

# The Organization of Information and Educational Web-space of the Clinical Department of the Medical Educational Institution

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## Abstract

The article describes the organization of the information and educational web-space of the clinical department of the medical educational institution. Currently, medical education is continuous and it is necessary to implement information web-technologies in the continuous study process. Based on own experience, an approximate structure and organization of the information and educational web-space of the clinical department of the medical educational institution and clinical department web-site structure were presented. Due to own experience, all the structural components of the web-space and web-site and their content are characterized. The advantages of using the information space by the departments of internal medicine of higher educational medical institutions, web sites and information technologies in teaching are discussed.

## Keywords

Continuous medical education, Information and educational web-space, Educational medical web-site, Informational web-site content, Medical education web-site organization and structure, Modern educational web-technologies

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## 1. Introduction

The main goal of continuous professional development to expand knowledge and skills. Despite some differences among world educational systems, there is a general trend in the structure, duration of studying, conditions of admission to medical institutions, education and admission to independent professional activities. At the same time, each model in medical education is built based on national characteristics and requirements of the health care system in each country.

**Modern medical education consists of several consecutive and continuous stages:**

- Basic medical education (pre-clinic and clinic);
- Postgraduate medical education (residency or specialization);
- Continuous professional development (advanced training of physicians).

The system of continuous postgraduate education in this context now plays the most important role.

Generally, the educational system is aimed to improve the theoretical and practical skills of graduates of higher medical educational institutions, increase the degree of their readiness for the independent professional activity, deep knowledge of their chosen specialty, share experience among colleagues of the relevant specialty.

**Modern medical education should be:**

- Based on the global approach and the principles of evidence-based medicine (EBM), knowledge of current classifications and guidelines (Scientific Society Guidelines based on EBM, Standards of medical care and guidelines for managing diseases);
- Affordable;
- Continuous;

- Versatile;
- Based on modern information and educational technologies;
- Active (emphasis should be on activity, student autonomy, ability to adapt to changing conditions of professional activity);
- Relevant to the health care system’s needs.

Adherence to these fundamental principles will ensure the success of mastering the educational material, contribute to the formation of a high level of intellectual and moral development of physicians, and ensure the competitiveness of the specialists and their integration into the world professional process, mastering communication techniques and adherence to the rules of bioethics.

The modern medical education requires constant improvement of professional knowledge, improvement of skills, and mastering of the latest technologies. Using Internet technologies and distance learning opens up new opportunities for continuous training of medical specialists and their retraining, making learning more accessible. Over the past decades, in all education systems, significant structural changes have occurred, due to the development of scientific and technological progress and its increasing impact on all aspects of society (Lopina, ICEEE2018, 2018).

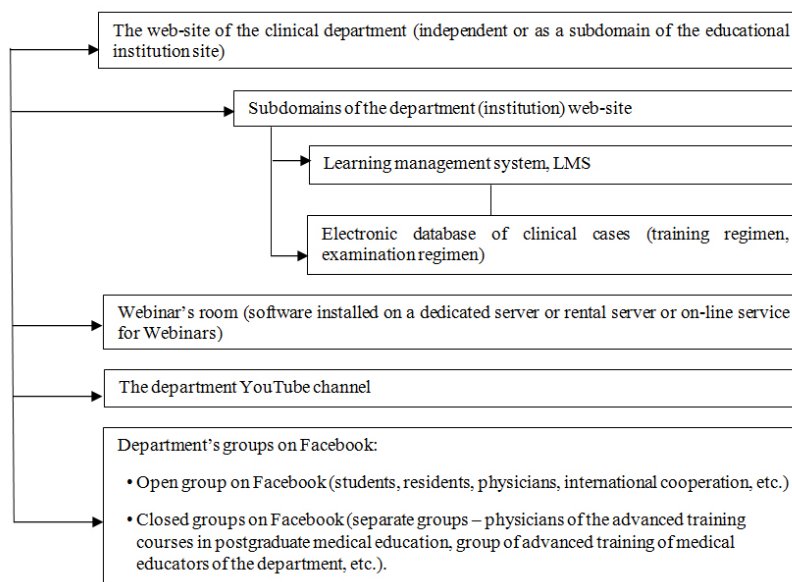
Currently, the process of informatization and internationalization of education takes place in educational content, in studying methods, and in the forms of study organization. The appearance of web-technologies in the first half of the 1990s became an obvious incentive for the development of information technology in education. In the second half of the 1990s, the formation of distance learning began, including Internet-based learning. The information web-technologies an integral part in modern education.

**Using information computer technologies in education provide:**

- Improving the organization of teaching, increasing the individualization of teaching;
- Increasing the productivity of students' self-preparation;
- Individualization of the work;
- Accelerating replication and access to educational materials;
- Increasing motivation to study;
- Activation of the learning process, the possibility of involving students in research activities;
- Providing flexibility in the learning process.

**2. The Organization of the Information and Educational Web-space of the Clinical Department of the Medical Educational Institution**

The way of structural organization of the informational and educational web-space of the clinical department of the medical educational institution has not been described in the literature until now. We presented the organization of the information and educational web-space of the clinical department of the medical educational institution based on own experience “**Figure 1**”.



**Figure 1. The organization of the information and educational web-space of the clinical department of the medical educational institution.**

### 3. The Organization of the Web-site of the Clinical Department of the Medical Educational Institution

#### 3.1. The Web-site Platform, Target Audience, Aims

Informational and educational space of the department may be a part of the general information and educational space of the medical educational institution. The web-site of the department can develop and implement the basic principles of modern medical education and the latest information technologies in the educational process in undergraduate and postgraduate education, which greatly increases the efficiency of the educational process and promotes the formation of professional competences.

The web-site of the department of internal medicine № 3 and endocrinology (<http://vnmed3.kharkiv.ua>) was developed in 2013. The site presents materials for a wide range of specialists in internal diseases - cardiologists, endocrinologists, rheumatologists, pulmonologists, gastroenterologists. For each specialty, clinical guidelines are presented, problematic sections are created according to the classifications, laboratory diagnostics for each section of internal medicine are presented. The web-site study materials are necessary for the daily clinical practice of the physician. The site hosts and constantly updates articles and presentations on internal medicine, medical online calculators are presented on the web-site.

The site of the department of internal medicine № 3 and endocrinology Kharkiv National Medical University has dynamically linked web pages based on the WordPress platform with the pages programmed in the html, css, php languages. The department site has two subdomains with the established two platforms of the e-learning Management System / LMS – Moodle. The web-site includes a free platform for webinars, which are installed on the dedicated server equipment.

**The site of the department № 3 of internal medicine and endocrinology of Kharkiv National Medical University provides:**

- Interactive communication of participants of the educational process;
- Information for public viewing;
- Information, access to which is possible only after entering the corresponding password or login.

The clinical department site target audience can include applicants, students, graduates, teachers/trainers, clinical residents, doctors of philosophy, physicians with different specialization in internal medicine, patients, pharmacists. The clinical department site can improve cooperation and communion between all participants of the educational process. The web-site forms also improving study cooperation and communion. There can be created the login form to enter the site, full version of education content, the form of information content search on the site, feedback form, feedback form with the possibility of attaching files (eg ECG, survey data for consultation, etc.), signature form for site updates, site news, form of the interactive online survey, questionnaire, registration form for webinars with the choice of the topic of the webinar, registration form for the conference, lectures, etc. Study cooperation and communion also provide based on department blog (Lopina & Zhuravlyova, 2018).

#### 3.2. The Structure of the Web-site of the Clinical Department

Due to own experience of educational web-site developing and administration of medical educational institution based on modern educational web-technologies the structure of the site of the clinical department № 3 of Internal Medicine and endocrinology of Kharkiv National Medical University may combine the following components “**Figure 2**”:

- The web-organizer – the schedule, the newsletter, the blog for organizing educational, scientific, medical work;
- The electronic library of publications (books, manuals, articles, theses of scientific and practical conferences);
- The webinar service, the web-class;
- The media library (presentations, video lectures, flash cards);
- The tools, resources of network testing and knowledge control;
- The Interactive Learning Systems;
- The Catalogue of educational materials for the specific target audience (students, residents, physicians, patients, etc);
- The medical on-line calculators (the scale of automatic risk assessment, the laboratory indicators, etc.);
- The system of access to external medical web resources (links);
- The distance learning/e-learning Management System (LMS);
- The electronic database of clinical cases;
- The practical training simulators, simulators of clinical cases, web-quests;
- The links to additional services: Facebook, YouTube.

#### 3.3. The Web-Organizer - Schedule, Blog for Organizing Educational, Scientific, Medical Work

The web-interactive schedule contains all calendar events, important time points, deadlines, lectures, and practical classes dates, conferences information with the opportunity to detail events. The department blog contains the information on upcoming conferences and events, updates about the main problems of internal medicine in the specialized sections are

presented. The Department blog can be structured according to the thematic headings for a specific target audience, as well as the ability to sort the information by the publication date. In addition, the department web-organizer may have a service for the automatic distribution of the messages, reminders, surveys, etc. to registered users.

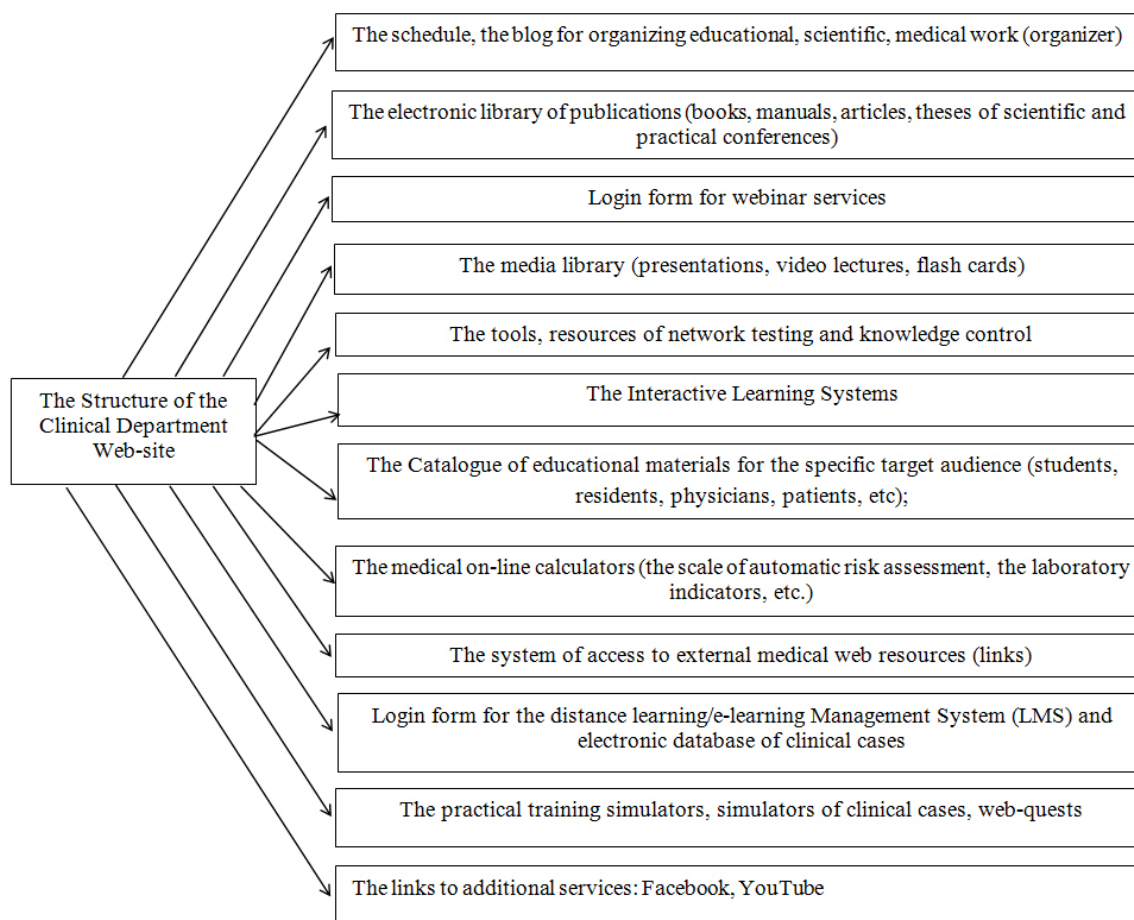


Figure 2. The web-site organization of the clinical department of the medical educational institution.

### 3.4. The Electronic Library of Publications

The electronic library of publications of the department is present annually updating materials that are available for the education process: educational and methodical aids, books, manuals, guidelines, articles on specialized sections (cardiology, endocrinology, rheumatology, pulmonology, gastroenterology, etc.), abstracts for students, residents, and physicians. Catalog of educational materials can be structured for a specific target audience (students, residents, physicians, patients) and structured in specific fields of internal medicine - educational materials in cardiology, endocrinology, gastroenterology, pulmonology, connective tissue disorders.

### 3.5. The Media Library (Video Lectures, Presentations, Flash cards)

Nowadays, multimedia is the main component of information and education technologies, which significantly affect the efficiency of the educational process. Video lectures, presentations allow a huge number of students listen to lectures in their own pace of mastering the study material. The department's website presents video collections, presentations on the main problems of internal medicine, which are broadcasted both from the site of the department and from the channels hosted on YouTube.

Especially effective is a problematic detailed article with a presentation/video lecture that clearly visualizes the material presented in the article on the one web-page of the department's web-site. It makes the possibility to choose a convenient form of familiarisation with study materials for advanced training - a review of the presentation and if necessary, a more detailed and in-depth article's reading, which, of course, saves both time and increases the quality of learning of the material.

**To study the "Internal Medicine" it is possible to create the following flash cards:**

- text (both sides of the interactive flash card have text information, for example, the disease and drugs for its treatment, the drug and its side effects, the drug and indications for its usage);

- combined:
  - ✓ image / text (for example, an electrocardiogram and its decoding, data on endoscopy, biopsy, radiography and possible diagnosis or description of visualization);
  - ✓ audio / text (for example, auscultation data of the lung, heart and possible diagnosis or description);
  - ✓ video / text (for example, dynamic visualization - coronary angiography and text visualization)

Flash cards can be located on the file site space created by site platform special plugins (such as Qwizcards (online quizzes and flashcards), Flashcard (Plugin for WordPress), Flashcard Slider, Easy Flashcards), or created based on others tools (AnkiApp, StudyBlue, Flashcards+ by Chegg, Quizlet, StudyShack, Brainscape, Studies, iStudious, Flashcard Machine, Cram). Flash cards can be accessible with or without the opportunity to control individual progress after creating own profile.

### 3.6. The Network Testing and Knowledge Control

The main opportunity for controlling learning outcomes is a test. The department's web-site presents tests on some sections of internal medicine. Before passing on-line testing, it is suggested to fill out a form for results registration of testing and to send the test results to students e-mail. Test tasks are presented both for controlling knowledge of students in training and exam regimen and for postgraduate medical education to improve knowledge and practical skills.

Study tests and topics materials for exam preparation on clinical department site may be classified by exam name (for example USMLE Step 1, USMLE Step 2, USMLE Step 3) and other principles.

There are several different approaches to the organization of the test knowledge control at the clinical department of the medical institution. The organization of the test can be based on the LMS platform, or using integrated site plugins in the platform of the site (TESTME WordPress, etc.). You also can create tests using special platforms with subsequent placement on the site file space (for example iSpring Quizmarker's), or testing organization by external services (SoGo Survey, Classmarker, EasyTestMaker or others). Tests can be public or closed to public viewing (Lopina, EBMA Conference 2018).

### 3.7. The Interactive Learning Training Systems

The interactive training systems on the department's website are presented by distance courses for students and physicians with the ability to consistently study topics within the course with knowledge management by conducting testing after each topic. Multimedia tutorials can be presented on a CD-ROM or other memory drives for an autonomous use on a personal computer or accessible on the department's web-site.

### 3.8. The Catalogue of the Educational Materials for a Specific Target Audience (Students, Residents, Physicians, etc)

The site contains clinical guidelines, video lectures, and presentations, articles on the main sections of internal medicine, a database of clinical cases with the possibility of commenting. An archive of electrocardiograms (ECGs) was created with the possibility of their discussion by experts, an opportunity to place various ECGs on the department site. The department's blog also presents educational materials on the main nosologies of internal medicine with a convince structural navigation.

### 3.9. The Medical Online Calculators and Risk Scales (Focus On Cardiology)

The site presents medical online calculators for evaluation of cardiovascular risk, assessment of glomerular filtration rate (the rate of glomerular filtration by the Cockcroft-Golts formulas, MDRD), body mass index, risk of bleeding and thromboembolic complications (HAS-BLED and CHA2DS2-VASc), TIMI, QTc calculating, assessment of the risk factors for venous thromboembolism in hospitalized therapeutic patients (Padua scale in Kucher modification) and in surgical patients (according Caprini), diagnostic criteria for the Dutch Lipid Clinics Network Criteria, Simon Broom Criteria, MEDPED Criteria, SYNTAX score, GRACE score, PRECISE-DAPT, DAPT, calculator for assessment the index of left ventricular myocardial mass, calculators of conversion of units of measurement of laboratory analyzes and many others for physicians everyday professional activity.

### 3.10. The System of Access to the External Medical Web Resources

For the convenience of interaction with the official site of the medical institution, the repository, various libraries, World Health Organization, Food and Drug Administration (FDA), International Classification of Diseases -10, the Cochrane library, PubMed, thematic associations in different medical spheres, the testing centers on the site there are a large number of links for the transition to external information and educational resources.

### 3.11. The Learning Management System

The Distance Learning System/ E-Learning Management System (LMS) system - "Moodle" was chosen and installed on the department's web-site subdomain. This LMS in our opinion most fully corresponds to the modern educational process, provides an opportunity for the placement of educational materials.

#### Using the Moodle training management system allows:

- multivariance of information representation;

- interactive learning;
- content structuring and its modularity;
- creation a constantly active help system;
- the self-control of training activities;
- the building of the individual educational trajectories;
- confidentiality of training;
- compliance with the principles of successful learning.

### 3.12. Case-Based Education

On the department's web-site are presented presentations of clinical cases, practical training simulators, the simulators of clinical cases and medical educational web-quests (Lopina & Zhuravlyova, 2018).

1. Publication (a detailed description of the clinical case or description of the standardized situation) (doc format, pdf, web-side format);
2. Publication or a described standardized patient with test simulator (interactive publication with test simulator);
3. Presentations of clinical cases - detailed presentation of a clinical case with visualization of the results of the examination, review of clinical guidelines important for presented in case pathology, discussing the peculiarities of the clinical case, treatment outcomes, discussion, outstanding issues, prospects of research, etc.
4. Practical training simulators are a combination of theoretical material on a specific topic with a large number of clinical situational tasks for it's mastering.
5. The simulators of clinical cases are the combination of a specific clinical case with logically related test tasks on the topic of the concrete clinical situation.
6. Medical educational web-quests are the combinations of several topics in the medical discipline due to one problem task with the elements of the detective-style information game, with the construction of a branching scenario and a combination of theoretical material on several topics, with the improvement of practical skills and test simulators (Lopina, Pécs, 2018).

Also, clinical department web-site may have several supplements, for example, site map, contact details, photo gallery and cooperation, history, collective or others.

## 4. Advantages of the implementation informational and educational web-space

For each participant in the medical educational process - students, physicians, teachers/trainers, patients we can summarize numerous advantages of the information and educational web-technologies introduction into the learning process "Figure 3".

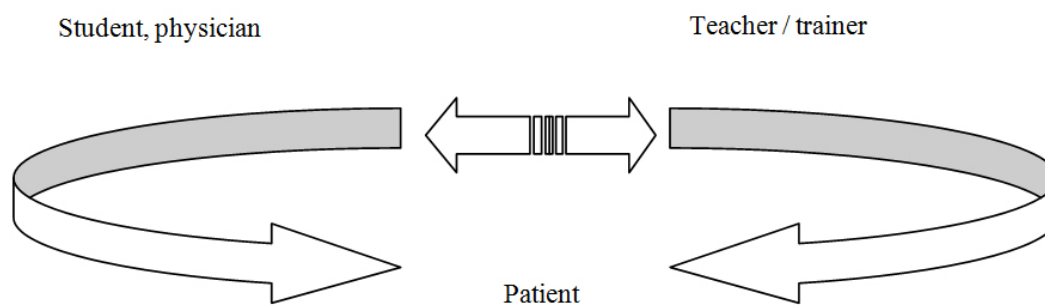


Figure 3. Participants of the medical educational process.

### The advantages of the informational and educational web-technologies introduction in the educational process for students/ physicians:

- improving the quality of education, access to a large number of educational information;
- the personality-oriented approach in education;
- the flexibility of education (learning at a convenient time, in a convenient place); the ability to choose the own learning topics, the lack of territorial restrictions on learning (access to the Internet), access to quality educational content at any time, place (availability on modern devices - phones, tablets, computers, increasing mobility of learning);
- high adaptability of educational material - audio, video materials, modern methods of diagnosis and treatment; stimulation

of active cognitive activity, development of logical thinking, analysis, generalization, systematization and evaluation of information, increase of motivation to self-education, formation of new competencies, realization of creative potential (development of research and creative abilities), development of skills to use accumulated theoretical knowledge;

- Reducing the barrier between theoretical knowledge and practical skills;
- ability to control own progress;
- learning without interrupting the main activity in asynchronous mode;
- High adaptability of learning (using all modern educational trends in the information society).

#### **The advantages of the informational and educational web-technologies introduction in the teaching process for the teacher/trainer:**

- improving the quality of education;
- facilitating the daily activities of the teacher/trainer;
- mass audience (a large number of students can engage with teaching materials in synchronous and asynchronous modes);
- the possibility of using a variety of pedagogical technologies, methods, forms, and resources of interaction among all participants in the educational process;
- the ability to control the learning process, the development of knowledge and skills of students, the ability to track their success;
- stimulation of active cognitive activity of students, doctors, development of their logical thinking, ability to analyze, generalize, systematize and evaluate information, increase motivation for self-education, formation of new competences, realization of creative potential (development of research and creative abilities) and development of skills for using accumulated theoretical knowledge in practice;
- Objection and automatic assessment system for student knowledge;

Disadvantages of the information and educational web-technologies implementation for teachers/trainers – are the necessity of significant time costs for the preparation of high-quality educational content, the necessity of attracting a large number of employees, the necessity of constantly increasing their own skills and knowledge, the necessity of developing modern educational web-technologies, which can be partially solved by attracting students.

The benefits of the information and educational web-technologies implementation for the patient are that clinical experience in a virtual environment does not have a risk to the patient, and most importantly - the patient gets better medical care ultimately.

## **5. Conclusion and Recommendation**

The implementation the web-sites of the clinical departments of medical educational institutions based modern information and educational web-technologies in the educational process in addition to traditional forms allows to improve the quality of education and gives a number of advantages for the continuous professional development of physicians.

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