The Manual Skills testing component is intended to measure your technical skills and eye-hand coordination during basic laparoscopic surgical maneuvers. These five tasks, designed by Dr. Gerald Fried and customized for the FLS Program, are based on the MISTELS program developed at McGill University and have been extensively tested to ensure that they reflect those technical skills that are fundamental to the performance of laparoscopic surgery. All tasks are demonstrated in the FLS didactic curriculum (Module 5), and each task is performed once during the test.

**Scoring.** The five exercises are timed. While the actual time required for each exercise varies according to its difficulty, a maximum time limit is instituted for each exercise. For all exercises, both time and accuracy are considered important for performance and high scores result from exercises performed efficiently and without error. Each exercise has its own scoring formula based upon a combination of time and accuracy measures. The scores for the exercises are normalized so that a maximum score for each is approximately equal and the scores for the five exercises receive equal weight in the summated total manual skills assessment score.

Each task is scored for efficiency (time) and precision, with penalties applied for specific errors or lack of precision. A person will fail if they are extremely inefficient, extremely imprecise, if they make egregious errors, or any combination of inefficiency and imprecision. The maximum time (cutoff time) gives a score of zero, thus if a task is performed close to or at the maximum time allowed it is not a passing score.

**Task One: Peg Transfer**

*Equipment: Two Maryland dissectors/graspers, pegboard, 6 rubber ring objects*

*Maximum time limit: 300 seconds*

Center the pegboard on the lower Velcro™ strip in the center of the marked square on the floor of the trainer box. Make sure the pegboard is centered in the camera’s field of view. Six objects are placed on the candidate’s non-dominant side of the pegboard.

The peg transfer exercise requires you to lift the six objects with a grasper/dissector first in your non-dominant hand and transfer the object midair to your dominant hand. Then, place each object on a peg on the opposite side of the board. There is no importance placed on the color of the objects or the order in which they are placed. Once all six objects have been transferred, the process is reversed. Each object is lifted using the dominant hand from the pegboard, transferred midair to the other hand and placed on the pegs on the original side of the board.

Timing for this task begins when you grasp the first object and ends upon release of the last object. Each transfer must be mid-air, without using the pegs or block for assistance. This exercise is timed and a penalty is assessed for any peg dropped out of the field of view. This exercise tests hand-eye coordination, ambidexterity and depth perception. A video demonstration of this task is included in Module 5 of the FLS didactic curriculum.
Task Two: Precision Cutting

Equipment: One Maryland dissector/grasper, one endoscopic scissors, large clip, 4x4 gauze piece with a pre-marked circle, two alligator clips
Maximum time limit: 300 seconds

This exercise requires you to cut out a circle from a square piece of gauze suspended between clips.

Place the large white clip on the Velcro™ strip at the top of marked square on the floor of the trainer box. Place the 4x4 gauze piece with the circle pattern face up so that the open edge of the gauze is secured in the clip. Use the small roped alligator clips to secure the bottom two corners of the gauze to keep the gauze taut and slightly suspended.

One hand should be used to provide traction on the gauze using the grasper and to place the gauze at the best possible angle to the cutting hand. If you wish, you may exchange instruments at any time during this task. You must start cutting from an edge of the gauze as demonstrated in Module 5 of the didactic curriculum.

Timing starts when the gauze is grasped and ends upon completion of cutting the marked circle. This exercise is timed and a penalty is assessed for any deviation from the line demarcating the circle. There are 2 layers of gauze, but the error scoring is based on the marked, top layer only. This exercise requires you to use both hands in a complimentary manner.

Task Three: Placement and Securing of Ligating Loop

Equipment: One grasper (choice of Maryland grasper/dissector or grasper with locked/ratcheted handle), one endoscopic scissors, one large clip, one pre-tied ligating loop or endoloop, one foam organ with appendages.
Maximum time limit: 180 seconds

Place the clip on the lower Velcro™ strip in the center of the square marked on the floor of the box ensuring it's in the center of the camera’s field of view. Place the foam organ in the clip so that the appendages are free.
In this task you are required to place a pre-tied ligating loop or endoloop around a tubular foam appendage on the provided mark. Once you have positioned the endoloop properly, break off the end of the plastic pusher at the scored mark on the outside of the box. Then secure the knot on the mark near the base of the foam appendage by sliding the pusher rod down. A penalty will be assessed if the knot is not secure and for any distance that the tie misses the mark.

Timing begins when instruments are visible on the monitor and ends when the ligating loop thread is cut. This task tests familiarity with the endoloop and requires bimanual skills. This skill can be used in the operating room for ligation of the appendix at its base or for securing a dilated cystic duct, for example. A video demonstration is included in Module 5 of the FLS didactic curriculum.

**Task Four: Simple Suture with Extracorporeal Knot**

*Equipment: Two needle drivers (or choice of one needle driver and one grasper), one knot pusher, one suture of 90 - 120cm length, one endoscopic scissors, one penrose drain with marked targets, one suture block
Maximum time limit: 420 seconds*

Place the drain firmly on the suture block, and place the suture block on the lower Velcro™ strip.

This suturing task requires you to place a simple stitch through two marks in a longitudinally slit Penrose drain. You are then required to tie the suture extracorporeally, using a knot-pushing device to slide the knot down. You must tie the knot tightly enough to close the slit in the drain. Be careful not to avulse the drain off the foam block. At least three square throws are required to ensure that the knot will not slip under tension.

Timing begins when an instrument is visible on the monitor and ends when the suture material and needle are cut. A penalty is applied for any deviation of the needle from the marks, for any gap in the longitudinal slit in the drain and for a knot that slips when tension is applied to it. If the drain is avulsed from the block, a score of zero will be applied. This task tests accuracy of placement of the suture and knot tying skills and requires ambidexterity and
depth perception. Please review the video demonstration of this task included in Module 5 of the FLS didactic curriculum for additional guidance.

**Task Five: Simple Suture with Intracorporeal Knot**

*Equipment: Two needle drivers, one suture of 15 cm length, one endoscopic scissors, one suture block, one penrose drain with marked targets*

*Maximum Time Limit: 600 seconds*

Place the drain firmly on the suture block, and place the suture block on the lower Velcro™ strip.

This suturing task requires you to place a suture precisely through two marks on a Penrose drain that has been slit along its long axis. You are then required to tie the knot using an intracorporeal knot.

You must place at least three throws that must include one double throw and two single throws on the suture. You must also ensure the knots are square and won’t slip.

*Between each throw you must transfer the needle to the other hand.*

Skills required include proper placement of the needle in the needle-holder, needle transferring, suturing skills and knot tying. A penalty is applied for any deviation of the needle from the marks, for any gap in the longitudinal slit in the drain and for a knot that slips when tension is applied to it. If the drain is avulsed from the block to which it is secured by Velcro™, a score of zero will be applied.

Timing begins when the instruments are visible on the monitor and ends when the suture material and needle are cut. This is a more complex task incorporating several skills including depth perception, hand-eye coordination, ambidexterity, and transferring skills. Please review the video demonstration of this task, included in Module 5 of the FLS didactic curriculum for additional guidance.