

# **Dysphonia - Illustrating a Nationwide Initiative to Provide Students with High Quality e-Learning Resources**

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## **Abstract**

Dysphonia is one of 16 e-learning projects coordinated and supported by the MedCal committee of the Council for Renewal of Higher Education. The application as such is a multimedia program about voice disorders and comprises a collection of patients suffering from hoarseness, which the user can explore in an interactive manner. The greatest benefits can be reaped by being able to integrate sound (voice) with images, video clips and descriptive text of various pathological conditions. Voice acoustic analysis is also provided. Each diagnosis is explicitly accounted for in classic textbook style. Descriptions of examination techniques, therapeutic sessions, and surgical interventions are included. The material can be accessed in multiple ways and supports explorative learning. The Dysphonia project is the product of a network of collaborators of various expertise supported by a nationwide initiative.

## **Introduction**

Information and communication technology (ICT) has become an integral part of undergraduate education as well as health care management today (Dørup et al. 1998/2000). Although the ICT-tools are readily available, the lone academic is generally not successful in producing educational software (Alexander and McKenzie 1998). On the other hand, academics must guarantee the educational content, and that the students' needs are met. E-learning is of special importance since information technology (IT) provides access to resources not available in books, i.e. sound and video, but also to more sophisticated procedures such as simulations and exploration of material in an integrated manner. However, since most e-learning projects are elaborate and expensive, but address a common ground for academic staff and students, a concerted effort is highly desirable.

## **MedCal - a nationwide initiative**

In order to support and streamline initiatives from individual academics, MedCal was created in 1994 as a subcommittee to the Council for Renewal of Higher Education with representatives from the Swedish Medical Schools (Rydmark et al. 1998). The MedCal committee is committed to support the development and implementation of computer assisted learning (CAL) in health science education (Medicine, Odontology, Veterinary Medicine). MedCal promotes the use of CAL by coordinating development projects, presently 16, of which 12 have been completed. MedCal initiates workshops and conferences for teachers, developers and deans, informs students and teachers about useful e-learning resources, distributes educational resources, strategies and initiatives, and initiates networks of departments and libraries.

## **Dysphonia**

### **Development**

One of the 16 MedCal supported projects, Dysphonia was developed at the Ear, Nose and Throat Department, Malmö University Hospital, a branch of the Medical Faculty, University of Lund, Sweden. The original program, created in *SuperCard* (Apple Computer), was called "Functional Laryngology" (all content in the Swedish language) and was introduced to medical students in 1993. By employing *SuperCard*, we were not only restricted to the Macintosh platform, but also subjected to the limitations of *SuperCard* for navigation and design.

### **A need to re-think**

In 1996 it was decided to switch to a cross platform medium and the choice fell on *Macromedia Director*, which offered greater flexibility. The object was to develop aspects that were deemed to be of crucial importance, viz. layout and navigation. To further the development, we included a programmer in the group and consulted design and content experts both nationally and internationally (Australia and USA) in addition to the medical specialist at the department. The development has been made in close collaboration with students to ensure that their requirements are also reflected in the program. The program has been presented at various meetings of experts in the discipline and in computer based learning.

We produced a number of versions of the program, re-named Dysphonia. Interest was fuelled at a gathering at Umeå University in 1998 arranged by the Council: "MedCal Workshop. Improvement of the Council's Multimedia Projects". This meeting proved to be a fertile ground for the exchange of ideas with and suggestions from other parties working on similar projects aided by the Council, and by experts in other fields.

Dysphonia was one of the award winners of the EASA (European Academic Software Award) competition held at Oxford in 1998 (Akerlund et al. 1998). Another MedCal project - Virtual Dentist - was also among the winners (Molin and Lind 1998).

### **Software turned courseware**

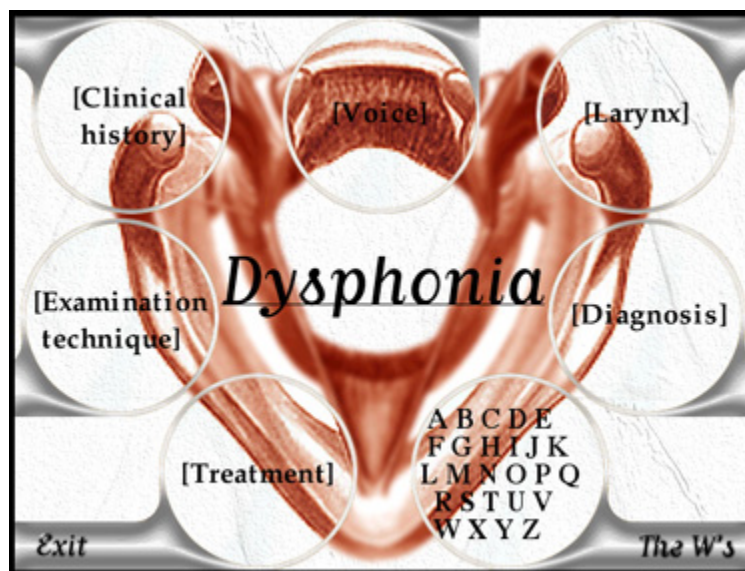
Dysphonia is thus a program about patients suffering from impaired voice quality, or hoarseness (i.e. dysphonia). It is intended for the training of undergraduate medical and speech therapy

students, postgraduate residents under continuous medical education in the Ear, Nose and Throat discipline, and others, such as General Practitioners at Health Care centres. The program is designed to be used by students who have no more than a basic knowledge of the anatomy of the larynx. Moreover, the program is intended to be adaptable for students with different learning strategies.

The material can be accessed in several explorative ways. Dysphonia is typically used during a scheduled session by groups of 7-8 students, with 1-2 students per computer. The students are given a couple of dysphonic cases to examine, aided by the program, in an explorative way (problem-based learning). An instructor is available at any time. Alternatively, the students work alone by accessing cases via the clinical history (case-based learning). After expressing their own interpretation of the voice and images respectively, the student can select the author's suggestion (text) on the screen. The user might also go the other way around and select a diagnosis, getting all information about it, and view a case as an example (linear access).

## Structure

To facilitate learning of the management of laryngeal disorders, interactive access is provided to a database of recorded dysphonic patients, and to another database that provides descriptions of various relevant ailments (a demonstration can be found at <http://www.aron.mas.lu.se/lingo/>).



**Figure 1. Dysphonia: Entrance**

By clicking on Clinical history the student can retrieve different patients (cases).

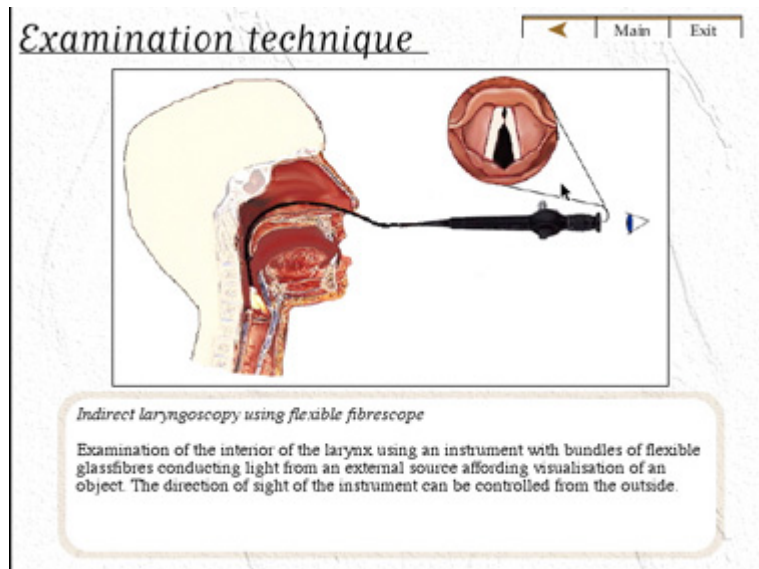


**Figure 2. Dysphonia: Examination of patient**

You can hear a recording of the patient's voice, complemented by voice acoustic analyses, i.e. Glottal Frequency Analysis, Long-Time-Average-Spectrum and GRBAS, perceptual evaluation of the voice. Further, you will find a still photograph of the vocal folds typical of the condition, pathoanatomy and video clips of the vocal folds (stroboscopy). There is also a section for management and followup.

The encyclopaedic side is useful in the *Diagnosis* section. This is a list of the most common laryngeal disorders. These are treated in classic textbook fashion: definition, terminology, prevalence, etiology, symptoms, findings, histology, differential diagnosis, management, course, prognosis, and literature. The description of the disorder is linked to the cases.

*Examination technique* zooms in on various means of voice analysis, laryngoscopy, diagnostic imaging and histological examination.



**Figure 3. Dysphonia: Indirect laryngoscopy**

*Treatment* focuses on surgical, radiological and pharmaceutical therapy, as well as modification of behavior, which is counselling and vocal exercises.

Finally, there is a *Glossary*. This is an alphabetical listing of medical terms and expressions for the novice. These terms are accessible from a database via hyperlinks in the text.

### **Students' opinion**

In total, more than 400 students have utilized the present version of Dysphonia. In 1998, a course questionnaire was filled out (n=85) aiming to find out about the students' opinion of the use of ICT (Nilsson et al. In manuscript). A great majority of the students (86.2%), agreed that they had benefited from the Dysphonia program with no differences regarding age, gender or previous computer experience. More than 80% of the students regarded the design and content of the Dysphonia software as good. In particular, they appreciated that Dysphonia illustrates proceedings that cannot be reproduced in textbooks, such as voice samples and video clips. Simulated, or virtual, patients are a valuable supplement to the teaching due to a lack of opportunities for the students to meet such patients during the course.

### **Language/culture**

The English language was no problem for the students, but Swedish and German translations are planned to be implemented soon. Cultural differences created no apparent problems. When Dysphonia was presented in Australia (The Flinders University of South Australia and The University of Adelaide 1997) not even the Swedish speaking patients were problematic, since it is the quality of the voice that has to be interpreted, not the language.

### **Continuous development**

A program of this nature must by necessity be updated regularly as new medical discoveries and techniques are made available. It would also be beneficial if more cases could be added whenever something of interest crops up at the clinic. The present version is stored on a CD-ROM, but it would be easier to implement these items if the program was on the Web, and had its foundation in a database program. A further development of Dysphonia will be presented at the Slice of Life Conference in Munich, Germany in August 2001 (<http://slice.gsm.com/2001/>).

## Concluding remarks

The experience gained by the Dysphonia project is similar to other MedCal projects developed by a few devoted educators, and highlights the need for long term planning regarding maintenance and financing. Since the content is of interest not only to undergraduate students but also professionals as a part of life long learning, collaboration with public service, or non-commercial, organizations must be considered. In this way, efforts in developing e-learning resources can be made more effective by sharing structures between disciplines and content within disciplines.

The Dysphonia project exemplifies the result of collaboration by a network of experts supported by a nationwide initiative. We propose the establishment of national boards for content, pedagogy and technology respectively, involving public service organizations like The National Board of Health and Welfare, The Swedish Society of Medicine, The Swedish Agency for Distance Education, and others.

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