A Pilot Comparison of Standardized Online Surgical Curricula for Use in Low- and Middle-Income Countries

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Original Investigation

A Pilot Comparison of Standardized Online Surgical Curricula for Use in Low- and Middle-Income Countries

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IMPORTANCE Surgical conditions are an important component of global disease burden, due in part to critical shortages of adequately trained surgical providers in low- and middle-income countries.

OBJECTIVES To assess the use of Internet-based educational platforms as a feasible approach to augmenting the education and training of surgical providers in these settings.

DESIGN, SETTING, AND PARTICIPANTS Access to two online curricula was offered to 75 surgical faculty and trainees from 12 low- and middle-income countries for 60 days. The Surgical Council on Resident Education web portal was designed for general surgery trainees in the United States, and the School for Surgeons website was built by the Royal College of Surgeons in Ireland specifically for the College of Surgeons of East, Central and Southern Africa. Participants completed an anonymous online survey detailing their experiences with both platforms. Voluntary respondents were daily Internet users and endorsed frequent use of both print and online textbooks as references.

MAIN OUTCOMES AND MEASURES Likert scale survey questionnaire responses indicating overall and content-specific experiences with the Surgical Council on Resident Education and School for Surgeons curricula.

RESULTS Survey responses were received from 27 participants. Both online curricula were rated favorably, with no statistically significant differences in stated willingness to use and recommend either platform to colleagues. Despite regional variations in practice context, there were few perceived hurdles to future curriculum adoption.

CONCLUSIONS AND RELEVANCE Both the Surgical Council on Resident Education and School for Surgeons educational curricula were well received by respondents in low- and middle-income countries. Although one was designed for US surgical postgraduates and the other for sub-Saharan African surgical providers, there were no significant differences detected in participant responses between the two platforms. Online educational resources have promise as an effective means to enhance the education of surgical providers in low- and middle-income countries.

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Surgical conditions are increasingly recognized as significant contributors to disease burden in low- and middle-income countries (LMICs), and treating these diseases can be a cost-effective way to improve global public health.[1,2] Physical infrastructure and access to supplies are critical limitations to surgical capacity in LMICs, but personnel training can be the most difficult and resource-intensive hurdle to improving delivery of care.[3] No reliable estimates of the "global surgical workforce" exist,[4] but there is general agreement on a shortage of surgical education in resource-limited regions of the world.[5-7] Furthermore, the paucity of local workforce training in rural and remote regions is exacerbated by poor retention of health care workers in those areas.[8]

Traditionally, these human resource shortages have been partly addressed by secular or faith-based organizations, which offer training through short-term workshops or longer-term attachments. Some organizations have established full training programs in resource-poor areas. Short-term missions are limited by their duration, cost, and sustainability, while longer-term programs face challenges in integrating with local surgical training programs. Surgeons in low-income countries have developed individual curricula for surgical training, but teaching faculty are often limited. While multiple strategies exist, the ideal model for educating providers in LMICs using a combination of local and international resources is unknown.[9-11]

Online education is rapidly becoming available in LMICs.[12] In the United States and Europe, standardized Internet-based curricula for surgical education are emerging as sophisticated tools for specialty training and continuing education. Groups such as the American Board of Surgery (ABS) and the Royal College of Surgeons in Ireland (RCSI) have been instrumental in developing valuable resources on the Internet for their constituent communities. For the RCSI, its School for Surgeons initiative has also successfully begun to address a shortage of surgical education resources in southern, central, and eastern Africa.

The purpose of this study was to survey surgical faculty and trainees in LMICs regarding two unique Internet-based surgical education curricula—one developed for African surgeons and one developed for US surgical residents—to assess the contextual suitability of both as educational tools in LMICs and to identify potential challenges to their international use. There are limited reports of provision of distance learning programs to Africa,[13,14] but to our knowledge, no objective evaluations have been conducted of factors that facilitate or hinder the effective use of online surgical resources.

Methods

Partner Organizations

The ABS is an independent, nonprofit organization founded in 1937. Its principal objective is to serve the US public by certifying surgeons who are suitably trained and qualified according to its standards. The ABS is composed of a board of directors representing the leading surgical organizations in the country.

The RCSI is 1 of 5 colleges in the National University of Ireland. It was granted a charter in 1784, before which its membership comprised a section of the Barbers Surgeons' Guild. As a contemporary medical institution, RCSI administers undergraduate degrees in medicine, nursing, and pharmacy and has locations in Dublin and abroad. It also provides oversight of Irish postgraduate surgical education and certifies practitioner competencies.

The College of Surgeons of East, Central and Southern Africa (COSECSA) is an independent body formed in 1996 to standardize surgical education within the region. It grew out of the Association of Surgeons of East Africa, an older organization dating back to the 1950s. It offers certification of surgical qualifications in 9 countries in sub-Saharan Africa: Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia, and Zimbabwe.
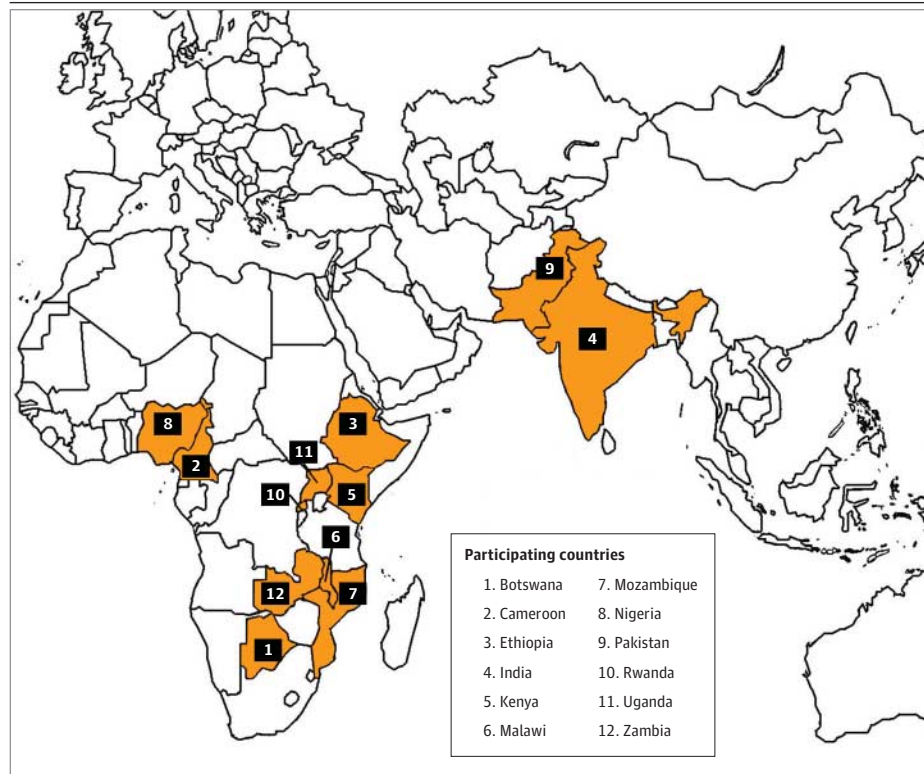
Online Resources

The Surgical Council on Resident Education (SCORE), a consortium formed in 2006 by the principal organizations involved in surgical education within the United States, is led by the ABS.[15] SCORE has developed an online competency-based curriculum focused in 6 competencies identified by the US Accreditation Council for Graduate Medical Education: patient care and technical skills, medical knowledge, professionalism, communication, practice-based learning, and systems-based practice. Topics parallel the 5-year general surgical postgraduate training program and reflect the requirements for ABS certification in general surgery in the United States. Content is administered by the SCORE Council and distributed via the SCORE Curriculum web portal (http://www.surgicalcore.org), which is intended to provide trainees with easy access to high-quality educational materials while also facilitating program instruction and self-study. More than 95% of general surgery training programs in the United States currently subscribe to the web portal. Currently, domestic charges for use are a $500 program fee plus $125 per resident annually.

In 2010, the RCSI successfully launched a dedicated e-learning platform for use by COSECSA faculty and surgical trainees (www.schoolforsurgeons.net). Using an open-source platform, the site was developed in a collaborative fashion by both RCSI and COSECSA faculty and is currently hosted in Ireland. More than 600 unique users have been registered, including COSECSA fellows, trainees, and accredited medical practitioners. Cost of the program is subsidized by RCSI; there are no charges for use for COSECSA members.

Study Design

An institutional review board approved the survey that was sent to participants, whose consent was obtained as part of receipt of their completed surveys. An open invitation was extended to surgeon educators and surgical trainees in LMICs. Prospective participants voluntarily responded via e-mail, providing contact information, hospital affiliation, level of surgical training, and country of practice. Respondents who were identified as surgeons or surgeons-in-training in countries designated as LMICs (defined by the World Bank) were enrolled;

Participating countries

1. Botswana	7. Mozambique
2. Cameroon	8. Nigeria
3. Ethiopia	9. Pakistan
4. India	10. Rwanda
5. Kenya	11. Uganda
6. Malawi	12. Zambia

Low- and middle-income nations from which surgeons participated are highlighted.

all others were excluded. Final participants were granted full online access to the SCORE and School for Surgeons websites for the 30-day review period. They were asked to familiarize themselves broadly with the two curricula in the context of their potential uses in their local surgical practice or training. Participants were encouraged to explore the available online resources offered on each platform. In addition, to ensure that comparable content was experienced by users within each web-based curriculum, participants were requested to complete a specific content module covering inguinal hernia care within each system.

Following completion of the inguinal hernia modules and self-directed review of each website, participants were asked to complete an anonymous online survey. Google Docs (Google) was used to administer the survey and compile responses. Survey questions were created via a cognitive interview process between representatives of SCORE, the School for Surgeons, and the COSECSA Council and were tested internally. Statistical significance between groups was calculated using a Fisher exact test to compare the proportion of collated responses that "agree" or "strongly agree" with the respective question (Prism, version 5; GraphPad Software).

Results

Seventy-five participants were enrolled and 27 survey responses were recorded from 12 different countries (**Figure**). Thirteen (48%) were self-identified as surgical trainees, 11 (41%)

as attending physicians or consultants, and 3 (11%) gave no response indicating level of training. The median year of medical school completion was 2003 (range, 1966-2009). Respondents were predominately male (85%), identified themselves as daily Internet users, and endorsed frequent use of both print and online textbooks as references (**Table 1**).

Responses to survey questions assessing the two platforms are compiled in **Table 2**. All comparisons of affirmative Likert scale responses regarding both the overall curriculum and the content-specific inguinal hernia module were not significantly different. Respondents agreed that they would use the curricula regularly if available and recommend both resources to colleagues. Regarding indications for use and perceived challenges to adoption of the curricula, respondents chose that they would use them most often to prepare for an upcoming lecture or operative case (**Table 3**). Slow Internet connection and technical issues were listed as the largest impediments to using the web portals.

Discussion

Through an unprecedented partnership between the ABS, RCSI, and COSECSA, the present study is the first to our knowledge to assess the suitability and practicality of two high-quality online resources for surgical education. After a guided experience and full access to the SCORE and School for Surgeons websites, respondents from 12 LMICs provided feedback that both systems were well organized and easy to use. Although the lo-

Table 1. Respondent Internet and Textbook Usage[a]

	No. (%)			
Survey Question	Frequently/ Daily	Somewhat Frequently/ 2-4 Times per Week	Rarely/On a Monthly Basis	Never/Do Not Use
How often do you use the Internet?	23 (85)	3 (11)	0	0
How often do you read a printed textbook of surgery?	10 (37)	9 (33)	7 (26)	1 (4)
How often do you read a printed surgical journal?	0	13 (48)	9 (33)	4 (15)
How often do you read an online textbook of surgery?	9 (33)	9 (33)	7 (26)	1 (4)
How often do you read an online surgical journal?	9 (33)	10 (37)	8 (30)	0

[a] Percentages are based on 27 submitted surveys.

Table 2. Survey Assessments of the SCORE and School for Surgeons Websites[a]

	No. (%)					
	Overall			Content Specific		
Survey Question	SCORE	School for Surgeons	P Value	SCORE	School for Surgeons	P Value
The content is organized well.						
Strongly agree	16 (59)	17 (63)		15 (56)	13 (48)	
Agree somewhat	8 (30)	5 (19)		10 (37)	9 (33)	
Neutral	1 (4)	3 (11)	.19	2 (7)	3 (11)	.42
Disagree somewhat	0	1 (4)		0	1 (4)	
Strongly disagree	0	1 (4)		0	1 (4)	
The topics are relevant to the surgical disease that I regularly see.						
Strongly agree	16 (59)	17 (63)		17 (63)	16 (59)	
Agree somewhat	6 (22)	5 (19)		7 (26)	5 (19)	
Neutral	3 (11)	4 (15)	.71	3 (11)	4 (15)	.47
Disagree somewhat	0	0		0	0	
Strongly disagree	0	1 (4)		0	1 (4)	
The website is easy to use.						
Strongly agree	10 (37)	11 (41)		16 (59)	13 (48)	
Agree somewhat	8 (30)	10 (37)		7 (26)	7 (26)	
Neutral	5 (19)	1 (4)	.52	3 (11)	3 (11)	.50
Disagree somewhat	2 (7)	3 (11)		1 (4)	2 (7)	
Strongly disagree	0	1 (4)		0	1 (4)	
Access to the website is fast and reliable.						
Strongly agree	7 (26)	8 (30)		10 (37)	12 (44)	
Agree somewhat	11 (41)	9 (33)		11 (41)	9 (33)	
Neutral	6 (22)	4 (15)	.76	3 (11)	3 (11)	.99
Disagree somewhat	1 (4)	2 (7)		2 (7)	1 (4)	
Strongly disagree	0	3 (11)		1 (4)	2 (7)	
I would use the curriculum regularly for surgical training, if it were available.						
Strongly agree	20 (74)	16 (59)				
Agree somewhat	3 (11)	6 (22)				
Neutral	3 (11)	3 (11)	.71			
Disagree somewhat	0	1 (4)				
Strongly disagree	0	1 (4)				
I would recommend the online curriculum to other surgical educators or trainees with whom I work.						
Strongly agree	22 (81)	20 (74)				
Agree somewhat	3 (11)	3 (11)				
Neutral	0	2 (7)	.49			
Disagree somewhat	0	0				
Strongly disagree	0	0				

Abbreviation: SCORE, Surgical Council on Resident Education.

[a] Content-specific responses are based on completion of an inguinal hernia module in both SCORE and School for Surgeons; percentages are based on total submitted surveys (n = 27).

cal practice environments of participants varied greatly, survey results indicated that the content was broadly relevant. Most important, respondents strongly believed that they would use the curricula regularly and recommend the web portals to colleagues.

The Internet has had an enormous effect on the ability to distribute educational content and promises to continue to revolutionize higher education.[16] Medical professionals have a high degree of responsibility for teaching and learning that continues throughout their careers, and the medium by which they choose to disseminate and gather information has an assortment of effects on pedagogy.[17] Internet access has traditionally been thought to be a significant limitation to medical education in LMICs, although the Ptolemy project has demonstrated that African surgeons prefer electronic resources over print references, and if access to current information is improved, surgeons are documented to read and learn more.[18,19]

Interestingly, within the context of the present study, Internet accessibility was not identified as a major challenge by respondents. Website speed and performance were reported sufficient in most cases, even in an area of the world that is widely regarded to be behind the "digital divide."[20] Online access is a great equalizer when it comes to the spread of information.[21] Improvements in infrastructure and programs such as the O3b satellite constellation[22] promise to continue to increase penetration of Internet access to rural and remote areas of LMICs. This can facilitate international collaboration and easily play a role in alleviating misdistribution of surgical education resources.[23] Furthermore, we have herein noted that, content aside, electronic learning systems appear robust and easily scaled up for groups of new users who would not otherwise have access to the information.

Despite any study limitations, we were impressed with a few interesting points. Even in the United States, broad availability of the SCORE web portal was preceded by uncertainty regarding the utility of delivering web-based content to trainees.[15] These concerns have subsided since reception to training programs has been excellent, to the extent that training programs and policies are being structured around the curriculum.[24] Before starting this study, we had surmised that some respondents would desire curricula specifically designed for their local context. For example, the US-based SCORE system incorporates use of laboratory and imaging technologies that may not be as readily available to LMIC practitioners. Also, there is little in the curriculum regarding surgical conditions related to infectious diseases endemic to LMICs but rarely encountered in the United States. However, survey responses consistently reflected wide agreement with the relevance and suitability of the SCORE curriculum to training and practice throughout Africa and the Indian subcontinent. Similarly, feedback was generally positive after use of the School for Surgeons website, despite many respondents hailing from countries outside the COSECSA region for which it was designed. When the two websites were compared with each other, there were no significant differences in survey responses assessing the overall curricula and the content specific to modules on inguinal hernia. It is apparent that respondents saw

Table 3. Indications for Use and the Perceived Challenges of Each Web Portal

Survey Question	No. (%)	
	SCORE	School for Surgeons
How would you use this Internet-based curriculum? (may select more than one)		
To prepare for a an upcoming lecture	23 (85)	19 (70)
To prepare for a surgical case	22 (81)	17 (63)
To prepare for an educational day	16 (59)	14 (52)
For an assigned reading/to assign a topic to trainees	20 (74)	18 (67)
Would not use	0	0
Did you encounter any problems using the website? (may select more than one)		
The Internet connection was slow.	7 (26)	5 (19)
Access to a computer was not always available.	4 (15)	4 (15)
There were technical issues (incompatible web browser, login did not work, videos would not play, etc).	7 (26)	10 (37)
The organization of the topics was difficult to navigate.	4 (15)	2 (7)
It was difficult to understand how to assign readings.	1 (4)	0
The topic sections did not seem to apply to diseases seen in my region.	2 (7)	1 (4)

Abbreviation: SCORE, Surgical Council on Resident Education.

value in both Internet-based systems despite their differences in presentation and focus.

These data are subject to the biases of survey-based research, including undercoverage and voluntary response bias. Specifically, our enrollment methods using primarily electronic communication and instruction exclusively in English were sources of bias when interpreting our results. Surgeons who are accustomed to routine Internet use are likely to feel more comfortable with online education platforms. Even within developing countries, access to computers and the Internet varies greatly, and this study may have been unable to reach practitioners in extremely rural or remote areas as well as those that have not routinely adopted computer use. Although this may limit the generalizability of our findings, we expect that rapid growth of Internet connectivity in LMICs, particularly among educated professionals, will mitigate that bias over time. Generally, our 36% response rate is near expected for nonincentivized research involving health care workers.[25] Last, some participants hailed from COSECSA nations and may have had previous exposure to the School for Surgeons curriculum.

Conclusions

These data suggest that use of online surgical training curricula can augment the education and training of a surgical workforce in resource-limited environments. Further studies will identify ways to scale up the use of these Internet-based systems for educational outreach in LMICs, evaluate their effect on training and surgical disease burden, and create standardized curricula.

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