FUNDAMENTAL LAPAROSCOPIC SKILLS
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Key points
- Laparoscopic surgery requires specific technical skills.
- Technical laparoscopic skills are best achieved through deliberate practice.
- There are 5 specific tasks that comprise basic laparoscopic technical skills.
- Procedure-specific simulation can improve clinical performance.

Laparoscopic surgery is a major component of the minimally invasive surgery (MIS) field. Over the past decade there has been slow but steady implementation of laparoscopic techniques into veterinary surgical practice. The upward trend of laparoscopy in veterinary surgery reflects the steeper rise of laparoscopy in human surgery. One of the factors that slow the adoption of laparoscopy is the technical challenge that laparoscopic surgery presents to the surgeon. These include but are not limited to; long instruments amplify movements and dampen tactile feedback, fulcrum effect, monocular vision, limited depth perception, magnification, fixed instrument access, decreased range of motion and use of non-dominant hand.

The competent laparoscopic surgeon has a balance of cognitive and technical skill. There is arguably greater challenge in acquiring and measuring technical skill relative to cognitive skill. The traditional approach for acquiring technical skill in medicine is the “Apprenticeship Model” of See one, Do one, Teach one. It has been demonstrated that the apprentice model is not as effective as specific skills training to improve laparoscopic performance in the surgery room. There has been a concerted effort to determine what an effective laparoscopic skills training program is. The study of laparoscopic skills is a prolific and energetic field that is replete with acronyms.

Acronyms related to Laparoscopic Skills
FLS Fundamentals of Laparoscopic Surgery
SAGES Society of American Gastrointestinal and Endoscopic Surgeons
ACS American College of Surgeons
ABS American Board of Surgery
MISTELS McGill Inanimate System for Training and Evaluation of Laparoscopic Skills
OSATS Objective Structured Assessment of Technical Skills
GOALS Operative Assessment of Laparoscopic Skills
MIS Minimally Invasive Surgery
VALT Veterinary Applied Laparoscopic Training

Currently the gold standard of basic laparoscopic skills is encompassed in the McGill Inanimate System for Training and Evaluation of Laparoscopic Skills (MISTELS). MISTELS consist of 5 specific tasks. (Fig 1)
Figure 1. The five manual tasks in the Fundamentals of Laparoscopic Surgery (FLS)

• Task 1—Peg Transfer: Six plastic objects are transferred on a pegboard. Errors are defined as objects that drop outside the surgeon’s field of view.

• Task 2—Pattern Cut: A circular pattern is cut along a 1-mm-wide line. Errors are defined as any deviation from the template

• Task 3—Ligating Loop: A loop is placed at a 1-mm-wide line on a foam appendage. Errors are defined as inaccuracy of loop placement and knot insecurity.

• Task 4—Suturing With Extracorporeal Knot-Tying: A 120-cm-long suture is passed through two targets on a Penrose drain, and three knots tied in an extracorporeal fashion are placed using a knot pusher. Errors defined as inaccuracy of suture placement, poor tissue approximation, knot insecurity and pulling the model from its Velcro attachment.

• Task 5—Suturing With Intracorporeal Knot-Tying (similar to task 4): A 12-cm-long suture is used, and three knots are tied in an intracorporeal fashion. The error definition is identical to that for task 4.
MISTILS is the technical component of the Fundamentals of Laparoscopic Skills (FLS) certificate program. This is a joint educational program of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and the American College of Surgeons (ACS). As of 2010 the American Board of Surgery (ABS) requires FLS certification for all general surgery residents seeking board certification. Below are the training targets for the 5 basic skills.

<table>
<thead>
<tr>
<th>Task</th>
<th>Allowable errors</th>
<th>Proficiency time (s)</th>
<th>No. of repetitions required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Peg transfer</td>
<td>No drops outside field of view</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>Pattern cut</td>
<td>All cuts within 2 mm of line</td>
<td>98</td>
</tr>
<tr>
<td>3</td>
<td>Ligating loop</td>
<td>Up to 1-mm accuracy error No knot insecurity</td>
<td>53</td>
</tr>
<tr>
<td>4</td>
<td>Extracorporeal suture</td>
<td>Up to 1-mm accuracy or gap error No knot insecurity</td>
<td>136</td>
</tr>
<tr>
<td>5</td>
<td>Intracorporeal suture</td>
<td>No model avulsion</td>
<td>112</td>
</tr>
</tbody>
</table>

Laparoscopic skills training and assessments in veterinary settings are important to improve surgical performance. There are several differences to the MISTELS encountered in veterinary clinical laparoscopy. Veterinary surgeons often work in a space either larger or more confined than the FLS training box due to the variable size of our patients, the portals can often not be spaced as wide as those on the box, and the orientation of suturing is not always similar to that in the FLS tasks, especially during standing equine procedures. A training program is developed that mimics the tasks trained in the MISTELS program but also incorporates training in a variable sized space, suturing in different orientations and exercises performed during complicating factors such as mirroring instead of triangulation of the scope and instruments. The future development of veterinary specific procedure simulations will be instrumental in the continued growth of laparoscopic surgery in veterinary medicine.

References