

PET 2018



WEO Program for Endoscopic Teachers, Singapore 2018

Endoscopic Simulators – Current Status

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Possible conflicts of interest*

None related to this talk

Objectives

- Describe the available simulators
- Describe the utilization, capabilities and limitations of simulators
- Explain how simulators may be incorporated into endoscopic training

Endoscopic Simulators

- Animal Models
- Mechanical Simulators
- Bio-simulators-Ex-vivo Models
- Computerized Simulators

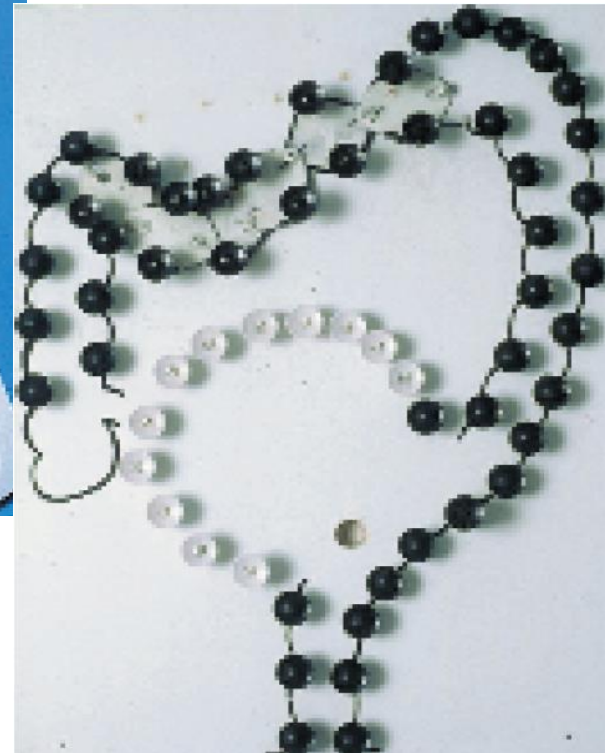
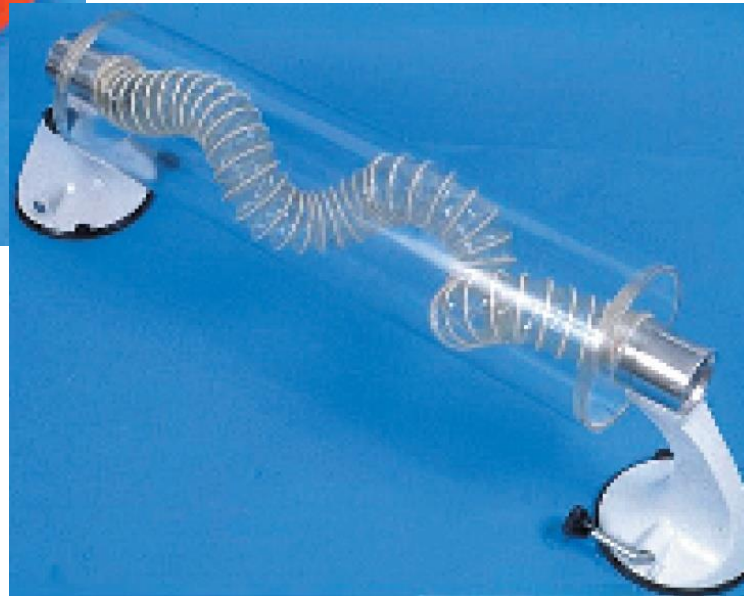
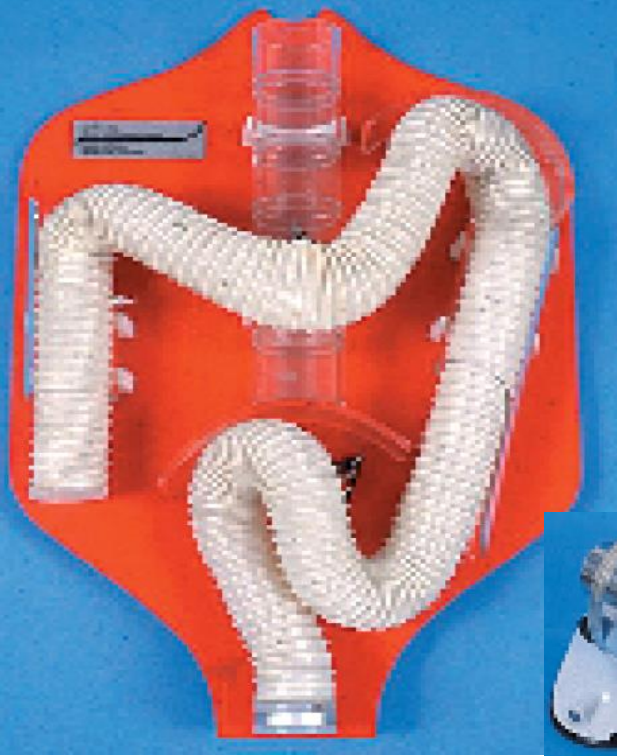


Animal Models

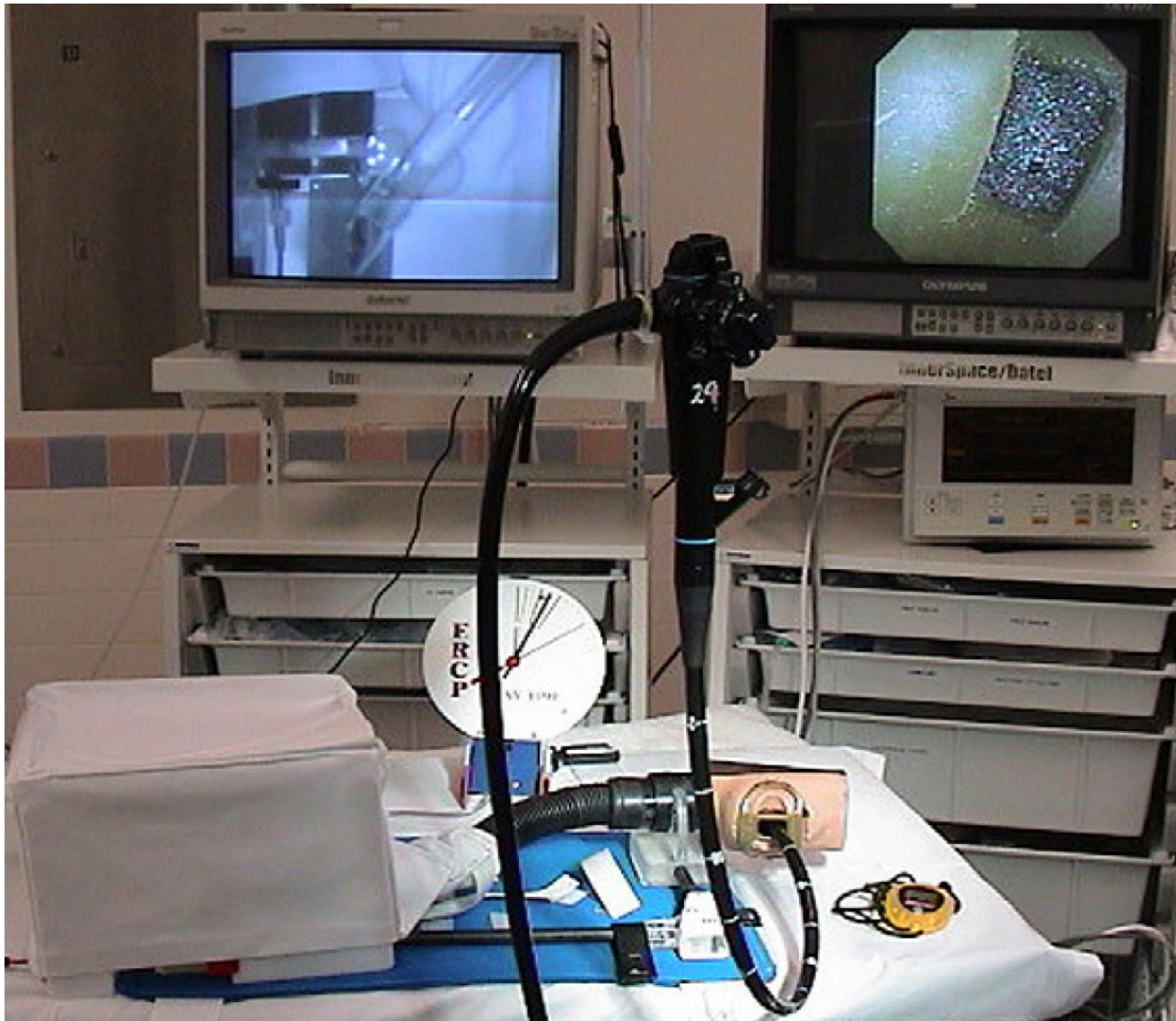
Limited Usage 2017

- Survival trials of new techniques
- Advanced techniques where bleeding and motility are needed prior to human experience e.g., ESD training

Mechanical Simulators



Development of a novel ERCP mechanical simulator



Joseph W. Leung et al Gastrointest Endosc 2007

The Box Simulator

A Promising Step Forward

- Inanimate low cost model designed with MIT engineers based on deconstructing key tasks
- Presently five 5 minute skills stations
- Intended to teach and assess colonoscopy specific skills

Endoscopy Training Box

- Polypectomy
- Retroflexion
- Ring Torque
- Tip Deflection
- Navigation / Loop Reduction



Summary of the NYSGE box trainer data (12/15/11-12/16/11)

Level	Mean total box score	Range
Novice (N = 2)	90	50-130
Fellows (N = 2)	253	150-356
Private practice (N = 5)	417.4	281-504
Attendings (N = 3)	541	409-649
Interventional attendings (N = 7)	879.6	555-1072
Others (N = 1)	Excluded; technician already knew how to scope	

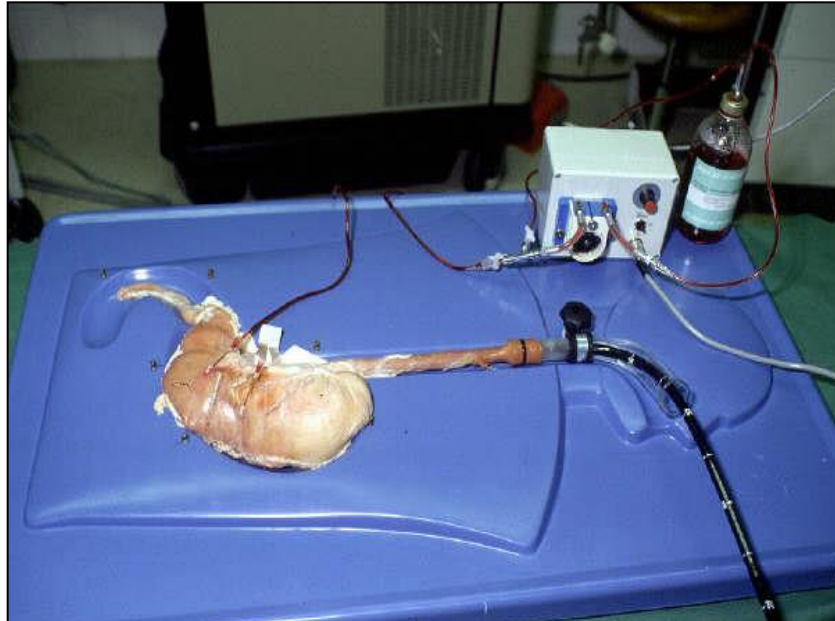
The Box Simulator in Action:

Endoscopy Training Box

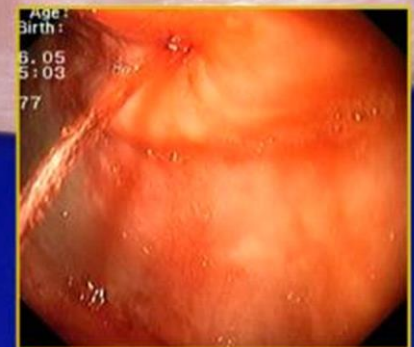
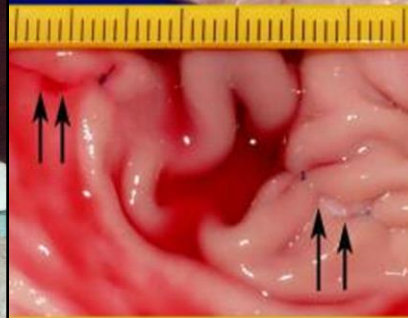
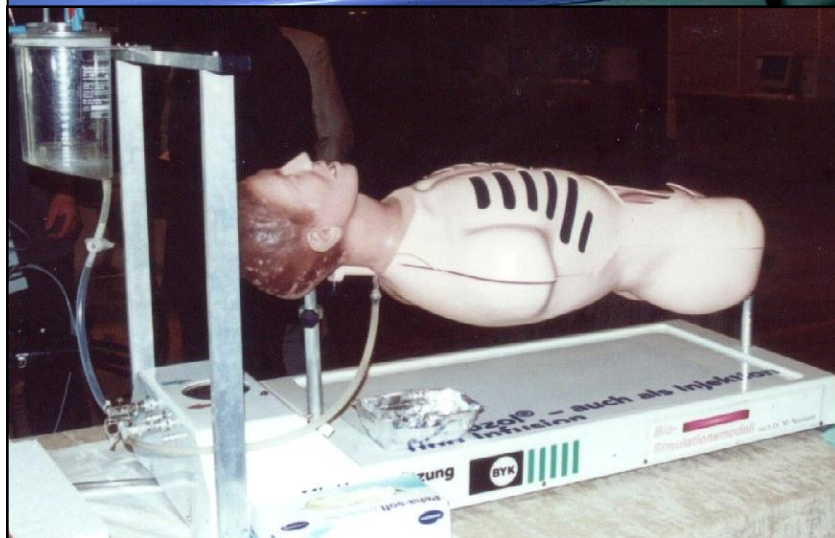
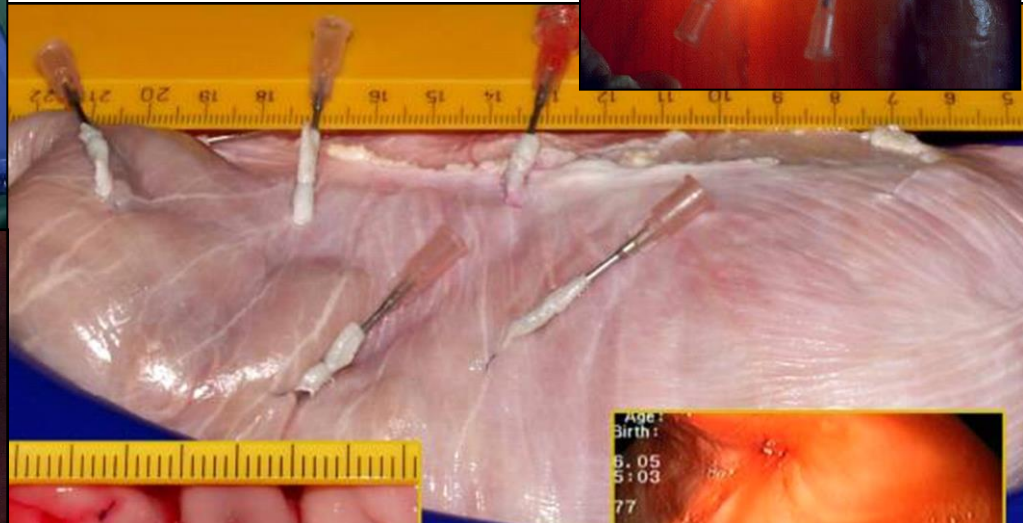
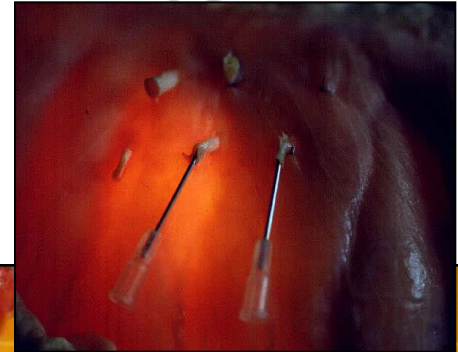
- Polypectomy
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The Biosimulator Ex-vivo Models

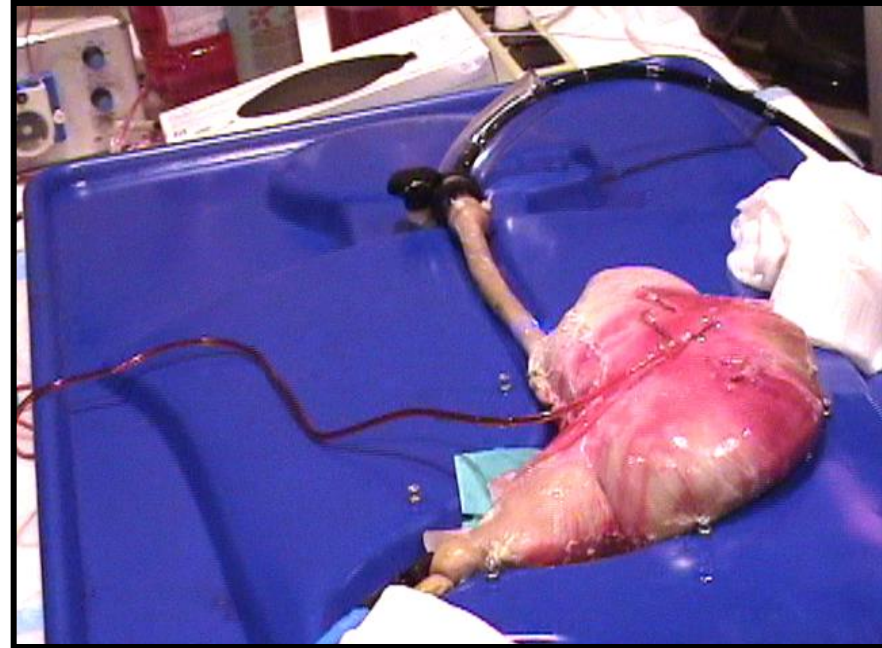
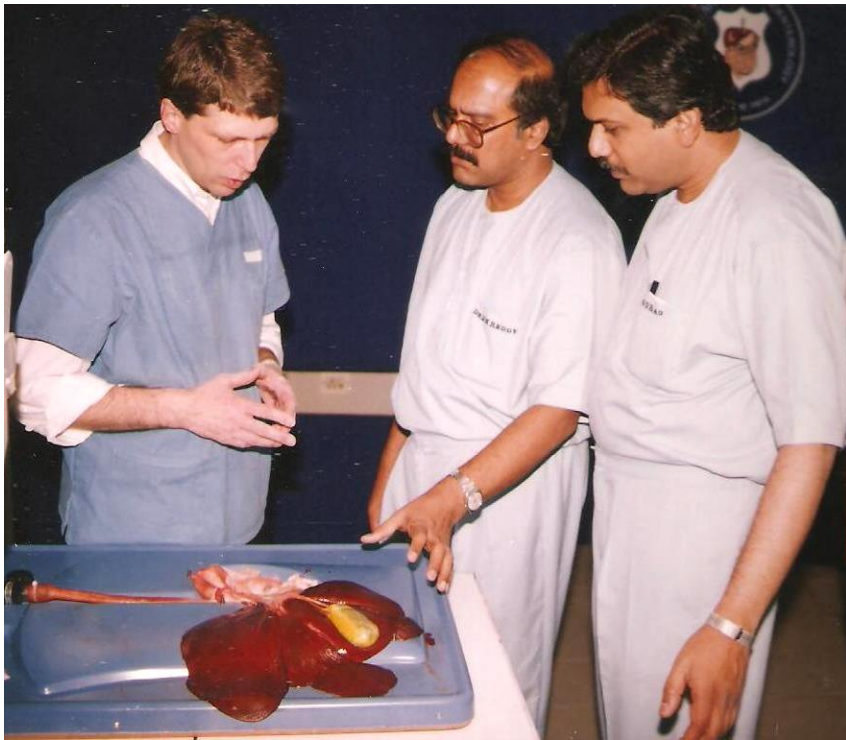


**Erlangen Active Simulator for
Interventional Endoscopy
(EASIE)**



A Turning Point in Simulator Training

Toronto Live course Oct 1995:
Juergen Hochberger introduces
EASIE model to a gasping
audience, fooling senior faculty
panel with realism of bleeding
Dieulafoy simulation

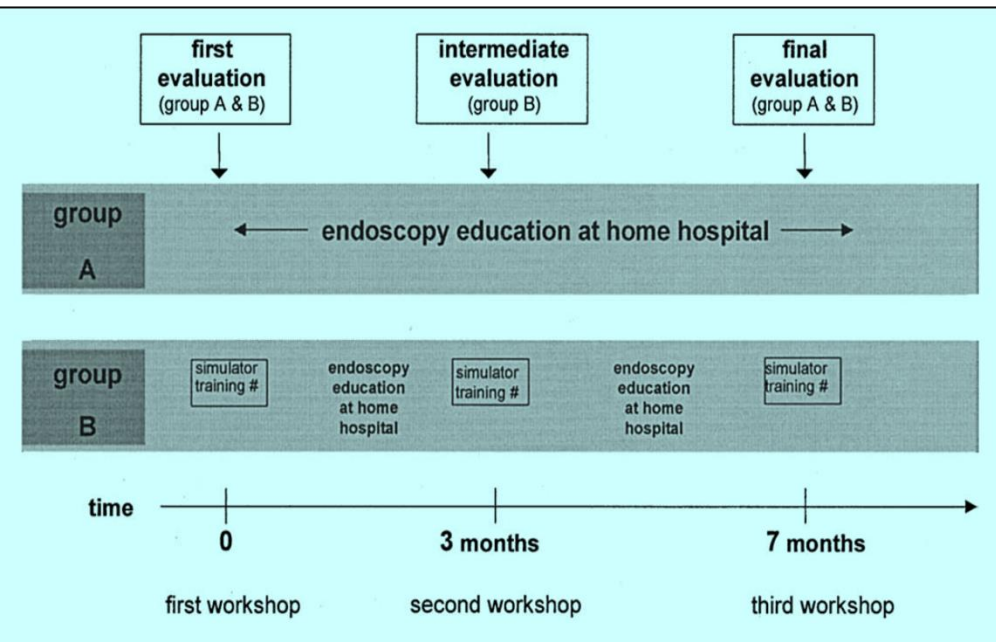


Why Ex-vivo Training Works

- Many aspects are very realistic
- Repetition possible
- Ethical benefit as zero risk to patients
- Education facilitated by low stress conditions
- Allows focus on specific procedure components

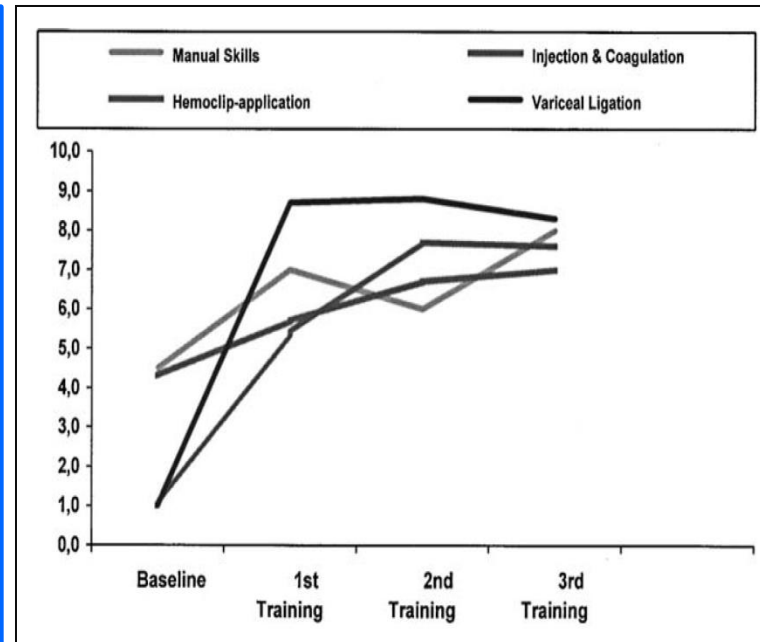
AND IT' S FUN !!!

Training with Simulator Saves Time, Patient discomfort & Potential Complication

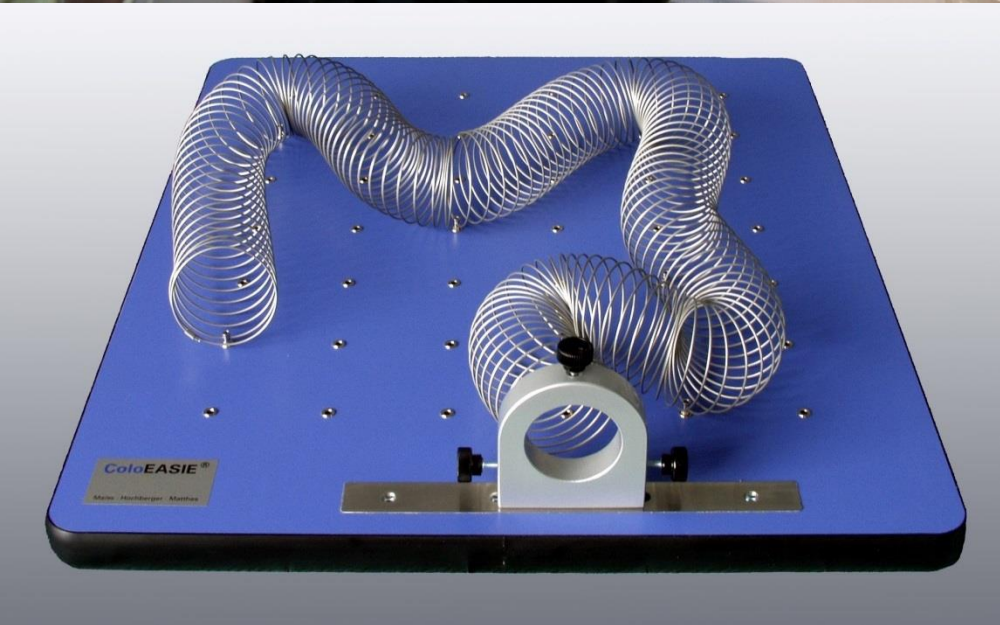
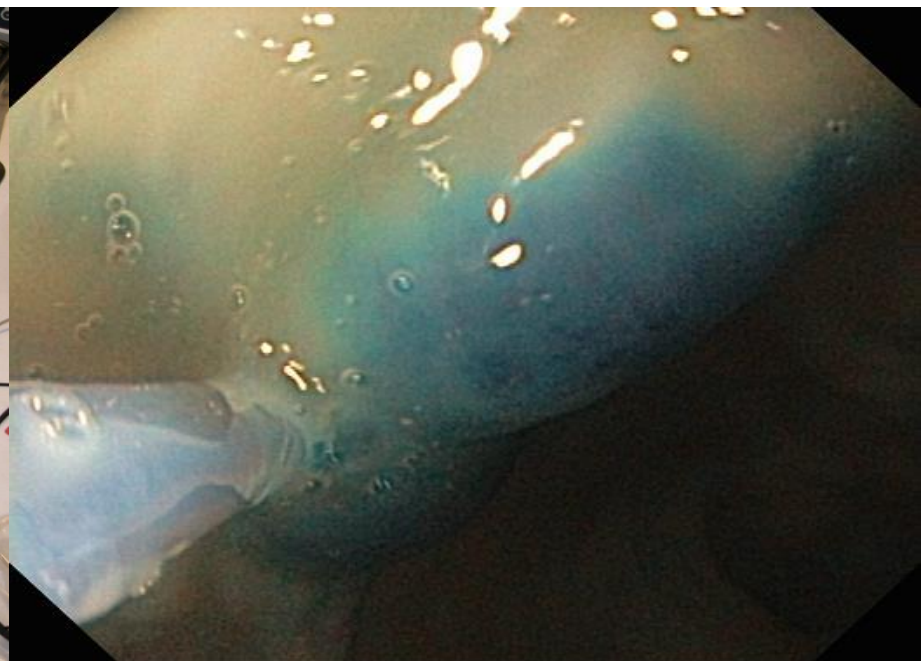


Schematic outline of project

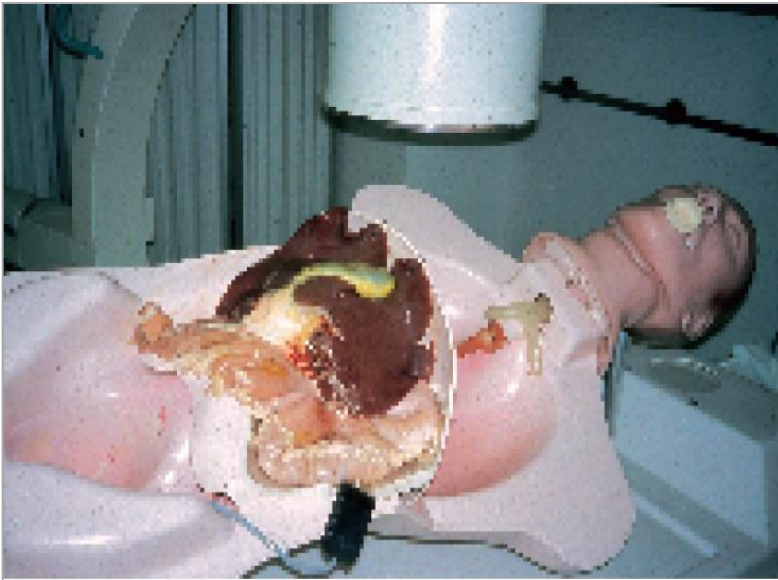
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Learning curves for all 4 technical procedures



Ex-Vivo ERCP Training



The Erlangen Endo-Trainer



ERC-training with the Erlangen Endo-Trainer simulator

Neumann M et al Endoscopy 2000

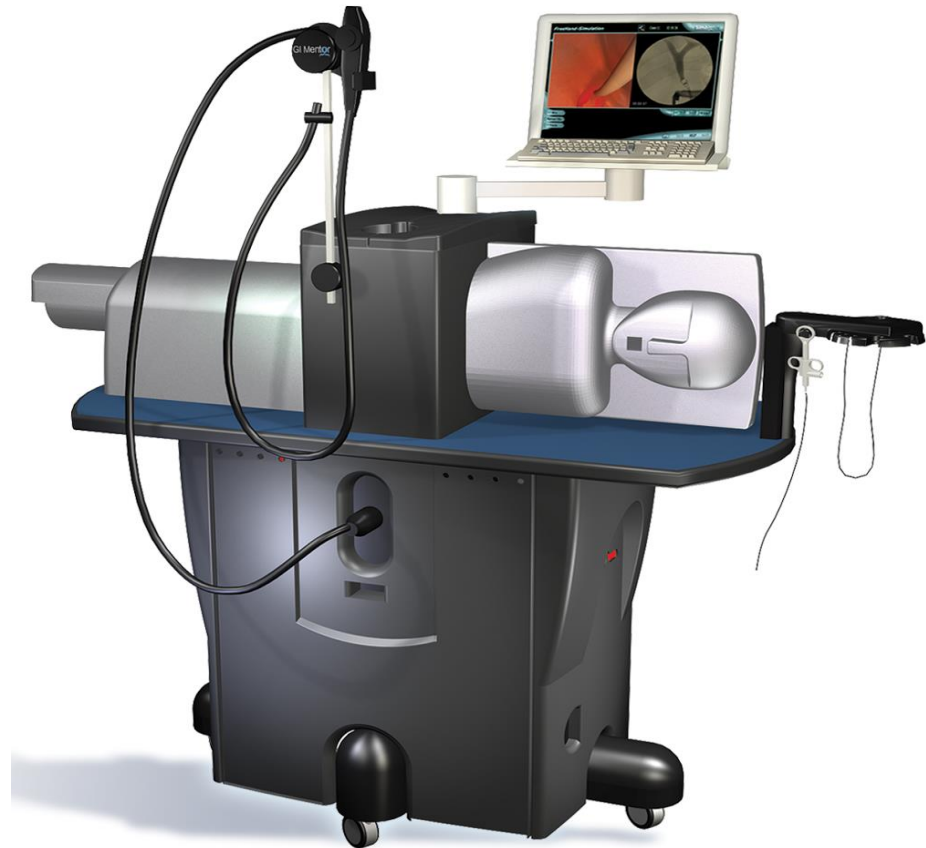
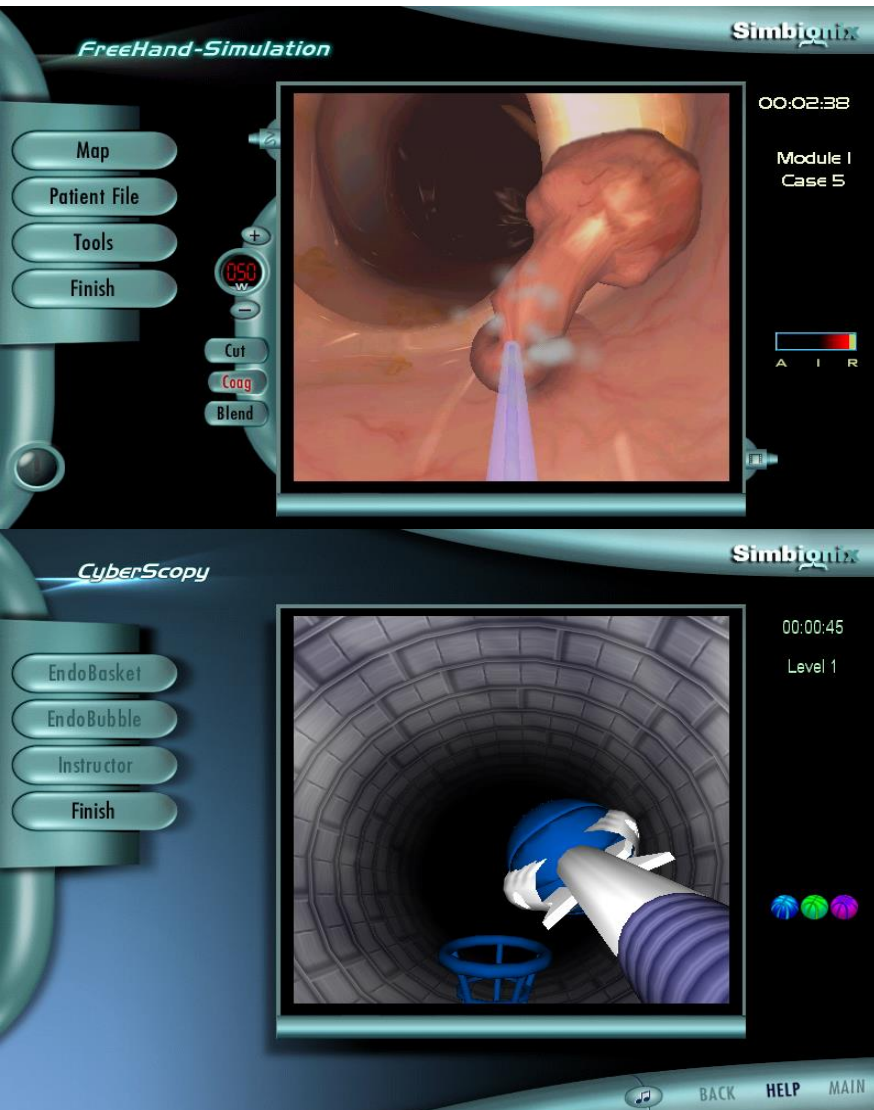
The Neo-Papilla: a new modification of porcine ex vivo simulators for ERCP training

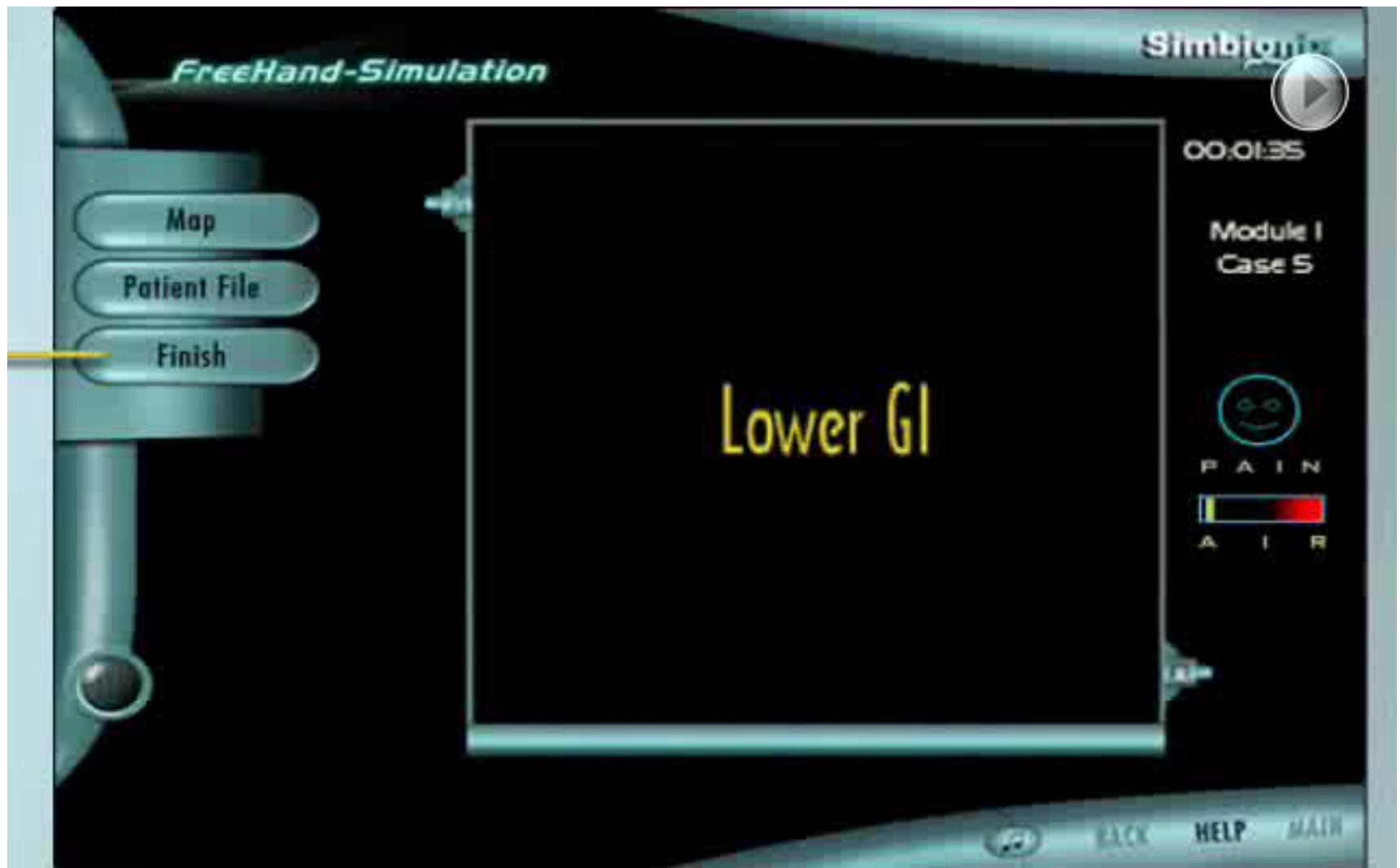


Available Virtual Simulators

Simulator	Manufacturer	Procedures available	Strengths	Limitations
Computer simulators				
GI Mentor	Simbionix USA	EGD, colonoscopy, hemostasis, ERCP, EUS	<ul style="list-style-type: none"> • Teaching early skills • Ready on demand 	<ul style="list-style-type: none"> • Cost of simulator and modules • Assessment abilities limited • Limited teaching beyond basic navigation skills
Endo VR (formerly AccuTouch)	CAE Healthcare (formerly Immersion Med.)	EGD, colonoscopy, hemostasis		

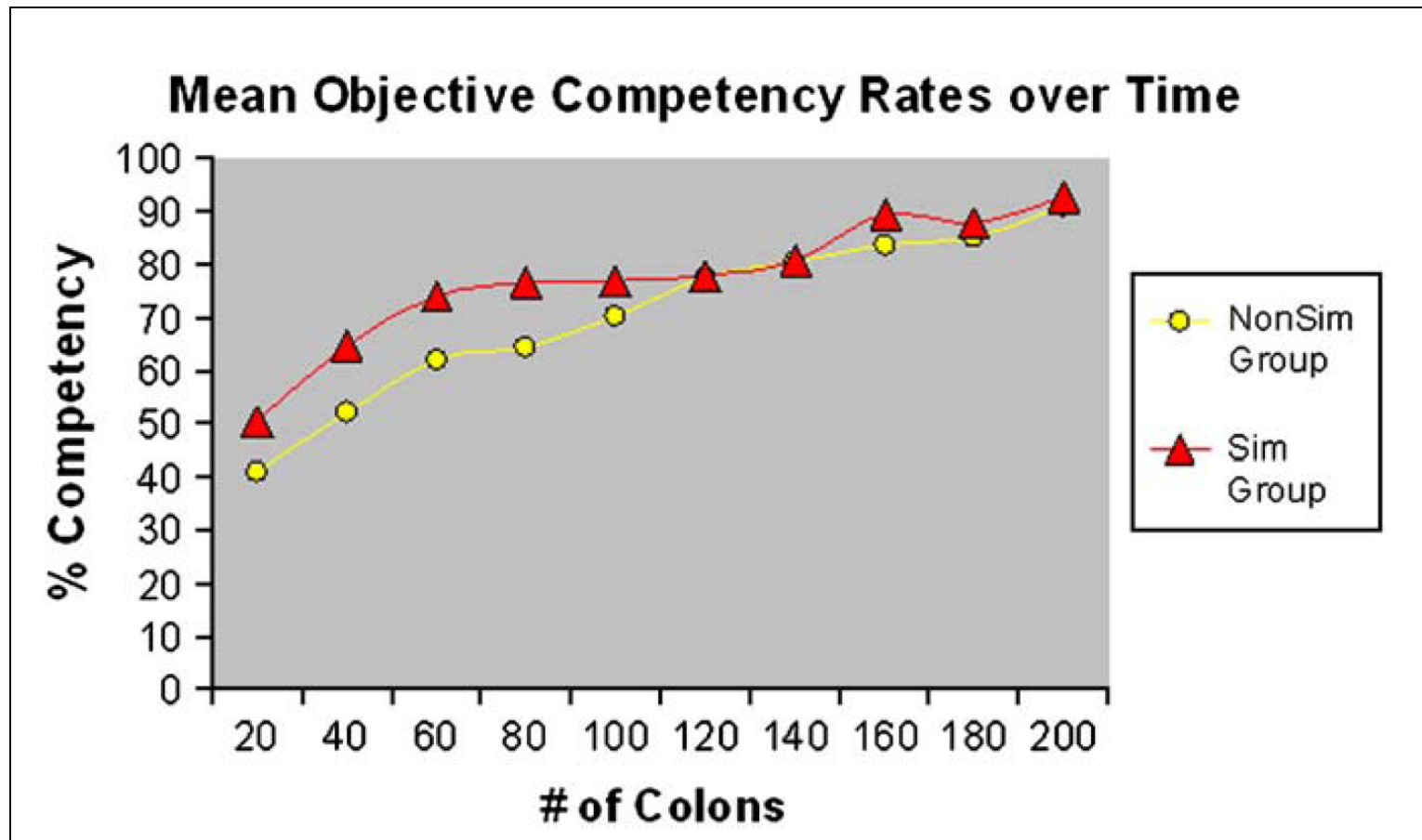
Forced Feedback Computer Simulators





Simbionix innovated the modeling of computer generated internal organs in a non-rigid, dynamic virtual reality. Real-time images simulate stretching, inflation, deflation and contraction of the digestive tract during procedures.

Virtual Reality Simulation Training Enhances Early Learning Curve for Real Colonoscopy



Cohen J., et al Gastrointest Endosc 2006

Pros and Cons of VR Sims

Advantages

- Safe, easy to setup and maintain, clean
- Multiple cases, anatomies and pathologies possible
- Allow feedback on loops, pain, lumen visualization

Disadvantages

- Too easy for non-novices
- Way too expensive!!!

Comparison of Simulators

	Mechanical	Bio-simulator	Computers
Cost	Low	++	+++
Diagnostic	+++	++	+++
Therapeutic	—	+++	++
Real tissue feel	—	+++	+
Maintenance	+++	+	++

Optimal Use of Current Simulators:

Mechanical Models & Computer Simulators

- Introduction for novices in scope dials & manipulation, loop withdrawal
- Pathology recognition [computer only]

Ex-Vivo Models

- Introduction to therapeutic techniques
- Training in new devices & techniques

Putting It All Together: The Hands-on Workshop



Ex-vivo Training at the ASGE Center for
Interactive Training & Technology [ITT]

Nuts and Bolts: Materials

- Mechanical models own or borrow from industry
- Ex vivo platforms:
[own or rent, inexpensive plastic trays]
- Obtaining tissue—commercial preparations sent frozen or in preservative—need rinsing in saline, note that local butchers require training.
- Special anatomy
 - Duodenum
 - Small intestine
 - Gallbladder/liver preparation
 - ERCP: Neopapilla; synthetic papillas, artificial blebs
 - Colon

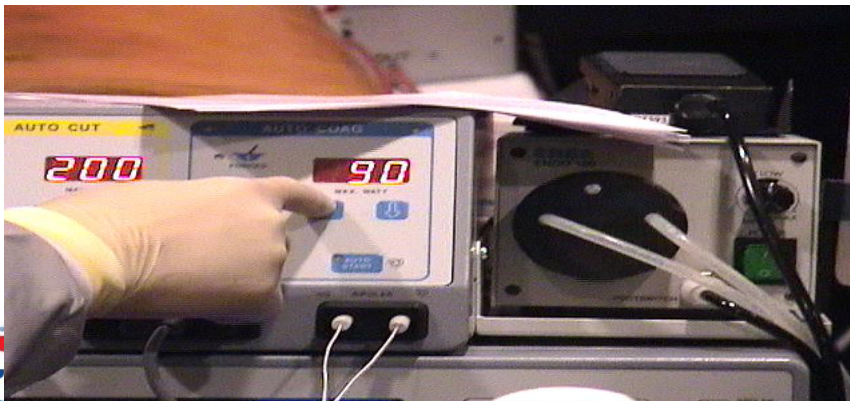
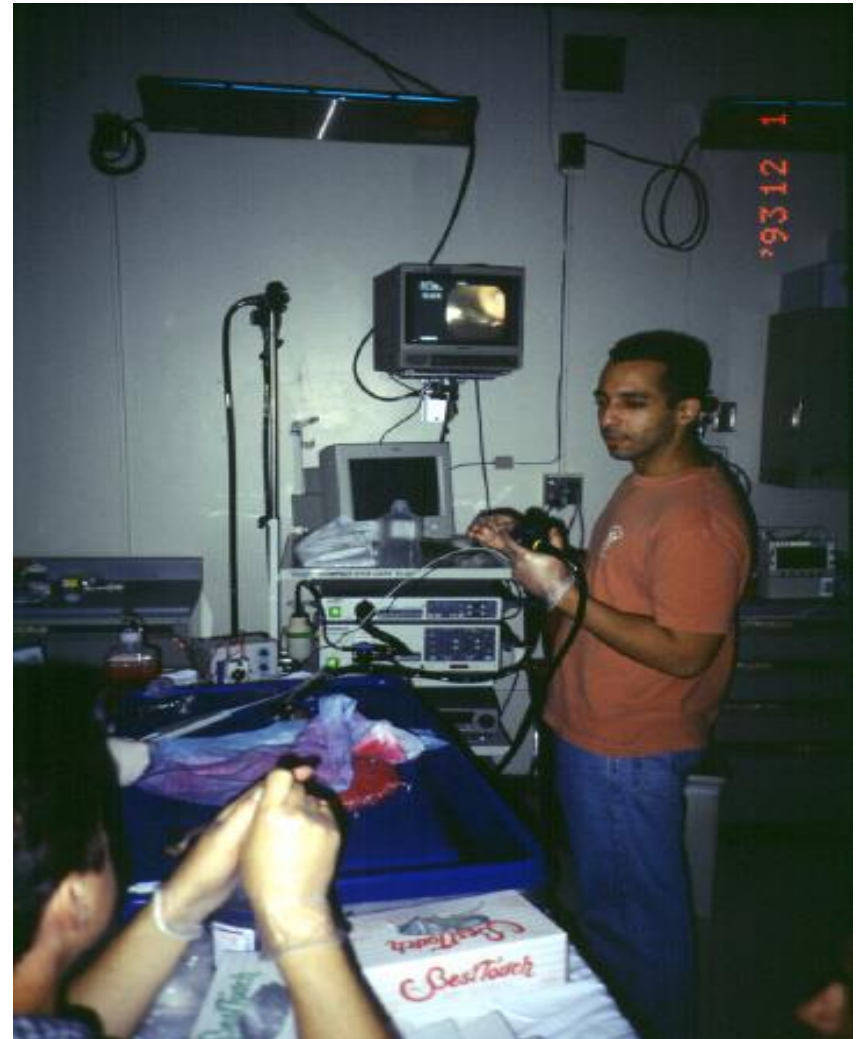
Lessons from Ex-Vivo Workshops

- Hands-on work is not sufficient to learn
- Other necessary elements:
 - Didactic background presentation
[pre-course review of videos is very helpful]
 - Sufficient time for trainees with scope
Feedback during training
 - Assessment of progress
 - Lots of teachers—labor intensive
 - Teachers who KNOW HOW TO TEACH
AND HOW TO USE THE MODELS!!!

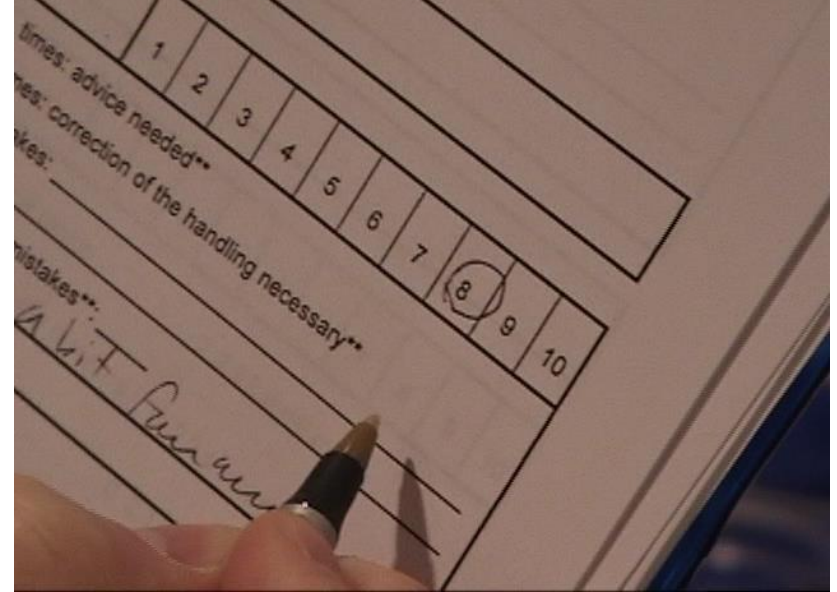
Proper Technique Must be Demonstrated before Practice

- Begin with expert demonstration of proper technique broken down into component steps.
- Deconstruction into steps sets agenda for the subsequent teaching, one step at a time
- Time is often limiting, so consider large group demonstrations prior to dividing students into stations

Precision Skills, Equipment Setup & Communication Emphasized



Intensive Training, Lots of Faculty



Simulation Design Considerations

- How many students, how many skills, and how much total time allowed—determines number of stations
- Usually best no more than 5 per station with one instructor with at least 6-7 minutes of solo scope time per student. When not scoping, others are serving as assistants and observing.

Deciding What and How to Teach

- Depends largely on intended audience
- Students attending sessions do not always have the experience they say they do—ex. ERCP courses
- Basic skills hand eye coordination –precision training stations are most important and underutilized no matter what the course topic
- Focus on proper technique but also most common mistakes and poor technique: “what not to do” and management of complications: “getting out of trouble”

Teaching Principles

- Instructor needs to emphasize importance of communication between the student endoscopist and the assistant
- Instructor needs to ensure trainee knows specifics of what device is used, settings of generator.
- It is possible to incorporate increasing degrees of difficulty –such as putting lesions to resect at harder locations.

Caveats

- Ex vivo work is most effective and worthwhile once some basic scope and dial control has been learned
- Plastic inanimate lower cost models are sufficient for this—computer models also work but at greatly increased cost.
- Avoid trying to get in too many techniques if it requires sacrificing enough time per student per technique.
- If possible some techniques likely benefit from serial ex vivo model work with interval supervised practice

Conclusion:

Hands-on Endoscopy Training works best if:

- Techniques are deconstructed into the component steps
- Faculty have experience teaching using the models
- Faculty agree on standard way to teach each skill
- Students have enough time to practice
- Time is allotted to post-training skill assessment and feedback.