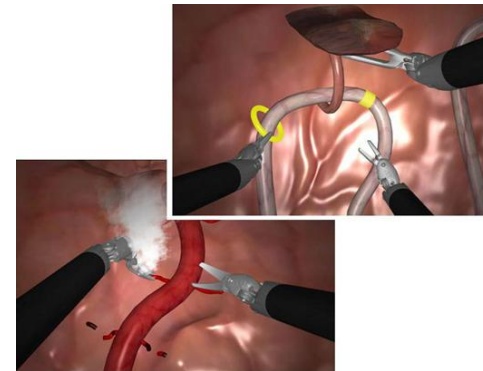


dV-TRAINER™

Skills Training for Robotic Surgery



m mic®

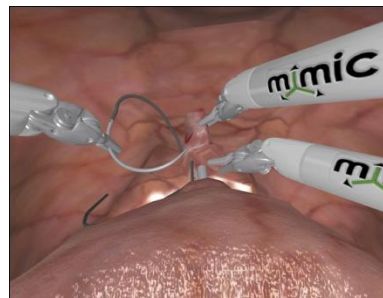
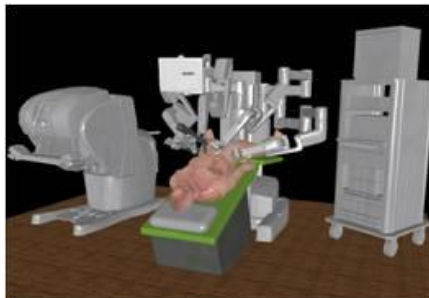
The Leader in Robotic Surgery Simulation

Outline

- **Mimic Company Background**
- **dV-Trainer™ Overview**
- **dV-Trainer™ Benefits**
- **Accurate & Realistic Simulation**
- **Exercise Modules - *MSim*™**
- **Performance Metrics - *MScore*™**
- **Mimic's Research Partners**
- **Validation Studies**

Mimic Technologies Background

- **Founded in 2001**
 - HQ in Seattle, WA
 - Spin-out from University of Washington
- **Business and Research Focus**
 - Robotic Simulation – dV-Trainer™
 - Force Feedback Device Technology
- **Funding**
 - Department of Defense (DARPA & TATRC)
 - Service and Product Revenue
- **Relationships**
 - Collaboration with Intuitive Surgical since 2003
 - 30+ Medical Institutions / Research Partners

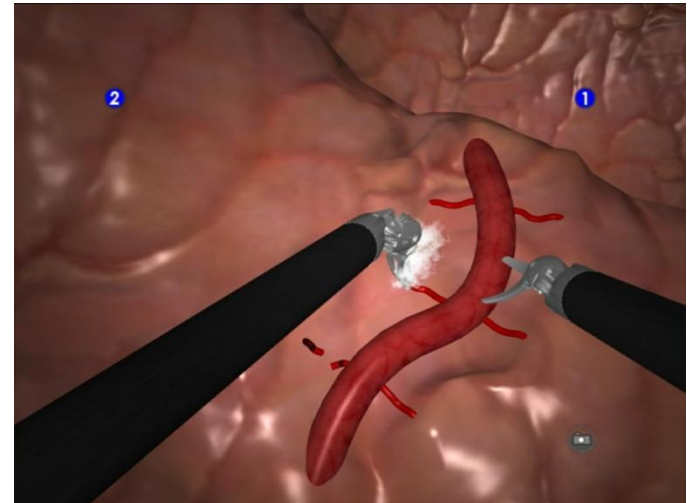


Mimic's dV-Trainer™

Overview

dV-TRAINER™

- **Skills trainer for robotic surgery**
 - Simulates the Surgeon Console of the *da Vinci*® Surgical System
 - Cost-effective “off-line” alternative to learning directly on robot
- **Target Users**
 - Surgeon with < 10 robotic cases
 - Surgery residents / fellows
- **Target Applications**
 - *da Vinci* training for novices
 - Skill retention / rehearsal
 - Surgeon credentialing / privileging
 - Academic research
- **Currently placed at 30+ Sites**

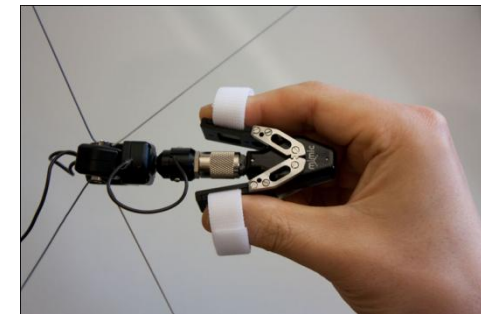


dV-Trainer™

Benefit Highlights

dV-TRAINER™

- **Cost-effective da Vinci Training**
 - Access to da Vinci robot not required
 - No set-up of robot
 - Does not degrade instruments
- **Improved da Vinci Utilization**
 - Frees up the clinical robot for revenue generating procedures
 - Speeds up surgeon learning curve
- **Accelerated Surgeon Training**
 - Accurately replicates kinematics, controls and instruments the da Vinci system
 - Comprehensive & validated exercises
- **Improved Patient Safety**
 - Surgeons can practice off-line before first proctored cases

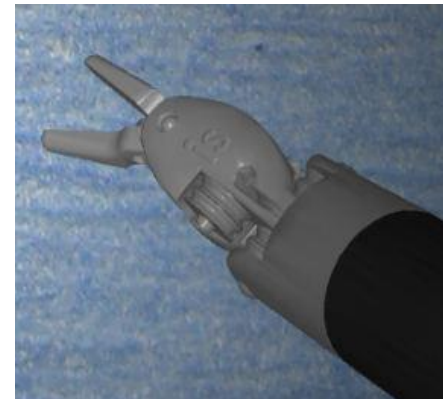
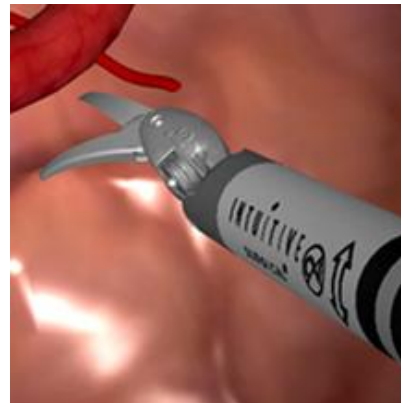
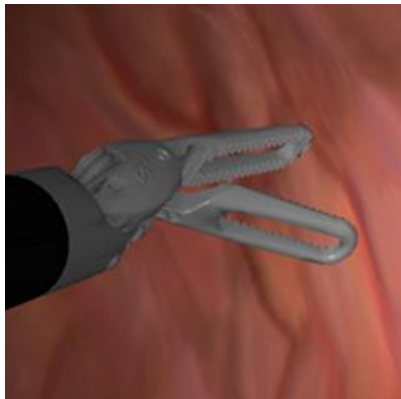
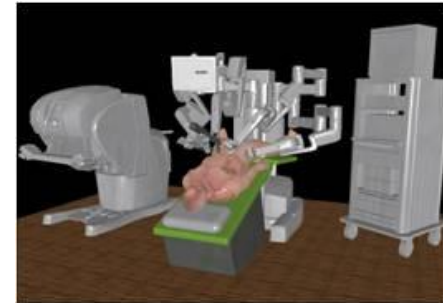


dV-Trainer™

Accurate, Realistic & Future Proof Simulation

- **Relationship with Intuitive Surgical:**
 - Accurate modeling of robot kinematics
 - Realistic icons and instruments
 - Product development insight
→ Future proof simulation platform
- **Mimic is providing on-board simulation for the Si Surgeon Console**

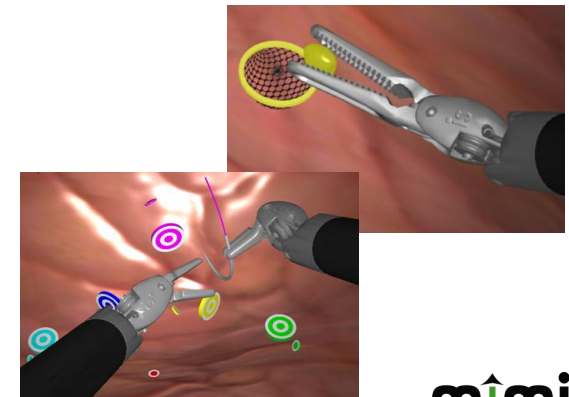
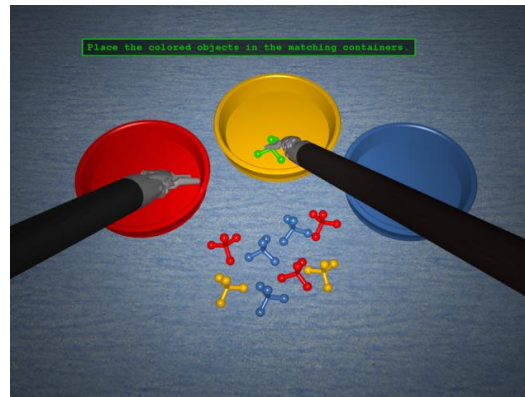
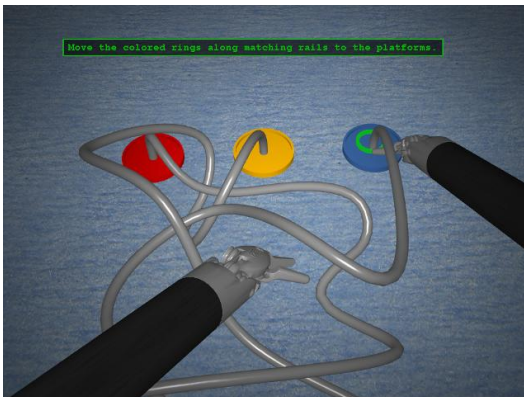
INTUITIVE
SURGICAL®



dV-Trainer™

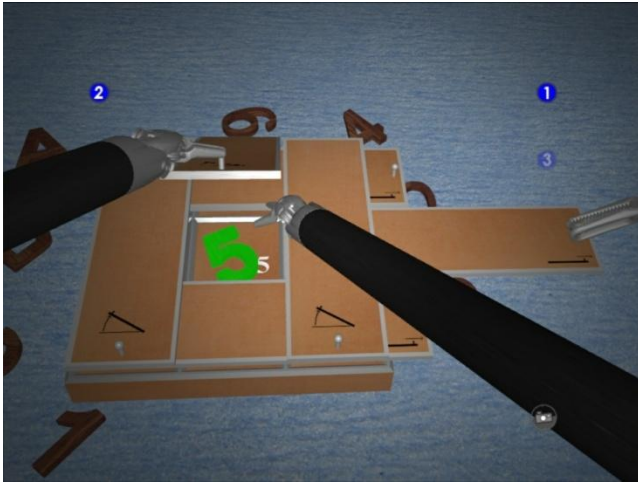
Training Modules - MSim™

- Built on *MSim™* - Mimic's surgical simulation platform
- 8 training modules
- 35+ realistic exercises
- Developed in collaboration with Research Partners
- Many exercises based on actual physical models
- Multiple validation studies

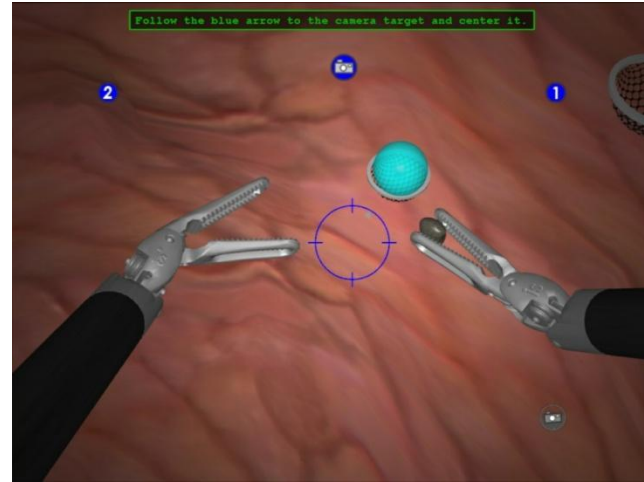


dV-Trainer™

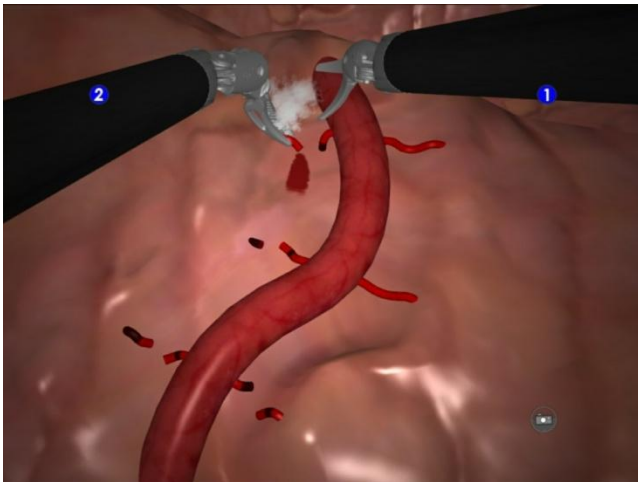
Examples - Training Modules



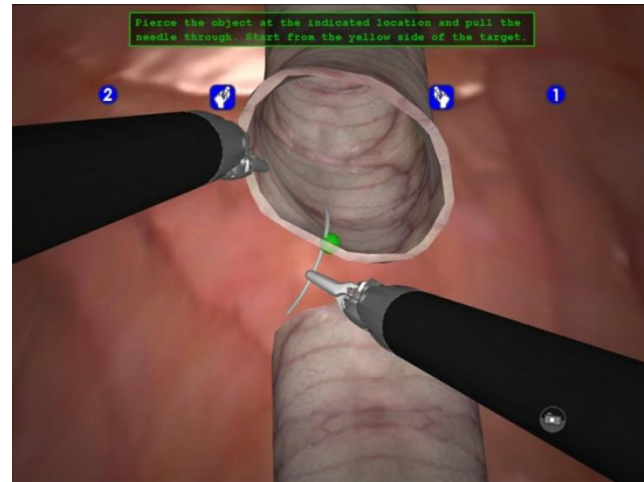
EndoWrist® Manipulation



Camera & Clutching



Energy Management

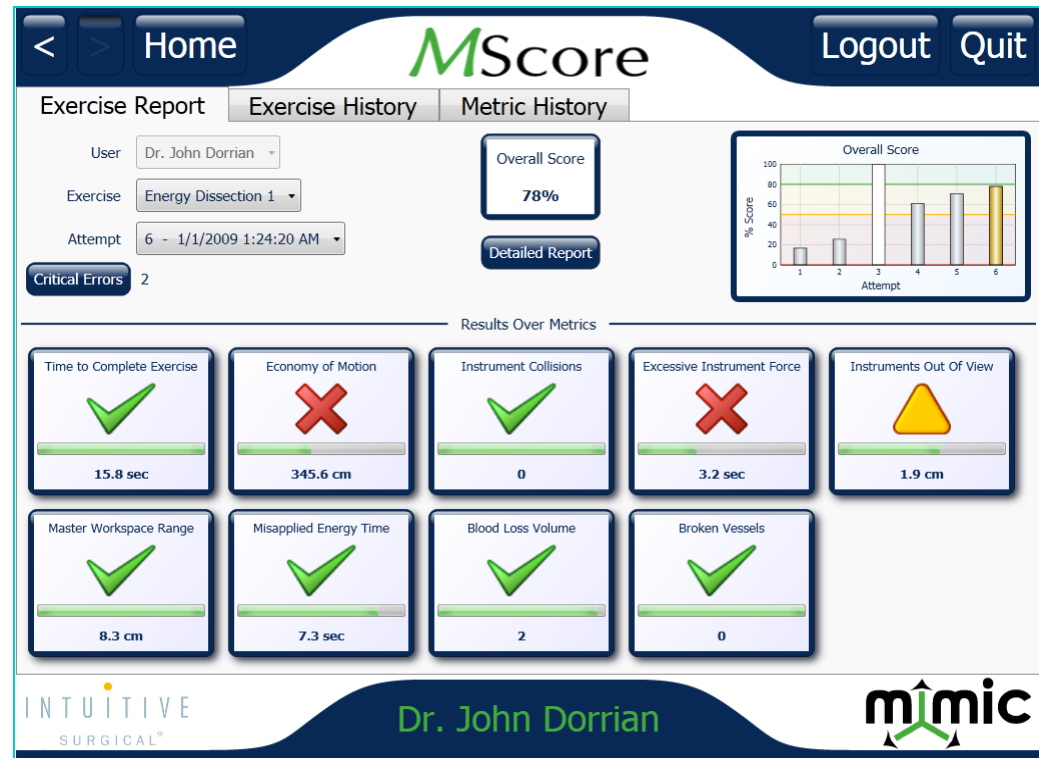


Needle Driving

dV-Trainer™

Performance Evaluation - MScore™

- Mimic's MScore™ for Comprehensive Metrics:
 - Time to Completion
 - Economy of Motion
 - Instrument Collisions
 - Number of Drops
 - Instruments Out of View
 - Master Workspace Range
 - Overall Score
- Learning History
- Credentialing / Privileging
- Research / Data Collection
- Admin Tools for Course Management
- Customizable Menus





Home

Logout

Quit

Exercise Report

Exercise History

Metric History

User: Dr. John Dorrian

Exercise: Energy Dissection 1

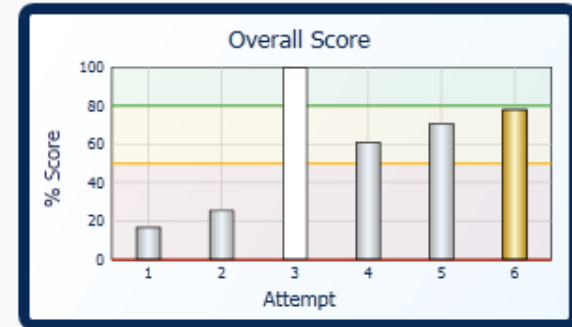
Attempt: 6 - 1/1/2009 1:24:20 AM

Overall Score

78%

Detailed Report

Critical Errors: 2



Results Over Metrics

Time to Complete Exercise



15.8 sec

Economy of Motion



345.6 cm

Instrument Collisions



0

Excessive Instrument Force



3.2 sec

Instruments Out Of View



1.9 cm

Master Workspace Range



8.3 cm

Misapplied Energy Time



7.3 sec

Blood Loss Volume



2

Broken Vessels



0

Customers & Research Partners

US & Canada:

Akron General Medical Center
Columbia University
Detroit Medical Center
Eastern Virginia Medical School
Indiana University
Intuitive Surgical
Lahey Clinic
Madigan Army Medical Center
MultiCare Health System
Naval Medical Center
New York University
Riverside Methodist Hospital
Stamford Hospital
Uniformed Services University
University of British Columbia
University of California, Irvine
University of Illinois at Chicago
University of Minnesota
University of Pennsylvania
University of Texas
University of Utah
University of Virginia
University of Washington
University of Western Ontario
University of West Florida

Japan:

Fujita Health University
Gifu University
Hirosaki University
Hiroshima University
Kyoto University
Nagoya University
Tokushima University
Tokyo Medical University

Europe:

University College Hospital
University Hospital of Nancy

Korea:

Korea University

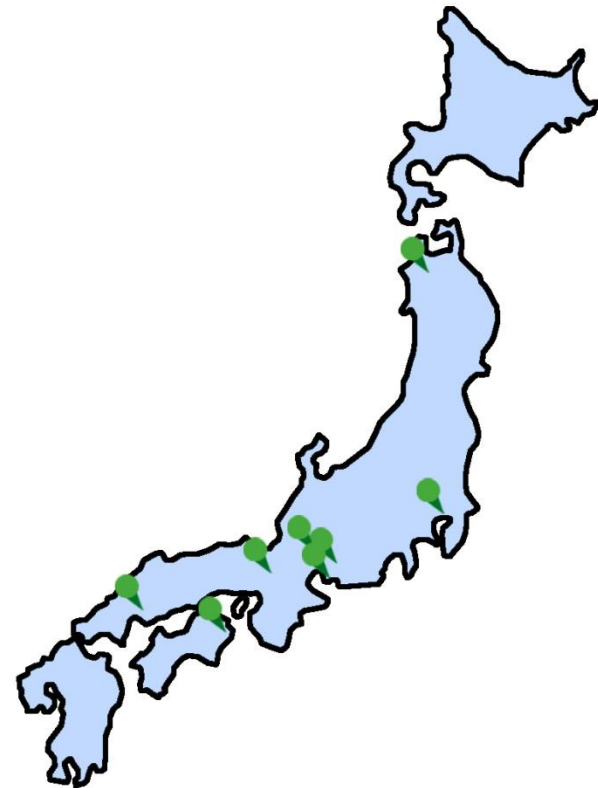


Customers & Research Partners

Indiana University Department of Urology	Feb-2007	Akron General Medical Center Department of Obstetrics and Gynecology	Apr-2009
Intuitive Surgical U.S. Headquarters	Jun-2007	Madigan Army Medical Center Urogynecology & Pelvic Reconstruction Surgery	May-2009
University of British Columbia CESEI	Jun-2007	MultiCare Health System Robotics and Minimally Invasive Surgery	May-2009
University of Minnesota Center for Research in Education and Simulation	Sep-2007	University of Texas M. D. Anderson Cancer Center	Jul-2009
University of Virginia Department of Urology	Nov-2007	Korea University Department of Colorectal Surgery	Aug-2009
Lahey Clinic Center for Minimally Invasive Urologic Surgery	Mar-2008	University of West Florida Institute for Human and Machine Cognition	Dec-2009
Columbia University Minimally Invasive Urology	Jun-2008	Eastern Virginia Medical School Department of Urology	Jan-2010
University of California, Irvine Minimally Invasive Surgery Education Center	Aug-2008	Uniformed Services University Department of Obstetrics and Gynecology	May-2010
University College Hospital Section of Laparoscopic Urology	Sep-2008	University of Illinois Division of Minimally Invasive, General & Robotic Surgery	Jun-2010
University Hospital of Nancy Department of Urology	Sep-2008	New York University Department of Urology	Sep-2010
University of Pennsylvania UPHS Robotic Training Center	Jan-2009	Naval Medical Center Medical & Surgical Simulation Center	Nov-2010
Stamford Hospital Department of Surgery	Feb-2009	Detroit Medical Center Sinai-Grace Hospital	Dec-2010
University of Utah Urologic Oncology	Feb-2009	University of Western Ontario Robarts Research Institute	Pending
University of Washington Institute of Surgical Intervention & Simulation	Feb-2009	Riverside Methodist Hospital Center for Medical Education and Innovation	Pending

Customers - Japan

Tokyo Medical University	Jan-2011
Hiroshima University	Jan-2011
Hirosaki University	Feb-2011
Gifu University	Mar-2011
Kyoto University	Mar-2011
Fujita Health University	Pending
Nagoya University	Pending
Tokushima University	Pending



Validation Studies

- **Validation studies needed to assess:**
 - Face Validity (realistic?)
 - Content Validity (useful as training tool?)
 - Construct Validity (novice vs. expert?)
 - Concurrent Validity (correlates with dry-lab?)
 - Predictive Validity (predicts OR performance?)
- **The dV-Trainer is the only robotic simulator that has been independently validated to show face, content, construct, and concurrent validity**
- **Predictive validity studies are underway**



Seattle Children's
HOSPITAL · RESEARCH · FOUNDATION

UW Medicine
SCHOOL OF MEDICINE

UNIVERSITY OF VIRGINIA
SCHOOL of MEDICINE

INDIANA UNIVERSITY
SCHOOL OF MEDICINE

PURDUE
UNIVERSITY.

Lahey
CLINIC

KOREA
UNIVERSITY

UNIVERSITY
OF MINNESOTA

Validation Studies

#	Study	Publication Date	Authors	Institution	Confirmed Validity
1	"Initial validation of a virtual-reality robotic simulator"	<i>J of Robotic Surgery</i> Sep 2008	<i>Dr. Lendvay, et al.</i>	U of Washington U of Minnesota U of Virginia	Face Content Construct
2	"Validation of a Novel Virtual Reality Robotic Simulator"	<i>J of Endourology</i> Mar 2009	<i>Dr. Sundaram, et al.</i>	Indiana University Purdue University	Face Content Construct
3	"Face, Content, and Construct Validity of dV-Trainer, a Novel Virtual Reality Simulator for Robotic Surgery"	<i>J of Urology</i> Jun 2009	<i>Dr. Moinzadeh, et al.</i>	Lahey Clinic Medical Center	Face Content Construct
4	"Does Training on a Virtual Reality Robotic Simulator Improve Performance on the da Vinci® Surgical System"	<i>J of Endourology</i> Mar 2010	<i>Dr. Lerner, et al.</i>	Indiana University Purdue University	Concurrent
5	"Validation study of 3D virtual robot simulator as robot surgery training system"	<i>J of Korea Colectal Surgery</i> April 2011	<i>Dr. Cho, et al.</i>	Korea University	Concurrent

Validation Studies

#	Institutions	Study Objectives
1	Akron General Hospital	Concurrent Validity for Skills Retention
2	Columbia University	Face, Content , and Construct Validity Assessment of Resident Training Curriculum
3	Indiana University	Predictive Validity
4	Johns Hopkins University	Training Assessment Across Training Platforms (dV-Trainer, Skills Simulator, Dry Labs)
5	New York University University of Illinois, Chicago University of Nancy (France) Uniform Services University	Optimum Curriculum for Accelerated Learning
6	UC Irvine	Face, Content , Construct and Concurrent Validity
7	University Medical Centre Utrecht (Netherlands) Lund University (Sweden)	Face, Content , and Construct Validity
8	University of Washington	Value of Surgical Warm-Up

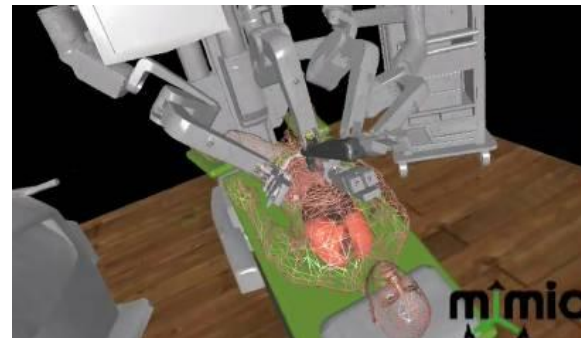
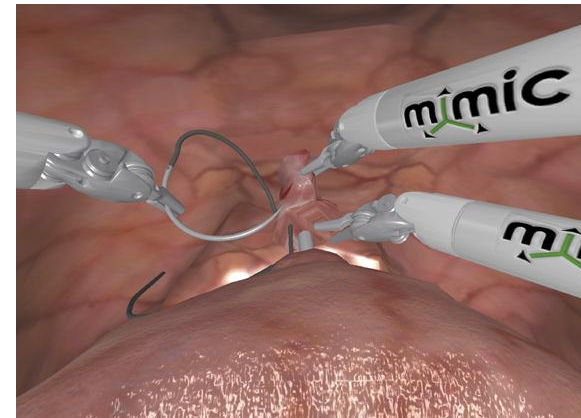
Potential Future Applications

Development Roadmap:

Basic Skills >> Task Training >> Procedure Training

- Suturing & Knot Tying
- Prostatectomy
- Hysterectomy

- Team Training
- Port Placement
- Prototyping



Thank You!

dV-TRAINER™

Skills Training for Robotic Surgery

