ORIGINAL ARTICLE

www.elearnSCI.org: a global educational initiative of ISCoS

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Objective: To develop a web-based educational resource for health professionals responsible for the management of spinal cord injury (SCI).

The resource: www.elearnSCI.org is comprised of seven learning modules, each subdivided into various submodules. Six of the seven modules address the educational needs of all disciplines involved in comprehensive SCI management. The seventh module addresses prevention of SCI. Each submodule includes an overview, activities, self-assessment questions and references.

Development of the resource: Three hundred and thirty-two experts from The International Spinal Cord Society (ISCoS) and various affiliated societies from 36 countries were involved in developing the resource through 28 subcommittees. The content of each submodule was reviewed and approved by the Education and Scientific Committees of ISCoS and finally by an Editorial Committee of 23 experts.

Key features: The content of the learning modules is relevant to students and to new as well as experienced SCI healthcare professionals. The content is applicable globally, has received consumer input and is available at no cost. The material is presented on a website underpinned by a sophisticated content-management system, which allows easy maintenance and ready update of all the content. The resource conforms to key principles of e-learning, including appropriateness of curriculum, engagement of learners, innovative approaches, effective learning, ease of use, inclusion, assessment, coherence, consistency, transparency, cost effectiveness and feedback.

Conclusion: www.elearnSCI.org provides a cost effective way of training healthcare professionals that goes beyond the textbook and traditional face-to-face teaching.

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INTRODUCTION

Spinal cord injury (SCI) management remains one of the most complex challenges for healthcare professionals. It requires skilful and coordinated input from a multi-disciplinary team of health professionals[1] and lifelong follow-up.[2] The goal of SCI management is to increase independence, restore dignity and hope, and maximise quality of life for those living with SCI. Until now, however, there has been a lack of professional development opportunities for healthcare professionals involved in the management of SCI and limited access to up-to-date SCI training and learning resources. This is particularly a challenge for low–resource countries and those in rural and remote areas.

Recognising the need to disseminate information about comprehensive management of SCI, the Education Committee of The International Spinal Cord Society (ISCoS) initiated and developed www.elearnSCI.org; a web-based educational resource. The aim of this resource is to increase understanding, skills and knowledge about the comprehensive management of SCI. The resource is appropriate for students and clinicians of all disciplines.

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THE CONTENT AND FORMAT OF THE RESOURCE

www.elearnSCI.org comprises seven learning modules, each consisting of a number of submodules. The first module is titled 'Overview for the whole team' and provides basic information about the management of SCI for all disciplines. Five other modules cater to the specific educational needs of doctors, nurses, physiotherapists, occupational therapists/assistive technologists and psychologists/social workers/peer counsellors. It is recommended that users go through the first module, 'Overview for the whole team', before accessing their discipline-specific modules. The seventh module mainly focuses on information about the prevention of SCI.

The modules are comprised of various submodules (Table 1) each of which covers a specific topic and includes (Figure 1):

- *an overview*: this is a didactic presentation outlining the key concepts of SCI management.
- *activities*: these come in various forms. In some modules the activities are primarily multiple-choice questions where users receive feedback about their responses. In other modules the activities are more complex with up to 50 screens containing case studies, more in-depth information, links to other resources, videos, interviews with experts and consumers, and many different types of interactive screens.
- *self-assessment questions*: these are multiple choice questions. Users receive a score which is logged in their profile page. The users can elect to have their results e-mailed to anyone, for example, their supervisors, lecturers or mentors.
- *references*: these are the key references for the submodule.

The learning modules are accompanied by a comprehensive definition of terms, including a glossary and abbreviations.

DEVELOPMENT OF THE RESOURCE

The project was first proposed at the Education Committee meeting during the 2009 Annual Scientific Meeting of ISCoS. It was approved a year later at the ISCoS Annual Scientific Meeting in New Delhi, and work began immediately thereafter. The Asian Spinal Cord Network, Indian Spinal Injuries Centre, Livability Ireland and the New South Wales Lifetime Care and Support Scheme partnered with ISCoS to develop the content and accompanying website, with substantial financial support from Access to Health Care.

Three hundred and thirty-two experts from ISCoS and various affiliated societies in 36 countries were involved in developing the content through 28 subcommittees, each working on a particular submodule. The basic content of each submodule was developed from a 3-day workshop conducted after the 2010 ISCoS Annual Scientific Meeting titled 'Comprehensive management of SCI'. The presentations in this workshop were used as a draft by the subcommittees. The content of each submodule developed by the subcommittees was ultimately reviewed and approved by the Education and Scientific Committees of ISCoS. The modules were then trialed at a workshop in New Delhi in April 2012 and feedback was taken from over 200 delegates. An Editorial Committee of 23 experts met simultaneously during the workshop to review and edit the submodules. Editorial work continued online thereafter.

The web platform for hosting the educational resource was developed by a company in New Delhi. The content sits on a website underpinned by a sophisticated content-management system, which allows the administrators to upload, move, copy and change the content of any screen, including the interactive screens. This feature was considered important for the long-term viability of the project: it

will enable ISCoS administrators to be largely independent of ongoing IT support on completion of the project.

The content was written in javascript and HTML with a SQL database. Some of the interactive screens have been written in HTML 5 code. Even though Flash can provide a good visual and interactive experience Flash was not used because it is not compatible with apple mobile devices, is not easy to maintain and cannot be used in places with slow internet connections.

www.elearnSCI.org was launched during the International Spinal Cord Society's 51st Annual Scientific Meeting in London on 4th September 2012. It will continue to evolve in the coming years. The development and widespread dissemination of the e-learning resource is an expression of the aims of ISCoS.

VISION

As the authority on the management of SCI, ISCoS will aspire to promote free and easy access to relevant educational resources on comprehensive management of SCI amongst health professionals involved in SCI management and also amongst people living with SCI, their families, health care providers, policy makers and the community in general.

MISSION

The mission of www.elearnSCI.org is to improve the quality of life of people living with SCI by disseminating awareness about SCI prevention and comprehensive management globally.

KEY FEATURES OF THE RESOURCE

www.elearnSCI.org:

- is based on evidence and the latest research thus providing the most up-to-date knowledge.
- is relevant to students as well as junior and experienced healthcare professionals.
- is free for all to access.
- is appropriate for those from high and low resource countries and for people from varying social, cultural and economic backgrounds, with content that reflects the realities of providing healthcare in both high and low resource settings (Figure 2).
- has been written in simple English with heavy reliance on illustrations and videos for those users for whom English is not their first language.
- has had consumer input. SCI consumers were involved in the compilation of the Psychologists, Social Workers and Peer Counsellors module and other relevant submodules such as vocational rehabilitation and community inclusion. In addition, consumers were represented on the editorial committee ensuring their perspectives were appropriately reflected in all content.
- is underpinned by a sophisticated content management system, which enables ISCoS administrators to change and update content without IT support, thus saving costs.
- complies with the principles of effective e-learning (Figure 3).

COMPLIANCE WITH PRINCIPLES OF E-LEARNING

The resource conforms with the widely acknowledged principles of effective e-learning[3–11] that includes the following.

Appropriateness of curriculum

The content. The content was developed to provide comprehensive information on the management of SCI appropriate for all members of the team.[3] The content of each submodule has been compiled by

Table 1 Depicts the sub-modules of each of the seven modules

Overview for the whole team module

Introduction to SCI	Nursing management
Team-based care – roles and responsibilities	Physiotherapy management
Prehospital care	Occupational therapy management
Emergency and acute care management of SCI	Assistive technology perspective and mobility and seating
Clinical assessment of patients with SCI	Psychosocial rehabilitation and team
Management of vertebral lesion	Communication skills for healthcare professionals
Respiratory management	Community inclusion
Nutritional management	Outcomes in SCI
Bladder management	Vocational rehabilitation
Bowel care and management	Issues specific to women with SCI
Sexuality, fertility and SCI	Prevention of SCI
Early and late complications in SCI	Cell transplant therapy
Autonomic dysreflexia	Management of SCI after disasters and emergencies

Doctors' module

Prehospital care	Early and late complications in SCI: pain
Clinical assessment of patients with SCI	Early and late complications in SCI: respiratory
Emergency and acute care management of SCI	Early and late complications in SCI: cardiovascular
Management of vertebral lesion	Early and late complications in SCI: genitourinary tract and neurogenic bladder
Respiratory management	Early and late complications in SCI: spasticity
Nutritional management	Early and late complications in SCI: pressure ulcer infection and sepsis
Bladder management	Psychiatric management of depression
Bowel care and management	Management of pediatric SCI
Sexuality, fertility and SCI	Aging with SCI
Early and late complications in SCI: musculoskeletal	Cell transplant therapy

Physiotherapists' module

The health essentials	Upper limb function: understanding movement
Principles of management	Strength: assessing and treating
Assessment	Contractures: assessing and treating
Setting goals	Motor skill: assessing and treating
Bed mobility and transfers: understanding movement	Fitness: assessing and treating
Wheelchair mobility: understanding movement	Respiratory: assessing and treating
Gait: understanding movement	Pain: assessing and treating

Nurses' module

Prevention module

Introduction to the concept and role of the nurse	Data collection
Spinal precautions	Global mapping tool
Maintaining skin integrity following SCI	Prevention of SCI through prevention of road traffic crashes (RTCs)
Respiratory function	Prevention of tetraplegia from diving into shallow water
Haemodynamic and cardiovascular issues following SCI	SCI falls
Genitourinary system and bladder management	
Managing neurogenic bowel dysfunction in people with SCI	
The role of nurses in facilitating healthy sexuality in people with SCI	

Psychologists', social workers' and peer counselors' module

Occupational therapists' and assistive technologists' module

Psychosocial adjustment to SCI	Personal ADLs
Psychosocial issues regarding family members	Instrumental ADLs
Psychosocial response to an activity of rehabilitation	Functional mobility
Family care giving and SCI	Hand function
Psychosocial response to medical complications of SCI	Wheelchair mobility and seating
Core element of counselling	Home modifications
Peer counseling: a holistic psycho-social rehabilitation approach	

Abbreviations: ADL, activities of daily living; SCI, spinal cord injury.

Figure 1 A screen shot from www.elearnSCI.org illustrating the splash page for the module titled: 'Overview for the Whole Team'. The side menu bar is for accessing the submodules. Each submodule comprises an overview, activity, self-assessment questions and references. A full color version of this figure is available at the *Spinal Cord* journal online.
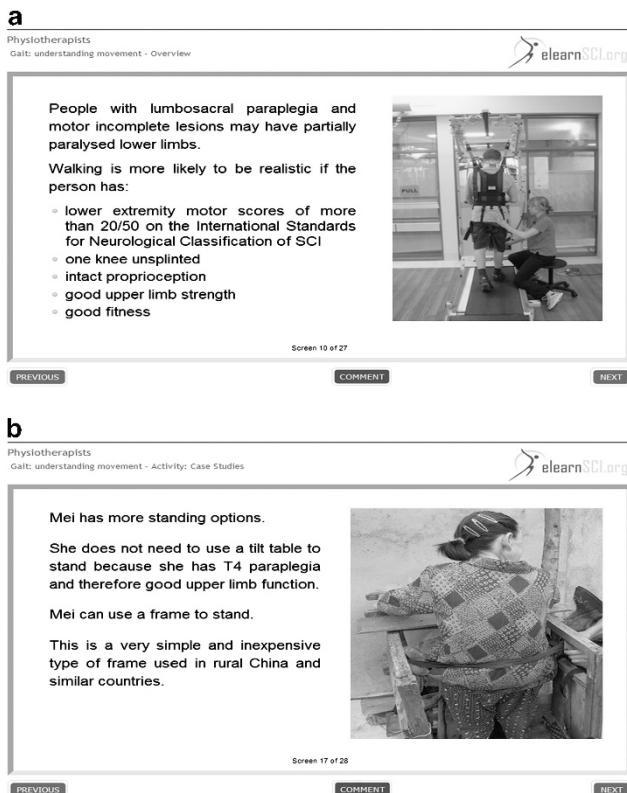
Figure 2 Two screen shots from www.elearnSCI.org illustrating the inclusion of both costly and inexpensive rehabilitation solutions. This approach was adopted to ensure the content of the website is applicable in high- and low-resource countries. A full color version of this figure is available at the *Spinal Cord* journal online.

leading experts from that particular field across the globe. In addition, the content is based on up-to-date SCI research and will be periodically revised as new evidence emerges.
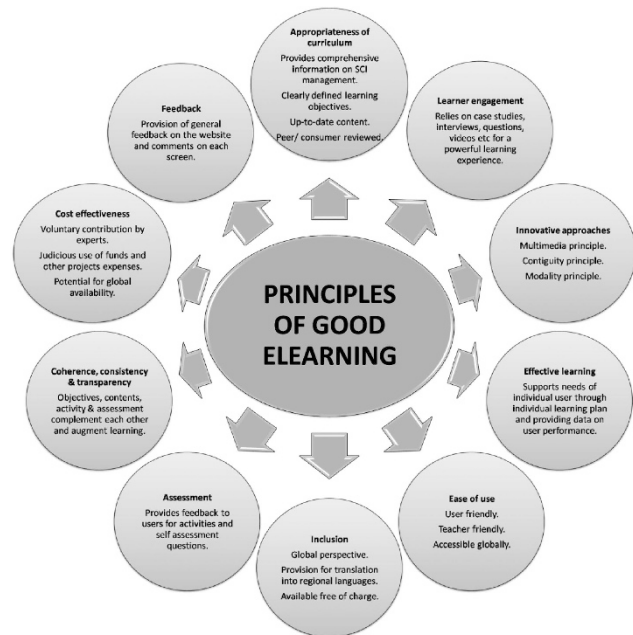
Figure 3 The 10 principles of effective learning which www.elearnSCI.org conforms to.

The first module titled '*Overview for the whole team*' provides information essential for all members of the team. The discipline-specific modules have the additional information that each discipline requires. This structure ensures that the content is directed at the appropriate level for each discipline.

The resource also has the potential to facilitate cross-training of professionals because everyone has access to all the discipline-specific modules in the resource. Cross-training is particularly important in low-resource countries, where limited number of professionals may be providing all types of multi-disciplinary care.

Figure 4 Three screen shots from www.elearnSCI.org illustrating the various types of interactive screens. These types of screens have been included to actively engage the learner. A full color version of this figure is available at the *Spinal Cord* journal online.

Figure 5 Three screen shots from www.elearnSCI.org illustrating use of innovative approaches (multimedia and contiguity principle) and learner engagement principles of e-learning. A full color version of this figure is available at the *Spinal Cord* journal online.

A workshop in New Delhi provided peer review and optimised the content of the educational modules. An evaluation is planned wherein the resource will be pilot tested with a sample of target users. Knowledge, skills and confidence will be assessed before and after reading the modules. The pre- and post-test measures will track the change in participants' understanding of the issues covered in the learning resource and enable an assessment of the potential impact of the learning content.

Learning objectives. The learning objectives for each submodule have been clearly defined using Blooms Taxonomy.[12] Although they generally address the cognitive domain (that is, knowledge), some also address the affective (that is, emotion) and psychomotor (that is, skills) domains. The inclusion of all three types of objectives reflects the underlying purpose of the learning experience, that is, to change/ improve knowledge, emotion and skills.

Peer/consumer reviewed. The appropriateness of the content has been reviewed by peers and consumers.

Learner engagement
Users are actively engaged in the learning process (Figure 4).[3] They are not passive recipients of information. They learn by reviewing real case studies, listening to interviews from experts, answering questions and viewing photos, videos[4] (Figure 5) and material from various SCI centres. It is these features that set this website apart from other sources of information and text books about SCI.

References and links detail the original source of the content. Direct pathways/links to other education resource material are also provided.

Interactive screens are an integral part of the activities. These engage the learner by providing immediate feedback.

Users can view their assessment scores for completed submodules providing motivation to cover the submodules, which are still pending or retake the assessments to improve their scores. They can also interact or discuss progress with their supervisors, lecturers or mentors and can email their improved scores to them.

Innovative approaches

Different types of illustrations, including still graphics such as line drawings, charts and photographs are employed through the modules to enhance the user experience.[3] Motion graphics such as video have been incorporated into the resource as well. Research has shown that adding graphics to words can improve learning.[4,5] This is popularly known as the multimedia principle[6] (Figure 5). Illustrations that are congruent with the instructional message have been used.

Learning occurs when new information is encoded into long-term memory.[7] According to Dual Encoding theory, content communicated with text and graphics sends two codes—a verbal code and a visual code. Learning is increased by the two opportunities for encoding into long-term memory.[7] In addition, the use of graphics and illustrations helps learners for whom English may not be their first language and reduces the need for detailed text.

Contiguity refers to the alignment of graphics and text on the screen.[6] In accordance with the contiguity principle, text related to the graphics is placed close to each other on the screens in www.elearnSCI.org (Figure 5).

Research has also shown that explaining graphics with audio improves learning (Modality principle[6]). However, as learning is actually depressed when a graphic is explained by a combination of text and narration that reads the text, this combination has been avoided.[6] There is an option of adding voice to some of the screens in the future. Whether or not this option is adopted will be determined by the outcome of research that has been planned to study the effect of voice overlay on learning.

Effective learning

Users have a wide variety of learning styles and needs. www.elearnSCI.org supports the needs of the individual.[3] Learners can go through the resource at their own comfortable pace, thus enabling them to learn the content effectively. Further, the summary of the assessments in the profile helps them reflect on their performance and focus effectively on topics they have not mastered well. They can also ask for the help of their supervisors, lecturers or mentors on these topics.

Ease of use

User friendly. The resource is user friendly and easy to navigate.[3,8] There is an option for users to access user guidelines or contact the administrator.

Teacher friendly. Even though it is an e-learning resource, teachers will find the content very useful for teaching purposes. In settings with few resources where students may not have easy internet access, teachers can use the resource for teaching in their classes.

Accessibility. The resource is accessible globally.

Inclusion

The international peer review process ensured that the information available is applicable globally irrespective of the cultural and socio-economic background of the region (Figure 2). Further, users from all economic backgrounds can access the resource because it is available free of charge.

The resource will continue to evolve over the coming years and findings from a planned evaluation will help guide it. Like other e-learning tools, elearnSCI.org is a 'living', dynamic and evolving body of information that will be continually kept up-to-date and thus should stay on the cutting edge of SCI care today and in the future. There are plans to evaluate the content in a systematic manner on a regular basis (every 3 years) incorporating feedback, periodic evaluations, suggestions, new technologies and new standards of care as they evolve. The revisions would be proposed by the subcommittees as part of three yearly evaluation and would be reviewed by the editorial committee.

In addition, there are plans to translate the content into different regional languages. Translations into Spanish and French have already been proposed. ISCoS along with its regional affiliated societies would be involved in translation process following the principles outlined by Biering-Sorensen et al.[13] This would ensure the availability of the resource to a gradually increasing proportion of non-English speaking health professionals. ISCoS further proposes to disseminate information about the resource in different parts of the world and especially in less resourced areas through its affiliated societies.

Assessment

Users can get feedback for their attempts at activities as well as self-assessment questions.[3] On attempting activity-based learning exercises, immediate feedback is given indicating if the response is correct or incorrect. On submitting the answers for self-assessment questions, the assessment of performance is displayed on the screen. The assessment experience enhances learning.[9] It may also motivate users to make an attempt to carefully go through the submodules, for which they have not scored well in the self assessment questions.

Coherent, consistent and transparent

Care has been taken to ensure coherence and consistency in the way the objectives, contents, activities and assessments complement each other and augment learning.[3] For example, the overview and activities are consistent with the objectives, and the self-assessment assesses the extent to which the objectives are met for a particular user.

Cost effectiveness

Web-based learning is, generally, a cost-effective way of providing education, hence its growing popularity within universities and educational institutions.[3,10,11] It is cost-effective because it minimises the need for costly face-to-face teaching and avoids the expense associated with bringing large numbers of learners together for formal classes.

There were two main costs associated with developing www.elearnSCI.org. These were the costs of developing the interface and the costs of bringing the experts together for editorial meetings. The costs associated with developing the interface were minimised by engaging an Indian-based IT company. The costs of developing the content were minimal because those responsible for this have donated their time and expertise. Recovery of the initial and ongoing expenses is not foreseen as the resource is available free of charge consistent with ISCoS' aim to ensure widespread information dissemination. A study on cost-effectiveness could be done subsequently (for example, at the first anniversary of the launch when the number of users over the year would be known) but it is difficult to imagine a more cost-effective means of providing a learning resource with the similar potential for global availability.

Feedback

Users have the ability to provide general feedback.[3] In addition, at the bottom of each screen there is the opportunity to provide specific feedback on that particular screen.

LIMITATIONS OF THE RESOURCE

Though elearnSCI.org is a valuable tool for information dissemination, like other e-learning resources, it cannot replace the traditional learning methods. An over-emphasis on e-learning without incorporating adequate 'hands-on' learning can compromise the understanding of the basics of management.

SUMMARY

Despite advances, SCI management still remains one of the most complex challenges facing healthcare professionals. Moreover, there is a lack of professional development opportunities for health professionals involved in the management SCI and limited access to up-to-date SCI training and learning materials/resources. In order to bridge this gap, ISCoS took the initiative to develop www.elearnSCI.org, a web-based educational resource that addresses the educational needs of all disciplines involved in the management of SCI. It is relevant to students as well as new and experienced SCI practitioners.[14]

The resource comprises seven modules, each consisting of various submodules. Each submodule covers a specific topic and includes a presentation, activity-based learning activities, references and self-assessment questions.

Experts of ISCoS and affiliated societies were involved in the compilation of the resource through subcommittees and review through Education, Scientific and Editorial Committees. On the basis of up-to-date SCI research, the educational resource is applicable globally, has a consumer input and is available free of charge. The resource has been developed taking into consideration the principles of effective e-learning.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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