make sure they are notifying you well in advance of a requested scenario.

SIMS Medical Center™

Photo 13

Typical storage unit with bins for organizing supplies. This unit is located in the Trauma Room. Check it daily to see if anything needs to be re-stocked from the 309 storage room or to be re-ordered from the vendor.

Large boxes of material should be kept in the "back" part of the storage area and smaller items placed in labeled bins placed on various shelves. Items that are more commonly used should be closer to the entrance with larger, and not so frequently used items toward the back. There are large colored plastic bins with covers that some faculty are using to contain kits. That is, a selection of items that correspond to a particular scenario or patient intervention. A good example is an IV kit complete with IV solutions, tubing, tape, alcohol wipes and catheters. It is your responsibility to check these kits before and after use to

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make sure all materials are present. You should keep a list of items for each kit either within the kit container or in a separate catalog at your desk. Since it is sometimes not easy to remember all the items used, you may want to find or take photos of each item and place in your catalog for easy reference.

Any item that you order and stock will be used by students and faculty. That means if you have a banned substance, like Betadine ®, do not stock it. Betadine ® will ruin the skin of any patient. Another item of concern is tape. Only paper tape should be used on our patients. Stocking any other type of tape is asking for trouble. Always check with the patient simulator spec sheet or talk directly with a manufacturer representative to ensure you are stocking the correct items for their patient.

Re-use as many items as possible as long as they are in good condition and clean or can be easily cleaned. Instead of using the original packaging, use zip lock bags and paper tape as a label. Include the packaging date and also an expiration date so students can see if the item has "expired." Make up the date by using two and up to six months for the expiration date. The one item that can NEVER be re-used is needles. Use extreme caution should you find a needle. Place in the proper disposal canister immediately. If you find unopened needles lying about, place them in one of the several locked cabinets available in each patient care area. Record your finding and report it to the Director of Clinical Education. You should never have to find a used or unopened needle after a simulation.

Check each patient post simulation to see if any part needs to be repaired or cleaned. If you feel that you can repair a particular part with current spares on hand, do so. If you feel that the repair is beyond our capability, contact the manufacturer as soon as possible to arrange repair. Be sure to take the patient

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off line and off the schedule. Remove the patient to 315 patient storage and tag as needing repair. The same is true for compressors or other necessary equipment that would not allow full operation of a patient. Work with faculty to determine how best to continue the scheduled simulations. When in doubt, contact the Director of Clinical Education first, then the Dean. Keep track of the condition of the patient's skin where needle sticks take place to determine if the skin needs to be replaced. This will cost money and take some time so err on the safe side and order earlier than when the skin can no longer be used. The same is true for other injection pads on all patients. After each use, remove, clean with distilled water and allow to dry. Be sure to clean hardware that may be holding on an arm or leg below the injection site. Students use normal saline (salt solution) to practice injections and the salt can erode metal very quickly.

While all patients are supposed to be left in pristine condition post simulation, you will find that is not always the case. Be prepared to remove tubes, remove tape, clean surfaces and cover the patient as though they were a family member. Always protect yourself while handling used materials. Even though none of our patients are "live" all standard of care safety procedures must be followed at all time. There are other rules as well.

Implementing Policies and Procedures

The administration and faculty have developed policy and procedure guidelines for the use of patient simulation. Much of the faculty driven policy is directed at how simulation scenarios are created and shared. While some of the policies and procedures are formalized there are some logical, common sense "rules" as well. It is your job to help educate users about these simulation rules and to enforce them as needed. Here is the current list.

- No Betadine ® is to be used on any patient. Find a substitute.

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- Only paper tape is to be used on any patient.
- Only orange based cleaners can be used on any patient.
- NO INK PENS are allowed in the room where we have a patient.
- Only small gauge needles or IV catheters may be used.
- Patients are to be covered at all times except during an intervention.
- After a simulation, patients should be left in pristine condition.
- Report all malfunctions immediately after a simulation.
- Only qualified personnel may operate a patient simulator.
- All equipment must be off and put back in place after use.
- All IVs, tubes, sensors are to be removed after simulation.
- All simulations must be scheduled through the Sim Tech.
- Patients are to be treated with respect at all times.
- Students must have proper uniform when working with patients.
- Patient safety is to be observed at all times.
- Any member of SIMS Medical Center™ must stop any unsafe practice.
- Students can expect to be video taped at any time.
- Users must follow standard protocol when handling needles.
- Users must follow standard protocol when using drugs of any sort.
- Visitors must be accompanied at all times.
- Students are only allowed in a control area when accompanied by a faculty member.
- Faculty may propose policy and procedures to be approved by the Dean.
- Respect will be shown at all times to all SIMS Medical Center™ members, students, users, guests and patients.
- Everyone models professional behavior at all times.

If you have worked in a medical environment before, many of these rules seem familiar. All are common sense and will help to create a culture of

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respect and caring for our patients. Do not hesitate to suggest additional policies and procedures.

Summary

We have covered just the basics of patient simulation at this point. As you work in the position you will learn a great deal more. Remember to always refer to the manufacturer's latest manual for technical information. Keep good records and remain flexible with your time and energy. Bear in mind that technical advances are being made every year and you will need to know those changes and help others to understand the value in creating a successful educational environment. The Patient Simulation Technician has an exciting and fun job. You are a vital part of a team responsible for the success of patient simulation. Your eventual knowledge of computers, electronics and simulation systems will provide the core of what we do. Do not expect to know it all today, but aim to learn a lot tomorrow knowing that your contribution will help patients, real patients of the future, to enjoy high quality health care. Welcome to the team.

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