

# Intro to daVinci Robotic Surgery Simulation

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# Objectives

- ▶ Robotic Surgery Simulation: General Concepts
- ▶ Overview of Surgeon Console
- ▶ Navigating the Simulator
- ▶ Types of Robotic Surgery Simulators
  - ▶ Xi Simulator
    - ▶ Logging on
  - ▶ SimNow Simulator
    - ▶ Logging on / Creating a User ID
- ▶ Review of Exercises & Simulation Content
- ▶ Simulator Locations & Instructions for Access

# Robotic Surgery Simulation: General Concepts

# Simulation for Robotic Surgery

- ▶ Robotic surgery simulation provides a practice tool using exercises & scenarios to help improve a user's facility with the daVinci systems
- ▶ Simulator device is mounted onto the back of a Surgeon Console and requires connection via a short blue fiber cable
- ▶ **\*\*\*UCSF residents are expected to engage in robotic simulation work whenever possible to enhance their skills for participation in robotic surgery cases\*\*\***



Back of Surgeon Console



Simulator mounted on back of Surgeon Console

# Important Principles

- ▶ Surgeon's head must remain continuously inside the viewer of the console in order for the hand controls to function (safety feature)
- ▶ When in simulation mode, each hand control functions as a mouse/pointer (squeeze to activate/squeeze to make a selection)
- ▶ 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

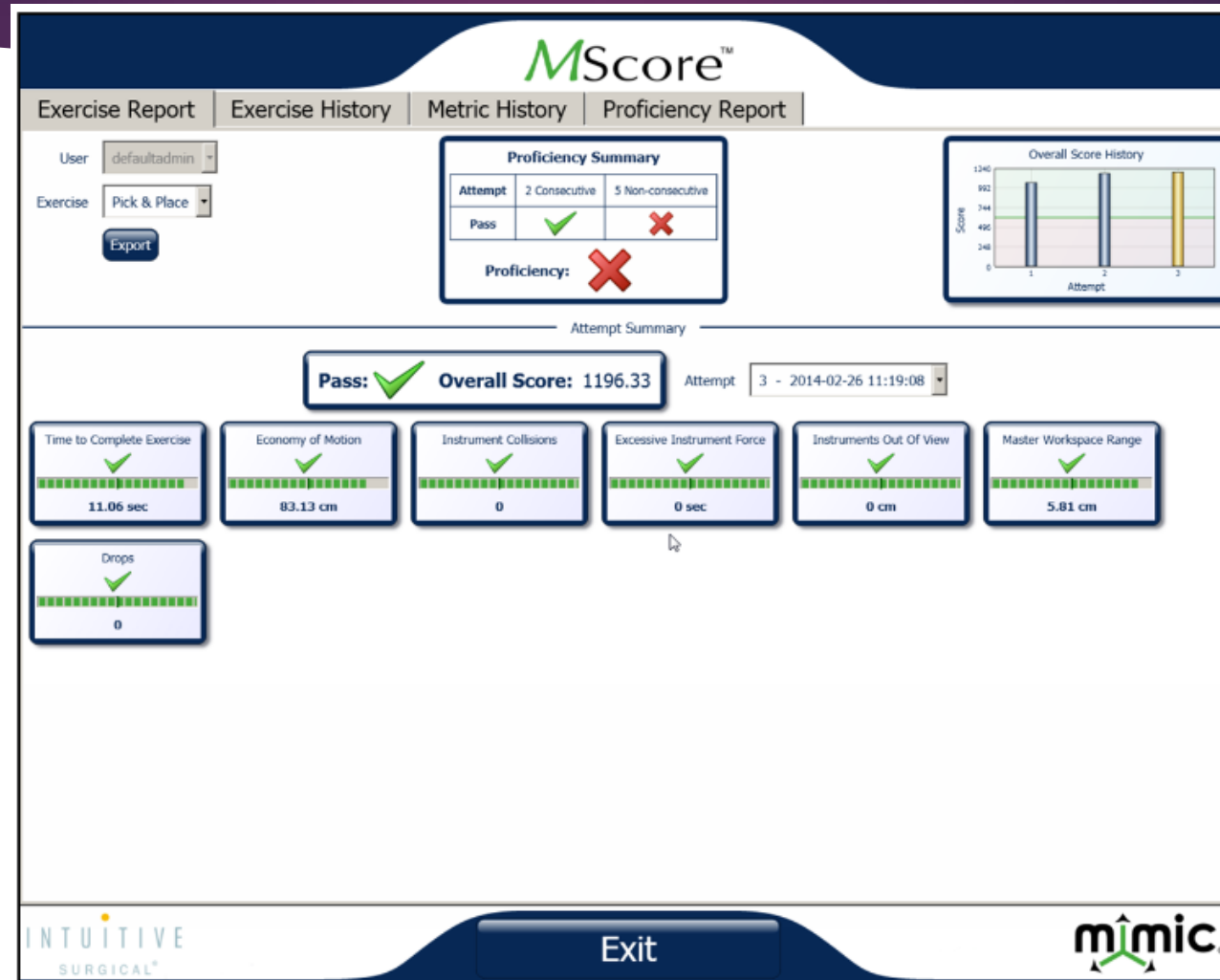
# Performance Metrics During Simulation

- ▶ 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)
    - ▶ Optimal use of **master workspace range**
  - ▶ **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

# Master Workspace Range

- ▶ Defined by Intuitive as “An average size of the surgeon’s hand control workspace”
- ▶ **Can be thought of as the area within which the surgeon’s hands should remain while operating for ergonomic hand placement (“a magic oval”)**
- ▶ When first learning to use the console, trainees’ hands often hit the sides of the console or the underside of viewer, or may find their hands very close to their body while using the hand controls
- ▶ Trainees should endeavor to prevent reaching and avoid collisions with the inner aspect of the console and viewer
- ▶ The **finger clutch buttons** and **master clutch pedal** help optimize use of the master workspace range to allow for more ergonomic hand placement while operating

# Sample Score Reports



# Sample Score Reports

USER:

EXERCISE:

ATTEMPT:  DATE: 08/08/2013 00:08:08

SCORE: **56.0**

**NOTES:**  
None

**SCORE BREAKDOWN:**

Efficiency Metrics	Raw Value	Pts.
Total time	10.0 sec.	56.6
Exercise Constant		0.0
Efficiency Subtotal		56.0

Penalties	Raw Value	Pts.
Total number of needle passages	0.0 ct.	0.0
Number of dropped needles	0.0 ct.	0.0
Penalty Subtotal		0.0

**Overall Score 56.0**

# Review of Exercises & Simulation Content

# Skills Focus in Robotic Surgery

Robotic Surgery Skill Category	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 4 <sup>th</sup> 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

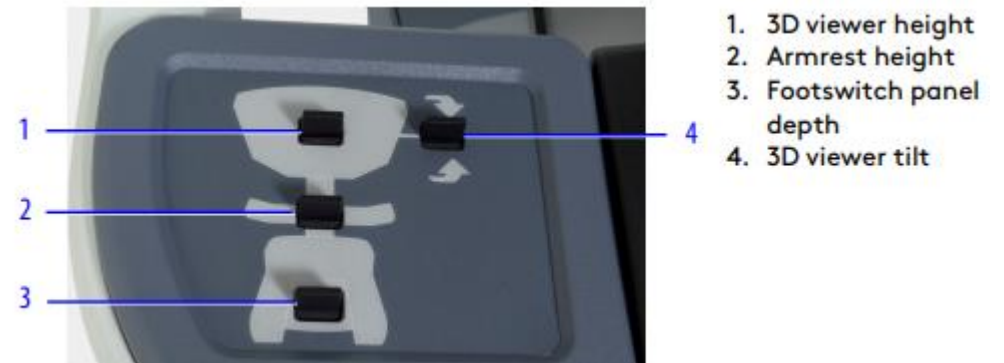
# Overview of Surgeon Console

# Overview -- Surgeon Console



## Ergonomic controls

- Located at the far left of the Armrest
- Allow you to adjust the position of the pictured components according to your body habitus



# Overview -- Surgeon Console



## Touchpad

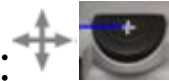
- Located on the Armrest
- Allows you to save your ergonomic settings by creating a user ID specific to the console
- \*\*\*NOTE: This user ID is different from the user ID for the **simulator**
- To create a user ID:  
Press **Unlock** then follow the prompts to create user ID and record your ergonomic settings
- If needed, settings can be changed/saved later

# Overview -- Surgeon Console



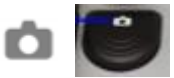
## Footswitch Panel

1. Master Clutch/Pedal:



Allows repositioning of **both** hands simultaneously without moving instruments for more ergonomic hand placement while working

2. Endoscope control (aka Camera clutch/pedal):



Allows movement of endoscope

3. Arm Swap Clutch/Pedal:



- Located to the LEFT of the Camera clutch/pedal
- Allows surgeon to alternate control of the 2 instruments on one side of endoscope

4. Yellow and blue pedals:



Cut and Coag for cautery-enabled instruments (similar to a bovie)

# Overview -- Surgeon Console

Finger Clutch button



## Finger Clutch button:

- Allows repositioning of **individual hands** without moving instruments for more ergonomic hand placement (vs master clutch = both hands)
- Frequent use is **\*\*\*highly encouraged & necessary\*\*\*** to maintain optimal hand position



## Hand controls (a.k.a. master controllers):

- User's head **MUST** be inside the 3D viewer for hand controls to function
- 3 beeps will sound when console recognizes user's head in 3D viewer
- Proper hand placement:
  - Place **THUMB & MIDDLE FINGER** in the Velcro loops
  - Leaves index finger free to use Finger Clutch button

### **\*\*\*To use Finger Clutch button:**

- Pull back button and HOLD
- Move hand as needed
- RELEASE Finger Clutch button

**Squeezing hand controls = activation**









# Navigating the Simulator

# Controlling the Pointer

- ▶ To move the pointer:
  - ▶ 1. Place your head in the 3D viewer on the Surgeon Console.
  - ▶ 2. Lightly grasp the hand controls.
  - ▶ 3. To unlock each hand control, close and release the hand control grip. You can then move either hand to control the pointer. If you remove your head from the 3D viewer, you must repeat this process to take control of the pointer.
- ▶ To select a button or an item on the screen:
  - ▶ 1. Use the hand controls to move the pointer arrow to the item.
  - ▶ 2. Close and release either hand control grip to select the item.

# Main Menu - Buttons

Button	Description
	Curriculum Opens the Curriculum screen
	Library Opens the Library screen (Exercise Library)
	Video Library Opens the Video Library screen
	Reports Opens the Reports screen
	Settings Opens the Settings screen
	Exit Logs the user out

# Curricula for Simulation

- ▶ The robotic simulator contains a vast library of multiple exercises and games (some more high-yield than others for specific surgical skill training)
- ▶ Curricula consisting of specific exercises can be created/assembled on the simulator and then assigned to individual users via a shortcut, according to established program curricula
- ▶ Minimum scores are usually indicated per program guidelines
- ▶ Curriculum exercises as indicated by your program should be prioritized over other exercises within the simulator library

# Types of Robotic Surgery Simulators

# 2 Types of Robotic Simulators at UCSF

-Xi Simulator

-SimNow Simulator (available at UCSF as of 3/8/2021)

# Xi vs SimNow Simulators

Xi Simulator	SimNow Simulator
<b><u>SCORES</u></b>	<b><u>SCORES</u></b>
<ul style="list-style-type: none"><li>• are stored <u>locally</u> on each individual unit (i.e., not networked)</li><li>• <u>WILL NOT</u> follow you between Xi simulator devices</li></ul>	<ul style="list-style-type: none"><li>• data are stored on a <u>cloud server</u> via an Internet connection</li><li>• <u>WILL</u> follow you between SimNow simulator devices</li></ul>
<b><u>EXERCISES</u></b>	<b><u>EXERCISES</u></b>
<ul style="list-style-type: none"><li>• Names are different for Xi exercises vs SimNow (but same type of skills practice is presented)</li></ul>	<ul style="list-style-type: none"><li>• Names are different for SimNow exercises vs Xi (but same type of skills practice is presented)</li></ul>
<b><u>USER IDs</u></b>	<b><u>USER IDs</u></b>
<ul style="list-style-type: none"><li>• Administrator must create user IDs</li></ul>	<ul style="list-style-type: none"><li>• Resident can create their own user ID through daVinci website</li></ul>

Xi Simulator

# Logging On – Xi Simulator

- ▶ **Xi Simulator**
  - ▶ Login: DefaultUser
  - ▶ PIN: 1234
- ▶ Click into white Username field to enter login
- ▶ If available, a personalized login & PIN 1234 can be used (created by Robotic Surgery Coordinator)
- ▶ Click into Username field to type in Login name (can also select from drop-down list, but will take longer)



# Xi Simulator

<b>Robotic Surgery Skill Category</b>	<b>Relevant Exercises include:</b>
Camera Control	Camera Targeting 1 & 2
EndoWrist® Manipulation	Matchboard 1 & 2
Needle Driving	Suture Sponge 1, 2 & 3
Energy Control	Energy Switching 1 & 2
4th Arm Control	Ring Walk 3

SimNow Simulator

# Logging On – SimNow Simulator

- ▶ New type of simulator available to all UCSF residents as of March 2021
- ▶ \*\*\*Requires a reservation on <https://ucfsimnow.skedda.com> to prevent conflicts/wasted trips
- ▶ Creating a login is performed **BEFORE** working on the SimNow simulator
- ▶ Use Google Chrome or Mozilla Firefox to navigate to the daVinci Surgery Community website (Internet Explorer is error-prone)
- ▶ Will need to enter your UCSF email and PW (created when you logged on to this site to complete the initial daVinci online modules)
- ▶ If you do not have an Intuitive account, click on the link to create an account (NB: for new accounts or forgotten PW, a PW will be emailed to you – this can take up to 1 hour. Make sure to check your Trash or Spam folder)

# Steps to Create a SimNow Login and PIN

1. Navigate to [www.davincisurgerycommunity.com](http://www.davincisurgerycommunity.com)
2. Click on **SimNow Link** at the top of the page
3. Log in with your UCSF email and password
4. Create your login and password for SimNow:
  - On the “Getting Started” page, click on **Find Your Hospital**
  - Enter the SimNow Simulator Serial Number for the corresponding campus from the list below:  
*Simulator Serial Numbers*  
*Mission Bay: SU1075*  
*Parnassus: SU1077*
  - Complete the remaining data fields, including your own unique user name and 4-digit PIN
  - Turn on **Notifications** and **Leaderboard Visibility**

# SimNow - Additional Features vs. Xi

- ▶ Upgraded content vs. Xi including:
  - ▶ More than 30 basic skills exercises and advanced training curricula modules and instrumentation for the daVinci systems
  - ▶ Instrument Playground: experiment with up to 12 different surgical instruments in one module
  - ▶ FRS (Fundamentals of Robotic Surgery): Virtual reality version of the skills drills exercises for daVinci surgery
  - ▶ Combo Exercises: Advanced simulation modules that test a variety of daVinci skills
  - ▶ Simulated specialty-specific procedures
  - ▶ Curriculum exercises can be assigned remotely to residents

# SimNow – Basic Skills Matrix

## SKILLS FOCUS

● = Primary ○ = Secondary

### SIMULATION EXERCISES

	EndoWrist® Manipulation	Camera Clutching	Master/Finger Clutching	Energy Control	Fourth Arm Control	Needle Control and Driving	Dissection or Knot Tying
1 30-Degree Scope Swap	○	●					
2 Sea Spikes 1	●						
3 Sea Spikes 2	●						
4 Sea Spikes Game	●						
5 Three Arm Relay 1	○	○	○		●		
6 Three Arm Relay 2	○	○	○		●		
7 Three Arm Relay 3	○	○	○		●		
8 Energy Pedals 1				●			
9 Energy Pedals 2				●			
10 Posterior Needle Driving - Around the World (ATW)						●	
11 Anterior Needle Driving - Horizontal						●	
12 Anterior Needle Driving - Vertical						●	
13 Anterior Needle Driving - ATW						●	
14 Combo Exercise	●	●	●	●	●	●	
15 Instrument Playground	●	●	●	●		●	

# SimNow – Basic Skills Matrix (cont'd)

## SKILLS FOCUS

● = Primary ○ = Secondary

	EndoWrist® Manipulation	Camera Clutching	Master/Finger Clutching	Energy Control	Fourth Arm Control	Needle Control and Driving	Dissection or Knot Tying
<b>SKILLS DRILLS</b>							
16 Ring Roller Coaster 1	●	○	○				
17 Ring Roller Coaster 2	●	○	○				
18 Ring Roller Coaster 3	●	○	○				
19 Ring Roller Coaster 4	●	○	○				
20 Ring Roller Coaster 5	●	○	○				
21 Around the World Needle Driving						●	
22 Big Dipper Needle Driving						●	
23 Running Suture						●	

# SimNow – Basic Skills Matrix (cont'd)

## SKILLS FOCUS

● = Primary ○ = Secondary

### FRS

- 24 Ring Tower Transfer
- 25 Knot-Tying
- 26 Railroad Track
- 27 4th Arm Cutting
- 28 Puzzle Piece Dissection
- 29 Vessel Energy Dissection

	EndoWrist <sup>®</sup> Manipulation	Camera Clutching	Master/Finger Clutching	Energy Control	Fourth Arm Control	Needle Control and Driving	Dissection or Knot Tying
24 Ring Tower Transfer	●						
25 Knot-Tying							●
26 Railroad Track						●	
27 4th Arm Cutting							●
28 Puzzle Piece Dissection	○		○				●
29 Vessel Energy Dissection				●			

# SimNow – Basic Skills Matrix (cont'd)

## SKILLS FOCUS

● = Primary ○ = Secondary

## BASIC SKILL SET

- 30 Camera 0
- 31 Wrist Articulation 1
- 32 Wrist Articulation 2
- 35 Clutch

	EndoWrist® Manipulation	Camera Clutching	Master/Finger Clutching	Energy Control	Fourth Arm Control	Needle Control and Driving	Dissection or Knot Tying
30 Camera 0		●	○				
31 Wrist Articulation 1	●		○				
32 Wrist Articulation 2	●	○	○				
35 Clutch			●				

# SimNow - Simulated Specialty-Specific Procedures

## ► Gynecology

### PROCEDURAL SIM

● = Primary Focus

Procedure	Guided	Non-guided	Instrument Exchange	Energy Use	Dissection	Knot Tying	Anatomy ID
<b>GYN HYSTERECTOMY</b>							
1 Freehand Hysterectomy	●	●		●	●		
2 Guided Adnexa Preservation	●			●	●		●
3 Guided Salpingo-oophorectomy	●			●	●		●
4 Bladder Flap Development	●	●		●	●		●
5 Colpotomy Incisions	●	●		●	●		●
6 Ureter Dissection	●	●		●	●		●

# SimNow

## Simulated Specialty-Specific Procedures

### ► Urology

#### PROCEDURAL SIM

● = Primary Focus

	Procedure	Guided	Non-guided	Instrument Exchange	Energy Use	Dissection	Knot Tying	Anatomy ID
<b>URO PROSTATECTOMY</b>								
7	Anatomy Identification: Bladder Neck Dissection	●						●
8	Anatomy Identification: Neurovascular Bundle Dissection	●						●
9	Anatomy Identification: Urethrovessical Anastomosis	●						●
10	Freehand Bladder Neck Dissection		●	●	●	●		
11	Freehand Urethrovessical Anastomosis		●	●			●	●
12	Guided Bladder Neck Dissection	●		●	●	●		●
13	Guided Urethrovessical Anastomosis	●		●			●	●
14	Neurovascular Bundle Dissection							
15	Guided Nerve-Sparing	●		●	●	●		●

# SimNow

## Simulated Specialty-Specific Procedures

### General Surgery / Thoracic / Colorectal

#### PROCEDURAL SIM

● - Primary Focus

	Procedure	Guided	Non-guided	Instrument Exchange	Energy Use	Dissection	Knot Tying	Anatomy ID
<b>GEN INGUINAL HERNIA</b>								
16	Guided Incision and Dissection	●		●	●	●		●
17	Anatomy Identification	●						●
18	Freehand Incision and Dissection		●	●	●	●		
<b>THOR LOBECTOMY</b>								
19	Guided Robotic-assisted Lobectomy	●		●	●			
20	Robotic-assisted Lobectomy Complete Procedure	●	●	●		●		
<b>CRO RIGHT COLECTOMY WITH ICA*</b>								
	Guided Intracorporeal Anastomosis	●		●	●	●	●	●
	Freehand Intracorporeal Anastomosis		●	●	●	●	●	

# Simulator Locations & Instructions for Access

# Simulator Locations

Mission Bay	Parnassus
<p><b>Xi simulator</b></p>	<p><b>Xi simulator</b></p>
<p><b><u>OR 4</u></b></p> <ul style="list-style-type: none"> <li>• <u>Weekdays</u>: Call MBOR charge RN (415-476-9643) for permission to use room &amp; request to have simulator connected by technician</li> <li>• <u>Weekends &amp; Holidays</u>: only need to call MBOR charge RN for permission to use room (simulator remains connected from Friday to Monday &amp; on holidays)</li> </ul>	<p><b><u>OR 8</u></b></p> <ul style="list-style-type: none"> <li>• Call MLOR charge RN (415-353-1580) for permission to use room &amp; request to have simulator connected by technician</li> </ul>
<p><b>SimNow Simulator</b></p>	<p><b>SimNow Simulator</b></p>
<p><b><u>PCMB bldg 3<sup>rd</sup> Fl – Room L-3163</u></b></p> <ul style="list-style-type: none"> <li>• <b>***FIRST STEP:</b> Go to <a href="https://ucfsimnow.skedda.com">https://ucfsimnow.skedda.com</a> to reserve simulator</li> <li>• Remains connected and available 24-7</li> </ul>	<p><b><u>Sciences Building 5<sup>th</sup> Fl Room S-0550 – SimNow simulator</u></b></p> <ul style="list-style-type: none"> <li>• <b>***FIRST STEP:</b> Go to <a href="https://ucfsimnow.skedda.com">https://ucfsimnow.skedda.com</a> to reserve simulator</li> <li>• Requires badge access through Gen Surg Residency Program office</li> <li>• Remains connected and available 24-7</li> </ul>

# Additional Helpful Tips

To **terminate an exercise**, quickly press down on the Footswitch panel button on the Ergonomic Settings panel on the armrest

To **restart simulator** in the event of a malfunction:

Press power button on console 

Press black I/O switch on side panel on simulator unit to O position to interrupt power



Wait for system to shut down (fan will stop making noise)

Press black I/O switch on side panel on simulator unit to I position to restore power

Press power button on console