GENERAL SURGERY RESIDENCY PROGRAM

CURRICULUM FOR ROBOTIC SURGERY

Revised: August 23, 2023

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I. Introduction

General

Robotic surgery, or robot-assisted surgery, allows surgeons to perform many types of complex procedures with a degree of precision, flexibility and control that is often difficult to achieve using conventional techniques. The preservation of a minimally invasive approach, superior optics provided by robotic surgery equipment and a more ergonomic surgeon experience are all well-established advantages of this treatment modality, with the goal of furthering optimal patient outcomes.

The primary platform for robotic surgery at UCSF is the daVinci robotic surgery system, manufactured by Intuitive Surgical. As of 2021, the principal platform in use at UCSF is the daVinci Xi robotic surgery system, which is Intuitive Surgical's 4th generation product. Newer platforms are also under consideration for adoption within the UCSF Health system, to ensure that our program provides educational content in robotic surgery that is consistent with the most current systems available on the market.

Representative Case Types in Robotic Surgery

Typical robotic surgery procedures performed at UCSF within the Department of Surgery include (but are not limited to):

- Inguinal hernia repair
- Ventral hernia repair
- Cholecystectomy
- Nissen fundoplication
- Paraesophageal hernia repair
- Esophageal resection
- Gastrectomy
- VATS surgery
- Low anterior resection
- Abdominoperineal resection
- Sigmoid colectomy
- Right hemicolectomy

The Resident Experience

The learning experience for trainees in robotic surgery can differ notably from that in conventional surgery, such as with open or laparoscopic approaches. Of note, there are both bedside- and console-focused roles for the resident during robotic surgery procedures, each of which are intended to provide a comprehensive understanding of the mechanics of a robotic surgery case from start to finish, reinforce the unique safety and communication considerations therein, and foster a sense of leadership in each resident, with an eye for their future practice as robotic surgeons.

Bedside Assistant Role

The use of the robotic surgeon console requires that the surgeon's head remain continuously inside the viewer area of the console in order for the hand controls to function (see image below). In furtherance of this, a two-way microphone and speaker system is built in to the robotic system, to facilitate communication. Therefore, it is critical that the bedside assistant be able to function competently at the bedside, serving as the "eyes and ears" of the attending surgeon as it pertains to the sterile field, and utilizing continuous closed-loop communication in order to ensure maximal safety and efficiency, while performing tasks including robotic instrument exchange, suctioning, passage of sutures or other items inside the patient, and providing surgical exposure. This role provides foundational experience to the

resident as they acquire fundamental understanding of robotic surgery and its application in the intraoperative environment.

Console surgeon role

At the discretion of the attending surgeon, residents will be asked to sit at the secondary surgeon console to either observe the procedure and/or perform specific surgical tasks inherent to the procedure. Additional focus is placed on unique methods of tissue manipulation with robotic instrumentation vs. conventional surgical instrumentation, use of electrocautery with the robotic system, and other specific features of the daVinci system. Robotic simulation work is especially important to augment the resident experience on the surgeon console and allow full participation on the console during robotic cases. Residents are, therefore, expected to spend time performing robotic simulation work whenever possible, in anticipation of these opportunities.

II. Curriculum Goals and Objectives

A. Provide introduction to robotic surgery technology, equipment and instrumentation
B. Develop understanding of similarities and differences between robotic surgery vs open and laparoscopic surgical techniques, and their application to clinical decision-making
C. Acquire understanding of unique intraoperative considerations and risks related to use of robotic surgery as a treatment modality

III. Residency Program Expectations

Required Item	How to Access	General Details
Completion of daVinci Online Modules	Intuitive Surgical website: https://my.intuitive.com Refer to ***Appendix A – Instructions for Access to***	• Provides general introduction to robotic surgery equipment and electrosurgery

Required Item	How to Access	General Details
	daVinci Online Modules for further instructions	
Dry labs	Orientation week	• Review of robotic docking, instrument exchange, basic troubleshooting and emergency procedures • Attendance will be recorded • Program office will provide details re: time and place for these sessions
Simulation Work	See section ***IV. Simulation Work*** below and ***Appendix B – Simulation Work*** for additional details	• Select exercises are assigned to target specific robotic surgery techniques for suturing, use of electrocautery, tissue manipulation, etc. • Method of submission of scores will vary for Xi (smartsheet) vs SimNow (cloud server)

IV. SIMULATION WORK

A. General

Robotic surgery training involves the use of simulation devices that mimic the surgical environment, and allow for practice involving the use of simulated robotic instruments. A vast library of exercises is loaded onto each simulator unit, however, certain exercises are higher-yield vis-à-vis specific surgical skills, versus other more general exercises within the library.

- Important principles in robotic surgery are reinforced during simulation exercises, including:
  - Keeping instruments in view at all times
  - Preventing instrument collisions
  - Ensuring visualization of cautery-enabled instruments prior to application of energy
  - Maintaining ergonomic hand placement while operating

- Performance metrics are derived according to 2 categories:
  - **Efficiency**, including:
    - Time to complete exercise

        - Economy of motion
          (i.e., total distance traveled by all instruments in the exercise)

    - **Penalties**, including:
        - Instruments in view
        - Missed targets
        - Drops
        - Improperly applied energy type

- Overall score is on a scale of 0-100
- Overall score = Efficiency score minus penalties

Robotic Surgery Skill Category	**Surgical Objective**
Camera Control	Optimizing visualization
EndoWrist® Manipulation	Tissue manipulation
Needle Control and Driving	Control of needle while suturing
Energy Control	Application of appropriate energy type
4th Arm Control	Managing 4th arm for optimal retraction/exposure
Dissection or Knot Tying	Tissue dissection & knot tying

- Relevant exercises are located under submenus named after the above skill categories
- Exercises focusing on the above skill categories can be found on both Xi and SimNow simulators

B. Simulator Types / Locations and Access

Two (2) types of simulator units are available for resident use, each with slightly different content libraries and correspondingly different curriculum assignments:

Xi Simulator	**SimNow Simulator**
SCORES	**SCORES**
• are stored locally on each individual unit (i.e., not networked)	• data are stored on a cloud server via an Internet connection
• WILL NOT follow user between Xi simulator devices	• WILL follow user between SimNow simulator devices
EXERCISES	**EXERCISES**
• Names are different for Xi exercises vs SimNow (but same type of skills practice is presented)	• Names are different for SimNow exercises vs Xi (but same type of skills practice is presented)
USER IDs	**USER IDs**

• Administrator must create user IDs	• Resident can create their own user ID through daVinci website

Xi Simulator Unit		**SimNow Simulator Unit (Mandatory GS Robotic Module)**
Submenu	**Exercise (>85%)**	1. 30 Degree Scope Swap (100%)
Camera Control	Camera Targeting	2. FRS 4th Arm Cutting (100%)
Endowrist® Manipulation	Matchboard	3. Three Arm Relay 3 (90%)
Needle Driving	Suture Sponge 1	4. Ring Rollercoaster 3 and 4 (90%)
Energy Control	Energy Switching 1	5. ATW (Around the World) anterior and
4th Arm Control	Ring Walk 3	posterior (90%)

Simulator Locations and Access

Campus	Location	Type	How to Access
Parnassus	MIS Fellows' Office 5th floor, Med Sciences Bldg, 513 Parnassus Room S-550	SimNow	Badge access required, contact Virginia Schuler for access
Parnassus	OR 8	Xi	Request permission from Parnassus charge nurse to use room & for equipment tech to set up simulator (phone (415-353-1580)
Mission Bay	PCMB building 3rd Floor Room L 3163	SimNow	
Mission Bay	OR 4	Xi	Request permission from MBOR charge nurse to use room & for equipment tech to set up simulator (phone (415-476-9643)

For simulator use at other affiliated sites (e.g., CPMC and/or the VA), please contact the charge nurse and/or OR manager at each respective site for additional details.

VI. TRAINING PATHWAYS FOR ROBOTIC SURGEONS / EQUIVALENCY CERTIFICATE FROM INTUITIVE SURGICAL

General

Practicing surgeons who wish to adopt robotic surgery into their practice typically engage with Intuitive Surgical to undergo focused training that includes completion of introductory online modules for the

daVinci system, simulation work, wet labs (porcine and cadaveric), case observations and other focused learning experiences. Intuitive Surgical then provides the surgeon with a certificate that the surgeon can present to the medical staff office at their institution in order to request robotic surgery privileges.

Residents and fellows attending a program with structured robotic surgery training such as the General Surgery Residency Program at UCSF are able to obtain an Equivalency Certificate from Intuitive Surgical, which allows the trainee to receive equivalency certification that stands in for the above-described training pathway. This certificate may be presented to a hiring institution at the time of employment for the purposes of obtaining robotic surgery privileges, as with the above-described pathway.

Requirements for Equivalency Certificate from Intuitive Surgical:

- A log of 10 cases in the role of bedside assistant
- A log of 20 cases as console surgeon performing significant portions of the procedure (verified by attending MD)
- Letter from residency program director, indicating completion of these cases, documenting resident experience and competency at time of graduation
- daVinci online module training certificate

Intuitive Surgical provides the following online portal for logging cases towards the Equivalency Certificate:

https://intuitivesurgical.co1.qualtrics.com/jfe/form/SV_0oG66j0LiWHgqY5

APPENDIX A

Instructions for Access to daVinci Online Module

All learning Plans and modules should be focused on the Xi technology platform.

https://ucsf.box.com/s/0aq2lqzm2qm1ykzcdlwhqjtgfr83k7sq

- If software selection is required, select Xi-Da Vinci OS4 v9.
- Select "Multiport and system fundamentals and Da Vinci technical skills (Resident or Fellow)-Xi" as the learning plan
- HIGHLY RECOMMENDED: resident should select Learning Plans for Xi Vessel Sealer, Xi EndoWrist Stapler 45, and Xi Sureform as additional Technology Learning Plans; if multiple options are given, select the newest software version.
- Complete all required modules and videos for the selected Learning Plans and then complete the accompanying assessment for that Learning Plan. The "In-Service" portion of the Learning Plan can be skipped, as this will be addressed during the hands-on training session.
- After successfully completing the required Online Assessment, save a copy of the certificate to your hard drive. It is also recommended that the resident send a copy of this certificate to their UCSF and personal email addresses for future reference.

APPENDIX B

Simulation Work

See Intro to Robotic Surgery Simulation

APPENDIX C

SIMULATION (Xi Only) COMPLETION FORM

You are encouraged to explore all the exercises, but the following are required. To meet the requirement you need to achieve a score of 85%. Some will be easy, but others will take multiple attempts to improve your skills and reach 85%. Please record your score, the date you achieved it and the location of the simulator used in the table below. Once all the required modules have been completed with a score of 85% or greater, upload this form to the Robotic Smartsheet. If you need assistance with Smartsheet access, please email Virginia Schuler in the Surgery Education Office: *Virginia.Schuler@ucsf.edu*

Module	Date Completed	Location	Score (%)
Camera targeting 1			
Peg Board 2			
Energy switching 1			
Ring walk 2			
Thread the rings			
Suture sponge 2			

****Don't forget to upload a photograph of the robotic screen illustrating the task name and your score for each module listed above.*

APPENDIX D

ROBOTIC CASE LOG: Bedside Assistant

Please place stickers from cases in which you were the bedside assistant and participated in inserting trocars, docking the robot, and inserting and exchanging instruments. You need a minimum of 10 cases. Once complete, please upload to the Robotic Smartsheet.

Patient Sticker	Date	Attending	Operation

APPENDIX E

ROBOTIC CASE LOG: Console Surgeon

Please place stickers from a minimum of 20 cases in which you were the console surgeon and performed a significant portion of the case. You may copy this page as many times as necessary. Once complete, please upload to the Robotic Smartsheet. Alternatively, if you use the MyIntuitive app, you can extract your case logs and submit directly in the Robotic Smartsheet.

Min/Mod/Max: Refers to the amount of time at the console you were acting as surgeon. (Min = 0-24% of the case as primary surgeon, Mod = 25-50% of the case as primary surgeon, Max = > 50% as primary surgeon)

Skills 1-6: Mark all that apply: 1) Retraction, 2) Tissue Manipulation, 3) Dissection, 4) Suture, 5) Electrocaudery/Staple, 6) other

Patient Sticker	Date/ Attending	Operation/ Min/Mod/Max			Skills (1-6)		
Jane Doe, MRN 1234567	1/1/17	Sigmoid colectomy			1 X	2 X	3
	Chern	Min X	Mod	Max	4	5	6
					1	2	3
		Min	Mod	Max	4	5	6
					1	2	3
		Min	Mod	Max	4	5	6
					1	2	3
		Min	Mod	Max	4	5	6
					1	2	3
		Min	Mod	Max	4	5	6

University of California
San Francisco

APPENDIX F

Attending Evaluation: Console Surgeon

This form is for residents in their final year who have already performed 20 cases as console surgeon. The evaluation is to be completed by the attending physician and reviewed with the resident at the completion of the case. Once complete, please upload to the Robotic Curriculum Smartsheet.

Patient Sticker	Resident	Date
	Operation	

Skill	Adequate	More Practice Recommended
Demonstrates understanding of trocar placement and spacing		
Understands principles of docking and is able to dock in a timely fashion		
Uses camera appropriately and is able to focus the camera		
Demonstrates appropriate clutching and maintains hands in a comfortable workspace		
Demonstrates ability to use third arm and switch between instruments		
SAFETY: Does not move instruments that are not in view		
SAFETY: Recognizes tissue response to assess grip strength and handles tissue appropriately		
Demonstrates ability to troubleshoot system and manage collisions		

Please comment on areas of strength:

Please comment on opportunities for improvement:

The resident demonstrates competency on the robotic system. YES NO

_____ _____

Attending Name Attending Signature

UCSF
University of California
San Francisco

APPENDIX G

Sample Letter from residency program director

Date:

RE: [Resident/Fellow's name]

Dear Intuitive Training Staff:

Dr. [Resident/Fellow's name] successfully completed a [residency or fellowship] in da Vinci® Surgery in [specialty] at [institution] from [dates].

I certify that during this time, [s/he]

• Participated in at least 10 minimally invasive da Vinci cases as a patient-side assistant and in at least 20 cases as the console surgeon (as documented in the attached procedure log which has been reviewed for accuracy).
• Received training on the following topics regarding da Vinci System use: Port placement, Patient Cart Setup, Docking and Undocking, Instrument Insertion and Exchange, Surgeon Console Settings, Camera Control.
• Clutching, EndoWrist Instrument Manipulation, 3rd Arm Control, Range of Motion, Retraction, Dissection, Suturing, Applying Energy, and Troubleshooting and Communication.

Dr. [Resident's /Fellow's name] is now qualified to perform minimally invasive procedures using the da Vinci Surgical System.

Sincerely,

[Name and title of Residency/Fellowship Director]