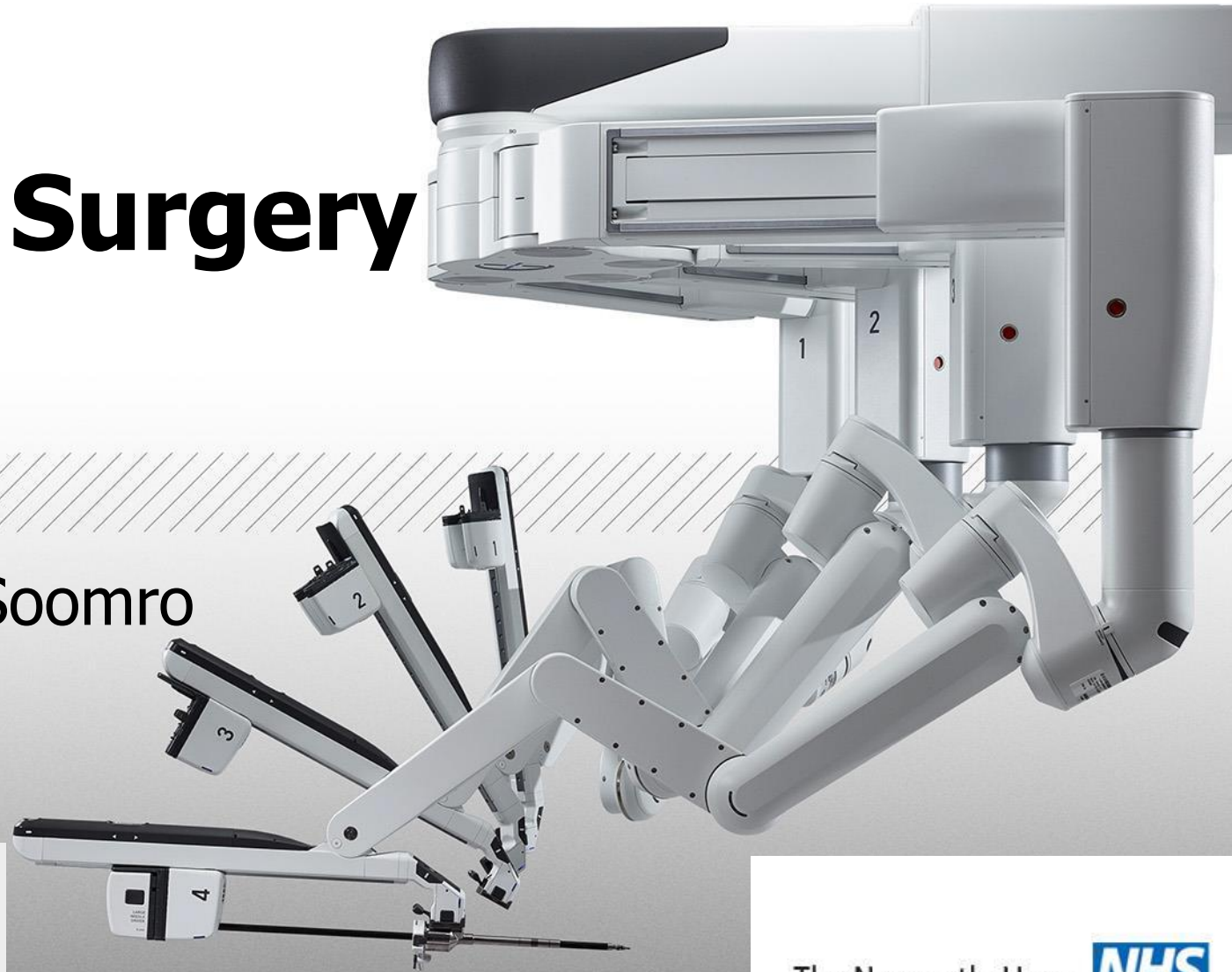


INTUITIVE  
SURGICAL®

# Robotic Surgery

Prof. Naeem Soomro









**There is no  
more science  
in surgery  
than in  
Butchering**

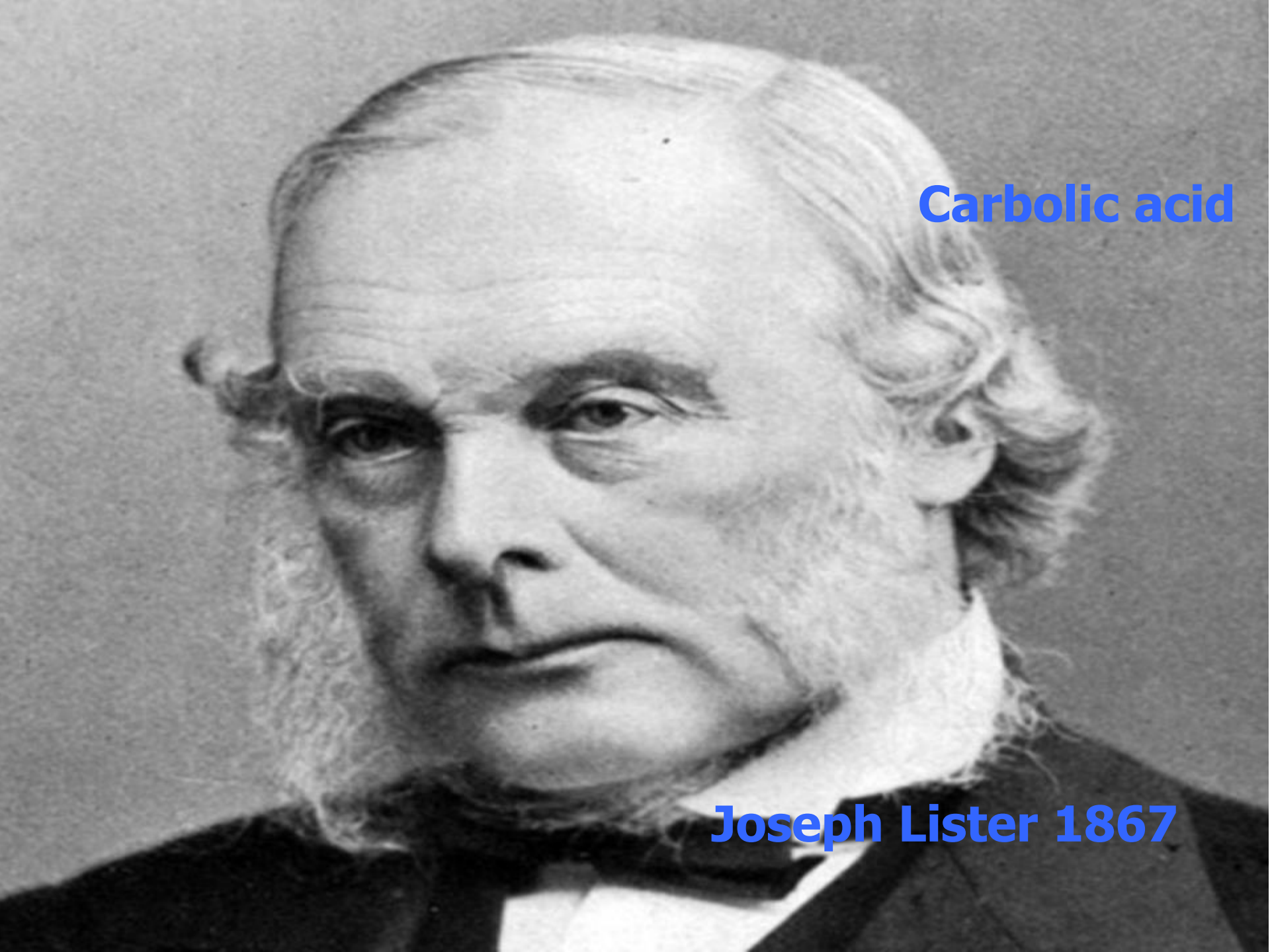
**Lord Thurlow  
1811, Parliamentary  
debate on  
establishment of Royal  
College of Surgeons**



# Anaesthesia



**Morton Ether Inhaler (1846)**



**Carbolic acid**


**Joseph Lister 1867**





**Penicillin**

**Alexander Fleming 1926**

A photograph of a person's bare torso, showing a vertical surgical scar on the midline of the abdomen. The scar is a deep red line running from the upper abdomen down to the lower abdomen. The person is wearing white underwear. The text "Open Surgery" is overlaid in blue with a black shadow.

**Open Surgery**

# Laparoscopic Surgery

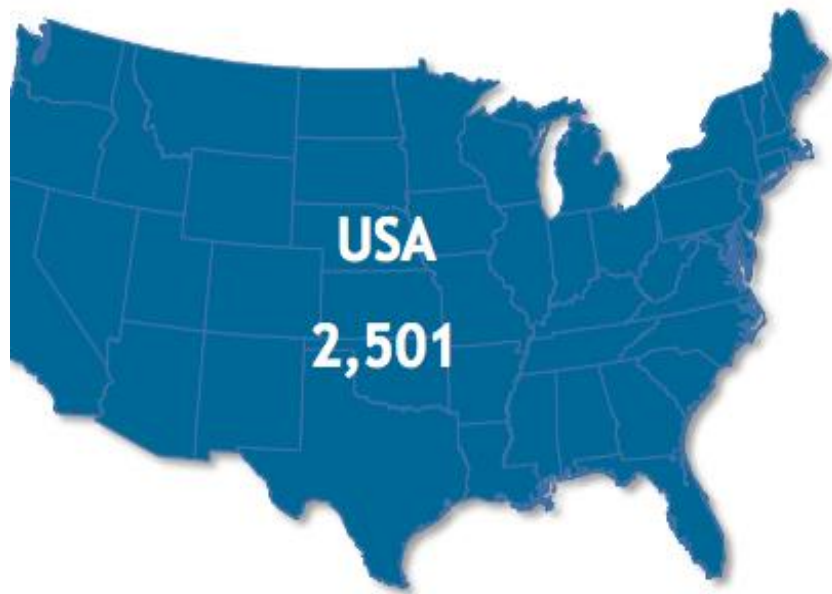




# Evolution of Surgery



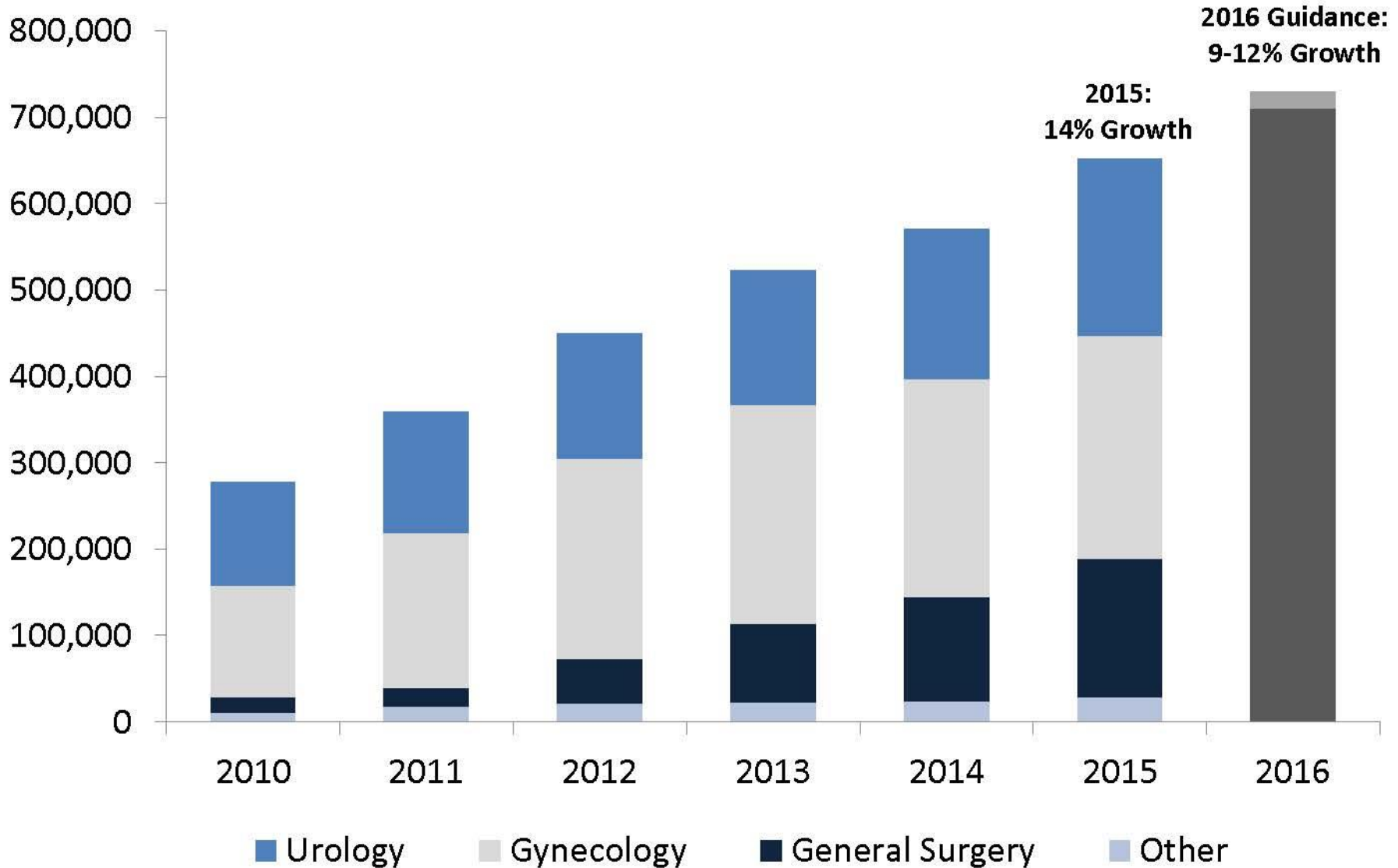
# *da Vinci*<sup>®</sup> System Installed Base



Rest of World: 182



# Worldwide Procedure Trend



# Da Vinci Density

Country	Dv Systems	Population (mills)	Systems / Mills
---------	------------	--------------------	-----------------

USA	2223	318	6.99
Switzerland	26	8	3.25
Belgium	33	11.2	3
Sweden	26	9.6	2.7
Denmark	15	5.6	2.68
Norway	11	5.1	2.15
Japan	193	126.7	1.53
Italy	81	59.9	1.35
France	86	66.6	1.29
Holland	20	16.8	1.19
Taiwan	24	23.4	1.02
Korea	47	50.2	0.93
Germany	73	80.2	0.91
<b>UK</b>	<b>47</b>	<b>63.7</b>	<b>0.73</b>
Canada	25	35.3	0.7



<b>Country</b>	<b>Hospital Name</b>	<b>Procedures</b>	<b>Specialties</b>
<b>United Kingdom</b>	<b>Guy's Hospital</b>	<b>495</b>	<b>1</b>
<b>United Kingdom</b>	<b>South mead Hospital Bristol</b>	<b>491</b>	<b>1</b>
<b>United Kingdom</b>	<b>Freeman Hospital Newcastle</b>	<b>458</b>	<b>6</b>

# European Multi-speciality Robotic Centres

Country	Hospital Name	Specialties
Finland	HUS / Meilahden sairaalat, LOS	6
United Kingdom	Freeman Hospital Newcastle	6
France	CHU de Rennes	5
Netherlands	Utrecht Medical Center (UNIVERSITAIR MEDISCH CENTRUM UTRECHT)	5
France	Hôpital Européen Georges Pompidou (HEGP)	5



# Cyberknife



**Targeting  
precision <0.2mm**

**Cranial and spinal  
<0.95mm**

**Moving targets  
with respiratory  
tracking 1.5mm**

# Additional Robotics Systems

**Neuromate**



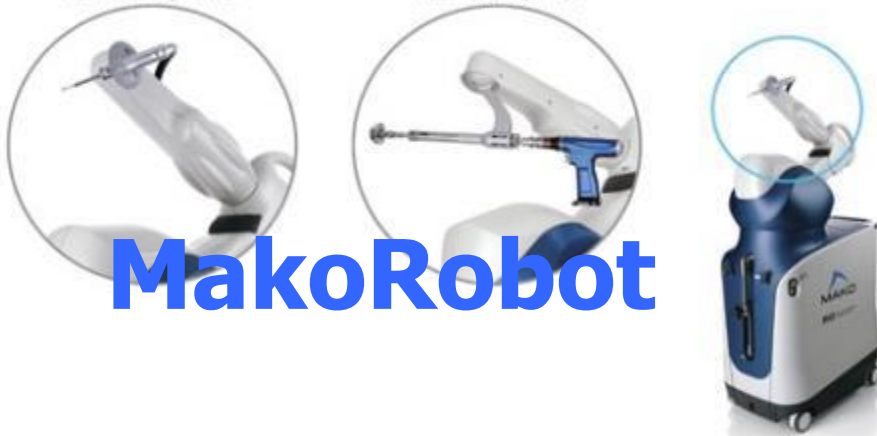
**ZEUS**



MAKOplasty® Knee

MAKOplasty® Hip

**MakoRobot**



**Robodoc**



RIO® Robotic Arm Interactive System

# Future of Robotic Surgery

A group of six men in 17th-century academic or clerical attire are seated around a table covered with a red cloth. They are dressed in dark, heavy clothing with prominent white collars and various styles of hats. The setting appears to be a formal meeting or a lecture hall, with wood-paneled walls in the background. The lighting is dramatic, highlighting the men's faces and the texture of their clothing.

**OPTIMISATION**

**MINITURISATION**

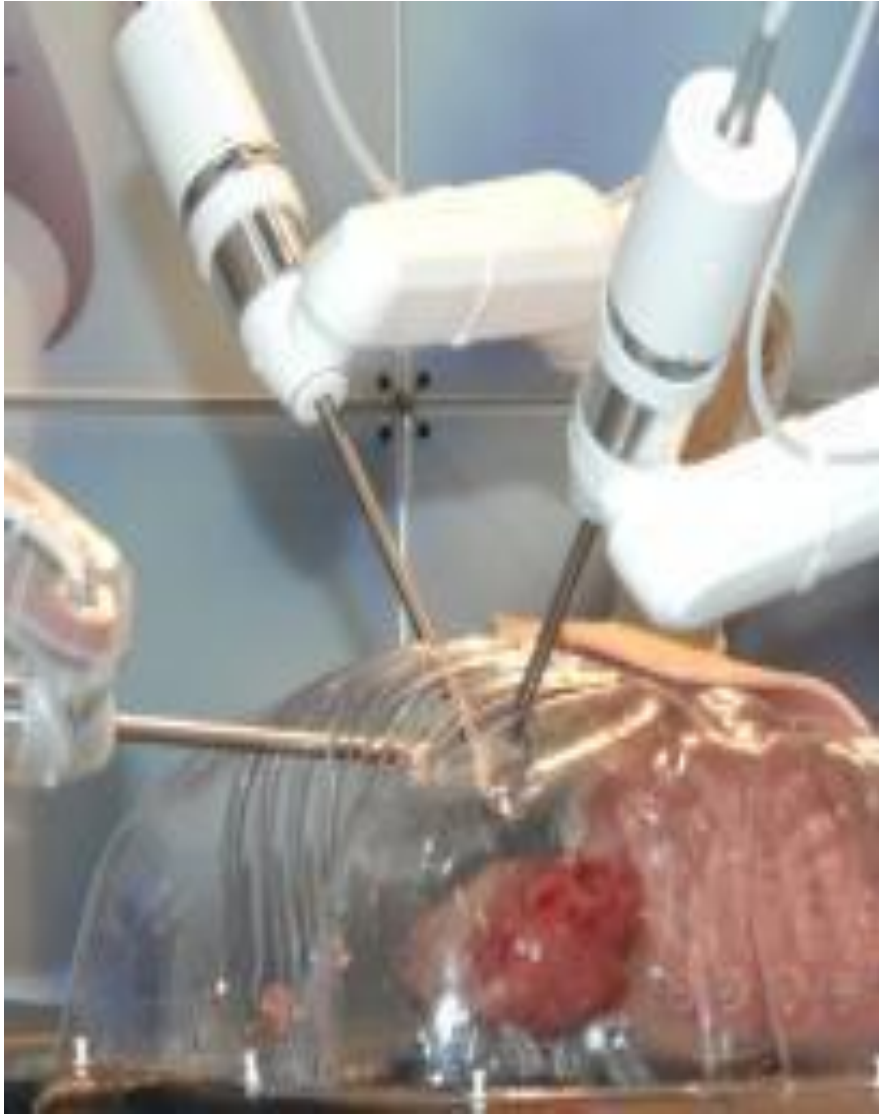
**INTRALUMINAL**

**IMAGING**

**INTEGRATED SURGICAL SYSTEMS**

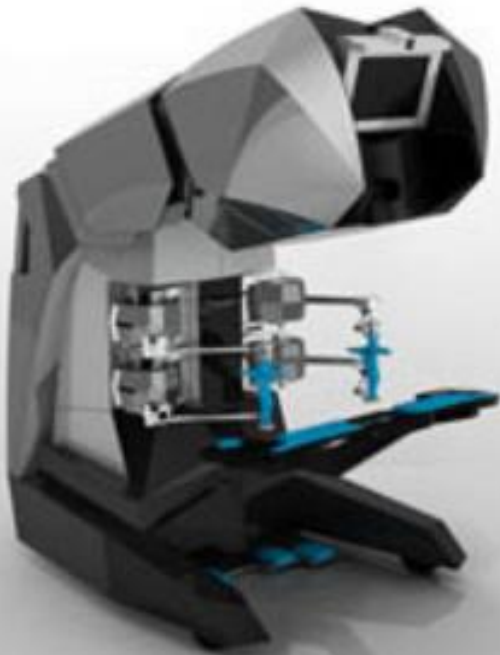


# Future Robotic Systems



# Amadeus

Titan Medical Inc. (CA)  
FDA submission 2014





# Miniaturisation



# Evolution of Cholecystectomy



**OPEN**

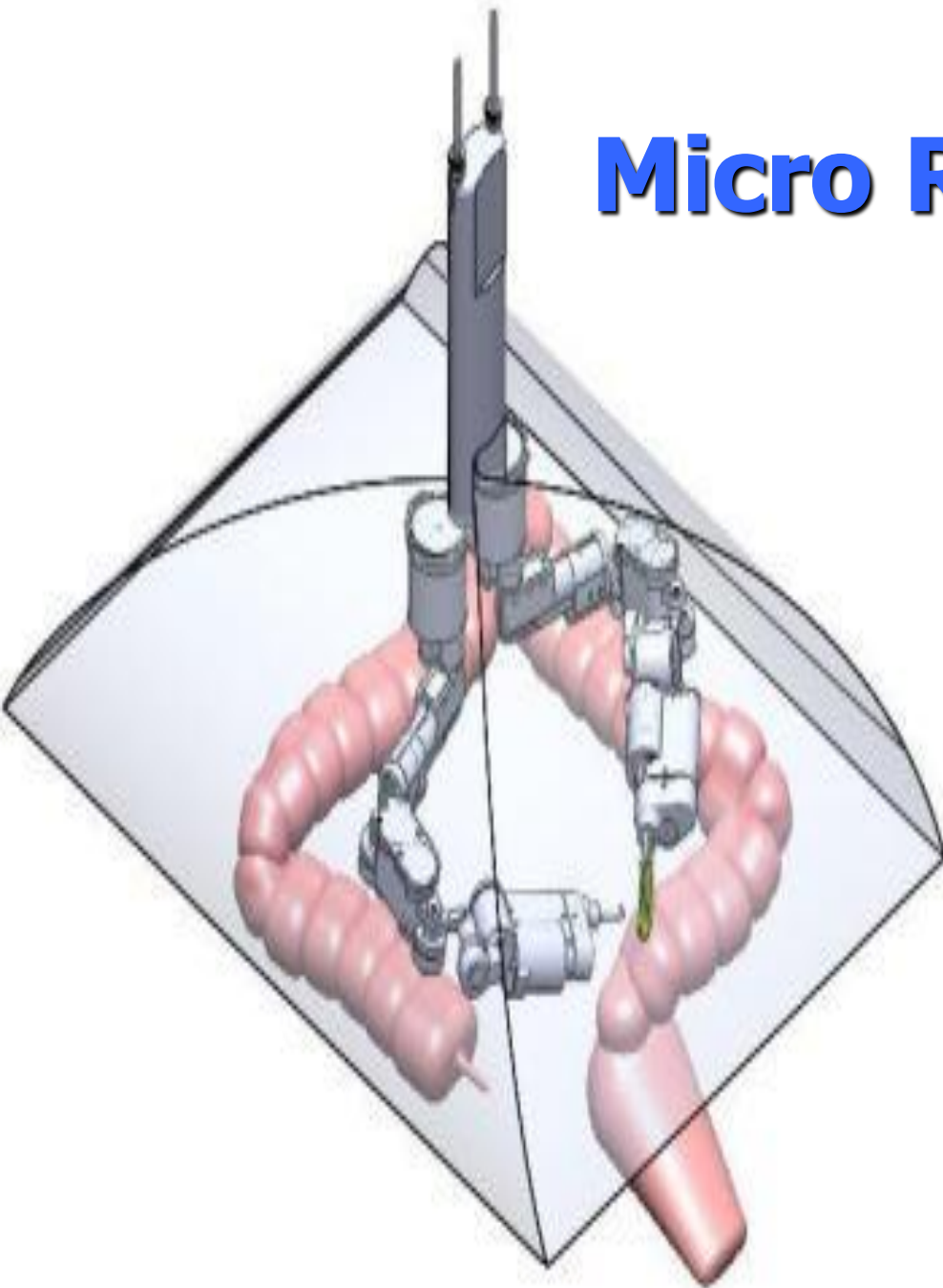


**LAPAROSCOPIC**



**SINGLE PORT**

# Micro Robots







**Intraluminal**



Artisan eXtend™  
Control Catheter

Designed to deliver catheter stability,  
reachability and contact force sensing.



IntelliSense®  
Contact Force Sensing

STABILITY PREDICTABLY



# Intra Vascular Robotic System

Sensei X  
Robotic System

Robotic catheterization for enabling  
intravascular procedures



Lynx®  
Robotic Ablation Catheter

Extend the potential of irrigated ablation  
with robotic catheter control.



# Endoscopic capsules-VECTOR



Screening capsule –no locomotion



Diagnostic capsule - magnetic locomotion and optical biopsy



Therapeutic capsule – diagnostic capsule + biopsy module (anal insertion preferable)





Imaging





# Image Fusion



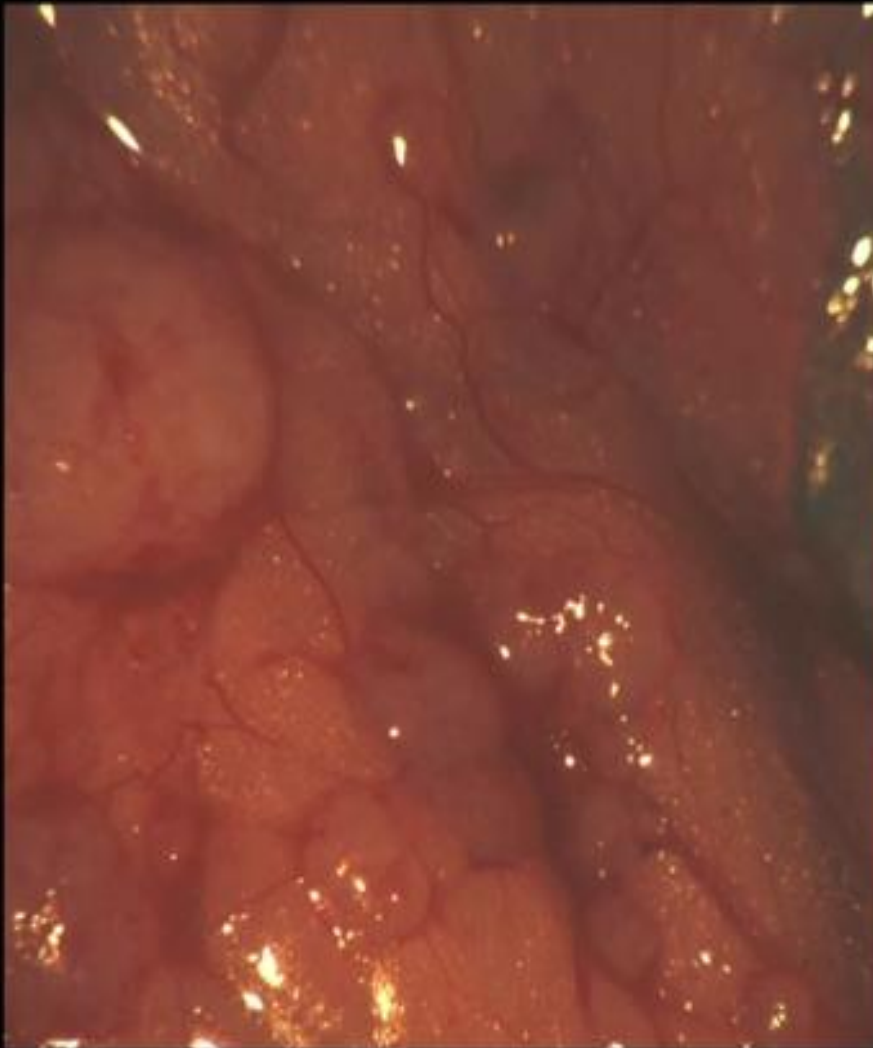
# What is Bioluminescence?

- The production of light by living organisms as a result of a chemical reaction either within certain cells or organs OR outside the cells in some form of excretion.
- Produced by the compound luciferin and the enzyme luciferase.

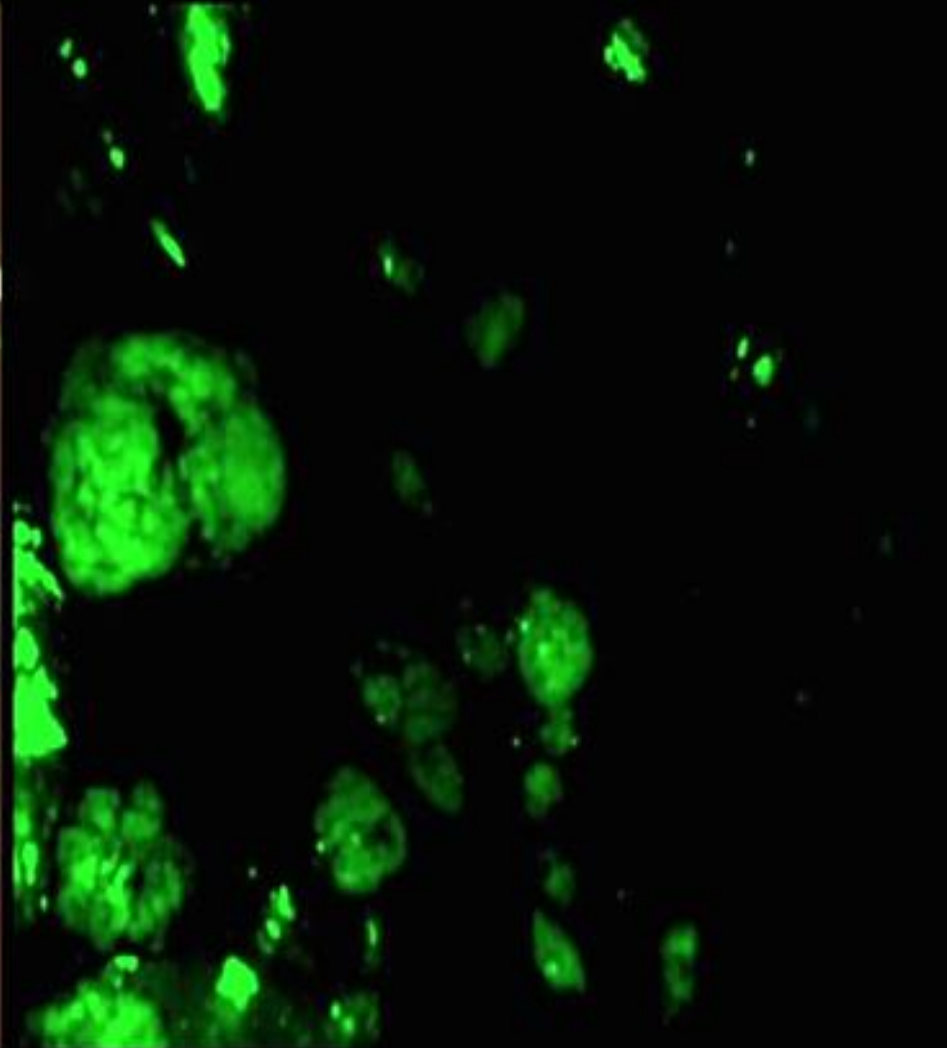


# In Vivo Imaging

Surgeon's former view

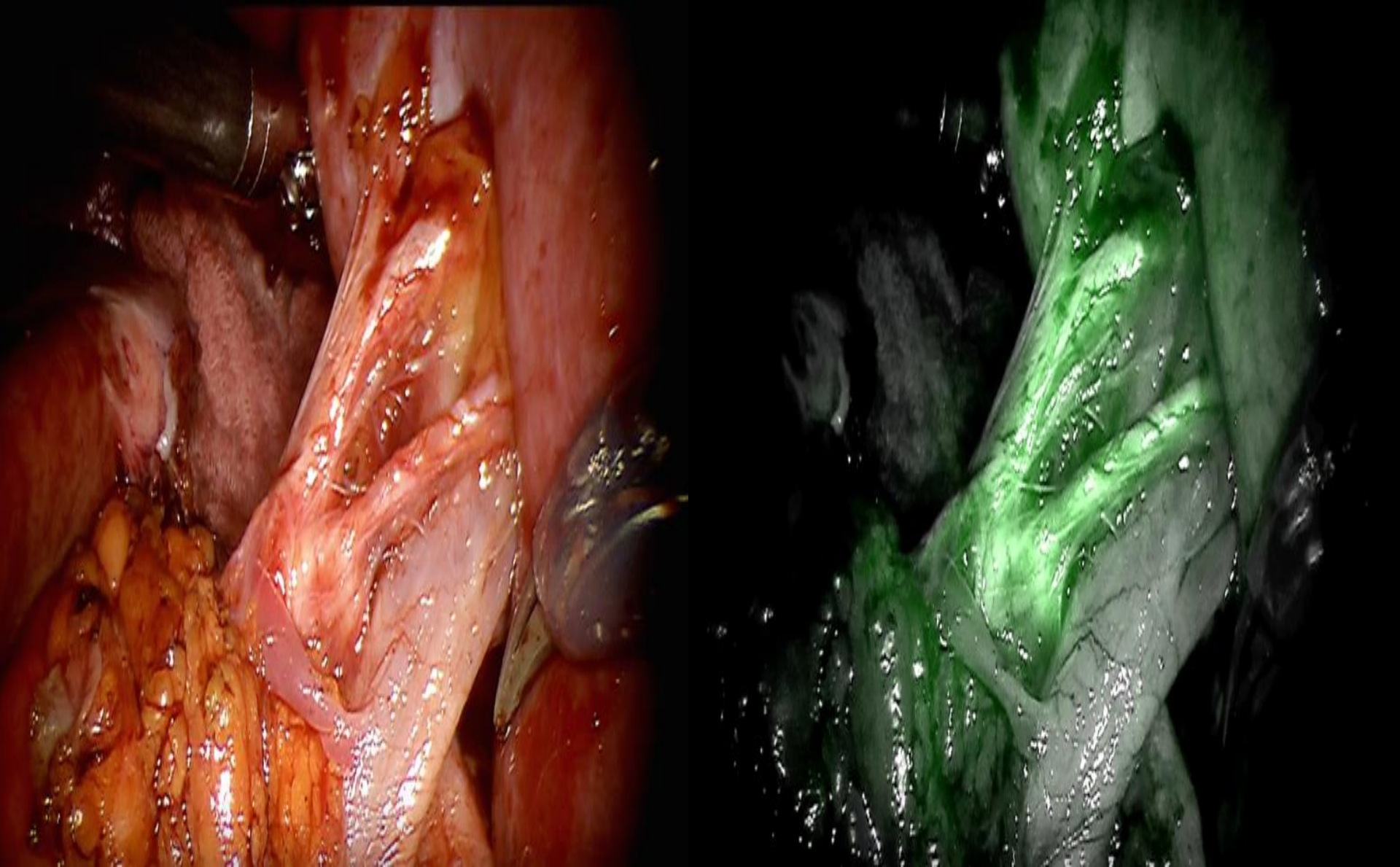


Surgeon's new view





# In Vivo Imaging



# Robotic Companies to Watch

a u r i s

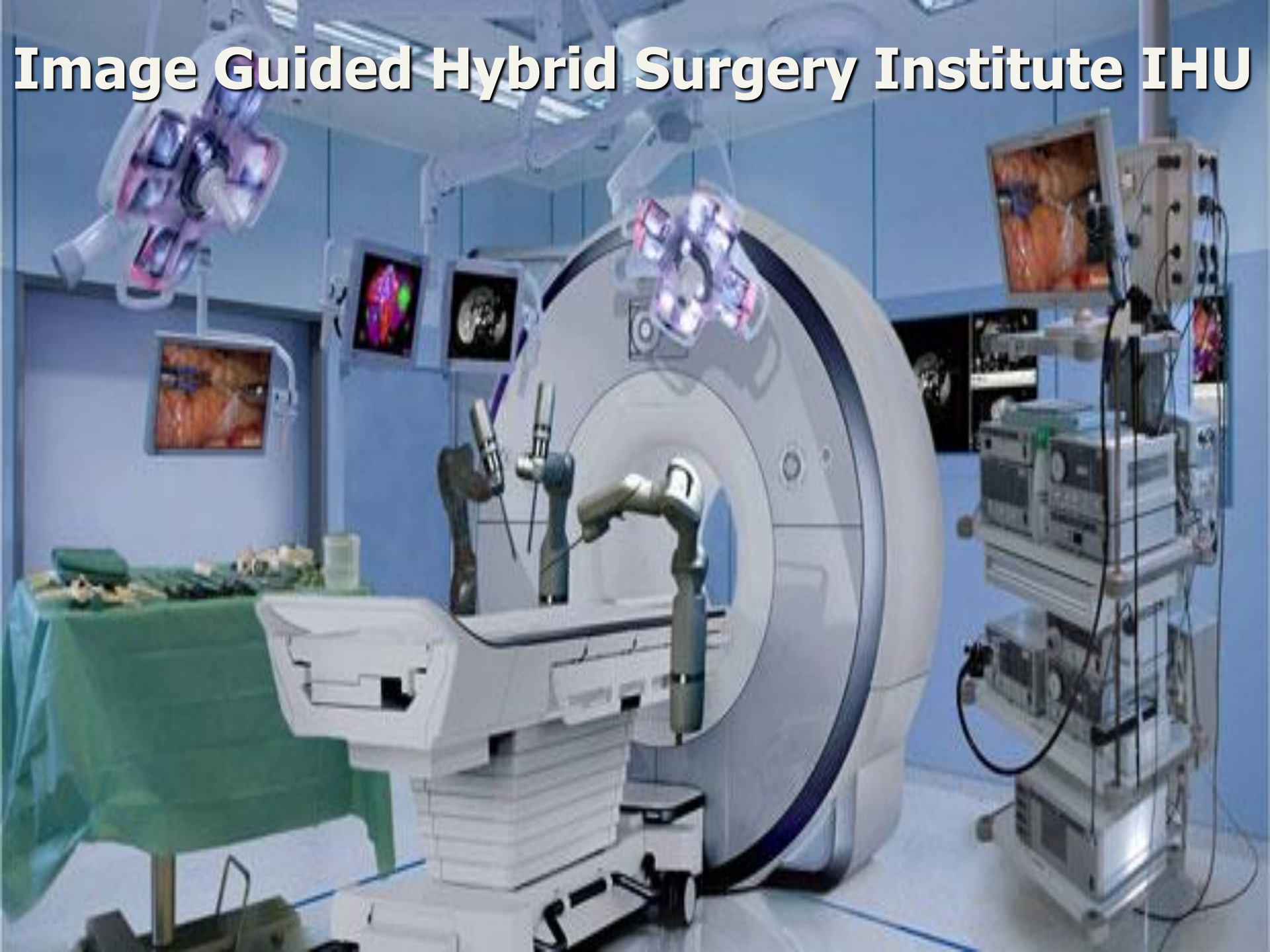


A dramatic painting depicting a group of men in 17th-century attire, possibly a scene of conflict or a medical procedure. The scene is set in a dark, dimly lit interior. In the foreground, a man in a red coat and a man in a yellow coat are prominent. The man in the red coat is holding a sword, and the man in the yellow coat is holding a dagger. In the background, several other men are visible, some wearing hats and armor. The overall atmosphere is one of tension and drama. The text "Integrated Surgical System" is overlaid in the center of the image.

# Integrated Surgical System



# Image Guided Hybrid Surgery Institute IHU



# Future Robotic Surgery

The background of the slide is a dark, atmospheric painting of a historical surgical scene. It depicts a group of men in a dimly lit, stone-walled room, possibly a cathedral or a large hall. The lighting is dramatic, with light streaming in from arched windows on the left, creating strong highlights and deep shadows. The figures are engaged in a medical procedure, with one man lying on a table and others gathered around him, some holding instruments. The overall mood is somber and historical.

- **Transcend human limitation in surgery**
- **Increase consistency and quality**
- **Promote better outcomes**
- **Cost effective surgical processes**



*da Vinci Xi*  
SURGICAL SYSTEM



ADVANCED INSTRUMENTS WITH  
WRISTED MOTION\*



FUTURE INNOVATION\*\*



INTEGRATED ENERGY



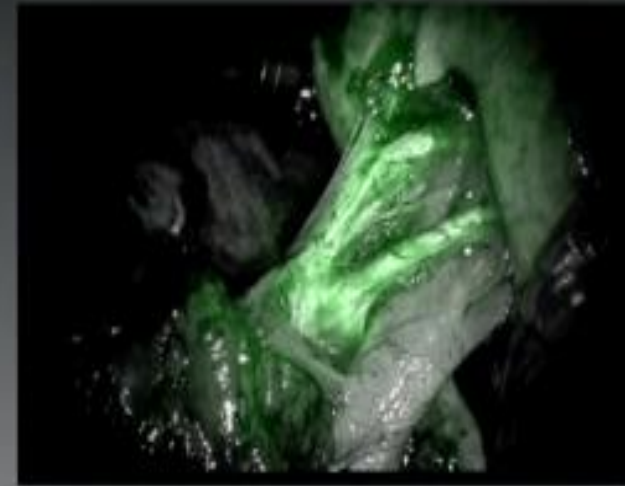
PRACTICE WITH SIMULATION



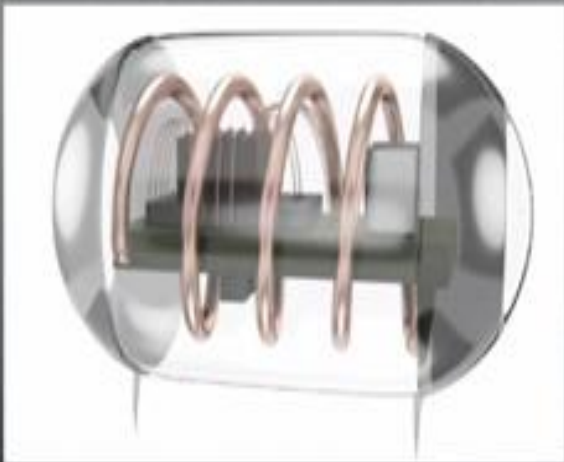
da Vinci Xi  
SURGICAL SYSTEM



REGENERATIVE MEDICINE



FLUORESCENCE IMAGING



IMPLANTABLES



AI INTEGRATION