

RUSH UNIVERSITY MEDICAL CENTER

Profile

- Largest private academic medical center in Illinois
- 809 bed teaching hospital
- 154-bed Johnston R. Bowman Health Center
- Ranked best in the nation in 12 of 17 categories in U.S. News & World Report's 2004 "America's Best Hospitals"
- 2002 Magnet Award winner for excellence in nursing
- www.rush.edu

Key Priorities

- Improve patient safety
- Improve training efficiency
- Reduce trainee frustration

Simulators and Modules Used

- Endoscopy AccuTouch System
- Introduction to Colonoscopy module
- Colonoscopy: Biopsy module
- Flexible Sigmoidoscopy module
- Introduction to Bronchoscopy module
- Introduction to Endoscopic Retrograde Cholangiopancreatography (ERCP) module

Key Benefits of System

- Speeds skills development
- Promotes faster colonoscopy procedures while lowering patient risk
- Provides self-directed study
- Cuts number of real cases needed for proficiency
- Helps determine individualized instruction needs
- Promotes step-wise skills expansion
- Provides realistic colonoscopy experience to transfer to the real procedure
- Supplies an effective recruiting tool



The Endoscopy AccuTouch System works with modules for upper and lower gastroenterology procedures as well as for bronchoscopy.

Rush University Improves Training, Patient Safety, Program Efficiency, and Recruiting

“The simulator did reduce the learning curve. We reduced flexible sigmoidoscopy to about 15 cases for achieved competence rather than 30, so we cut the number of cases that was necessary to achieve what we thought was clinical competence in half.”

—Dr. Michael D. Brown, gastroenterology program director, Rush University Medical Center



Endoscopy AccuTouch System

A computer-based system for teaching and assessing motor skills and cognitive knowledge of flexible bronchoscopy and upper and lower gastrointestinal flexible endoscopy. Real-time computer graphics include anatomic models developed from actual patient data. Force feedback is transmitted through the flexible scope to provide tactile sensations mimicking the actual feel of a procedure.

“Everybody says that the feel is dead on. It’s exactly the way a colonoscopy feels, with the tugs and the withdrawals and the torquing. Even the tug when you do a biopsy is there, and it has the right amount of tug. So everybody has been very impressed by the haptics.”

—Dr. Michael Brown

Relieving the Frustration of Learning Endoscopy

In 2001 when Dr. Michael Brown of Rush University acquired an Immersion Medical Endoscopy AccuTouch System, he was looking for a way to reduce the frustration of the gastroenterology fellows in his program. “The fellows were sort of thrown into endoscopy. Oftentimes, a scope would be taken away from them almost immediately, and they just couldn’t make good use of the actual patients they were given. They just weren’t making rapid progress,” says Brown.

Brown believed the AccuTouch Endoscopy System would make his life easier, he says. “I thought it would be easier to assess the fellows’ skill sets. I thought that they’d have an improved learning curve and would do better in their first human cases.”

Rush’s Section of Digestive Diseases purchased the Immersion Medical Endoscopy AccuTouch System with ERCP, Colonoscopy, Flexible Sigmoidoscopy, and Bronchoscopy modules, and shortly thereafter organized a study to assess the effectiveness for teaching flexible sigmoidoscopy.

A Five-year Study

The study’s abstract, published in the 2002 proceedings of the American College of Gastroenterology meeting in Seattle, describes results for family practice and internal medicine residents.

One-month clinics in which all residents participated met once or twice weekly and included instruction on six to ten procedures in each session. From 1997 to 2001, standard training included a one-hour didactic session on 60 cm flexible sigmoidoscopy followed by patient-based supervised hands-on training. Residents were scored objectively on their performance by a single supervising attending gastroenterologist, with a maximum score of six points as shown in the table below. Average scores of five were felt to reflect technical competence.

One point	30 cm intubation
Two points	60 cm intubation within 10 minutes
One point	Successful retroflexion
One point	Patient discomfort moderate or less (assessed by attending)
One point	All pathology visualized

Starting in 2001, all residents participating in the clinic performed at least 15 flexible sigmoidoscopies on the Immersion Endoscopy AccuTouch System and then began procedures on patients. They were allowed to continue training with the simulator during the one-month rotation. The simulator-based training group was also scored using the six-point method.

Simulation Shortens Learning Curve

The groups were analyzed using two tailed t-tests for comparison of mean scores. By the eighteenth procedure, the study revealed statistically significant differences between the overall competency of the standard groups (average score of 2.6) and the simulator groups (average score of 4.5).

“The simulator did reduce the learning curve. We reduced flexible sigmoidoscopy to about 15 cases for achieved competence rather than 30, so we cut the number of cases that was necessary to achieve what we thought was clinical competence in half,” says Brown.

Satisfying, Successful Training

Today’s endoscopic training at Rush begins with didactic lectures on endoscopic technique, then simulator training for 30 to 40 cases. “Now, by the time they get to do their first real patient, they’re already up and running. I’ve had first year fellows who can make it to the cecum during their first case, which rarely happens. You see them making the correct maneuvers. They don’t do what you see a neophyte typically do, which is pushing the scope randomly. They actually complete sophisticated maneuvers, they torque, they withdraw; so you see them applying the behaviors they learned on the simulator without instruction from the attending. All the attendings have noted that.”

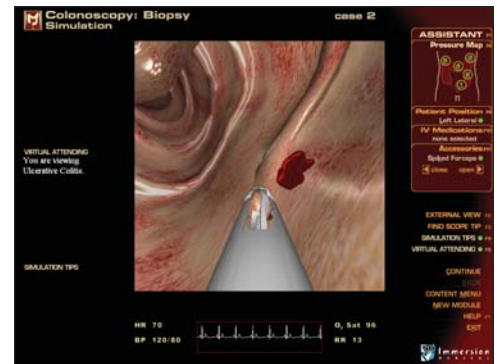
Brown asks the fellows to complete all the simulator’s cases at least twice and tells them that if they do, the odds of their navigating the scope during the actual patient procedure are much higher. “We’ve documented that,” he adds.

The AccuTouch system’s step-wise cases help develop knowledge and skills by presenting progressively difficult anatomy and pathology. In Rush’s program, most fellows can perform 30 or 40 cases within a week. “There are people that will stay on the simulator for hours and practice and practice,” says Brown. “Some take it as a challenge. They get a tough case, and they really want to pursue it until they get it right.”

In Brown’s mind, the simulator has solved the training problem in terms of getting people trained faster and also in terms of helping the entire program operate more efficiently. “My opinion has always been the endoscopy attending fails the minute they touch the instrument. Their prime directive is to teach the fellow how to do the case, not to do the case themselves. I think since we’ve had the simulator, in general the attendings have been better at meeting their directive of being teachers and not endoscopists,” he says.

“We would buy it again in a heart beat. My fellows would say that it’s a plus for the program, and I think it’s helped us attract fellow candidates. We try to get the best fellows, and when we’re interviewing residents, we show them the simulator and say, ‘This is accessible to you all the time. You can fine tune your skills, you’ll do better when you meet your first patients, and nobody else in the city has it.’”

—Dr. Michael Brown



MODULES:

Introduction to Colonoscopy

A colonoscope that looks, feels, and handles like a real scope produces red-out when its tip presses against mucosa. Students also clear stool from the lens, observe paradoxical motion when in a loop, and can practice on several patient cases. A comprehensive didactic section is also included.

Colonoscopy: Biopsy

This module stresses use of forceps introduced through the working channel of the endoscope. Students examine mucosa and lesions, observe tissue deformation that accurately reflects the amount of pressure exerted by the tool, and experience tissue resistance when taking a sample.

Colonoscopy: Basic Polypectomy

Users identify, capture, transect, and remove simulated polyps using snares, mini snares, and hot forceps. Complications include uncontrolled bleeding when the polyp head is guillotined, electrocautery-induced perforation, and vasovagal reactions.

Introduction to Flexible Sigmoidoscopy

The real-time graphics show anatomy from actual patients and react like real tissue in real time; the colon expands with air insufflation and collapses with suction. The anatomy and procedure are explained through educational aids including 3-D animations, video tutorials, a pathology atlas, and information on indications, contraindications, and complications of flexible sigmoidoscopy.



MODULES, Cont'd:

Introduction to Bronchoscopy

This module includes videos covering the entire procedure, an interactive 3-D model emulating the tracheobronchial tree and adjoining anatomic structures, and software that teaches the navigation of a bronchoscope in the simulated anatomy. The simulation includes an external view and a virtual aide tool that helps students understand the location of the scope and which bronchiole or branch they have entered.

Transbronchial Needle Aspiration (TBNA)

Users learn correct use of a cytology needle to biopsy a lymph node. Four cases present progressively difficult anatomies and pathologies, supplying broad experience to extend proficiency. The virtual attending feature advises the user on correct technique and warns of potential harm to the patient.

Pediatric Difficult Airways

The patients in this module range in age from neonates to school age children. The user places an endotracheal tube in either static anatomy for novice users, or dynamic anatomy, in which the patient breathes spontaneously. This choice provides increasing difficulty for learning progression.

Bronchoalveolar Lavage and Endobronchial Sampling

The sampling tools for this module—a needle, forceps, and brush—appear on the video screen after they have been inserted through the working channel of a realistic bronchoscope. Use of the tools will cause tissue deformation and realistic bleeding. The patient breathes, coughs, and exhibits changes in vital signs based on user actions.

Lower Patient Risk

In addition to solving their training problem, Brown believes the simulator has helped lower the risk to patients. “I’m totally convinced that it reduces patient risk,” he says. “The fellows have to do their first colonoscopy on somebody, and it might as well be after they’ve done 30 on a simulator. And I think that’s clearly nice for those first 30 patients in the learning curve of a fellow.”

Brown notes that he doesn’t think a fellow could seriously hurt a patient as the attending would intervene, but he does believe that simulator training helps the fellow avoid patient discomfort. “I think the procedures go quicker. I think they’re less likely to damage the colonic wall and create an artifact,” he says. “Many fields I can think of, whether you’re flying an airplane or simply driving a car, have simulators available, and it’s amazing that medicine has taken so long to come up with this.”

Monitoring and Predicting Individual Performance

Brown finds the AccuTouch system’s database and metrics feature convenient for tracking trainee progress. Each user is given a login password, and they receive immediate feedback on their performance for each case, which can also be accessed by system administrators. “I monitor their progress. If they know I’m looking, I think it helps them persist and try to complete each case,” says Brown.

“It’s very helpful because I have my inklings about how people are going to perform, and so far it’s been very accurate,” says Brown. “People who had trouble with the simulator seem to also have trouble with real patients.”

Using this predictive quality, Brown has been able to foster more individualized education for the fellows. “I can predict who might need a few extra weeks on the endoscopy service versus others. For example, this year was very interesting. The trainee who really did well on the simulator, on his first live case, he got to the cecum very easily and in very quick time. He has probably turned out to be the best first year fellow we’ve had in ten years. And the simulator predicted that very accurately,” he says.

“It definitely supports the idea that you can predict who’s going to have trouble, and who’s going to be kind of an all-star with it. I will pay more attention to that fellow if it looks like there’s going to be difficulties. I’ll tell the attendings that they had trouble with the simulator, and that they may want to watch them a little more carefully and give them a little more verbal instruction than some of the others.”

“The fellows have to do their first colonoscopy on somebody, and it might as well be after they’ve done 30 on a simulator. I think that’s clearly nice for those first 30 patients in the learning curve of a fellow.”

—Dr. Michael Brown



The AccuTouch system reproduces the look and feel of colonoscopy procedures with stunning graphics and force feedback action.

used it a bit. And all the attendings are curious, so all of them have tried it. When new modules are installed, they'll come and play around with them. They've noticed that when you get to the higher numbered cases they get pretty tough—very coiled colons and patients who are a little more medically unstable—so it's a little more challenging to sedate. So, the cases give a nice progression up the hill."

Realism So Important for Colonoscopy

Before deciding on the AccuTouch system, Rush used a model rubber colon for training. "They were horrible," says Brown. "They allowed you to learn how to turn the knobs, and I guess practice a little bit moving the scope back and forth. But they had no feel for what a real colonoscopy was like. So we didn't use it much, and the fellows got annoyed with it in about five minutes."

What sold Brown and the rest of the attendings on the AccuTouch system was its realistic touch feedback, or haptics. "There was another company we looked at, but Immersion was the only one that had haptics, that had the feel, and that's so important in colonoscopy. All the attendings played around with both systems, and we thought the Immersion system had the highest fidelity as far as mimicking a true colonoscopy.

"Everybody says that the feel is dead on. It's exactly the way a colonoscopy feels, with the tugs and the withdrawals and the torquing. Even the tug when you do a biopsy is there, and it has the right amount of tug. So everybody has been very impressed by the haptics. It's a pretty nice recreation of a colonoscopy experience."

Widespread Use

The Immersion Medical Endoscopy AccuTouch System works with modules for upper and lower gastroenterology as well as for bronchoscopy. Brown says that in addition to the 12 or 13 gastroenterology and internal medicine residents who use the simulator to learn flexible sigmoidoscopy each year, about three pulmonary and three critical care fellows use it routinely for bronchoscopy.

Residents and fellows are able to train independently and at a time that fits their schedule. In addition, several of the attending physicians use the simulator to keep their skills fresh. "I use it to brush up on ERCP," says Brown. "One attending who was leaving us wanted to learn a little bit more about ERCP, and she

"Now, by the time they get to do their first real patient, they're already up and running. I've had first year fellows who can make it to the cecum during their first case, which rarely happens. You see them making the correct maneuvers. They don't do what you see a neophyte typically do, which is pushing the scope randomly. They actually complete sophisticated maneuvers, they torque, they withdraw; so you see them applying the behaviors they learned on the simulator without instruction from the attending. All the attendings have noted that."

—Dr. Michael Brown

“We’re getting our endoscopy done in a timely fashion, and we’re getting our teaching directive taken care of. I think we’re doing better in patient care. I think we’re doing better in teaching, and I think the simulator has improved both of those, and that’s two of our major thrusts at Rush.”

—Dr. Michael Brown

Brown says that he does not have first hand experience with the system’s bronchoscopy module, but that in talking with the pulmonary fellows, “They like it.”

An Effective Tool for Recruiting

Rush is completely happy with their AccuTouch simulator and uses it to attract top talent to the program. “We would buy it again in a heart beat,” says Brown. My fellows would say that it’s a plus in the program, and I think it’s helped us attract fellow candidates. We try to get the best fellows, and when we’re interviewing residents, we show them the simulator and say, “This is accessible to you all the time. You can fine tune your skills, you’ll do better when you meet your first patients, and nobody else in the city has it.’ So, to us it’s a great recruitment tool, and I think all the fellows have enjoyed using it and found it very effective.”

Return On Investment

A recent Frost & Sullivan study on return on investment for Immersion Medical simulators found that many institutions have realized a financial gain—as much as \$150,000 yearly—either from selling practice time or from putting on courses using the simulator. Although Rush hasn’t yet developed those programs, Brown says they may do so in the future. “I think if we charged other people to use it, if we charged other programs in the city and our critical care people, we probably could have recouped the cost over the four of five years we’ve had it.

“But from our standpoint, the return comes from making those first colonoscopy cases faster. We schedule them for an hour, and now we’re contemplating—because the fellows are better at it these days—getting them down to 45 or 30 minutes.”

Another cost savings revealed by the Frost & Sullivan study was in reduced scope damage. Brown believes that the simulator teaches better scope handling and so would have an impact on repair cost. “I know that fellows tend to be rough on scopes. They tend to stretch the wheel cable out.”

All the Right Stuff

Besides solving the overall training problem, the AccuTouch system has helped Rush become more efficient, especially when fellows are just starting. “We’re getting our endoscopy done in a timely fashion, and we’re getting our teaching directive taken care of,” says Brown. “I think we’re doing better in patient care. I think we’re doing better in teaching, and I think the simulator has improved both of those, and that’s two of our major thrusts at Rush.”

About Rush University Medical Center

Rush University Medical Center includes the 809-bed Presbyterian-St. Luke's Hospital (including the Rush Children's Hospital) and the 154-bed Johnston R. Bowman Health Center for the elderly. It is home to the seven Rush Institutes, which draw together patient care and research to address major health problems, offering primary health-care services as well as the latest treatments for arthritis and orthopedic problems, cancer, heart disease, mental illness, and diseases associated with aging and neurological problems. Integral to the medical center is Rush University, which includes Rush Medical College, the College of Nursing, the College of Health Sciences, the Graduate College, and a cooperative educational network of 14 liberal arts colleges and universities in six states from Tennessee to Colorado. Rush is also a center for basic and clinical research, with physicians and scientists involved in nearly 2,300 investigations, many of which are multidisciplinary.

About Immersion Medical, Inc.

Immersion Medical designs, manufactures and markets computer-based medical training simulation systems worldwide. The systems integrate proprietary computer software and tactile feedback robotics to create highly realistic medical procedure simulations that help train doctors. The company's four key product lines are the CathSim® AccuTouch System, the Endoscopy AccuTouch System, the Endovascular AccuTouch System, and the Hysteroscopy AccuTouch System.

About Immersion Corporation

Founded in 1993, Immersion Corporation is a recognized leader in developing, licensing, and marketing digital touch technology and products. Bringing value to markets where man-machine interaction needs to be made more compelling, safer, or productive, Immersion helps its partners broaden market reach by making the use of touch feedback as critical a user experience as sight and sound. Immersion's technology is deployed across personal computing, entertainment, medical training, automotive, mobility, and 3D simulation markets. Immersion and its wholly-owned subsidiaries hold more than 240 issued patents worldwide.

Dr. Michael D.

Brown

Dr. Brown's clinical interests include gastroesophageal reflux disease, endoscopy, functional bowel disease, and irritable bowel syndrome. He

attended the University of Illinois College of Medicine, an internal medicine residency program at Michael Reese Hospital and Medical Center in Chicago, and fellowships in gastroenterology at Michael Reese and the University of Chicago Hospitals. Dr. Brown is American Board certified in Internal Medicine and Gastroenterology and currently serves as program director of Gastroenterology at Rush University Medical Center in Chicago. He is a fellow in both the American College of Physicians and American College of Gastroenterology.



HEADQUARTERS Immersion Corporation, 801 Fox Lane, San Jose, CA 95131 USA
T: +1 408.467.1900 | F: +1 408.467.1901 | Email: info@immersion.com | www.immersion.com



This document does not create any express or implied warranty about Immersion or about its products or services. Immersion's sole warranty is contained in its product warranty. The end-user documentation shipped with Immersion's products constitutes the sole specifications referred to in the product warranty. Immersion has made reasonable efforts to verify that the information contained herein is accurate, but Immersion assumes no responsibility for its use or for any infringement of patents or other rights of third parties that may result. Specifications are subject to change without notice. The features described in this publication are based on the latest development plan. Certain features, however, may not be available upon initial product release. Contact Immersion for the most current information.

©Immersion Corporation. Immersion, the Immersion logo, AccuTouch, and CathSim are trademarks of Immersion Corporation. All other trademarks are the property of their respective owners. All rights reserved.

Lit#CSS.Rush.0205.[pdf].v1