



FLORIDA HOSPITAL
NICHOLSON CENTER

Simulation & Surgical Training: Fundamentals of Robotic Surgery

Roger Smith, PhD

Chief Technology Officer

roger.smith@flhosp.org

www.nicholsoncenter.com

Grants Leadership



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

Source: US Department of Defense

PI: Richard Satava, MD
Minimally Invasive Robotics Assoc

Source: Intuitive Surgical Inc.

* This work was supported by an unrestricted educational grant through the Minimally Invasive Robotics Association from Intuitive Surgical Incorporated.

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Congressional/DoD Research Project

Robotic Curriculum



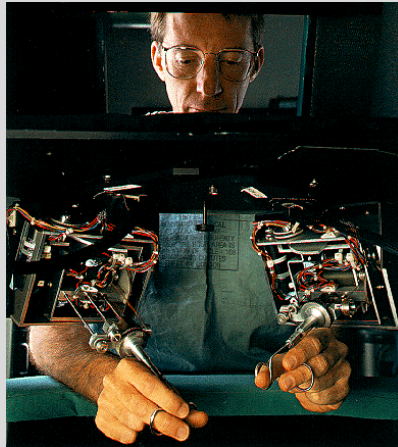
Curriculum Development:

- Define Robotic Surgery outcomes
- Develop Robotic Surgery curriculum
- Develop specific training tasks

Curriculum Validation:

- Validate training tasks
- Identify testing measures
- Set passing criteria

Telesurgery



Communication Latency:

- Map surgical movements to latency
- Redesign for latency tolerance
- Introduce instruments for safety
- Target city-pairs by latency

Automatic Surgery:

- Record movements in simulator
- Execute movements with robot
- Measure accuracy of outcome

Simulation



Surgical Rehearsal:

- Patient-specific rehearsal simulator
- Simulated patient physiology
- Measure impact on surgical perform

Military-use Validation:

- Identify military constraints
- Validate simulator for military-use
- Define deployable package

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"Hi, I'll be performing your surgery tomorrow."

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Intuitive Surgical's Training Pathway

Surgeon and OR Team Pathway

| Phase | Content | Trainer |
|---|-------------------------------|--|
| I: Introduction to <i>da Vinci</i> 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.

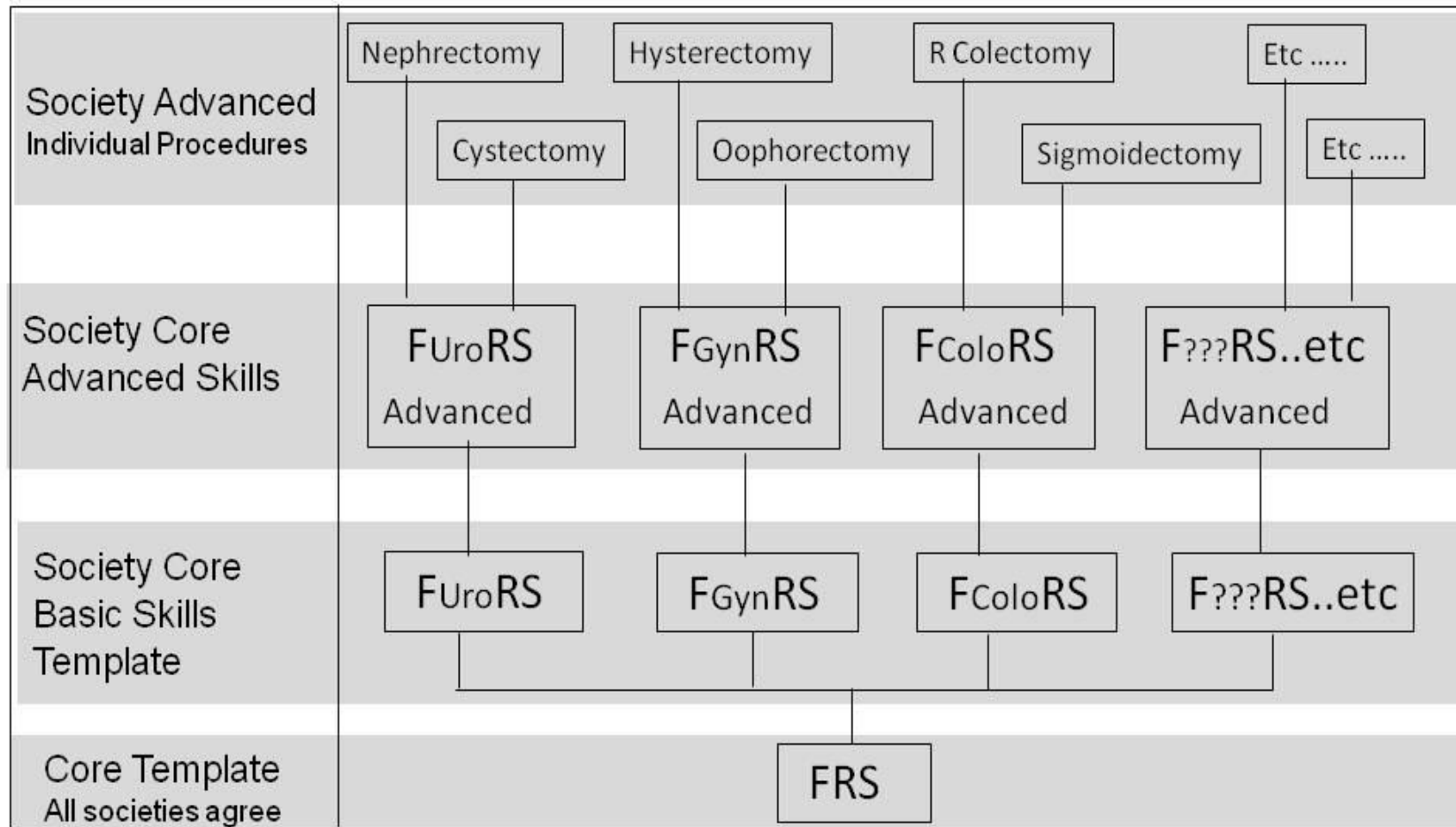
Note: The intent is to create a curriculum that is device-independent. This is admittedly difficult given the single approved surgical robot at this time. Therefore, significant attention is being paid to material that is device-flexible in anticipation of future robots.

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 Medical 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 Sources**
+ Executive Committee

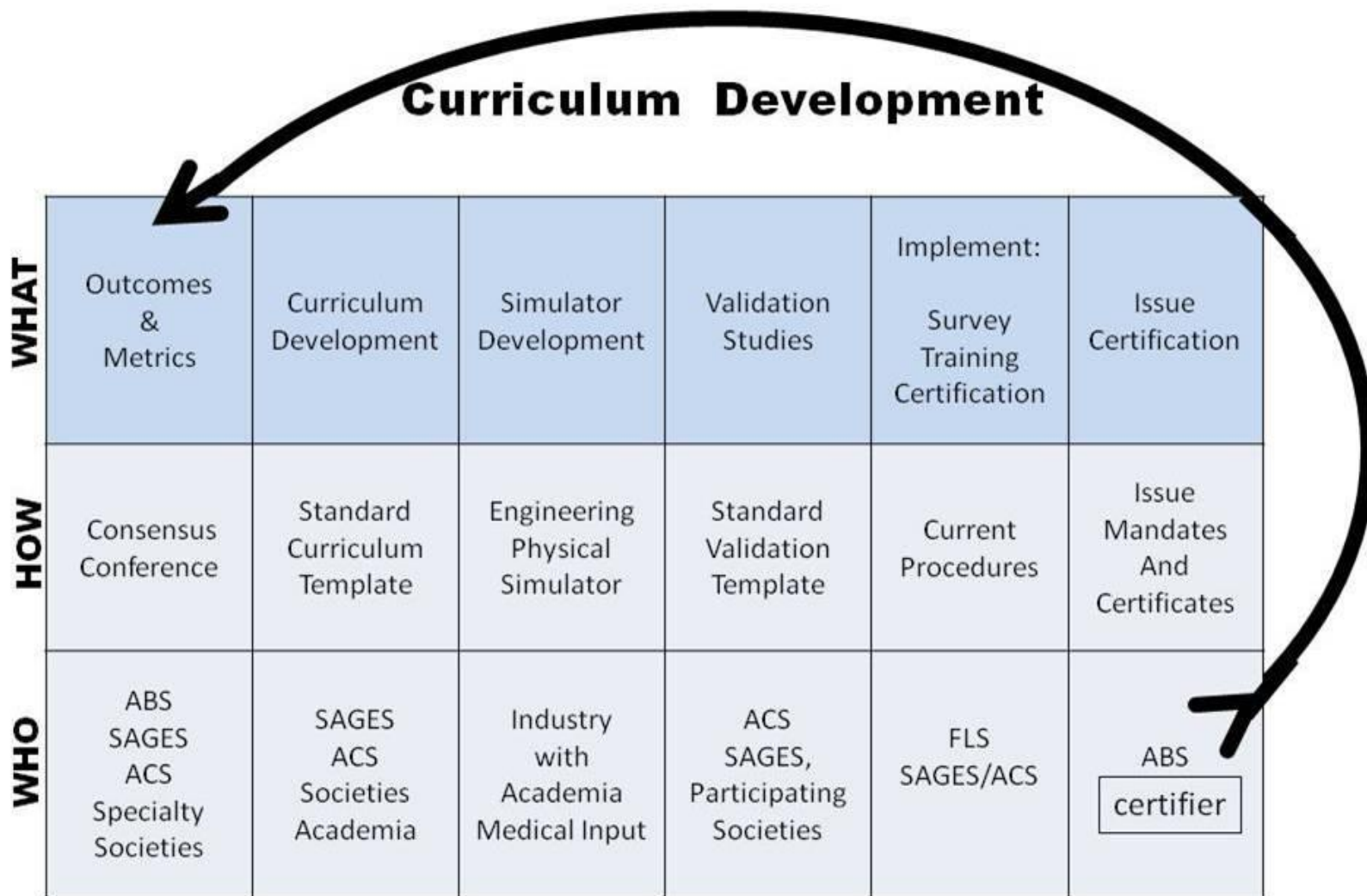
Development of Curriculum from common template

“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 (December, 2012)
4. Validation Studies
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

Skills Definition (Sample)

| Task Name | Description | Errors | Outcomes | Metrics | Importance Rating | | | | | Rank Order |
|----------------------------|---|---|---|--|-------------------|---|---|---|-------------|------------|
| | | | | | 1 | 2 | 3 | 4 | Total Score | |
| 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 | |

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

• Vincenzo 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

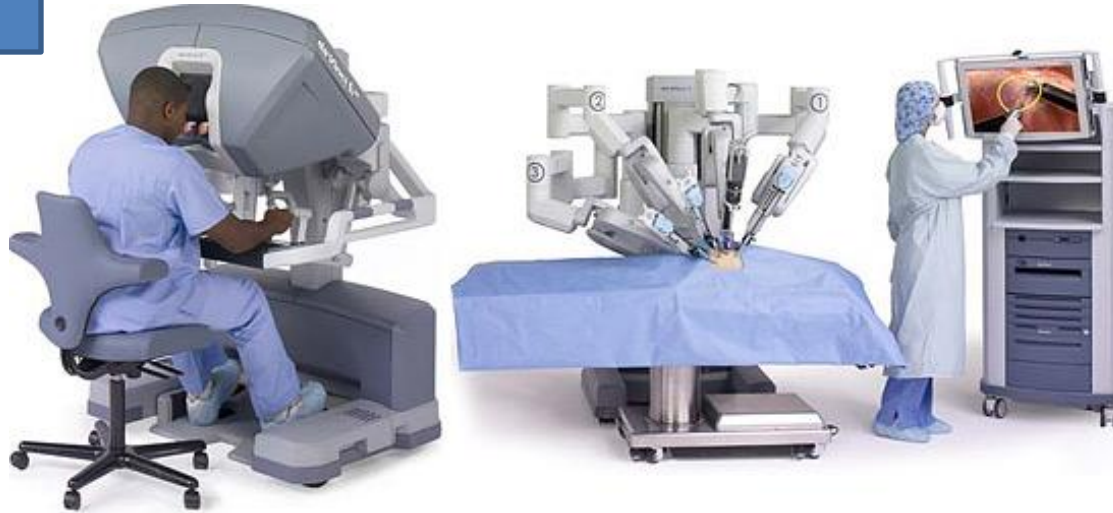
• Oscar Traynor

• Thomas Whalen

• Gregory Weinstein

Testing Environments

Robot



Simulator



#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
- Florida Hospital is actively supporting this effort with surgical experts and grant funding

Fundamentals of Robotic Surgery

Download Reports, Papers, and Presentations

<http://www.SimulationFirst.com/frs>



Thank You!