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Welcome - Dr. Roger Smith, Dr. Jeffrey Levy, Dr. Martin Martino

The meeting was held at the Florida Hospital Nicholson Center in Celebration Florida.

Florida Hospital Nicholson Center is a 54,000 square-foot advanced medical learning facility that has trained more than 50,000 physicians from around the globe on leading-edge clinical and surgical techniques. Utilizing state-of-the-art surgical suites, and labs, plus advanced medical simulation robotics and learning centers, medical professionals can acquire and advance their skills in a highly collaborative surgical learning environment. Later in the meeting a tour of the center was given to all participants.

Dr. Levy explained that the following organizations were invited to the FRGS consensus conference and almost all of them had at least one representative participating. See the participant list in Appendix A.

- ACOG
- CREOG
- ABOG
- AAGL
- SGO
- AUGS
- ASRM
- SGS
- AMA
- JCAHO

Briefing and Curriculum Review: ASSET and FRS - Dr. Jeffrey Levy

The meeting was started by Dr. Jeffrey Levy providing a description of the previous work that has accomplished by 2 groups (ASSET and FRS) that has led to the FRGS meeting.

Alliance for Surgical Simulation in Education and Training (ASSET)

ASSET was formed in April 2010. It is a coalition of senior leadership from a diverse cross-section of US and international surgical societies, accrediting organizations, and US military and government that is driving consensus on how to best utilize simulation to have the greatest impact on surgical education, training, and evaluation, with the ultimate goal to improve patient care and safety. As a result of its meetings, ASSET’s members developed a curriculum template for teaching surgical education with the aid of simulation. The Delphi method to develop the consensus-based framework was published in 2012 (Zevin, et al. Framework for Curriculum Development. J Am Coll Surg. Vol. 215, No. 4, October 2012.)
Fundamentals of Robotic Surgery (FRS)

Led by Principle Investigators Dr. Richard Satava, Dr. Roger Smith, and Dr. Vipul Patel, the Fundamentals of Robotic Surgery formed a group of almost 80 international robotic experts to create and develop a validated multi-specialty, technical skills competency-based curriculum for surgeons to safely and efficiently perform basic robotic-assisted surgery.

Four consensus conferences were conducted, including:

**Outcomes Measures** (Dec 12-13, 2011)

Experts agreed upon the critical skills, tasks, and most common errors that needed to be included in a comprehensive basic curriculum. The result was a table that defined the skills/tasks/errors, the desired outcome measures, and the metrics that should be measured. The table was rank ordered both as to sequence in which these occurred, as well as a second table that rank ordered the measurements in terms of their priority.

26 psychomotor skills were outlined and then incorporated into 7 tasks that could evaluate proficiency of the robotic surgeon. The 7 tasks are depicted in the graphic below.

The outcome measures table developed at the previous meeting was reviewed and then included into the curriculum development process. The ASSET curriculum template was reviewed in detail, so it could be adapted for the FRS curriculum development process. The curriculum was completed and then reviewed by all of the participating societies. Multimedia components to enhance the curriculum were identified and later created.

The curriculum was broken down into 4 parts:

a. Introduction to Robotic Surgical Systems (see example screen shots below)

b. Didactic Instructions (see example screens shots below)
c. Psychomotor Skills Curriculum (see example screens shots below – physical model and robotic simulator)

d. Team Training and Communication Skills (see example screens shots below)

The curriculum is near complete and will be launched in the e-learning delivery system in August 2013.

Validation Study Design (November 17-18, 2012)

This conference developed the design of the Validation Study, to meet the most rigorous evaluation criteria for high stakes testing and evaluation.
Dr. Levy emphasized that the previous work done by FRS should be utilized as an excellent resource for the FRGS group and serve as a great starting point for the development of its specialty-specific gynecologic robotic curriculum.

**Designing the Physical Training Model for FRS: Lessons Learned – Dr. Roger Smith**

There have been several designs developed to accomplish the 7 tasks outlined by the FRS group. Before printing the first physical model on a 3-D printer, design elements were modified and tested in 5 physical model prototypes (see images below).

Dr. Smith described some of the lessons learned during physical model development and testing, which are outlined below.

1. Smaller Dome. Too large for robotic range of motion.
2. Robot Orientation. Need to standardize instrument position.
5. Tower Position. Need positive incline angle to mitigate gravity.
8. Incision. Can lead to uncontrolled skin tears. Better if separate attached material.
10. Space Usage. Large enough to use multiple times for training.

**Briefing and Curriculum Review: RTN - Dr. Martin Martino**

Dr. Martin Martino introduced the Robotic Training Network (RTN), which is a collaboration of nine Obstetrics and Gynecology programs with a mission to develop an educational curriculum to teach the basic principles of robotic surgery. Their goal is to design a standardized approach to teach basic robotic surgical skills in a stepwise fashion to trainees throughout Graduate Medical Education training programs.
RTN Sites

There are nine RTN sites, which include:

1. Beth Israel Deaconess
2. Cleveland Clinic
3. Duke
4. Johns Hopkins
5. Lehigh Valley Health Network
6. U. Central Florida
7. UMDNJ
8. U. of North Carolina- Chapel Hill
9. Wright State University

RTN Curriculum

The vision of the Robotic Training Network (RTN) is to standardize the robotic surgical curriculum and education for residents/fellows-in-training (Ob/Gyn and General Surgery) through the development of a collaborative network. A structured curriculum for robotic surgical training has been developed and consists of multiple phases (see table below):

1. Phase I covers the bedside assistance
2. Phase II covers the surgeon console
3. Phase III (in development) is for ongoing maintenance of skills

Each phase includes self-guided learning, dry lab, and operating room components. The ACGME Core Competencies have been included throughout the programs.

<table>
<thead>
<tr>
<th>Phase I (Bedside)</th>
<th>Activity</th>
<th>ACGME Core Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self-learning</td>
<td>Medical Knowledge</td>
</tr>
<tr>
<td></td>
<td>Dry Lab/Simulation</td>
<td>Practice-based learning &amp; improvement</td>
</tr>
<tr>
<td>Operating Room</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assessment of skill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality improvement exercise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assessment of professionalism</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase II (Console)</th>
<th>Activity</th>
<th>ACGME Core Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self-learning</td>
<td>Medical Knowledge</td>
</tr>
<tr>
<td></td>
<td>Dry Lab/Simulation</td>
<td>Practice-based learning &amp; improvement</td>
</tr>
<tr>
<td>Operating Room</td>
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<tr>
<td></td>
<td>Assessment of skill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality improvement exercise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assessment of professionalism</td>
<td></td>
</tr>
</tbody>
</table>

They now have 50 programs across the United States that have agreed to participate in this curriculum and share assessment outcomes.

Validated Scoring/Assessment Tool

RTN designed and validated an assessment tool to complement their educational robotic surgical training curriculum. General guidelines for assessing the skill drills are described below.
<table>
<thead>
<tr>
<th>Depth Perception/Spatial Orientation/Accuracy</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constantly overshoots target, slow to correct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accurately directs the instruments to target</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Force/Tissue Handling</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breaks model, ring, or suture; damages needle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Handles model, suture, and/or needle well; traction is appropriate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dexterity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor coordination of hands; repetitively drops ring or band; inappropriately drops needle or poor suture management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Expertly uses both hands; always transfers rings or bands without dropping. Optimal needle or suture management.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertain movements with little progress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Confident, fluid progression, adjusts quickly</td>
</tr>
</tbody>
</table>

### Robotic Training Exercises

Five robotic exercises/drills were tested among various institutions in the RTN and found to demonstrate reliability and construct validity for basic robotic skills.

**Drill #1 - Tower Transfer:** Subject should pick up rubber band, transfer to other hand, place on tower, proceeding from shortest to tallest tower. If subject fails to transfer band between hands, points should be deducted from “Dexterity”.

<table>
<thead>
<tr>
<th>Depth Perception/Accuracy</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Force/Tissue Handling</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Dexterity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Efficiency</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total Score:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>/20</strong></td>
</tr>
</tbody>
</table>

**Drill #2 - Roller Coaster:** Move black ring from right to left side of the model without dropping the ring.

<table>
<thead>
<tr>
<th>Depth Perception/Accuracy</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Force/Tissue Handling</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Dexterity 1 2 3 4 5
Efficiency 1 2 3 4 5
Total Score: /20

**Drill #3 - Big Dipper:** Use CT-1 or GS-21 needle. Pass needle from point #1 to #5 in sequential order.

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<thead>
<tr>
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<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>Depth Perception/Accuracy</td>
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</tr>
<tr>
<td>Force/Tissue Handling</td>
<td>1</td>
<td>2</td>
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<td>5</td>
</tr>
<tr>
<td>Dexterity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Efficiency</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Total Score: /20

**Drill #4 - Railroad Tracks:** Use CT-1 or GS-21 needle with 0-Vicryl or 0-Polysorb suture trimmed to 8-inches in length. Pass needle from top to bottom dots in sequence to run the suture line from right to left.

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<th>5</th>
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<tbody>
<tr>
<td>Depth Perception/Accuracy</td>
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</tr>
<tr>
<td>Force/Tissue Handling</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Dexterity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Efficiency</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Total Score: /20

**Drill #5 - Suturing:** Use CT-1 or GS-21 needle with 8-inch 0-Vicryl or 0-Polysorb suture. Place one figure-of-eight stitch with 4 square knots (1 surgeons knot followed by 3 single throws).

<table>
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</tr>
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<tbody>
<tr>
<td>Depth Perception/Accuracy</td>
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<td>Force/Tissue Handling</td>
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</tr>
<tr>
<td>Dexterity</td>
<td>1</td>
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<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Efficiency</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Total Score: /20

**FRGS Meeting Goals – Dr. Jeffrey Levy**

The following are the goals for the FRGS meeting:

- Discuss best practices in curriculum development.
- Build upon previous work and experience from FRS, RTN, Ob/Gyn societies and academic institutions to establish a standardized robotic surgical curriculum specific to gynecologic surgeons for development and maintenance of robotic surgical skills.
- Design gynecologic-specific robotic psychomotor skills for the beside assistant and console surgeon.
- Determine the most appropriate validation process for the curriculum.
- Discuss quality, cost, credentialing and transparency as it relates to gynecologic robotic surgeons.
- Following this meeting each participant will go back to his/her respective organizations and societies and present the results to obtain input and “buy in.”
Establishing Outcome Measures

Part 1: Skills for Gynecologic Surgery - Dr. Martin Martino, Dr. Nazema Siddiqui

The group reviewed the 26 skills that were developed through a Delphi process at the first FRS meeting, which are listed below. There was strong agreement that these skills are the same ones that are needed in gynecologic robotic surgery. They were reviewed in relevance to their importance in gynecologic surgery.

1. Situation Awareness
2. Eye-Hand Instrument Coordination
3. Needle Driving
4. Atraumatic Handling
5. Safety of Operative Field
6. Camera
7. Clutching
8. Dissection-Fine & Blunt
9. Closed Loop Communication
10. Docking
11. Knot tying
12. Instrument Exchange
13. Suture Handling
14. Energy sources
15. Cutting
16. Foreign Body Management
17. Ergonomic Position
18. Wrist Articulation
19. Robotic trocars
20. System Setting
21. Multi-Arm Control
22. Operating Room Set-Up
23. Respond to Robot System Error
24. Undocking
25. Transition to Bedside Assist
26. Clip Applying

There was significant discussion whether to remove #26 (Clip Applying) from the list. It was determined that although infrequently used in gynecologic surgery, it would be useful to know how to apply robotic clips in emergency situations like hemorrhage.

Part 2: Measurement Methods - Dr. Nazema Siddiqui, Dr. Amanda Fader

Each of the 26 skills was then reviewed in respect to the appropriate measurements/metrics needed to assess them. Some of the measurements that were discussed for the 26 skills with consideration of potential errors are listed below.

- Time
- Accuracy
- Dexterity
- Economy of motion
- Tissue damage (including collateral tissue damage)
- Material stress, straining, indentations and deformations
- Material damage
- Knot security
- Correct robotic settings
- Number of adjustments
- Instrument collisions
- Robotic arm positioning
- Appropriate camera positioning
- Magnification of field of view
- Energy choice and activation
- Ergonomics (including use of console settings, posture and muscle fatigue)
- Missed information and poor communication
- Coordination between console surgeon and bedside assistant
- Insertion techniques
- Removal techniques

Part 3: Tasks to Assess Technical Skills - Dr. Martin Martino, Dr. Nazema Siddiqui

The group then reviewed the 7 tasks that were identified at the FRS meeting that would determine proficiency needed to perform robotic surgery. The 7 tasks consolidated the 26 skills into a very efficient mechanism for assessment. These tasks (see image above) included:

Task 1: Docking and Instrument Insertion
- Demonstrate safe docking of the robotic arms and insertion of the instruments through the ports into the ‘abdomen’ box.
- Bring the instrument tips into the operative field of view without error.

Task 2: Ring Tower Transfer
- Show effective navigation of the camera and use the camera clutch.
- Maneuver the instruments such that the potential of wristed instrumentation is utilized maximally for precise instrument tip positioning.

Task 3: Knot Tying
- Demonstrate the skills necessary to successfully place a suture.
- Demonstrate the skills necessary to successfully tie a square knot.

Task 4: Railroad Track
- Precisely control the needle and suture using the robot.

Task 5: Utilization and switching of 4th arm
- Safely and effectively switch back and forth between the second and the fourth arm of the robot.

Task 6: Pattern dissection
- Safely and precisely perform fine dissection without damaging the surrounding or the underlying structures.
Task 7: Vessel Energy and Dissection
- Identify and choose the unipolar and bipolar pedals correctly.
- Apply energy to precisely and safely seal and divide vessels.

It was determined that these 7 tasks were very similar in nature to the 5 RTN tasks, but were more comprehensive by including both instrument insertion and vessel dissection/energy application.

The group concluded that although these 7 tasks were appropriate for basic robotic abilities, more tasks would be needed to determine proficiency for gynecologic-specific robotic procedures. See Group 2: Psychomotor Skills Curriculum below for details.

Curriculum Development Working Group Introduction – Dr. Levy

Full-Cycle Development Process

Curriculum development should be a full-cycle development process that begins with the outcomes and metrics. All stakeholders, including the accrediting bodies, should be involved in the curriculum development process from the very beginning to ensure the final curriculum and assessment methods will meet the rigorous requirements of determining proficiency, meeting standards, and possibly even fulfilling certification criteria. A graphical description of the process is provided below.

![The Metrics Drives the Process](diagram.png)
Assumptions about the Curriculum

It was determined that the FRS curriculum previously developed over the past 2 years will serve as the very basic curriculum that all specialties engaging in robotic surgery must complete. The FRS will serve as a prerequisite to participating in the specialty specific FRGS curriculum. This model is outlined in the “Sweet Tree” graphic below.

The specialty specific curriculum will build upon the FRS curriculum, but does not need to repeat all of the basic information provided in FRS. It is advisable for the specialty specific curriculum to reinforce the basic information with a brief summary of what has already been covered. The major emphasis of the specialty specific curriculum should be the unique information/skills that must be taught for the surgeon to become proficient in robotic procedures in that specialty.

Curriculum Outline Structure

A suggested outline curriculum structure for gynecologic robotic surgery was discussed. It was determined that it should be broken up into 5 modules with the ACGME core competencies included throughout the program.

Module 1: Introduction to Robotic Surgical System
- Assessment

Module 2: Bedside Assistant
- Didactics
- Technical Skills
- Assessment

Module 3: Console Surgeon
Curriculum Development Groups

The FRGS participants were then broken down into 3 working groups to facilitate the curriculum development process. The groups were:

- Group 1: Didactic Instructions for Gynecologic Robotic Surgery
- Group 2: Psychomotor Skills Curriculum
- Group 3: Team Training and Communication Skills

The groups came together half way through the development process to provide a Preliminary Report on progress made to ensure alignment of all groups on the content and direction of each component of the curriculum development process. The groups came together again at the end of the development process to provide final reports. Discussions and final reports are provided from the 3 working groups below.

Group 1: Didactic Instructions for Gynecologic Robotic Surgery - Dr. Amanda Fader, Dr. Arnold Advincula

The didactic components of the FRS and RTN curricula were reviewed. The specific advantages of each curriculum were discussed. From these discussions and other group input, a curriculum outline was established for Didactic Instructions.

Module 1: Introduction to Robotic Surgical Systems

Unique Features of Robotic Surgery
A brief overview of the some of the unique features of robotic surgery will be provided reviewing some of the materials presented in more detail in the FRS didactic section of the curriculum, which is a prerequisite for the FRGS course.
1. Information Amplification
2. Three Dimensional Imaging
3. Eliminate Motion Reversal
4. Favorable Motion Scaling
5. Tremor Elimination
6. Increased Degrees of Freedom in Instrument Motion
7. Stable Camera Platform
8. Ergonomically Improved Surgeon Positioning
**System Component and Safety Features**
A detailed system overview will be provided that reviews the functioning of each system component and the safety features.

1. Surgeon Console
2. Robotic Cart (Remote Manipulator Arms)
3. Visual Cart (Visualization Support System)

**Literature Review**
This section will include an article review and a review of society position statements.

2. ACOG Position Statement on Robotics
3. AAGL Position Statement on Robotics
4. SGO Position Statement on Robotics

**Assessment Questions**
A series of questions will be provided that must be passed.

**Module 2: Bedside Assistant**
A brief overview of materials pertinent to the bedside assistant will be provided as a review of the materials presented in more detail in the FRS didactic section of the curriculum, which is a prerequisite for the FRGS course. There will be a specific focus on the essentials of docking (side docking), patient positioning specific for gynecology procedures and a vaginal cavity check.

**Bedside Assistant Essentials**

1. Overview
2. Si Robot Docking (Side Docking)
3. Powering On and Connector Cables
4. Homing and Calibrating the Robotic System
5. Positioning of Components
6. Sterile Draping
7. Patient Transfer and positioning (Include Morbid Patient, Trendelenberg, Lithotomy)
8. OR Team Members and Their Positioning
9. Trocar Insertion
10. Docking of Robot Cart and Arms
11. Undocking
12. Removing Trocars and Closing Incisions
   1. Cavity Check
13. Transfer Patient from OR Table to the Gurney
14. Transport to Recovery Room
15. Powering Down

**Assessment Questions**
A series of questions will be provided that must be passed.

**Module 3: Console Surgeon**
A brief overview of materials pertinent to the console surgeon will be provided as a review of the materials presented in more detail in the FRS Didactic section of the curriculum, which is a prerequisite for the FRGS course. There will be a specific focus on console operations.
Console Surgeon Essentials
1. Overview
2. Si Console e-module
3. Final Review of Set-Up
4. Surgeon Transition to Console
5. Activate Instruments
6. Establish Ergonomics of the Console
7. Operating Master Controllers
8. Indexing/Clutching
9. Visualization Capabilities
10. Motion Scaling
11. Collision Avoidance
12. Arm Switching
13. Prevention of Injury to the Patient or Assistant

Assessment Questions
A series of questions will be provided that must be passed.

Module 4: Technical Skills
Covered in the Group 2 Report.

Module 5: Team Training and Communication Skills
Covered in the Group 3 Report.

Module 6: Quality Metrics and Cost Considerations

Gynecologic Procedures
Discussions (and videos) about errors, complications, and troubleshooting will be provided for 4 gynecologic procedures, including:
- Hysterectomy
- Myomectomy
- Lymph Node Dissection
- Sacrocolpopexy

*It is important to note that going through this module does NOT provide procedure credentialing for the surgeon. It is only developed an assessment tool. If the user is a practicing surgeon, he/she must already be credentialed in the procedure(s) chosen.*

Article Review
The following articles will be reviewed:
- CIMA article
- Cost Issues Article
- Quality Improvement article

Assessment Questions
A series of questions will be provided that must be passed.
Group 2: Psychomotor Skills Curriculum: Gynecologic Procedures - Dr. Martin Martino, Dr. Nazema Siddiqui

The psychomotor skills have been divided into those needed by the bedside assistant and those needed by the console surgeon.

**Bedside Assistant Psychomotor Skills**

The bedside assistant psychomotor skills will be taught in 2 Dry Labs described below:

**Dry Lab 1**
Must complete all tasks below without prompting:
- Properly position patient
- Select appropriate port placement in relation to pathology
- Select appropriate port placement in relation to other ports
- Direct patient cart to correct location for docking
- Move instrument arms and “docks” the robot

**Dry Lab 2**
Must complete all tasks below without prompting:
- Insert instrument into robotic arm
- Insert instrument in “abdomen” while watching with camera
- Demonstrate an instrument exchange while maintaining instrument memory
- Demonstrate camera insertion
- Demonstrate camera removal and cleaning
- Demonstrate camera swap – 30 down to 30 up
- Perform safe and efficient emergency undocking

**Assessment**
1. OR Performance – Proctor Assessed
   a. Surgical Set-Up
   b. Docking and undocking
   c. Instrument Transfer
2. Initiate and Maintain Case Log

**Console Surgeon Psychomotor Skills**

The group reviewed all of the 26 skills and determined that the previous 7 tasks developed by FRS are appropriate for robotic surgeons. These 7 tasks will serve as a prerequisite for the FRGS Psychomotor Skills module. In addition, 3 more advanced specialty specific tasks for gynecologic robotic surgeons will be developed and are described below.

**Task 8: Dissection of Bladder Flap**
- Incise the anterior peritoneal reflection overlying the upper bladder and lower uterine segment to safely mobilize the bladder inferiorly.
- This important step moves the bladder out of the way in preparation for excision of the cervix from the upper vaginal fornices.
**Task 9: Colpotomy**
- Safely and precisely perform an anterior and posterior colpotomy without damaging the surrounding or the underlying structures.
- Safely incise around the entire cervix into the upper vaginal fornices in order to free the cervix and attached uterus.
- Remove the detached uterus and cervix.

**Task 10: Cuff Closure**
- Precisely control the needle and suture using the robot.
- Demonstrate the skills necessary to successfully place a suture in the vaginal cuff.
- Demonstrate the skills necessary to successfully tie a square knot in the vaginal cuff.

**Assessment**
1. OR Performance – Proctor Assessed
   a. Task 8
   b. Task 9
   c. Task 10
2. Initiate and Maintain Case Log

**Physical and Simulation Training Models**
Some ideas for development of the physical model were also discussed. A rough depiction of one idea is shown below.
Group 3: Team Training and Communication Skills - Dr. Jeffrey Levy, Dr. Owen Montgomery

Discussions

The session started with a discussion about teamwork that included:

- Teamwork is not solely a consequence of co-locating individuals together. Rather, it depends on a willingness to cooperate, coordinate, and communicate while remaining focused on a shared goal of achieving optimal outcomes for all patients.
- Teamwork is even more important in robotic surgery since there is a lack of situation awareness due to the console surgeon’s head being in the robot console and his/her lack of proximity to the operating room table.
- The robotic team consists of:
  - Console surgeon
  - Bedside assistant
  - Scrub nurse
  - Circulating nurse
  - Anesthesiologist/anesthetist
  - Other healthcare professionals
  - Other technicians
  - Cleaning staff
- Even though the delivery of care requires teamwork, members of these teams are rarely trained together; they often come from separate disciplines and diverse educational programs.
- Teams make fewer mistakes than individuals, especially when each team member knows his or her responsibilities, as well as the responsibilities of other team members.
- Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS™) is a systematic approach developed by the Department of Defense (DoD) and the Agency for Healthcare Research and Quality (AHRQ) to integrate teamwork into practice. TeamSTEPPS™ is based on 25 years of research related to teamwork, team training, and culture change. It is designed to improve the quality, safety, and the efficiency of health care. It as the team training strategy used in the FRS curriculum and will also be used in FRGS.

Curriculum

The previously developed FRS Team Training and Communication module was reviewed line by line along with its accompanying multimedia. Specific changes to the text were made where adaptations/revisions were needed to support the gynecologic robotic surgery curriculum. These changes will be addressed in the new FRGS Team Training and Communication module.

Team Training Scenarios

A good portion of this group’s time was spent on revising the team scenarios that were previously done for the FRS curriculum. Seven new scenarios were developed within 3 categories: Pre-Operative, Intra-Operative and Post-Operative settings. The group constructed an outline of each scenario, which will be videotaped at Lehigh Valley Hospital within the next 2 months.
In the e-learning program, first a “bad” example of the scenario will be presented. The learner will have the opportunity to rate components of the scenario and determine which areas the team communication could have been improved. There will then be a second “good” version of the same scenario that the learner can review (see the example below).

Pre-Operative

1. **Prebrief** – The entire team must be prepared for the case, understand the patient situation, and act in a professional manner

   A prebrief is a short session prior to start of a procedure to discuss the team composition, assign essential roles, establish expectation, discuss potential problems, and anticipate outcomes and likely contingencies. Particular attention might be paid to staff and provider availability and the potential for switching out during the case, workload among the team members, and issues around available resources. For robotic procedures a brief must be held prior to the patient being brought into the room. An example that is similar to the FRS scenario will be redeveloped for FRGS.

Intra-Operative

2. **Huddle** – Show non-surgeon leadership and include check-back

   A huddle is characterized as ad hoc team meeting, frequently around a single patient and often prompted by a rapidly changing patient condition. The purpose of a huddle is to re-
establish situational awareness, reinforce plans already in place and assess the need to change plans. Huddles are often even shorter than briefs. Huddles can be called by any member of the team, and in the case of a robotic procedure would not necessarily mandate the surgeon moving away from the robotic console. An example that is similar to the FRS scenario will be redeveloped for FRGS.

3. **SBAR – Bladder injury where the circulating nurse informs surgeon there is air in Foley**

One of the best tools for quickly raising situational awareness is the SBAR. SBAR stands for:

- **Situation** – What is the immediate issue that is driving the need for the patient procedure?
- **Background** – What are the salient clinical background pieces or context that immediately impacts on the patient and the procedure which is being performed?
- **Assessment** – Unambiguously identifies the problem that is being addressed
- **Recommendation** – Indicates accurately the immediate recommendations that will move this patient’s care forward

SBAR is a technique that most frequently is used for communicating critical information that requires immediate attention and action concerning a patient’s condition. However, SBAR is also a very useful tool for organizing care around a procedure, brief, debrief, huddle, and handoff of care.

An example will be used where the circulating nurse notices that the Foley is filling with air. The surgeon is informed and realizes there has been an injury to the bladder and then repairs it. Depending on the difficulty of the repair, a urology consult could be on stand-by.

4. **Emergency undocking - Pelvic wall dissection with severe bleeding and dropping BP.**

In this scenario, the surgeon is operating on the lateral pelvic side wall in a case of severe endometriosis. The surgeon encounters significant bleeding, probably from one of the major vessels, which he is having difficulty controlling. The anesthesiologist confirms the patient’s blood pressure is dropping rapidly and calls for blood. The surgeon decides that an emergent undocking is necessary and announces the emergency to the team. The team carries out the emergency undocking and prepares the open tray.

5. **CUS-2 Challenge – Case is over 4 hours long and is not progressing well.**

CUS is a tool that is simply defined as:

- **C** - “I am concerned.”
- **U** - “I am uncomfortable.”
- **S** - “This is a safety issue.”

CUS is a tool that can be used at times of conflict around diagnoses or decisions as to how procedures should continue. CUS is a simple awareness and call-to-action tool if patient safety is at risk.
The two-challenge rule states that it is a team member’s responsibility to assertively voice concern (CUS) at least two times to ensure it has been heard. The team member being challenged, whether it is the robotic surgeon, scrub nurse, anesthesiologist, or other team member must acknowledge the challenge. If the outcome is still not acceptable, then the team member making the challenge is mandated to take a stronger course of action (i.e. utilize a supervisor or chain of command). Mutual support allows the healthcare team to come to mutually satisfying solutions, enhance patient safety and allow for the highest quality patient care without compromising relationships.

The case is over 4 hours long and is not progressing well. The OR staff expresses concern to the surgeon. The surgeon does not give an appropriate response. The OR staff expresses concern again. The team leader then asks for Chief of Robotic Surgery (possibly Chairman of chief of GYN) for second opinion (per normal OR protocol).

Post-Operative

6. End of case scenario – Demonstrate the difference in outcome when it is done well vs. poorly.

Upon completion of the procedure the surgeon will notify the team that a time-out must be taken before ‘closing’. All instruments must be checked, specimens reviewed again, and the operative site checked, especially paying attention to the site where the trocars were inserted for tissue tearing, bleeding, retained foreign bodies, etc. The surgeon and/or first assistant will inform the anesthesia team when they will be closing and how long it should take.

The undocking of the robot will be the reverse of the setup, and include safe removal of all instruments from the operative site, powering the robot down, undocking of the robot from the vicinity of the patient, and moving all ancillary equipment (towers, energy sources, etc.) away from the patient. Only then would it be safe to reposition the patient and transfer to a gurney. A debriefing is needed as the completion event of the procedure.

There will be modeling of the good end of a case, including:
1. Surgeon letting anesthesia know about case coming to a close
2. Care of patient (undocking, expectation of team)
3. Patient removed from the table and leaves the room in excellent condition.
4. Huddle

7. Debrief of the case with the entire team.

A debriefing is needed as the completion event of the procedure. Several issues should be addressed including:
• What are the key concerns for recovery and management of this patient?
• Have any equipment problems been identified that need to be addressed, including robot error messages? If so, who will follow-up?
• What are the opportunities to improve?
• What are the lessons learned?
• Has each member of the team been given the opportunity to provide feedback?
• Was there closed loop communication for any quality improvement/risk management issues?
The OR staff will have a debrief about the bladder injury case.

**Validation Method Discussion – Dr. Richard Satava**

Definitions
- **Outcomes Measure**
  - The final result that is to be measured
  - Time, speed, accuracy, communication skill, leadership
- **Metric**
  - Quantity being measured: seconds, mm
  - Quality measured: repeats command (unambiguous)
- **Benchmark**
  - The reference level to which the student is compared
  - This is NOT the score (Score = 100%)
- **Standard**
  - Performance metric set by an accreditation body
  - This is an “external” metric
- **Training**
  - Act of teaching a particular skill or type of behavior
  - The faculty member actively instructs
- **Assessment**
  - Evaluate the nature, ability, or quality of performance
  - The faculty evaluates (only teaches if formative feedback)
- **High Stakes Test**
  - Test that has major consequences or is the basis of a major decision
  - Conducted by an independent, external body
- **Certification**
  - Confirmation that a certain level of achievement has been reached
  - Awarded by an accredited authority after high stakes test

**Outcomes Measures**
- The prime determinant of the entire educational process
- Set by key stakeholders in training & certification (societies, boards, etc)
- Measures include correct and incorrect (errors)
- Must be unambiguous, measurable, relevant and practical

**Metrics**
- Must support an outcomes measure (“no measurement, no metric”)
- Useful both in training and assessment (formative feedback)
- Used in generating final results reporting (summative feedback)
- Applicable to high stakes testing
- Quantitative whenever possible – accurately measurable or binomial
- If Qualitative, unambiguously defined (for IRR ≥ 0.80)

**Errors**
- **Definition**
  - “the state or condition of being wrong in conduct or judgment” - OED
  - “a deviation from accuracy or correctness” (does not imply “fault”)
- **Characteristics**
  - Very difficult but important to unambiguously define
• May be individual or ‘system’ and overt (immediate) or latent
• Can be with or without ‘consequences’ (James Reason “Human Error”)
• Not all errors are relevant – define minor and critical errors
• Mistake - a fault from misjudgment, carelessness, or forgetfulness

• Application
  • Arguably the most important measure of skill or judgment
  • Fundamental principle behind patient safety (No errors)
  • Must train student in most common errors (avoid, recognize, remediate)

The “Validities”
• The Basic Five
  – Face: Looks like what it supposed to simulate
  – Content: Teaches and measures the correct knowledge and skills
  – Concurrent: Is as good as/ better than the current curriculum
  – Construct: Design actually shows experts are better than novices
  – Predictive: Learners who do well on simulation, do well on patients
    • Very difficult to prove clinical outcomes, but laboratory outcomes (animal) can be highly predictive
• Other Considerations
  • Reliability
    • Intra: Repeated measures are the same
    • Inter: Two or more raters score the same
    • Inter-rater reliability: IRR = > 0.80 (ie 95% confidence level)
  • Usability: Practical and easy to implement (eg GUI)
  • Transfer of Training: Amount of time in simulator equals amount of time in real life
  • Learning curve: Two consecutive trials with no improvement in score (performance)

Validation Study Design
• Design Validation Trial Criteria
  • Choose the validation types
  • Define the validation measures (consensus conference)
  • Design the study (randomized control trial?)
• Design Multi-Institutional Study
  • Determine number of subjects (n) by power analysis / criteria for sites
  • Establish benchmark competency criteria by faculty
  • Conduct the trial (establish a web-based database for study)
  • Analyze and publish results (consider multiple journals?)

Setting the Benchmark Criteria for Any Curriculum
• Train expert/experienced surgeons
  • to their learning curve
  • Two consecutive trials with no improvement
• Calculate the mean of their performance
• Calculate the standard deviation
• Choose benchmark (eg 1 standard deviation below the mean)
Summary: Metrics Drives the Process
1. Defining difference for skills and procedure training & assessment
2. Allows for objective (and accurate qualitative) assessment
3. Creates evidence-based measures
4. Changes time-based to criterion (benchmark)-based performance
5. Measures proficiency (benchmark) and reliability (standard deviation)
6. Provides accurate measure of improved performance (learning curve)
7. Assures training program assessment (between student performance)
8. Assures transparency and accountability
9. Provides testing and certification authorities measures for standards

FRS Validation Study Design – Dr. Jeffrey Levy

Define “Expert” so the Benchmark can be Set
- Set a minimum required criteria for expert robotic surgeons as a pre-screen
  - More than 5 cases a month
  - More than 50% of cases are completed robotically
  - Clinically active
  - Could have fellowship training in robotics
- Ask experts who have met the required minimum criteria to submit a video of a procedure
- Relatively straightforward multi-specialty tasks for assigning groups (based on expert performance)
- Train the raters of the videos in objective parameters that verify expertise in robotic surgery. This will ensure inter-rater reliability.
- Make sure the raters are blinded
- Focus on safety not “how I do it” (objective criteria)
- Groups will be based on performance metrics rather than PGY levels, or experience levels

Demographic Data Collected in the Research Study
- Age
- Gender
- Specialty
- Hand dominance
• Number of robotic cases
• Number of robotic cases per month
• Number of robotic cases in last 6 months
• Number of robotic cases in the last 6 months that have involved robotic suturing (stapling/clipping/etc)?
• Length of time in years/months doing robotic surgery
• Greatest familiarity of robotics system (Si/S/Standard)
• Involvement in fellowship/resident training including robotics
• Number of laparoscopic cases
• Involvement in simulator training (robotics)
  – Number of hours spent on robotic simulators in the last 6 months (0, 0-10, etc)?
  – Reason for use robotic simulators (course/warm up/research)
  – Simulator used most
• Past/present experience with video games (quantify)
• Number of years in surgical practice

Study Design: Phases of the Study
• Phase 1: Pilot at Florida Hospital Nicholson Center (logistics and refinements to model)
• Phase 2: Get face and content validity from the society leadership and boards
• Phase 3: Get face, content, and construct validity at test sites and society meetings
• Phase 4a: Get concurrent validity with video correlations
• Phase 4b: Predictive validity – full research study at 10 sites (IRB will be needed for every site)

Study Design: Graphic Representation

Prospective Randomized Trial for Cognitive, Technical, and Team Skill Training in Robotic Surgery

Phase 1: Aptitude Assessment

Pre-trained Group

Online Didactic plus Technical Skills Training on Physical Model

Standard Group

Online Didactic plus Technical Skills Training on Robotic Simulator

Assessment Against Proficiency Levels

Expert Task Performance Proficiency Levels
Value of Quality and Cost - Francine Miranda, RN

Quality, risk and patient safety in robotics fall into 3 categories:

- Surgical
- Mechanical
- Institutional

Surgical quality indicators, include:

- Estimated blood loss
- Transfusions
- Length of stay greater than 72 hours
- Retained foreign bodies
- Surgical site infections
- Dehiscence
- Surgical injury to bowel, bladder, ureter, surrounding organs
- Major vessel injury
- Sepsis
- Thromboembolic disease
- Pneumonia
- Airway issues
- Hearing Loss – Bleeding
- Visual Loss
- Mortality
- Conversions
- Nerve injuries related positioning
- Core Measure compliance by individual surgeon
  - Costs - Variable, Fixed and Total per surgeon
  - Total surgical time
  - Pathology discrepancies

Mechanical risk and quality indicators, include:

- Hardware
  - Arching
  - Lost Visualization
  - Arms not moving correctly
- Software
  - Error Measures
  - Trouble shooting issues not easily resolved
- Instruments
  - Cleaning
  - Care related to movement
  - Breakage (shearing)

Institutional risk indicators include:

- Credentialing
  - Surgeon
- Bedside Assistant
- Policies & Procedures
- Equipment Maintenance

Metric Scorecard for Reporting

![Image of Metric Scorecard for Reporting]

**LEHIGH VALLEY HEALTH NETWORK - DEPARTMENT OF OBSTETRICS AND GYNECOLOGY**

**METRICS SCORE CARD FOR:**

**Reporting Period:**

**GYNECOLOGY**

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**SURGICAL PROCEDURE BY TYPE**

**POSTOPERATIVE COMPLICATIONS**

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* Bowed, Bladder, Major Vessel, Organ, Uterus
** Includes: Dehiscence, Ruptured Endometrial Pregnancy, If Delay in Diagnosis

References:
- HSI, RPM, Infection Control, Patient Safety

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30
Credentialing Consensus Recommendations - Dr. John Lenihan

The aviation industry can teach us a great deal. Not only do pilots go through intense training to get an initial pilot’s license, but they also go through a tremendous amount or simulation training and then have testing every 6 months that they must pass. In contrast, once a physician becomes board certified, there is essentially nothing he/she has to do to maintain surgical skills or prove proficiency.

RSIG-AAGL is presenting a new system where there will be:

- Initial Credentialing
  - Establish Standards to comply with learning curves
  - Easy Cases first with qualified assistants
  - Then progress to more complicated cases
- Maintenance “Currency”: Establish minimum guidelines for numbers of cases to maintain surgical skills
  - Encourage the use of simulators to maintain skills
  - If minimums not met, require re-training and re-certification (proctoring)
- Competency Certification: Establish standards, utilize simulation

New Approach to Initial Credentialing and Privileging

1. Select surgeons likely to be successful for training
2. Establish initial training and proctoring guidelines
3. Establish “currency” guidelines: the minimum number of procedures required to maintain proficiency
4. Establish metrics to monitor “competency”
5. Consider simulation as a means to insure proficiency

The Future is Competency Based Credentialing

- Establish Metrics for Operative Standards
  - Op Times, EBL, Complications rates, etc.
  - Triggers should be determined locally or based on National Data Bases (> 2 SD’s from normal?)
- Consider retraining or mentoring if a surgeon consistently falls outside standards
  - Use of Simulators
  - Use of Mentor Surgeons as assistants/proctors
- Include CME component
  - Require Advanced courses, national or local meetings, etc.
Summary of Suggested Guidelines
- Only train surgeons who can do > 20 cases per year
- Suggest at least 15 basic cases without problems or concerns before being privileged to perform more complex cases. Also:
  - Get advanced training
  - Encourage skills demonstration on simulator
  - Require > 20 cases per year to maintain skills
  - Establish competency metrics using standard deviations of normal and annual simulation proficiency
  - Develop policy for residents and surgeons trained elsewhere

Developing Future Strategy for Transparency – Keith Nahigian

1. The future of a successful strategy in medicine includes being transparent with hospital quality outcomes, patient safety programs and education initiatives.
2. Recommendations are to initiate a registry (risk-adjusted) for hysterectomy for benign and malignant conditions to post length of stay, readmissions <30 days, and volume on a public site for patients to view.
3. Plan to create Quality Measures for Robotic Surgery Programs
4. Create Center of Excellence model (COE) for contributing and sharing data to participating institutions and have these COE’s partner with CMS and HHS for quality reporting initiatives.
5. Educational programs with simulation and credentialing guidelines emphasizing proficiency training are important quality metrics to share with patients and payors.
6. Collaborations with local legislative leaders in the House and Senate to increase knowledge and understanding of robotic surgery.
APPENDIX A: FRGS Participants

The conference attendees included:

- **Co-Directors**
  - Jeffrey Levy
  - Martin Martino

- **Organizational Committee**
  - Arnold Advincula
  - Amanda Fader
  - Nazema Siddiqui

- **FRGS Participants**
  - Carolyn Coleman
  - Michael Galloway
  - Suzanne Gavigan
  - Lennex Hoyte
  - Robert Holloway
  - Kathy Huang
  - Kimberly Kenton
  - John Lenihan
  - Francine Miranda
  - Owen Montgomery
  - Rachel Morcrette
  - Keith Nahigian
  - Tony Ogburn
  - Robert Rogers
  - Dante Roultte
  - Richard Satava
  - Roger Smith
  - Pamela Soliman
  - Renata Urban
  - Robert Wah

The following robotic experts and educators were not able to attend the FRGS meeting, but have expressed interest in being involved in curriculum development and in future meetings. They include:

- John Boggess
- Robert Bristow
- William Burke
- Sandra Carson
- Sean Dowdy
- Pedro Escobar
- Tommaso Falcone
- Ginger Gardner
- Barbara Goff
- Vivian Von Gruenegan
- Laura Havrilesky
- Warner Huh
• Rosanne Kho
• Mario Leitao
• Frank Ling
• Javier Magrina
• Andrea Mariani
• Chuck Miller
• Ceana Nezhat
• Pedro Ramirez
• Leslie Randall
• Mark Smith
• Jonathan Solnik
• Krish Tewari
• Mark Woodland
• Kristine Zanotti
APPENDIX B: FRS Participants

The conference attendees included:

FRS Participants
Arnold Advincula, MD, FACS
Rajesh Aggarwal, MBBS
Abdulla Ali Al Ansari, MD, FRCS
David M. Albala, MD
Richard L. Angelo, MD
Mehran Anvari, MD
John Armstrong, MD, FACS
Garth Ballantyne, MD, MBA
Michele Billia, MD
James F. Borin, MD
David M. Bouchier-Hayes, MD
Timothy C. Brand, MD, FACS
Jan Cannon-Bowers, PhD
Sanket Chauhan, MD
Rafael F. Coelho, MD
Geoff Coughlin, MD
Alfred Cuschieri, MD
Prokar Daskapua, MD
Ellen Deutsch, MD
Gerard Doherty, MD
Brian J. Dunkin, MD, FACS
Susan G. Dunlow, MD
Gary Dunnington, MD
Ricardo Estape, MD
Peter Fabri, MD
Vicenzo Ficarra, MD
Marvin Fried, MD
Gerald Fried, MD
Vicenzo Ficarra, MD
Anthony G. Gallagher, PhD
Larry R. Glazerman, MD, MBA
Teodor Grantcharov, MD, PhD, FACS
Piero Giulianotti, MD
David Hananel
James C. Hebert, MD, FACS
Robert Holloway, MD
Santiago Horgan, MD
Jacques Hubert, MD
Wallace Judd, PhD
Lenworth Jacobs, MD
Arby Kahn, MD
Keith Kim, MD, FACS
Sara Kim, PhD
Michael Koch, MD, FACS
Timothy Kowalewski, PhD