Robotic Simulation Training in Colorectal Surgery

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Disclosures

• None
Outline

• Training to Proficiency in CRS
  • Program Overview

• Virtual Reality (VR) Simulation
  • da Vinci system

• Non-VR Simulation
  • Cadaveric
  • Non-operative competencies
Introductory Training

• **Online Modules:**
  
  • Completion of interactive online modules covering the basic design and operation of the da Vinci system
Introductory Training

• Technology In-Service Overview:
  • In-person overview of the system conducted at the hospital by Intuitive clinical sales representative
  • Register for VR skills simulation training
VR Simulation Training

• da Vinci VR Skills Simulator Training:
  • Camera Control / Targeting
  • Instrument Manipulation
  • Object Transfer
  • Energy Devices
  • Energy Switching
  • Thread the Rings
  • Matchboard
  • Suture / Needle Control
  • Use of 3rd arm
  • Etc.
VR Simulation Training

- da Vinci VR Skills Simulator Training:
  - Completion of modules w/ score of ≥90%

<table>
<thead>
<tr>
<th>Overall score</th>
<th>Composite evaluation of the performance of the exercise.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to complete</td>
<td>Number of seconds to complete the exercise.</td>
</tr>
<tr>
<td>Economy of motion</td>
<td>Number of centimetres of instrument tip movement.</td>
</tr>
<tr>
<td>Instrument collisions</td>
<td>Number of times that the instruments touched each other.</td>
</tr>
<tr>
<td>Excessive instrument force</td>
<td>Number of seconds that excessive robotic force was applied against objects in the environment.</td>
</tr>
<tr>
<td>Instrument out of view</td>
<td>Number of centimetres that an instrument tip moved outside the viewing area.</td>
</tr>
<tr>
<td>Master workspace range</td>
<td>Radius in centimetres than contains the movement of the instrument tips.</td>
</tr>
<tr>
<td>Drops</td>
<td>Number of objects dropped from the grasp of the instruments.</td>
</tr>
</tbody>
</table>
Non-VR Simulation Training

• Cadaver Labs:
  • Low Anterior Resection
    • Total Mesocolic Excision
  • Right Colectomy
    • Central Mesocolic Excision
Training

- Bed Side Assist:
  - Positioning
  - Docking
  - Targeting
  - Instrument introduction / Exchange
  - Troubleshooting
    - Arm positioning
    - Boom position
    - Etc.
Training

- Operative Competency:
  - Have forms completed by consultant when resident / fellow performs ≥50% of case as console surgeon
  - Global Evaluative Assessment of Robotic Skills (GEARS)
  - Global Assessment Scale (GAS)
Global Evaluative Assessment of Robotic Skills (GEARS)
Robotic Competency Evaluation Form

Post case completion the GEARS Form needs to be completed by the consultant
Send completed form to Larisa Radman: Radman.Larisa@mayo.edu

| Fellow Name | _________________________________ |
| Case Reference | __________________________________ |
| Operating Date | __________________________________ |

**Depth perception**
- 5: Constantly overshoots target, wide swings, slow to correct
- 4: Some overshooting or missing of target, but quick to correct
- 3: Accurately directs instruments in the correct plane to target

**Bimanual dexterity**
- 5: Uses only one hand,gross nondominant hand, poor coordination
- 4: Uses both hands, but does not optimize interaction between hands
- 3: Expertly uses both hands in a complementary way to provide best exposure

**Efficiency**
- 5: Insufficient effort; many uncertain movements, constantly changing focus or progressing without progress
- 4: Slow, but planned movements are reasonably organized
- 3: Confident, efficient and safe conduct, maintains focus on task, fluid progression

**Force sensitivity**
- 5: Rough moves, tears tissue, injures nearby structures, poor control, frequent suture breakage
- 4: Handles tissues reasonably well, minor trauma to adjacent tissue, rare suture breakage
- 3: Applies appropriate tension, negligible injury to adjacent structures, no suture breakage

**Autonomy**
- 5: Unable to complete entire task, even with verbal guidance
- 4: Able to complete task safely with moderate guidance
- 3: Able to complete task independently without prompting

**Robotic control**
- 5: Consistently does not optimize view, hand position, or repeated collisions even with guidance
- 4: View is sometimes not optimal. Occasionally needs to relocate arms - occasional collisions and obstruction of assistant
- 3: Controls camera and hand position optimally and independently. Minor collisions or obstruction of assistant

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Global Assessment Scale (GAS)
Robotic Competency Evaluation Form

Post case completion the GAS Form needs to be completed by the consultant
Send completed form to Larisa Radman: Radman.Larisa@mayo.edu

**Clinic #** is NOT to be used on this form

| Fellow Name | __________________________________ |
| Case Reference | __________________________________ |
| Operating Date | __________________________________ |

**A. SURGEON / TISSUE Information:**
Clinic # is NOT to be used on this form

**B. ASSESSMENT SCALE**

1. Not performed, step had to be done by trainer
2. Partly performed, step had to be partly done by trainer
3. Performed, with substantial verbal support
4. Successfully performed with minor verbal support
5. Competent performance, safe (without guidance)
6. Proficient performance, couldn’t be better

**1. Exposure:**

| 1. Correct OR set up | 1 2 3 4 5 6 N/A |
| 2. Correct patient positioning | 1 2 3 4 5 6 N/A |
| 3. Safe access technique | 1 2 3 4 5 6 N/A |
| 4. Exposure of operating field | 1 2 3 4 5 6 N/A |
Non-VR Simulation Training

• Non-Operative Competencies:
  • Simulation center scenarios
    • Air Embolus
    • Pelvic Bleeding
    • VF Code
  • Evaluations
Non-Operative Competencies

• Evaluations

1. Communication and Team Skills (4)
2. Leadership (6)
3. Decision Making (5)
4. Situational Awareness (5)
5. Stress and Distractors (5)
6. Overall Score
7. Feedback
Robotic Simulation Training

• The face of surgical education has changed dramatically over the past decade with the introduction and advancement of simulation platforms.

• As simulation models continue to be developed and refined, they will play an increasingly important role in the acquisition of surgical skills and the advancement of surgical technology.

• One of the challenges in the use of simulation for training is the successful incorporation of these methods into a validated surgical curriculum.
Thank you