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# Fundamentals of Robotic Surgery

Summary of the Ongoing Project

*FRS Summary for Distribution at SLS 2012, Boston, MA*

# Grants Leadership

PI: Richard Satava, MD
Minimally Invasive Robotics Assoc

Source: Intuitive Surgical Inc.

PI's: Roger Smith, PhD & Vipul Patel, MD
Florida Hospital Nicholson Center

Source: US Department of Defense

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# Intuitive Surgical's Training Pathway

## Surgeon and OR Team Pathway

| Phase | Content | Trainer |
|---|---|---|
| I: Introduction to *da Vinci* Surgery ▼ | Product Training ▼ | Intuitive Surgical |
| II: Preparation and System Training ▼ | | |
| III: Post System Training ▼ | Clinical Training ▼ | Independent Surgeons & Societies/Academic Institutions |
| IV: Advanced Training ▼ | | |
| Beyond the Pathway | Continuing Clinical Education | Independent Surgeons & Societies/ Academic Institutions |

- Phases I-II focus on product training, while phases III-IV focus on clinical training
- Beyond the pathway, skills are honed with continuing clinical education

# FRS Mission Statement

Create and develop a validated multi-specialty, technical skills competency based curriculum for surgeons to safely and efficiently perform basic robotic-assisted surgery.

**Note: The intent is to create a curriculum that is device-independent.** This is admittedly difficult given the single approved surgical robot at this time. Therefore, significant attention is being paid to material that is device-flexible in anticipation of future robots.

# Participating Organizations

- **American Association Gynecologic Laparoscopy (AAGL)+**
- American College of Surgeons (ACS)
- American Congress of OB-Gyn (ACOG)
- **American Urologic Association (AUA) +**
- American Academy of Orthopedic Surgeons (AAOA)
- American Assn of Thoracic Surgeons (AATS)
- American Assn of Colo-Rectal Surgeons (ASCRS)
- American Assn of Gynecologic Laparoscopists (AAGL)
- **Florida Hospital Nicholson Center***
- **U.S. Department of Defense (DoD)***
- U.S. Department of Veterans Health Affairs (VHA)
- **Minimally Invasive Robotic Association (MIRA)***
- Society for Robotic Surgery (SRS)
- **Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) +**
- American Board of Surgery (ABS)
- Accreditation Council of Graduate Med Education (ACGME)
- Association of Surgical Educators (ASE)
- Residency Review Committee (RRC) – Surgery
- Royal College of Surgeons-Ireland (RCSI)
- Royal College of Surgeons-London (RCSL)

*** Funding Organizations**
**+ Executive Committee**

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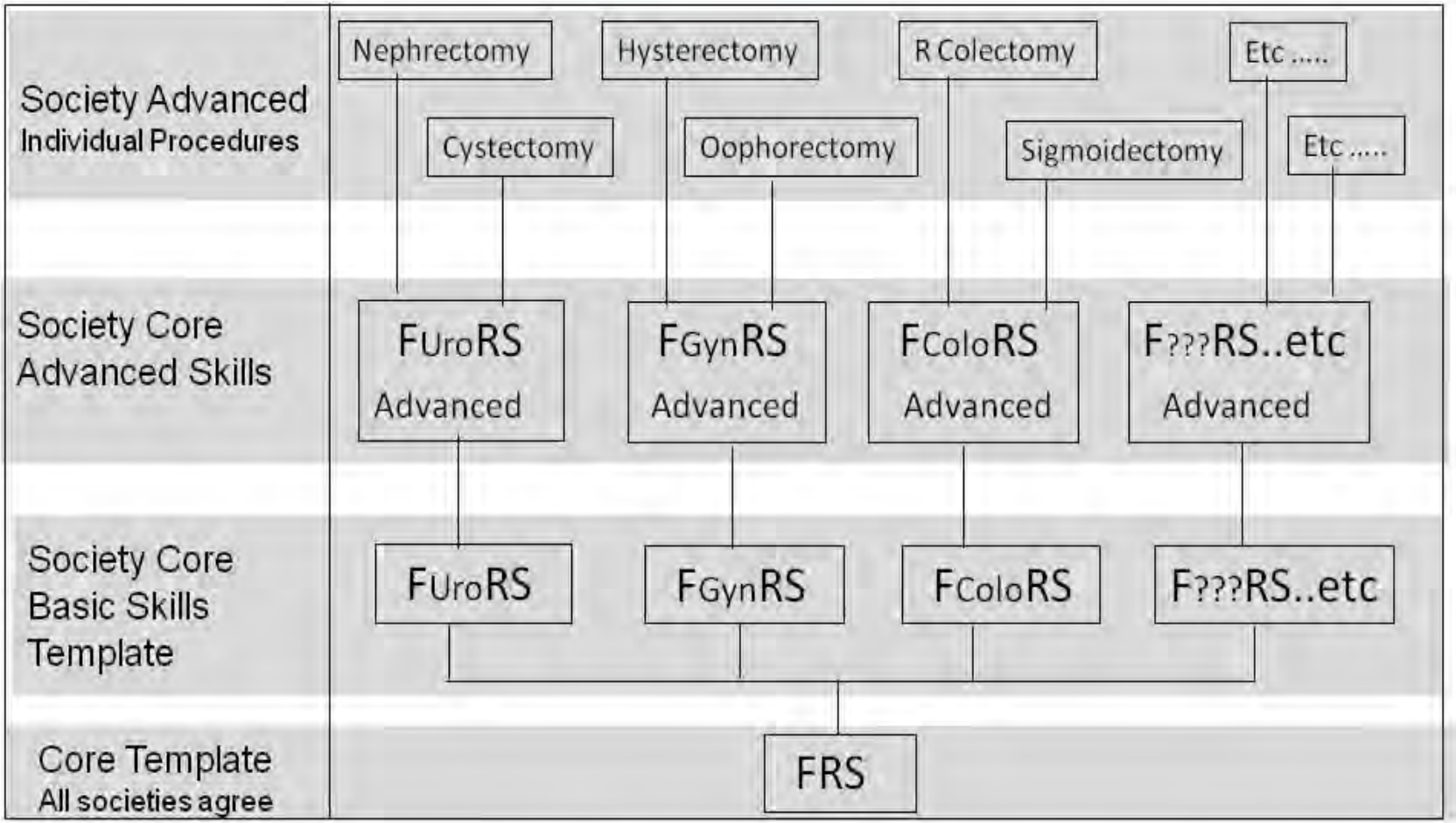
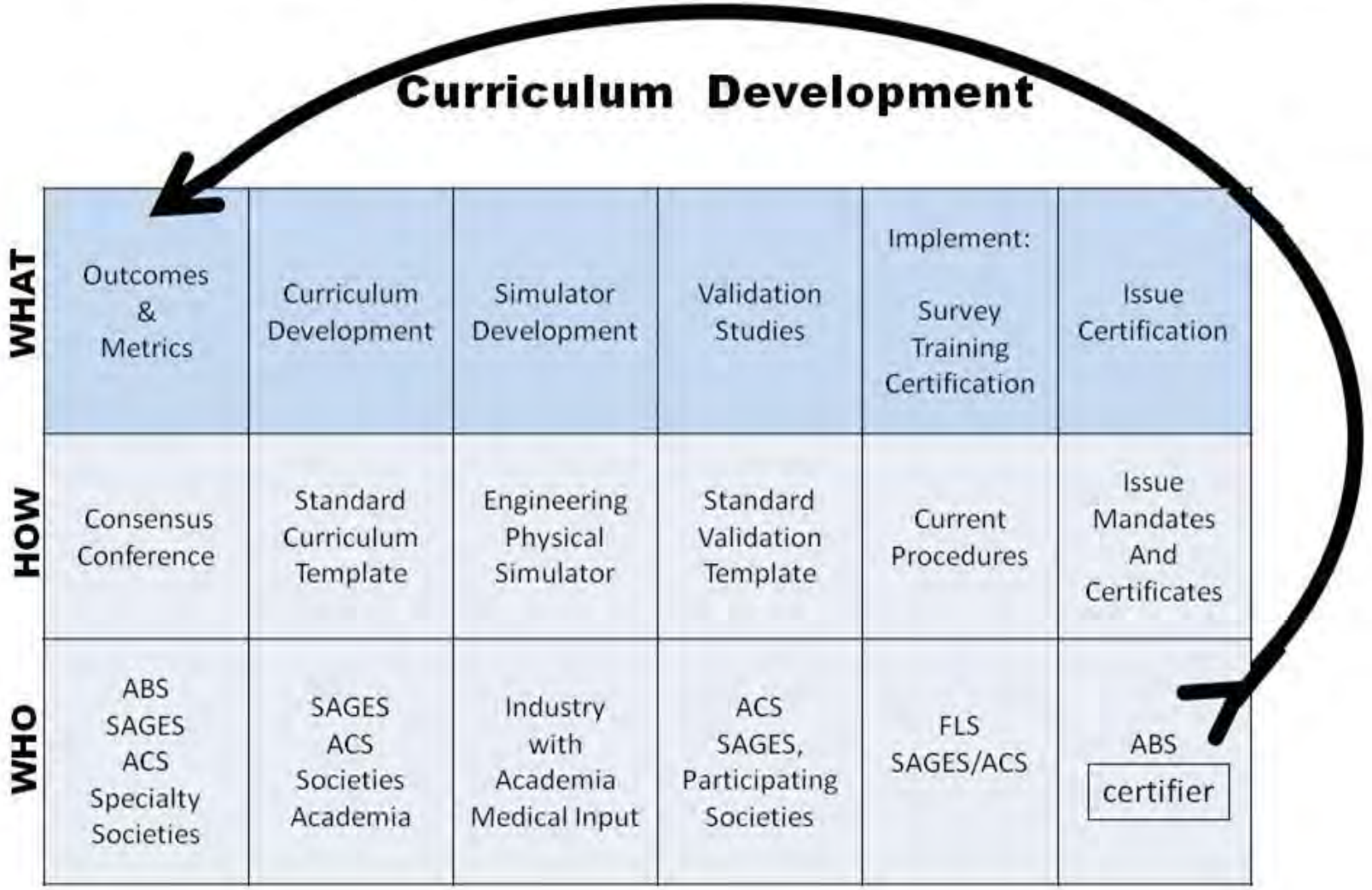
# Development of Curriculum from common template

## "Sweet* Tree"




* Adapted from Rob Sweet, MD, Professor of Urology, University Minnesota, 2010

# The Metrics Drives the Process




*Creator: Rick Satava, MD, Univ of Washington*

# Consensus Conference Process

1. Outcomes Measures (Dec 12-13, 2011)
2. Curriculum Outline (April 29-30, 2012)

2.5 Curriculum Development (Aug 17-18, 2012)

3. Validation Criteria (November 17-18, 2012)
4. Validation Studies (2013)
5. Transition to Objective Testing Organization (est. July 2013)

- Expert Discussion and Contributions
- Modified Delphi Voting Mechanism

# #1 Outcomes Measures

| Pre-Operative | Intra-Operative | Post-Operative |
|---|---|---|
| System Settings | Energy Sources | Transition to Bedside Asst |
| Ergonomic Positioning | Camera Control | Undocking |
| Docking | Clutching | |
| Robotic Trocars | Instrument Exchange | |
| OR Set-up | Foreign Body Management | |
| Situation Awareness | Multi-arm Control | |
| Closed Loop Comms | Eye-hand Instrument Coord | |
| Respond to System Errors | Wrist Articulation | |
| | Atraumatic Tissue Handling | |
| | Dissection – Fine & Blunt | |
| | Cutting | |
| | Needle Driving | |
| | Suture Handling | |
| | Knot Tying | |
| | Safety of Operative Field | |

# Faculty Members: Outcomes Measures

| | |
|---|---|
| Arnold Advincula, MD | American Assoc of Gynecologic Laparoscopists & ACOG |
| Rajesh Aggarwal, MD | Royal College of Surgeons - London |
| Mehran Anvari, MD | Minimally Invasive Robotic Association (MIRA) |
| John Armstrong, MD | USF Health, CAMLS (now Florida Surgeon General) |
| Paul Neary, MD | Royal College of Surgeons - Ireland |
| Wallace Judd, PhD | Authentic Testing Corp. |
| Michael Koch, MD | American Board of Urology |
| Kevin Kunkler, MD | US Army Medical Research & Materiel Command TATRC |
| Vipul Patel, MD | Global Robotics Institute - Florida Hospital Celebration Health |
| COL Robert Rush, MD | US Army Madigan Healthcare System |
| Richard Satava, MD | Minimally Invasive Robotic Association (MIRA) |
| Danny Scott, MD | Society of American Gastro and Endoscopic Surgeons (SAGES) |
| Mika Sinanan, MD | University of Washington |
| Roger Smith, PhD | Florida Hospital Nicholson Center |
| Dimitrios Stefanidis MD | Association for Surgical Education |
| Chandru Sundaram, MD | American Urological Association |
| Robert Sweet, MD | American Urological Association |
| Edward Verrier, MD | Joint Council on Thoracic Surgery Education |

# Outcomes Definitions (Sample)

| Task Name | Description | Errors | Outcomes | Metrics | Importance Rating | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 2 | 3 | 4 | Total Score | Rank Order |
| **Needle driving** | Accurate and efficient manipulation of the needle. | Tearing tissue, Troughing the needle, Needle scratching, Wrong angle on entry/exit, Adjacent organ injury, (more) | Accurate and efficient placement of needle through targeted tissue, Following the curve of the needle, without associated tissue injury | Time, accuracy, tissue damage, material damage | 0 | 0 | 3 | 6 | 33 | 3 |
| **Atraumatic handling** | Haptic comprehension. Using graspers to hold tissue or surgical material without crushing or tearing. | Traumatic handling, Tissue damage or hemorrhage | Manipulates tissue and surgical materials without damage | Metric-respect for tissue, Stress and strain indentation and deformation | 0 | 0 | 3 | 6 | 33 | 4 |

# #2 Curriculum Development

| Didactic & Cognitive | Psychomotor Skills | Team Training |
|---|---|---|
| **Lecture-based** | **Principle-based** | **Checklist-based** |
| Intro to Robotic System | Based on Physical Models (Virtual Models are Derivative) | #1: WHO Pre-Op |
| Pre-Operative Activity | 3D Exam Tools | #2: Robotic Specific |
| Intra-Operative Activity | Use Tasks that have Evidence of Validity | #3: Undocking & Debriefing |
| Post-Operative Activity | Multiple Outcomes Measured per Exercise | #4 Crisis Scenarios |
| Each Activity includes: Goals, Conditions, Metrics, Errors, Standards | Cost Effective Solution | |
| | High Fidelity for Testing, Lower Fidelity for Training | |
| | IRR Requires Ease of Administration | |

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# Faculty Members: Curriculum Develop

- Arnold Advincula
- Abdulla Al Ansari
- David Albala
- Richard Angelo
- James Borin
- David Bouchier-Hayes
- Timothy Brand
- Geoff Coughlin
- Alfred Cuschieri
- Prokar Dasgupta
- Ellen Deutsch
- Gerard Doherty
- Brian Dunkin
- Susan Dunlow
- Gary Dunnington
- Ricardo Estape
- Peter Fabri
- Vicenzo Ficarra
- Marvin Fried
- Gerald Fried
- Tony Gallagher
- Piero Giulianotti
- Larry Glazerman
- Teodar Grantcharov
- James Hebert
- Robert Holloway
- Santiago Horgan
- Lenworth Jacobs
- Arby Kahn
- Keith Kim
- Michael Koch
- Rajesh Kumar
- Gyunsung Lee
- Raymond Leveillee
- Jeff Levy
- C.Y. Liu
- Col. Ernest Lockrow
- Fred Loffer
- Guy Maddern
- Scott Magnuson
- Javier Magrina
- Michael Marohn
- David Maron
- Martin Martino
- W. Scott Melvin
- Francesco Montorsi
- Alex Mottrie
- Paul Neary
- Eduardo Parra-Davila
- Vipul Patel
- Gary Poehling
- Sonia Ramamoorthy
- Koon Ho Rha
- Richard Satava
- Steve Schwaitzberg
- Danny Scott
- Roger Smith
- Hooman Soltanian
- Dimitrios Stefanidis
- Chandru Sundaram
- Robert Sweet
- Amir Szold
- Raju Thomas
- Oscar Traynor
- Thomas Whalen
- Gregory Weinstein

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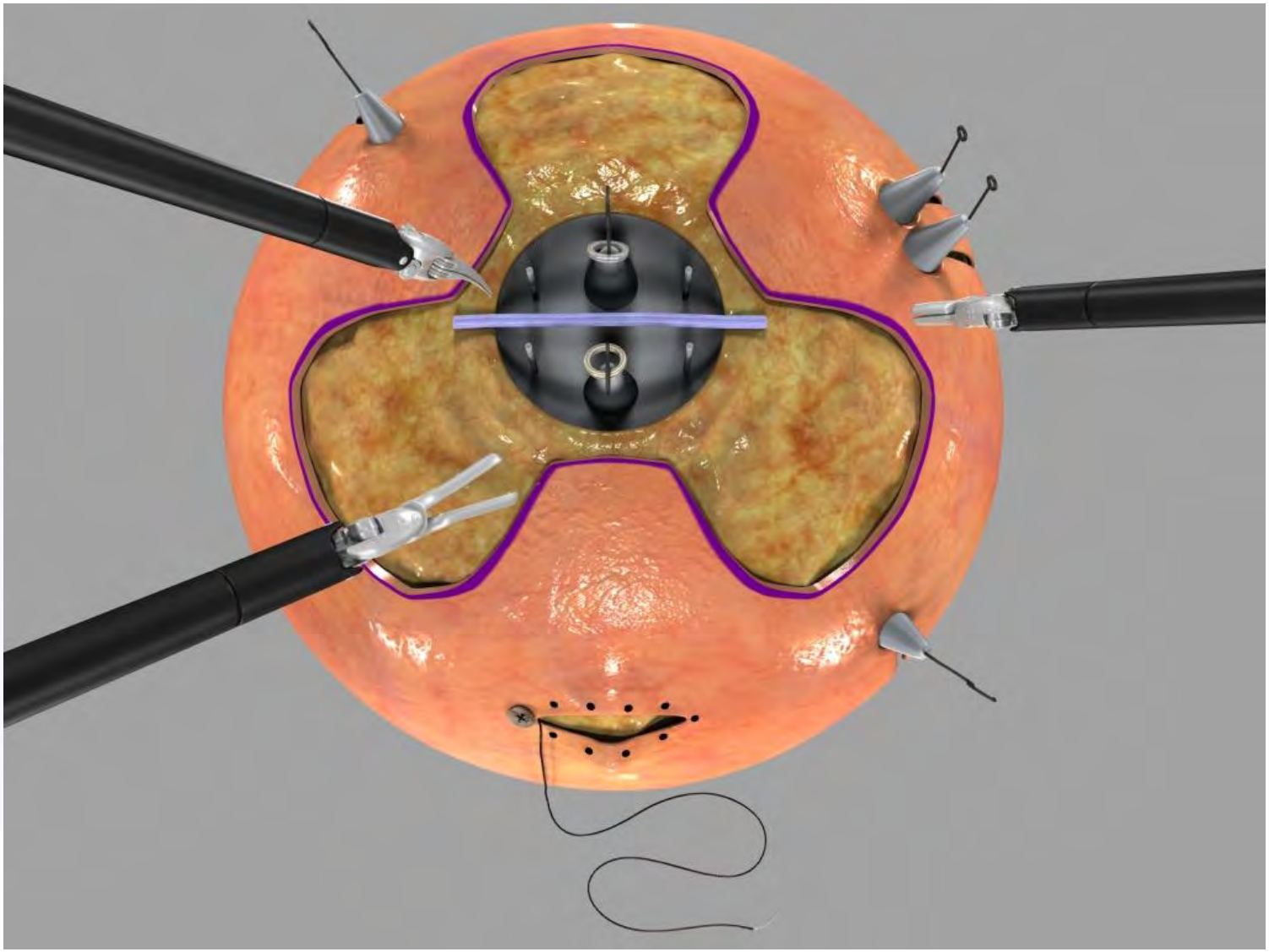
# Didactic Knowledge (Sample)

| Title | Description | Desired Presentation Format (Images/checklists/videos..) |
|---|---|---|
| Trocars placement: trocar entrance injury, incorrect position, spacing and location, incorrect insertion depth, port-site injury | • Ports placed in areas of previous scars<br>• Not checking for injuries after placement<br>• Tip of the trocar not visualized during insertion | Video demonstrations of safe use of open cutdown, Verress needle, and Optiview techniques. Ideally video showing injuries occurring<br>Video of arm collisions at the bedside due to inappropriate trocar placement<br>Video or picture showing injury to port site when port not inserted appropriately<br>Images of correct and incorrect port positions (outside view and inside) |

# Psychomotor Multi-Skill Device Design



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# Team Training and Communication (Sample)

Checklist 1: Pre-operative
Checklist 2: Robotic Docking
Checklist 3: Intraoperative (see above)
Checklist 4: Undocking
Checklist 5: Debriefing

**Checklist 3: Intraoperative Checklist (Pauses at Critical Steps in the Procedure and time-based - hourly)**

•Is there good team communication concerning instrument usage and transfer?
•Are all foreign objects accounted for (i.e. white boarding) and removed?
•Are the periodic checks occurring to discuss case progression, team member continuity, and other issues?
•Has there been regular communication with anesthesia?

# Testing Environments

Primary:
Robot

Derivative:
Simulator



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# #3 Validation Conference

- Criteria
  - Validate the curriculum and passing criteria that will be used to grant certification

- Multi-Institutional Study
  - 10 independent sites
  - ACS AEI accredited
  - Faculty in at least 2 specialties

# Conclusions

- Objective curriculum in robotic surgery is needed for certification
- Development of such a curriculum is underway by a multi-specialty working group of experienced surgeons

# Thank You!

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