

# Laparoscopic Surgery – Training and Certification for Surgeons and the Need for a Universal Translator

## **Abstract**

Steven Schwaitzberg MD, FACS is Professor and Chair of the Department of Surgery at the University at Buffalo School of Medicine and Biomedical Sciences. Previously he was chief of surgery at the Cambridge Health Alliance and Professor of Surgery at the Harvard Medical School. Dr Schwaitzberg has set a goal to provide laparoscopic training remotely for surgeons who may be located anywhere in the world by utilizing video conferencing in conjunction with a newly evolving “universal translator”. The coming together of these technologies will enable the trainer and the trainee to converse remotely, in real-time and in a wide range of languages.

As a lead-in to the development of a universal translator by Dr. Schwaitzberg and his associates, this paper overviews the basics of laparoscopic surgery and the recommended training that is currently available to surgeons who are looking to become proficient in this type of surgery. It also discusses the Fundamentals of Laparoscopic Surgery™ (FLS)<sup>[1]</sup>, a proficiency-based training and the ongoing effort by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)<sup>[2]</sup> to make it a requirement that all graduating and practicing surgeons become certified in FLS before they perform this surgery.

## **Background**

There are three main categories which the medical community describes the invasiveness of surgical procedures:

- 1) Non-invasive procedures
- 2) Minimally invasive surgery
- 3) Invasive procedures or open surgery

*Non-invasive surgical procedures* are when no break in the skin is created and there is no contact with the mucosa, or skin break, or internal body cavity beyond a natural or artificial body orifice. Similarly, examination of the ear-drum or inside the nose or a wound dressing change all fall outside the strict definition of a non-invasive procedure. There are many non-invasive procedures, ranging from simple observation, to specialized forms of surgery, such as radiosurgery<sup>[3]</sup>.

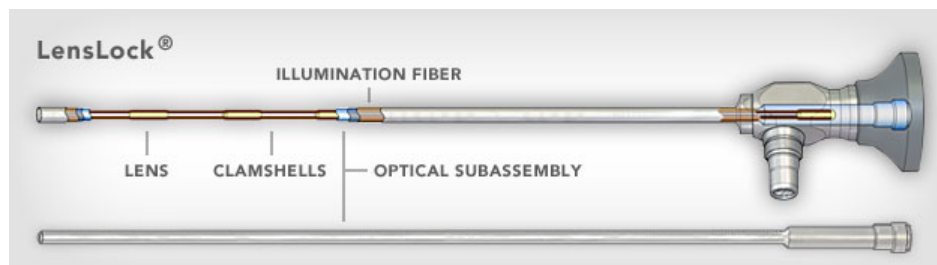
*Minimally invasive surgery (MIS)* typically involves the use of arthroscopic (for joints and the spine) or laparoscopic devices and remote-control manipulation of instruments with indirect observation of the surgical field through an endoscope or large scale display panel, and is carried out through the skin or through a body cavity or anatomical opening. These include both the SILS™<sup>[4]</sup> (Single Incision Laparoscopic Surgery) and NOTES<sup>[5]</sup> (Natural Orifice Transluminal Endoscopic Surgery) techniques.

Invasive procedures or open surgery, involve large incisions where the tissues are exposed to the air. Although a typical invasive procedure means cutting skin and tissues so the surgeon has a direct access to the structures or organs involved, a rectal examination is also an invasive procedure. The structures and tissues involved can be seen and touched, and they are directly exposed to the air of the operating room. Examples of open surgery include herniated disk surgery, the removal of organs, such as the gallbladder (is now mostly done laproscopically) or kidney, and most types of cardiac surgery and neurosurgery.

### **Laparoscopic Surgery**

Laparoscopic surgery is a minimally invasive technique in which surgery is performed within the abdomen through small incisions (usually 0.5 – 1.5cm) as compared to larger incisions needed in open (invasive) surgical procedures.

The key element in laparoscopic surgery is the use of a laparoscope (*Fig. 1*), a medical device that enables the surgeon to have an exceptionally clear view of the inside of the abdominal cavity to explore areas such as the abdomen, gallbladder, colon, kidney, stomach, intestines, pancreas, spleen and all the female organs as well as the bladder and prostate in men.



*Fig. 1 Laparoscope (courtesy of Precision optics Corp)*

As an example, laparoscopic gallbladder surgery (cholecystectomy) removes the gallbladder and gallstones through several small incisions in the abdomen. The surgeon inflates the abdomen (insufflation) with carbon dioxide gas. This elevates the abdominal wall above the internal organs like a dome to create a working and viewing space for the surgeon. CO<sub>2</sub> gas is used because it is common to the human body and can be absorbed by tissue and removed by the respiratory system. It is also non-flammable, which is important because electro-surgical devices are commonly used in laparoscopic procedures.

The surgeon inserts the lighted laparoscope attached to a video camera into one incision near the naval (**umbilicus**). The surgeon then uses a video monitor as a guide while inserting surgical instruments into the other incisions to remove the gallbladder (*Figs 2 & 3*).

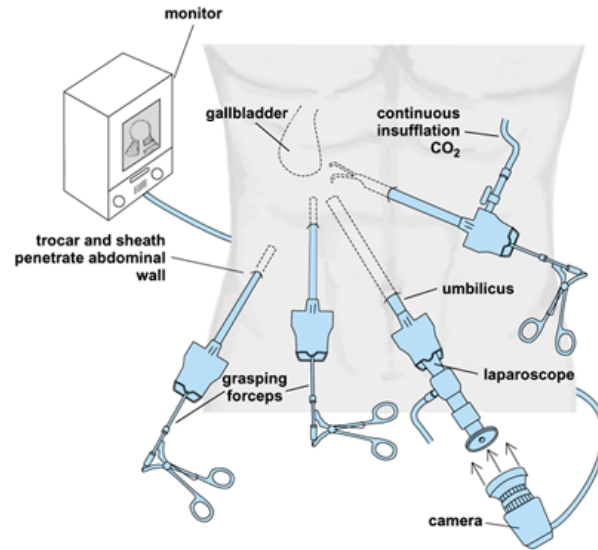


Fig. 2 Surgical Tools for Laparoscopic Gall Bladder Surgery (Cholecystectomy)  
(Courtesy of Precision Optics Corp)

### Advantages of Laparoscopic Surgery

Compared to an open (invasive) surgical procedure, laparoscopic surgery offers a number of advantages to the patient which includes:

- Reduced hemorrhaging with less chance of needing a blood transfusion.
- Smaller incision requiring less pain medication
- Often same day discharge from the hospital compared to 4-5 day hospital stay with open procedure
- Shorter recovery time, often 7 to 10 days away from work and other activities compared with 4 to 6 weeks after an open procedure
- Less post-operative scarring than an open procedure.
- Reduced exposure of internal organs to possible external contaminants thereby reduced risk of acquiring infections.
- Images are magnified 2.5 times on display monitor resulting in less instrument motion errors



Fig. 3 Surgical Tools for Laparoscopic Surgery (courtesy of Laparoscopic.md)

### Disadvantages

While laparoscopic surgery is clearly advantageous in terms of patient outcomes, the procedure is more difficult to perform from the surgeon's perspective when compared to traditional, open surgery. For example:

- The surgeon has limited range of motion at the surgical site resulting in a loss of dexterity
- There is poor depth perception
- Surgeons may be at a disadvantage at times when using tools to interact with tissue rather than manipulate it directly with their hands.

Laparoscopic surgery requires unique motor skills that are difficult to learn even by the more experienced surgeons and it is also a difficult procedure to teach. For example, the endpoints of the surgical tools that are used during surgery move in the opposite direction to the surgeon's hands due to the pivot points at the entrance to a patient's abdomen. This may result in an inability for the surgeon to accurately judge how much force is being applied to tissue as well as a risk of damaging tissue by applying more force than necessary due to moment arm magnification.

This limitation also reduces tactile sensation thus making it more difficult for the surgeon to feel tissue which may at times be an important diagnostic tool, such as when palpating for tumors. Another example is the high level of difficulty when making delicate maneuvers such as tying internal sutures

For these reasons, SAGES and the American College of Surgeons (ACS)<sup>[6]</sup> are jointly recommending that institutions credentialing surgeons to perform laparoscopic surgery consider FLS training program be a requirement of their credentialing process. FLS is the only validated and objective measure of a surgeon's fundamental knowledge and skills related to laparoscopic surgery.

### **FLS Training**

FLS was introduced in 2004 by SAGES as an educational program to teach and to assess fundamental cognitive knowledge and technical skills unique to laparoscopic surgery. This training permits learning in a completely safe environment without putting patients at risk<sup>[7]</sup>.

FLS is a comprehensive web-based education module that includes an FLS Training Simulator<sup>TM[8]</sup> (Fig 4), a system designed for hands-on skills training component and didactics including assessment tools designed to teach the physiology, fundamental knowledge and technical skills required in basic laparoscopic surgery. The goal of the program is to provide surgical residents, fellows and practicing physicians an opportunity to learn the fundamentals of laparoscopic surgery in a consistent, scientifically accepted format and to test cognitive, surgical decision-making and technical skills all with the goal of improving the quality of patient care.

### FLS Trainer Simulator

The SAGES FLS committee members have developed a technical skills curriculum specifically designed for use in third year residency training programs. The curriculum is proficiency-based, whereby trainees are oriented to the materials and self-practice until expert-derived performance levels are reached. This program has proven to be effective in training and assessing both cognitive and technical skill aspects related to laparoscopic surgery.

The FLS training protocol consists of:

- Didactics; web-based study guides
- Hands-on manual skills practice and training via the FLS Laparoscopic Training Simulator;
- An assessment tool that measures the trainees' cognitive and technical skills.
- Testing for certification



Fig.4 FLS Training Simulator™ (Courtesy of VTI Medical Inc-worldwide exclusive distributor)

The web-based study guides cover didactics, interactive patient scenarios and manual skills training that contain printable text reviews and practice questions. The online system allows program coordinators to administer and closely track the progress of their individual users.

The FLS Training Simulator provides laparoscopic manipulations that include instrument navigation, a simulated environment (torso) and simulated internal organs that enable the trainee to practice five technical skills:

- Dexterity
- Cutting
- Endoloop suturing
- Knot tying intra-corporeal
- Knot tying extra-corporeal

Along with video feedback this protocol ensures that all trainees achieve an excellent level of performance and has correlated with a uniform successful passing score according to the FLS technical skills testing criteria.

### FLS Certification

In 2008 a study was made to investigate the feasibility of implementing the FLS skills training curriculum and to evaluate its effectiveness in preparing trainees for certification. The resulting paper entitled “Certification Pass Rate of 100% for Fundamentals of Laparoscopic Surgery Skills after Proficiency-based Training”(D.J.Scott et al) concluded that this proficiency-based curriculum was feasible for training novices and uniformly allowed sufficient skill acquisition for FLS certification.

For the study, twenty one novice medical students at two institutions viewed video tutorials and were then asked to perform one repetition of the five designated FLS tasks as a pretest. The trainees next practiced the tasks over a two month period until they achieved proficiency for all tasks.

It is interesting to note that no trainee passed the certification examination at pretesting while 96% of the trainees achieved proficiency during the training process, and at post-testing, 100% of the trainees passed the certification examination.

The authors of the report encouraged “a more widespread adoption of this curriculum”.

### **SAGES**

The mission of SAGES is to improve quality patient care through education, research, innovation and leadership, principally in gastrointestinal and endoscopic surgery. SAGES is a leading surgical society representing a worldwide community of over 6,000 surgeons that can bring minimal access surgery, endoscopy and emerging techniques to patients worldwide. The organization sets the clinical and educational guidelines on standards of practice in various procedures including laparoscopic surgery which is critical to enhancing patient safety and health.

Steven Schwaitzberg MD, FACS is Professor and Chair of the Department of Surgery at the University at Buffalo School of Medicine and Biomedical Sciences and a nationally-known pioneer in minimally invasive surgery and past president of SAGES. He currently chairs the FLS committee for SAGES. In his 2013 Ted Talk<sup>[9]</sup> he stated; “Imagine giving a lecture and being able to talk to people in their own native language simultaneously. It would make a world of difference to be able to communicate with

surgeons in different parts of the world in their native language. Ideas would be freely exchanged and surgical techniques would be improved.”

### Worldwide FLS Training

In the first step in creating his vision for a universal translator, Dr. Schwartzberg has teamed up with IBM Research Human Ability and Accessibility Center<sup>[10]</sup> and their partners Polycom<sup>[11]</sup>, Nuance<sup>[12]</sup> and Lionbridge Technology Inc<sup>[13]</sup> to prototype an integrated collaborative platform that translates the instructor’s voice into one of 11 languages selected by the student.

He stated; "The foundation of the system is built on IBM Sametime Meetings collaboration platform<sup>[14]</sup> We then integrated multi-party video conferencing from Polycom, speech-to-text capability using Nuance’s Dragon Medical software, captioning technology from IBM Research Human Ability and Accessibility Center and finally, the ‘secret sauce’, translation technology from Lionbridge Technology Inc. Expect much more to come as we think about trying to make the world a smaller place."With this current technology prototype and future refinements, Dr. Schwartzberg is making it possible to train the next generation of surgeons to perform minimally invasive surgery around the globe.

### Society of American Gastrointestinal and Endoscopic Surgeons Social Collaboration Platform



Fig. 5 Platform of social collaboration used in Dr. Schwartzberg's TED talk.

## Looking Forward

Further work in this area includes refining the lexicon of words used in this field so that the accuracy of translations specific to this area of work can be improved. It appears that sub title word display remains superior to re-speaking the translated words to avoid distraction from poor accent etc. Work in the area is ongoing and product development could be expected within the next 2 years.

The issues of lexicon, i.e. the specific set of words most commonly used is germane as one would hope to respond to a variety of health care settings and other specialties remotely since transmission lag is sought to be minimized. Finally the project must be designed to be a "learning system" with feedback loops allowing end-users to correct mistakes and misinterpretations for continuous improvement

## Notes and References

<sup>[1]</sup> **Fundamentals of Laparoscopic Surgery (FLS)**; [re;www.fundahttp://www.flsprogram.org/](http://www.flsprogram.org/)

<sup>[2]</sup> **The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)** started in the late 1990s represents the largest general surgery society in the United States. It is a worldwide community of over 6,000 surgeons allied health professionals that can bring minimal access surgery, endoscopy and emerging techniques to patients in every country. The SAGES mission statement is to improve quality patient care through education, research, innovation and leadership, principally in gastrointestinal and endoscopic surgery. (<http://www.sages.org/about/>)

<sup>[3]</sup> **Radiosurgery (Stereotactic)** is a form of radiation therapy that focuses high-powered x-rays on a small area of the body

<sup>[4]</sup> The SILS technique (single incision laparoscopic surgery) involves placing multiple instruments through a single access point. The ability to articulate allows the surgeon to approach the surgical site from different angles, thereby restoring triangulation and improving visualization.

<sup>[5]</sup> NOTES is an experimental surgical technique whereby "scarless" abdominal operations can be performed with an endoscope passed through a natural orifice (mouth, urethra, anus, etc.) then through an internal incision in the stomach, vagina, bladder or colon, thus avoiding any external incisions or scars.

<sup>[6]</sup> **The American College of Surgeons (ACS)**. (<http://www.facs.org/about/corppro.html>) is a scientific and educational association of 60,000 surgeons worldwide that was founded in 1913 to improve the quality of care for the surgical patient by setting high standards for surgical education and practice. In 2005, ACS partnered with SAGES to its lend support to FLS, now a joint program of SAGES and ACS and is managed by a steering committee that includes representatives from both organizations

<sup>[7]</sup> **SAGES Literature** <http://www.sagemedicalgroup.com/Main%20Page.html>

<sup>[8]</sup> **VTI Medical™ (VTIM)** in association with The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) is the exclusive worldwide manufacturer and distributor for the patented FLS Trainer System which includes a wide range of training tools and accessories for the Fundamentals of Laparoscopic Training Program (FLS). (<http://www.vtomedical.com/about.html>)



[<sup>9</sup>] **TedTalks;** ([http://www.ted.com/talks/steven\\_schwaizberg\\_a\\_universal\\_translator\\_for\\_surgeons.html](http://www.ted.com/talks/steven_schwaizberg_a_universal_translator_for_surgeons.html))<sup>1</sup>

[<sup>10</sup>] **IBM Research Human Ability and Accessibility Center** <http://www-03.ibm.com/able/education/#Captioning>

[<sup>11</sup>] **Polycom** <http://www.polycom.com/>

[<sup>12</sup>] **Nuance** [https://www.google.com/#bav=on.2,or.r\\_cp.r\\_qf.&fp=aabfeb84bfcc56d1&q=Nuance](https://www.google.com/#bav=on.2,or.r_cp.r_qf.&fp=aabfeb84bfcc56d1&q=Nuance)

[<sup>13</sup>] **Lionbridge Technology Inc** <http://www.lionbridge.com/our-company/>

[<sup>14</sup>] **IBM Sametime Meetings collaboration platform** <http://www-01.ibm.com/software/lotus/products/sametime/ucc-platform.html>)

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