Advances in Robotic Technology

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Disclosure

No Financial Relationships With Any of the Companies and Their Products
Do I Love Intuitive?
REMIND ME AGAIN HOW ROBOTIC SURGERY IS SAFE...

SCALPEL

DANGER PATIENT ROBINSON!
Why Robotics

- Less pain
- Faster recovery
- Less wound complications
- Less infections
- Less Blood loss and transfusions
- Shorter Hospital Stay
Technology Components

- Hardware, size
- Ergonomics
- Imagery
- Simulation
- Analytic Feedback on Learning Curve
- Cost

Clearly not there yet!
Specialties

- Urology
- Gynecology
- Otorhinolaryngology
- General Surgery
- Cardiac and Thoracic Surgery
da Vinci Surgery

da Vinci Procedure Volume Growth Rates**
** Growth Rates are calculated as a Compound Annual Growth Rate (CAGR)

All US daVinci Procedure Volume 2009-2013

24%
NY da Vinci Procedure Growth 2009-2013

NY da Vinci Procedure Volume 2009-2013

- Head & Neck
- Cardiac
- Thoracic
- General Surgery
- Urology
- GYN

Procedure Volume

2009  2010  2011  2012  2013

2009  2010  2011  2012  2013
DaVinci Surgery Has Enabled Minimally Invasive Surgery\textsuperscript{1} in Traditionally Open Procedures

\begin{itemize}
\item **Prostatectomy**
- 2003: 95% (4\%)
- 2005: 88% (10\%)
- 2013: 87% (12\%)

\item **Hyst-Malignant**
- 2005: 1\% (10\%)
- 2013: 2% (20\%)

\item **Hyst-Benign**
- 2005: 59\% (22\%)
- 2013: 33\% (30\%)

\end{itemize}
da Vinci is undeniably a powerful technology

NOT PERFECT!

There are several improvements and innovations that competitors could offer down the line that stand to greatly advance the field of robotic surgery.

Cost of the da Vinci system a problem

Imperative for improving value and reducing cost in accountable care
Competition

- Healthy
- Allows for more innovation
- Ultimately drives cost down
Competitors

- Titan’s Amadeus
- Titan Medical’s new *SPORT* system (Single Port Orifice Robotic Technology)
- SOFAR’S Telelap ALF-X (Now Transentereix)
- The Surgibot system (Transenterix)
Titan Medical Amadeus Prototype
Titan’s SPORT™ Surgical System
(Single Port Orifice Robotic Technology)
Titan’s Sport™ Surgical System

• a surgeon-controlled single incision robotic platform that includes a 3D vision system and interactive instruments through a single incision.

• a surgeon workstation provides the surgeon with an interface to the robotic platform and also provides a 3D endoscopic view

• The design contemplates a collapsible device that, when collapsed, would be capable of being inserted into the patient’s body cavity through a skin incision of approximately 25mm.
Titan’s SPORT™ System

- Once inserted, the device is configured to deploy into a working configuration wherein the 3D high definition vision system and interactive multi-articulating instruments would be capable of being controlled by a surgeon at the workstation.

- Cost ~ $800,000 vs $2.1 Mil for da Vinci
Mobile Unit!
**SURGEON CONTROLS**

Enabled user to control robotic instruments through one-to-one movements of the surgeon controllers.

Controls system requires minimal learning curve and is a natural extension of the users' arms.

Developed simulation and training system.
Telelap ALF-X
Telelap ALF-X

INNOVATIVE ADVANTAGES FOR PATIENT AND SURGEON
Telelap ALF-X

- Flexible platform for different specialties
- Up to 4 manipulating arms
- Tactile feedback
- 3D-HD eye-tracking system
- Ease of use to the surgeon and the whole team
- Shorter surgical procedures
- Reusable instruments

Therefore more accessible and less costly
Telelap ALF-X

- Each manipulate arm is universal and interchangeable.
- It can maneuver the endoscope (or any other surgical instrument) and has an interface for any type of surgical instrument, whether single- or multi-purpose.
- This modularity and adaptability, coupled with the low cost of its instrumentation make it attractive for all surgical disciplines.
Telelap ALF-X

- TELELAP ALF-X gives the surgeon the possibility to maneuver as if using standard laparoscopic handles which naturally
- Speeds up familiarization and initial training
- Does not alter the movements of the traditional laparoscopic surgery, but increases its efficacy, precision and quality.
- Allows sharing the 3D view and hence enhances communication with the other surgeons present in the operating room.
SurgiBot System (Transenterix) 1\textsuperscript{st} Patient Side Robotic Platform
SurgiBot System (Transenterix)
SurgiBot System (Transenterix)

- NC based Research Park Triangle (RPT) company
- Robotically enhanced laparoscopy
- 1st surgical platform designed to address economic and clinical challenges associated with current laparoscopic and robotic options.
- A market-expanding technology with a compelling value for a wide variety of surgical facilities
SurgiBot (Transenterix)

- Currently in process of FDA clearance
- Recently acquired Telelap ALF-X from Italian company SOFAR for reported $100M
- This combination accelerates the commercialization timeline and revenue ramp as can immediately begin selling the ALF-X in many markets globally.
Issue of Learning Curve

- Competitor’s aim at long LC associated with da Vinci

Two problems:

- Longer ORT drives up the cost of surgery
- Inexperienced surgeons likely to have worse outcomes
Overcoming The Learning Curve

- Increasing flexibility and accuracy of the instruments
- Incorporating haptic feedback
- Improving visualization with superimposed imagery
- Virtual Reality surgery
- Improving surgical simulation with real life surgical simulation modules

(We are not there yet!)
Improving Visualization

Titan’s SPORT
Improving the Learning Curve

- eye-tracking technology allows surgeons to activate instruments, manipulate endoscopes, and control visualization by simply directing their gaze to various parts of the screen.

- This feature also has a safety component: the eye-tracking technology would halt an operation automatically whenever the surgeon’s gaze moves away from the surgical field.
Reducing The Cost Impact

- We need a cheaper alternative.
- Initially Amadeus system $< 600K,
- Titan’s SPORT $800,000
- Telelap between $1M and $1.3M,
- The Telelap even features reusable instrumentation, which eliminates some of the ongoing costs that can add up to thousands of dollars per case.
Advances in Imaging and Virtual Surgical Planning for Robotic Partial Nephrectomy
Dilemma
Resection Planning
Robotic Ileal Conduit
isolation of 15 cm distal ileum
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