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The European experience—current use of simulator training in Europe

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Diagnostic and interventional endoscopy has undergone an enormous evolution and refinement in the past 2 decades. Consequently, the requirement of skill sets for endoscopists increased and a need for training and education have become clear. Since the mid-1990s, different training simulators have been developed. This article describes the status of endoscopy training in Europe and the current use of simulators in various European countries. Several working groups have developed and established various simulators and training platforms for nearly all diagnostic and interventional techniques. Therefore, the availability of different training simulators is not unexpected in most European countries.

Endoscopy underwent a tremendous development in the past 2 decades and often replaced surgical procedures, even in patients with malignant disease. In particular, the expansion of interventional techniques, for example, endoscopic submucosal dissection (ESD), led to enhanced requirements of skills from the endoscopist. An endoscopist needs several years of practical training and continuous refinement of his or her theoretic knowledge and manual skills.[1,2] Various working groups started in the 1990s to improve training practices by developing new simulator platforms.[3] Until 1990, only plastic phantoms existed, which allowed the training of only basic manual skills in diagnostic endoscopy.[4] In the meantime, a number of simulators were developed (Table 1) and nearly all diagnostic and interventional endoscopic procedures can be simulated and trained.[5-14] Even for Natural Orifice Transluminal Endoscopic Surgery (NOTES), simulators like the EASIE-R simulator (EndoSim LLC, Berlin, MA) or the ELITE system (CLA, Coburg, Germany) were presented and pilot studies were conducted.[15,16]

Although a variety of simulation systems exist and the need for training is clear, standardized obligatory training programs have not been introduced into the endoscopic education in comparison with the training for ultrasonography in Germany (in nearly all European countries ultrasound is performed by physicians), where a structured education by accredited ultrasound tutors and training courses are mandatory to achieve graduation for ultrasound. Therefore, endoscopic newcomers often must rely on the policy "learning by doing" under the supervision of an experienced colleague, usually from the same endoscopy department.[2] We present an overview of the current use of simulator training in Europe.

Available training simulators

First, we will describe the currently available endoscopy simulators in Europe (Table 1). The first training simulator was the plastic phantom developed by Classen and Ruppin in 1974.[4] This type of simulator is still in use at some hospitals. Additionally, manufacturers of endoscopes lend these plastic phantoms for upper gastrointestinal (GI) endoscopy or the Koken colonoscopy simulation model (Colonoscopy Training Model-I-B, Koken Co, Ltd, Tokyo, Japan) for training of basic skills in lower GI endoscopy. By far the most advanced static simulator is the Interphant

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Table 1 Endoscopy simulators used for training in Europe[5-14]

Simulator type	Simulator name	Simulation possibilities	Availability
Static simulators	GI-Phantom Classen and Ruppin	Diagnostic upper GI endoscopy	All over Europe
	Koken colonoscopy simulator	Diagnostic lower GI endoscopy	All over Europe
	Tübingen Interphant model	Diagnostic and interventional upper and lower GI endoscopy	Germany
	ELITE system	NOTES simulation	Germany
	X-Vision ERCP training system	Various ERCP procedures	Germany
Computer simulators	Simbionix GI-Mentor	Diagnostic and partly interventional upper and lower GI endoscopy	All over Europe
	CAE AccuTouch	Diagnostic and partly interventional upper and lower GI endoscopy	All over Europe
	Olympus colonoscopy simulator	Diagnostic lower GI endoscopy	In studies
Animal part simulators	compactEASIE	Diagnostic and all interventional upper GI endoscopy; enteroscopy and double-balloon ERCP	All over Europe
	Erlangen Endo-Trainer	Diagnostic and all interventional upper and lower GI endoscopy; enteroscopy and double-balloon ERCP	All over Europe
	coloEASIE	Diagnostic and all interventional lower GI endoscopy and proctoscopy	All over Europe
	EASIE-R	All diagnostic and interventional upper and lower GI procedures, including double-balloon enteroscopy and NOTES procedures	All over Europe
Narcotized animals	Pigs	Diagnostic and interventional diagnostic upper GI endoscopy NOTES procedures	In special training centers in Europe

model developed by Grund et al from Tubingen, Germany.[17] The Interphant model, in contrast to all other plastic phantoms or static models, allows most interventional techniques.[17] This model is currently used at endoscopy courses in Germany but is not commercially available. In 2008, a new endoscopic retrograde cholangiopancreatography (ERCP) simulation model, the X-Vision ERCP simulation system, which allows ERCP and sphincterotomy without fluoroscopy, was presented by another German group. It is a static simulator made of plastic. The artificial biliary system can be seen through a glass panel. A conductive material is used for the papilla, which allows electrosurgical manipulation.[8,18]

At the end of the 1990s, virtual reality widened the spectrum of endoscopy simulators. Recently, the Simbionix GI-Mentor (Simbionix USA Corp, Cleveland, OH),[5] the AccuTouch system[19] from Immersion Medical Corporation now distributed by CAE (CAE, Montreal, Canada), and the Olympus Endo TS-1 colonoscopy simulator (Olympus KeyMed, Southend, UK) became available.[9] The GI-Mentor as well as the AccuTouch can simulate some interventions, such as sclerotherapy, polypectomy, and sphincterotomy, in a virtual reality environment.[20] Special computer instruments are used but they differ from real accessories. Additionally, a module for endoscopic ultrasound exists for the Simbionix GI-Mentor.[20] Some centers in Europe use these computer simulators for training purposes.

At the moment, the largest variety of simulation possibilities is warranted by ex vivo animal model simulators or biosimulation models.[2,3,21-23] They can be used in all steps of the educational pyramid described by Hochberger and colleagues.[2] Biosimulation models can be summarized in simulators using organs of animals, which are usually obtained fresh from a slaughterhouse. This kind of simulation is common for training in surgical disciplines such as laparoscopic abdominal and thoracic surgery, gynecology, urology, ear, nose, and throat, and orthopedics. Freys et al reported first in 1995 on the use of a pig stomach for teaching diagnostic gastroscopy.[24] In 1996, Hochberger and Neumann developed a new simulator, the Active Simulator for Interventional Endoscopy (EASIE), for the simulation of interventional endoscopy. In 1997, the EASIE concept of training and teaching in interventional upper GI endoscopy on specially prepared porcine upper GI organ packages was developed by Hochberger, Maiss, and Euler, which included 1-day training courses for doctors and nurses on different topics like endoscopic hemostasis, ERCP, and polypectomy.[10] More than 30 different interventional techniques can be practiced in the upper GI tract and hepatobiliary system.[2] This system is currently available as the EASIE or the Erlangen Endo-Trainer all over Europe in different courses.[23,25] Recently, the EASIE simulator was refined by Matthes et al and they presented the EASIE-R