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Medview - a computerised teaching aid in oral medicine and oral pathology

Abstract

The problems to solve

Oral medicine and oral pathology are disciplines that comprise diagnosis and treatment of diseases in the oral cavity and adjacent tissues. Oral medicine focuses on clinical diagnosis and treatment of mucosal lesions, including oral cancer, while oral pathology contributes to the diagnosis of these disorders at a microscopic level.

Available teaching aids do not cover the full spectrum of diseases related to oral medicine and oral pathology and the clinical training is insufficient. There is a lack of the coordination between the two disciplines and language barriers hamper the international exchange of teaching materials. These are serious problems when one considers that dentists regularly survey a majority of the population and, thus, are in an ideal position to decrease morbidity and mortality as a consequence of oral diseases.

The leading educational idea

The leading idea is that the information gathered in the clinical setting should be immediately available to provide students with new knowledge. After years of discussion with students the following ideas have emerged to form the present project.

* A large collection of clinical cases, including images, will give the students sufficient exposure to the various clinical manifestations of individual oral diseases.
* A shorter time lag between collection of clinical data (disease history, status, clinical images, histopathology images, laboratory findings, etc.) and the production of teaching material will ensure that students are exposed rapidly to the full spectrum of oral diseases.
* Interactive studies will enable students to extract new knowledge about populations of patients as well as individual cases.
* Integration of data from both the clinical and the histopathological examinations will satisfy the requirement to coordinate the oral medicine and oral pathology aspects of cases.

* A translater of clinical data and terms will enable students with different native languages to obtain new knowledge independent of the data's geographical origin.

The implementation

The Institute of Odontology, Göteborg University, and Department of Computing Science, Chalmers University of Technology, have developed MEDVIEW, a prototype for the collection and analysis of large amounts of clinical data. This computerised system will provide the basis for the proposed project and will be adapted to meet the educational demands described above. A description of MEDVIEW is given below followed by an outline of how students will use the program in a direct hands-on manner to learn about oral medicine and oral pathology.

Registration of clinical information:

The registration of clinical information is carried out by the participating teachers as part of their clinical practice. In addition, several oral medicine clinics in the cities of Falun, Karlstad, Västerås, Örebro, will populate the database with cases. Thus, the registration form will not be used by the students.

The registration form supports rapid and accurate collection of a large amount of varied clinical information. The clinician and the histopathologist use the same type of registration form. At present, at least 25 new cases are registered every week and the database now contains more than 700 cases and over 1500 appointments.

Patient overview:

The registration form does not facilitate a comprehensive overview of the patient. The program solves this problem by automatically extracting values from the registration form and placing them in a predefined context. Thus, values of age, sex and occupation, might be presented in text as '53 year old female teacher..'. Clinical and histopathological images are displayed. The patient overview will be used by the students to examine different clinical cases.

As emphasised in Registration of clinical information above, items can easily be added to the lists offered to the user for data entry. When a new item is added it is possible to convert it so that it fits the context used in the patient overview. When the question 'In what country were you born?' is answered 'Sweden', Sweden may be converted to 'svenskt' to fit into the Swedish patient overview which reads '..och är av svenskt ursprung'. Thus, different predefined contexts in different languages can be used successfully if the items are translated from one language to another. This means that a student in London can use an English patient overview (context) to read a registration made in Swedish.

Analysis tools:

The analysis tools will be the primary means for students to learn from

MEDVIEW ´s knowledge base. The Cube is a tool for visualising large amounts of clinical data and provides students with an overview of the data base.

When data from several thousands of patients are displayed in *The Cube* it may be difficult to recognise clinically meaningful patterns. To solve this problem it is possible to group parameter values in a hierarchical manner. For example, diseases such as Herpes labialis, Herpetic gingivostomatitis, Shingles, etc., can be grouped into viral diseases. Such classifications of parameter values will reduce complexity and facilitate the detection of interesting patterns in the data.

The Bar diagram may be used for descriptive analysis of data. It is a more conventional and simpler way to examine clinical data, and will initially be the way for students to get acquainted with MEDVIEW. For example, The Bar diagram is ideal when different frequencies (e.g. age and distribution) are to be studied.

Student - MEDVIEW interaction
To learn about MEDVIEW, the students will be given a 2 hour introductory lecture. An instruction with a predefined work plan will be presented. The students will be guided to learn the basic descriptive knowledge through using MEDVIEW to answer questions such as 'Which are the 5 most common oral mucosal lesions?', 'What percentage are these of the total amount of referrals?'This information is easily extracted from the database using *The Patient Overview, The Bar Diagram* and *The Cube*. The students will also be taught how to use more conventional databases in order to get knowledge about different etiological theories. Thus, the instruction together with different databases will comprise a comprehensive grounding in basic knowledge about different oral disorders.

Update

Progress report 1 (May 2001)

The MEDVIEW project was funded in the beginning of October 2000. During the first six months a number of different actions have been taken. The registration module has been installed at the collaborative Universities in Denmark and UK. This module has been used for registration of information related to both oral medicine and oral pathology. In total, clinical information from over 2200 visits have been gathered.

Two prototypes for analysis of large amount of clinical information have been developed. These new tools are further developments of the Bar Diagram and The Cube. They will be used by the students during the next course in oral medicine and oral pathology, which will commence in October 2001.

For the past spring course, a CD was developed with clinical cases and/or common text-based information of the most common oral mucosal lesions. Half

of the students received the CD containing the text-based information, while the other half were also exposed to clinical cases gathered by MEDVIEW. In the written examination, the students were given questions related to the text-based information. In addition, a diagnostic test was performed were the students had to diagnose 20 clinical cases, presented as clinical pictures. The first part of the examination comprised questions related to the text-based information and the two groups of students had similar scores on this part. A significant difference was revealed regarding the diagnostics skills, where the group exposed to the clinical cases presented with higher a score. Thus, the outcome of the examination supports MEDVIEW as a valuable teaching tool in oral medicine and oral pathology.

Progress report 2 (December 2001)

The first versions of the analytical tools, developed to visualise large amount of clinical information, has been completed. These tools can now be used as part of the oral medicine and oral pathology course. To make the entire MedView program accessible on the Internet, a student group from the Chalmers University of Technology and students in dentistry are collaborating on a mutual interface. A coordinator has been employed (50%) to supervise the progress of this work and to later implement the result of the project. As part of their final course, two students of technology have also developed a new version of the registration form and the patient overview. This had to be done to conform the program to be used in a distributed form. Thus, students with different backgrounds are highly involved in the development of the program and the ongoing activities will secure that MedView will be student-oriented.

Progress report 3 (August 2002)

The various programmes comprising MedView have now been completed. The registration forms have been used to collect text and image-based information from more than 2500 patients. A visualisation programme for information related to both oral medicine and oral pathology for single patients has been produced. Both these programme have been developed by toolboxes which have been designed for end-users. Programmes for visualisation of large amount of clinical information has also been produced which enable the students to perform population studies.

Student groups from Chalmers University of Technology and the Faculty of Odontology have in a collaborative effort developed a web-based program comprising the different parts of MedView. As a teacher, different case-based quizzes regarding problems related to oral pathology can be constructed. The students can access all patients in the database by various modes. They can produce their own examinations with the starting point in images or single patients. The students can also download lectures from this web-application. The programme will be used in the course in oral medicine and oral pathology the coming semester.

The third and final year of the project will focus on studies of how the students are using the program and to adjust the programme according to the students' desires.

MEDVIEW - A COMPUTERISED TEACHING AID IN ORAN MEDICINE AND ORAL PATHOLOGY

MEDVIEW - A COMPUTERISED TEACHING AID IN ORAN MEDICINE AND ORAL PATHOLOGY

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Abstract

MedView is designed to support the learning process in oral medicine and oral pathology. A clinical database has been created from the referrals and comprises a large variation of clinical cases displayed by images and text based information. The students reach the database through the Internet or other media. They can practice and learn at any convenient time. MedView contains search tools to explore the database and the student can study single cases or analyse various clinical parameters. MedView has dramatically changed the education in oral medicine and pathology. Traditional lectures has been abandon in favour of self-learning material using gathered clinical cases which reflects a full panorama of problems related to oral medicine and pathology.

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Introduction

Rationale for change

From the aspect of analysis, the unassisted human mind has limited ability to learn from obtained clinical data. One way to overcome these problems is to use computer-based systems. The present paper describes a computer programme, MedView, aimed at facilitating the process by which we may obtain new knowledge within the field of clinical oral medicine and pathology.

Research and teaching in oral medicine and oral pathology are associated with the fact that the prevalence's for many mucosal lesions in the population are relatively low. The students will be exposed to only a limited number of patients as part of their own clinical activity. The clinical education of students is therefore restricted to consultations in which they see only a few patients as part of their teacher's practice.

Typical cases in conventional teaching aids, such as textbooks and atlases, often represent a fragment of the various forms in which an oral disease may appear clinically. Another limitation is the time lag between the points at which the clinical information is generated to a situation when it is converted to new knowledge available to students. With the rapid developments in the health care sector, there is an impending risk that this information will rapidly lose its immediate relevance. Thus, conventional teaching aids will not contribute substantially to the clinical experience of the students.

With increasing internationalisation, it is very common to have both foreign and home students taking courses, with the resulting demand for teaching aids to be produced in different languages. Students can often communicate in English, but there is no consensus that all teaching material should be produced in that language. Most countries would like to protect their own language as part of their national character. Thus, the international exchange of information related to oral medicine and oral pathology is obstructed by language barriers. The implication of this is that students will not be able to study clinical materials from other countries.

Review of relevant literature

Numerous dental Computer Assisted Learning (CAL) programs have been produced over the past ten years. Most of the CAL programs in UK have been developed with funding from the Department of Health and through independent funding (www.nccped.co.uk/pages/CALpgms.html). However, there are only a few CAL programs related to oral medicine and pathology, and unfortunately, these programs are more than 5 years old. No updated versions of these CD-ROM programs are available (Oral Manifestations of AIDS and Oral Ulceration, Eastman Dental Institute, London, UK)

AADSoft is an on-line, and updated, version of the AADS Index to Computer-based Resources in Dental Education (http://tasc.sdm.buffalo.edu/AADSoft/default.asp). The six AADSoft databases claim to collectively define the current state of

information technology in dental education. The site provides a limited number of programs, which are related to oral medicine and pathology. The most interesting one has some features in common with MedView (www.dent.ucla.edu/ce/online/case_studies). The number of cases is limited and the quality of the clinical images is poor and it is not possible even for an experienced clinician to make the correct diagnosis.

MedView was developed to improve the learning process in oral medicine and oral pathology. In the first part, the development of the program was focused on the collection of representative cases where clinical information can be visualised. The possibility to successfully use traditional paper-based clinical records and retrospective analysis for this purpose is very limited. This generates a demand to work with prospective methods and formalized information in clinical research. Instead of limiting this methodology to a single condition for the period of the study, there is every reason to use it on all patients encountered in daily clinical practice. The objective for the second part of the development of MedView was to create different user interfaces between the students and the aggregated clinical information.

Questions

The development of a teaching aid in oral medicine and pathology are constrained by the accessibility of clinical cases. The students need to encounter a large number of cases in order to train the pattern recognition of various oral mucosal disorders. To develop new cases is very time consuming as the clinical information had to be gathered from different sources, i.e. records, clinical radiological and pathological image archives, laboratory data, etc. A key question for the MedView project was to develop at tool where a large amount of clinical data could be collected as part of daily clinical practice of different teachers and clinicians. The next question was related to the development of an efficient interface by which the students should get exposed to the clinical cases.

Importance of the project to you and why

During the last 10 years, I have been lecturing about oral mucosal diseases as part of continuing education to health care professional in dentistry and medicine. It has been very distressing to witness the lack of knowledge in the field of oral medicine. This is serious problem when one considers that dentists regularly survey a majority of the population and, thus, are in an ideal position to decrease morbidity and mortality as a consequence of oral diseases. The course participants are not to blame for their lack of knowledge but the educational institutions have to consider why the teaching objectives have failed. It has been very common to talk about all kind oral diseases – frequent as well as infrequent occurring one's. The teaching in oral medicine and pathology has not been focused on the most prevalent diseases and has not described basic elements as clinical characteristics, aetiology, prevalence figures, diagnostic procedures, treatment and prognosis. It has not been uncommon that the teacher has shown clinical pictures patients with disorders that he or she has never seen as part of their own clinical practice.

The importance of the project to me is that I as a teacher have been provided with numerous cases that reflect the Swedish oral medicine panorama. As the most common diseases appears in many different clinical form, the students have now been given the possibility to make acquaintance with all different forms of a common disease. The implication of this is that the students are better prepared to properly treat a larger number of patients with diseases related to oral medicine.

Method

Students (who)
Oral medicine and oral pathology are given in a variety of courses related to dentistry. (i) Dental students: One course (30 students) is given in oral medicine and oral pathology at the 7th semester comprising 5 credit points. The ratio between female and male students is approximately 2:1. The course has been changed from a traditional lecture course to seminars utilising cases generated by MedView. Four students have used MedView to make a profound analysis of two different mucosal lesions (oral lichen planus and geographic tongue) as part of a degree project (10 credit points). Two female students from Faculty of Odontology, Malmö University, have used MedView during one month to collect cases with mucosal lesions at Sri Lanka. Cases generated by MedView have also been exploit during a Continuing Education Course with 12 students. The program has also been used at Eastman Dental Institute as part of a post-graduate training. (ii) Dental hygienist students: One course (20 students) is given in oral medicine and oral pathology at the 4th semester comprising 2 credit points. The course comprises only of female students. The course has been changed from a traditional lecture course to seminars utilising cases generated by MedView. Students from Chalmers University of Technology: 20 students have developed the MEduWeb (see below) as part of their degree project (20 credit points) in collaboration with dental students.

Innovation (what and how)- technical aspects

MedView is a computer system for formalized registration and subsequent analysis of clinical concept and image-based information. The programme has been developed in close collaboration with the Department of Computing Science, Chalmers University of Technology, Göteborg, Sweden.

MedView operates with an input application (MedRecords), focused on gathering and computerized storage of clinical data. The output applications (MedSummary, MEduWeb, Aggregator, Medviewer and MVizualizer) are designed to visualize information from the database (Fig. 1). They are therefore aimed at analysis, inter-pretation and learning, both on individual patient basis and on selection of groups of patients from the database. Medview currently consists of 2000 patients and the information is accessible for students, clinicians and scientists.

MedRecords – a formalized input and storage of clinical information

All clinical information is entered using electronic protocols, where case history and data from the clinical examinations are defined by formalized parameters. The patients are registered and identified with a nine-digit code, which is known only to the treating surgeon. The reason is to permit transfer of information within the network without compromising the identity of the patient, and the procedure has been approved by the Swedish Data Inspection Board.

The MedRecords protocol as it appears on screen is demonstrated in Fig. 2. During the clinical interview and examination, the operator enters the correct parameter, which is then inserted adjacent to the corresponding question. Clinical information regarding results from biopsies, laboratory tests and other invasive or non-invasive investigations are included, as are diagnoses, treatment modalities and clinical outcomes of performed therapies.

It must be emphasized that the protocols are flexible and can be changed by the user to meet new or altered demands. This is accomplished by MedRecords Creator. These applications enable the addition of new values or parameters on a continuous basis. They can also be used to create entirely new protocols for specific topics or scientific evaluations. The protocols can therefore be created in any language. MedRecords contains a function, which permits the user to simultaneously observe a summary of registered information develop as values are inserted in the protocol. When the examination is completed, the obtained summary can be copied and pasted into a document or template and printed out without updating the MedSummary application (see below).

Images

The clinical appearances of mucosal lesions are registered with digital images. All images in the entire database are saved in a single picture file. The images are given an identity by the programme, and no renaming procedures are required. By a “click-and-drag” procedure, an attachment is made between the individual image and the input protocol (Fig. 2). Technically, all images are taken with 3 CCD cameras in order to ensure a high quality of colour balance. Images from other sources may be included. If the pathologist provides digital images from the histopathological examination, these images can also be attached to the MedRecords file, and the same is possible for x-ray images.

Information from other sources

MedRecords can attach other relevant information to the input protocol. This may include references to scientific papers or an entire document, or links on the Internet. This is performed with the same procedure as for images and the input protocol will include a link to the relevant site. Comments can be added as free text.

Consequently, Medview generates a database based on formalized and harmonized criteria, where information can be retrieved, visualized and analyzed.

The amount of input data is extensive and difficult to overview if presented only in the input/protocol (MedRecords) form. Medview contains several applications to visualize

the information in the database. The applications are designed to meet varying demands, depending on the reasons for analysis and/or learning.

MedSummary – to view clinical information of a single patient

MedSummary synthesizes the information entered into the registration protocols and automatically generates a summary where selected information is displayed as a readable text, with digitized images of the mucosal lesions shown simultaneously (Fig. 3). The character of the generated summary is in its layout in most ways similar to the regular patient record we encounter in daily practice.

MedSummary operates in two steps. The first step is to identify the patient in the database, which is done by the nine-digit code. When the patient is selected, the date(s) for the patient's visits are displayed. In the second step, the operator selects the visit(s) to be shown and the summary is displayed. The images in the middle column can be enlarged to a full-screen mode.

The summary is technically a combination of a pre-existing text framework and registered input data, where the input data are directly inserted or translated into the proper spaces of the summary framework, generating a readable text. As for MedRecords, the summary application is flexible and the MedSummary Creator allows alterations in the text framework if required, since input data are unaffected. Thus, the operator can select the data to be displayed in MedSummary. The summary can be printed out or included in a template if paper copies are necessary in the clinic. Also, it must be strongly emphasized that the language of MedSummary can be chosen by the user. Since the text framework of MedSummary can be created by the user, it can therefore also be written in any language and layout suited to the requirements by the clinic or users of the system.

The Aggregator – for gathering of parameters into larger groups

Some topics generate hundreds of possible values. From the aspect of analysis, it would be extremely difficult to analyze the database if individual values could not be assembled into larger groups. The Aggregator was designed for this purpose and permits clustering of input data into a separate category. One example where this is useful is to put individual drugs into larger categories such as "diuretics", "NSAID" or "steroids". The clustering can then be used as an analytical tool to detect patients with established criteria. The aggregator can therefore also be applied in order to sample patients with similar professions, similar diagnoses or in any situation where a clustering of parameters is regarded essential for the analysis. The structure of the clustering is saved and stored in a separate file and can be used by other members of the network. This application is also well suited for the situation where international differences in nomenclature exist in multicenter trials. Differences in nomenclature can be overcome by aggregating the chosen values into suitable categories.

MedViewer - Sampling of patients from the database

Patients can be selected from the MedView database according to any combination of parameters included in the registration protocols. A search may include a single

criterion, as finding all patients with a diagnosis of “reticular oral lichen planus". It can also be more complex with several criteria involved, as finding “female patients aged between 40 and 60 tears with any clinical form of oral lichen planus treated with local application of clobetasol". The search profile can thus be decided and directed by the operator according to the purpose of the analysis (Fig.4). The computer identifies patients that fulfil the chosen criteria in the search and displays them in a diagram (Fig 4). The individual patient is represented by a separate icon. By clicking on the icon, the summary of the record including images is displayed.

Databases from individual clinics can be combined to a single database, including all the patients within the network. Conversely, it is also easy to create a separate database with, for example, patients with histopathologically confirmed oral lichen planus, if a member of the network wants to perform a separate analysis of this lesion.

MedVisualizer – for statistical analysis of the database

The application is used for visualization and statistical analysis of the database. The entire database or a selection according to predefined criteria is opened. The group selected can then be subjected to various forms of statistical analysis, which generates numerical values but also a visualized result of the analysis (Fig. 5). New selections can also be performed within the diagram and subjected to further analysis by a “click-and-drag” procedure. The characteristics of the second selection are then visualized in a new diagram, and the application also enables the possibility to see clinical images and text information of the individual patients (Fig. 5). MVisualizer enables statistical analysis, but the programme does not in itself contain statistical programmes. The data or numerical values obtained from the chosen analysis are transferred to a spreadsheet, which can be saved in the form of an Excel-file. This file can then be imported into a statistical programme for subsequent statistical analysis.

MEduWeb – a web based application for learning and training

Theoretical education in oral medicine to dental students is usually given through lectures, books and scientific papers. Textbooks often present a small number of cases for each diagnosis and photographs may not always be in colour. A textbook also covers a great variety of diagnoses, where many of them represent conditions that are rare and seldom encountered. Students may therefore receive information that does not reflect the reality a clinician in oral medicine encounters in daily practice.

The clinical education is frequently limited to patient demonstrations and the students are seldom offered the possibility to monitor the patients over time during their basic training. The learning that comes with experience from treatment outcomes may therefore be missing when the student graduates.

MEduWeb is designed to support this learning process in oral medicine. Since the database is created from the referrals, it shows the variation of cases at an oral medicine clinic. The students reach the database through the Internet. They can therefore practice and learn at any convenient time. MEduWeb contains search tools for the database and the student can identify cases for a given topic (Fig. 6). The student can therefore find a

large number of cases of several diagnoses, but also to combine the search with other parameters in the MedRecords protocol. This interactive nature permits the student to follow patients over time, test various hypotheses and display them in a diagram form. Diagnostic tests and exercises can be included and the student can perform these tasks through the Internet. Course information, lectures, edited cases and other relevant information can be added to MEduWeb.

System requirements

Since Java is a cross-platform programming language, MedView runs on most common operating systems including Windows, Mac OS, and Linux. At least 128 MB RAM is recommended. To access the MEduWeb system an Internet connection and Netscape or Internet Explorer 4.0 or better is required. On the server-side pages are generated dynamically using Java technology.

Innovation (what and how)- pedagogic aspects

The first year of the project was devoted to the technical development of the program. A teaching module distributed through CD-ROM's comprising basic knowledge in oral medicine and pathology. This module replaced traditional textbooks and atlases. Conventional lectures to the class as whole were given in a traditional fashion.

During the second project year, cases generated by MedView were used to develop seminars that replaced the lectures. Half of the class received CD-ROM's comprising basic knowledge in oral medicine and pathology and the other half received traditional lectures. The examination was a mix of short answers and a diagnostic test based on clinical images. The correction of the diagnostic test using the clinical images, were done without knowledge of which students that used the CD-ROM and which one's that were given lectures. The students from Chalmers University of Technology started to collaborate with dental students to develop MeduWeb. The students had their own agenda, which did not involve any teachers.

The third and last year seminars completely replaced the lectures. At the introduction, the students received a CD-ROM with 50 cases with oral diseases and program with basic information about the most prevalent diseases related to oral medicine and pathology. Four student-driven seminars were held where the students brought up questions regarding the 50 cases. During the seminars the student also preferred to be cross-examined to simulate the coming examination.

Four students used MedView to make a profound analysis of two different mucosal lesions (oral lichen planus and geographic tongue) as part of a degree project (10 credit points). After an introduction to MedVisualizer, the students made different analysis related to the two mucosal lesions. They looked for differences in gender, age profile, medication, rated discomfort (VAS-scale), etc. The students presented their findings by a presentation to the class using PowerPoint.

Procedures and Results

In the first part of the evaluation, two student groups were compared. The first group received conventional lectures and the other group were provided with a CD-ROM containing cases from MedView and basic information about oral mucosal lesions. The examination comprised two parts. One part with traditional short answer questions and a second part composed of 20 images representing common mucosal lesions. The students were asked to give a correct diagnosis of the presented 20 cases.

There were no statistical differences in the grades given to the students in the two groups. The ratio between the points on the two parts of the examination were also similar when the two groups were compared.

The second part evaluation, all students received basic information, distributed on a CD, on common oral mucosal lesions. MedView cases (n=55) were also included on the CD, containing both clinical and histopathological information. In four seminars, the students had the opportunity to discuss the 55 cases with a teacher. They were asked to go through a part of the course material prior to the seminar. At the examination, the individual student was asked question on one of the 55 cases. The change in the teaching procedures, from conventional lectures to the seminars, was evaluated during 30 minutes discussion about the student's experiences.

The students appreciated that they were able to select there own study time as the major advantage. They also put forward the ability to repeat the course material at there own convenience. The students had preferred to have the cases on a website but the problem was that only one third had access to broadband. As shown above, MeduWeb is the part of MedView that was developed to satisfy these needs. Thus, the lack of infrastructure limits the use of programs that demands high level of interactions.

From the teachers perspective, it was a great satisfaction to notice that the students were much more active during the seminars compared the more traditional lectures. This was presumably depending on the preparation that students were asked in to do in advance to the seminars. The discussion with the students was kept on a high level and their knowledge about oral medicine was considerably higher than in the passed. During the examination the students presented with improved skills to discuss clinical characteristics, etiology, diagnosis, treatment, prognosis, etc.

Discussion

The most obvious negative critique that should be given to the project is that we probably put to much effort to develop the technical platform of the program, which was not paralleled by a proper pedagogic evaluation. It had been of great value if someone with knowledge in pedagogy had been involved from the start of the project. The evaluation had been more professional which may had influenced the development of the program at an early stage.

Due to an insufficient infrastructure of the network the students were not allowed to use MedView outside the Dental school. This restriction seriously hampered the student driven development of the program. Although the total number of features of MedView has not been used they will be parts of future courses in oral medicine and pathology along with the development of network capacities.

The international partners of the project (Universities of London and Copenhagen) have experienced the same difficulties. Therefore, MedView has not been implemented at the undergraduate level. However, both London and Copenhagen are using MedView to collect data as part of their post-graduate research and training.

The positive outcome of the project is the clear improvement of the undergraduate students skills to discuss various aspects of oral mucosal lesions will less teacher-driven education. In times with decreasing economical resources, this is an important result of the project. Assembling of different information to create clinical cases, useful as part of the teaching process, is a time consuming process. In fact, most teachers will hesitate to do this work as it takes a lot of effort. With Medview, the time to collect necessary clinical information is reduced by approximately 80%. During the last 3 years over 6700 examinations have been stored in MedView and can easily edited to a clinical teaching case.

Conclusions

MedView has been successful in recruitment of new funding. Vinnova has approved a grant over 3 years with an annual economic support of 1.000.000 SEK. These recourses will be used to develop tools for the distribution of data (Nätbaserad kunskapshantering som stöd för klinisk verksamhet och kunskapsdelning) by using MedView as a platform. Along with this project the program will implemented to its full capacity in the undergraduate training in oral medicine and pathology.

[J-l1]studenterna kan läsa när de vill. lärarna kan lättare plocka fram fall. studenterna är bättre förberedda genom kontinuerlig tentamen.
alla studenterna klarade sig. startar på en högre nivå. Oral medicin och patologi jobbar närmare tillsammans.
Lingua geografica