Dr. Mark Shikhman works with WCCCD Surgical First Assistant students using the Endoscopic Surgery Simulator
Minimally invasive procedures (also known as minimally invasive surgeries) have been enabled by the advance of various medical technologies. Surgery by definition is invasive and many operations requiring incisions of some size are referred to as open surgery. Incisions made can sometimes leave large wounds that are painful and take a long time to heal. Minimally invasive surgery refers to surgical techniques that limit the size of incisions needed and so lessens wound healing time, associated pain and risk of infection.

In 1988, Dr. J. Barry McKernan, after making only a 10mm incision, inserted a laparoscope (or miniature camera) into a patient’s abdomen and removed a gall bladder. The patient recovered in days, rather than weeks or months. This was the first laparoscopic cholecystectomy performed in the U.S. and the beginning of the minimally invasive movement in surgery.

Minimally invasive procedures, which include laparoscopic surgery, use state-of-the-art technology to reduce the damage to human tissue when performing surgery. For example, in most procedures, a surgeon makes several small ¾ inch incisions and inserts thin tubes called trocars. Carbon dioxide gas may be used to inflate the area, creating a space between the internal organs and the skin. Then a miniature camera (usually a laparoscope or endoscope) is placed through one of the trocars so the surgical team can view the procedure as a magnified image on video monitors in the operating room. Then, specialized instruments are placed through the other trocars to perform the procedures.

**Potential benefits of minimally invasive procedures**

Not only do these procedures usually provide equivalent outcomes to traditional "open" surgery (which sometimes require a large incision), but minimally invasive procedures (using small incisions) may offer significant benefits as well:

- Less major bleeding
- Fewer post-op infections
- Fewer complications
- Shorter length of stay
- Quicker return to normal activities
- Quicker return to work
- Less scarring
- Comparable or lower cost

The execution of the minimally invasive procedure requires special skills and adequate training of Surgeons as well as Surgical First Assistants actively involved in such surgery.
The *Endoscopic Surgery Simulator* was created to bring the WCCCD Surgical First Assistant students’ training to an advanced level. It will simulate the training environment as close as possible to the real surgical procedure. The ESS is intended to mimic the abdominal and thoracic cavities with the ability to place multiple trocars into specifically indicated positions. No use of the insufflation gas is needed. Laparoscopic instruments and 5- or 10-mm cameras can be introduced through the trocars for surgical manipulation.

The Endoscopic Surgery Simulator can be used for the advanced stage of the Surgical First Assistant program’s student training. It can also be used for the beginning stage without laparoscope and camera placement. Two hinged mirrors are built into the device which allows the ability to change the angle from 0° to 90° for indirect observation of the action inside the simulator. Multiple “games” are designed for developing proper hand coordination, dexterity, surgeon/assistant harmonization, and laparoscopic/thoracoscopic skills development.
Game 1:

Pic. 1 and 1A Present the ESS with a few Trocars (5 mm; 10-11 mm) inserted inside the Simulator. By adjusting two (superior and inferior) mirrors move instrument from one point to the other (Pic. 1C shows different shape devices placed in these points).
Game 2:

Three different color posts (Red, green, and blue) are placed inside the ESS. Fifteen (15) rings of 3 identical colors placed around the “cavity” (Pic. 2). Your task is to pick up one ring after another and place them on the matching post (Pic. 2A, 2B, and 2C).

This task has to be completed in 2 min. Correct placement of each ring gives 2 points (30 points for full completion). This game can be modified by placing all 15 rings on one post in the specific arrangement:

![Arrangement Image](image1)

![Arrangement Image](image2)

![Arrangement Image](image3)
Game 3:
Ring-posts (Pic. 3) placed inside the “cavity”. Vessel-loop has been passed through the ring (Pic. 3A). Both ends of the vessel-loop equalized in length and Endoclip placed to secure them in position (Pic. 3B).

Completion time: 1 min (10 points).
Game 4:
Ring-post (Pic. 4) placed inside the “cavity”. Vascular graft (Penrose drain or umbilical tape) placed through the ring. Both ends secured by suturing them together (Pic. 4A, 4B)

Completion time: 3 min (20 points).
**Game 5:**
Suturing Post (Pic. 5) placed inside the “cavity”. 2-0, 3-0 silk (Vicryl, Prolene) “sutured” through the opening (Pic. 5A). Instrument-tied, cut (Pic. 5B). All three sutures have to be completed (Pic. 5C).

Completion time: 6 min (24 points: 8 for each stitch).
Game 6:
Carousel Post (Pic. 6) placed inside the “cavity”. Vessel-loop has been passed through the hole of the “roof” (Pic. 6A). Endoclip secures the vessel-loop (Pic. 6B). Loop is stretched out and placed around the hook on the tension (Pic. 6C). All four vessel-loops placed around the carousel (Pic. 6D).

Completion time: 8 min (36 points).
Endoscopic Surgery Simulator (ESS)
Surgical Technology Program

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**Game 7:**

Individual cubical and cylinder shape devices placed in different location of the “cavity”, simulating gallbladder, loose gallbladder stones, tissue biopsy, resected wedges of the lung, etc. (Pic. 8). Endopouch is placed inside the “cavity” (Pic. 8A). Devices placed inside the pouch (no more than two at the same time) (Pic. 8B).