

Infection control in dentistry - present requirements

Lucia Barlean, Ioan Danila
Iasi, Romania

Summary

The risk of infection spread in dentistry has to be a major concern within the framework of technical and medical parameters under permanent change. The European dental education requires the specialists in this field to have a high level of medical training, the standards for clinical skills and abilities including knowledge on the control of “cross infection” and the prevention of physical, chemical, and microbial contamination. This paper deals with the preventive assessment of the present requirements on infection transmission: sources of infection, impact of some severe viral diseases (HIV, HBV, HCV, SARS), environment, routes of transmission, devices, techniques, protocols, modern materials used in infection control.

Kew words: infection control, abilities and skills in the European standards, occupational diseases.

Introduction

Infection control in dentistry is a main concern due to the risks the medical staff in this specialty is exposed to. Despite human and material efforts, occupational diseases continue to consume significant health care worldwide. At the same time, the risk of infection transmitted to patients treated in dental surgeries by the medical staff or other patients (“cross-infection”) remains high.

In this view, the European academic education is greatly concerned with teaching the students an integrated medical approach of the health care.

In Europe, for dentistry there are two educational models: “*stomatological*”, based on extended medical knowledge and specialty training restricted to the last year (or last two years) of study, and “*odontological*”, almost exclusively based on specialty training.

By analyzing the curriculum presented by European Union experts on dental academic education, the important place of **preventive dentistry** within the integrated training of the future doctors becomes evident from the number of assigned hours, it being placed at the confluence of general medicine disciplines with the specialty one.

Average number of hours in the curriculum of dental academic education in the European Union:

Discipline	Average number of hours
Chemistry	123
Physics	103
Anatomy	174
Histology	85
Physiology	141
Biochemistry	56
Pharmacology	53
Preventive medicine	40
General surgery	45
General medicine	68
Otorhynolaryngology	47
Prosthetics	380
Dental materials	70
Conservative dentistry	481
Preventive dentistry	78
Dental anesthesiology	42
Oral surgery	223
Oral disease	69
Clinical practice	843
Pedodontics	126
Orthodontics	253
Periodontology	194
Dental radiology	69
Dental occlusion	92
Oral oncology	23
Gerontology	30
Implantology	34

Patient's care is the main responsibility of health professionals. The standards imposed to medical education by the European Union require that the future specialists to have basic knowledge on patient safety. This knowledge includes clinical skills and abilities in the absence of which the dentist could not provide quality care and patient's safety is not guaranteed.

Standards – clinical abilities in dentistry – European Union:

1. Notions of fundamental medical sciences (biological and behavioral) that are at the foundation of modern health care;
2. Practice of dentistry within the context of general health care, without negative influences on patient's state or environment;
3. Understanding of his moral and ethical responsibilities towards the individual and community;
4. Giving priority to the needs and objectives of reducing the share of oral diseases in the community;
5. Knowledge on the etiology, biological processes at molecular level, pathogenesis, demographic aspects, prevention and treatment of oral diseases;
6. Notions of dental practice-related pharmacology;
7. Knowledge on dental biomaterial;
8. Ethical and forensic regulations for dental practice;
9. **Cross-infection control and prevention of physical, chemical and microbiological contamination in dental practice;**
10. Use of modern methods for pain relief and anxiety control during dental treatments;
11. Understanding the important role of continuous professional education in view of applying the advanced methods in dental practice;
12. Abilities for getting involved in health promotion activities in communities;
13. Ability to assess the care provided to patients;
14. Ability to analyze the scientific literature and to apply the results in his practice.

The Iasi school of dentistry has European orientation both with respect to the curriculum and the progressive modulation in the accumulation of theoretical knowledge and its conversion into practical skills and abilities.

The Department of Oral Health (Preventive and Community Dentistry) has a great contribution to the familiarization of students with the standards for cross-infection control and prevention of contamination in dental practice and their observance.

The results of a questionnaire-based assessment of the knowledge gained by the last year students (VI) of the Iasi School of Dentistry revealed the need for improving their knowledge in this field by inducing firm clinical behavioral abilities, organization of practical "exercises" in ideal circumstances and conditions for applying the infection control, and direct participation in disinfection (decontamination) and sterilization activities.

The present paper aims at outlining the present requirements for the prevention of infection spread in the circumstances of a diversification of infectious diseases by the progression of some severe viral diseases such as HIV, viral hepatitis B and C, and appearance of some new ones, such as Severe Acute Respiratory Syndrome (SARS).

The preventive assessment of infection transmission in dentistry makes possible the framing of infection control measures in the three stages of prophylaxis:

- A. Primary:
 - a. Preventive assessment of environmental parameters
Detection of infection sources
 - b. Determination of patients and staff susceptibility to infections
 - c. Compliance with the regulations for decreasing the risk of infection exposure
 - d. Management of dental team activity
 - e. Immunization programs
- B. Secondary:
 - a. Evaluation of aseptic techniques: disinfection (decontamination), sterilization
- C. Tertiary:
 - a. Health care for the occupationally exposed staff (OES)

Sources of infection in dental practice

By its specific activities, the dental team is exposed to a cumulus of professional noxes that include:

- physical exhaustion (posture, visual effort, noise) and psychic stress

- contact with noxious materials and substances (toxic, allergenic)
- exposure to infections - airborne: *bacterial*, TB, staphylococcus, pneumococcus *viral*: flu, other respiratory viral diseases, measles, SARS
- digestive: enterobacteria, enteroviruses
- blood: HBV, HBC, HIV

Infection risk is closely related to the emergency nature of some clinical activities, when a patient is treated before being investigated, circumstances when bleeding acts, parenteral interventions or incisions of pus collection are performed. Oral cavity has a remarkable microbial flora (over 300 species): saprophytes, pathogens (specific organisms: *Treponema pallidum*, tubercule bacilli, *Actinomyces*) or conditioned pathogens (opportunistic organisms). The microbial load of the environment (air, surfaces), high-tech devices and installations that are difficult to decontaminate or sterilize complete the picture of the conditions in which the activity in a dental surgery takes place. Finally, the incorrect therapeutic acts, ignorance, incompliance with the safety measures, all contribute to an increased risk of infection exposure.

Preventive assessment of the environmental parameters

The 3-year researches of the Department of Oral Health were aimed at determining the level of microbial, mycotic and viral pollution in dental surgeries. These researches consisted in the placement of Petri dishes holding culture media in various areas of dental surgeries in view of determining the air contamination as well as in collecting samples from various exposed surfaces (coat, safety glasses, instrument table, lamp, and dental unit table). Data processing, performed at the Iasi Institute of Public Health, demonstrated levels above those recommended by the Ministry of Health for all hygiene indicators, and also the presence of some pathogenic agents not admitted by these standards (*Table 1*).

Assessment of the risk for viral diseases transmission

The main viral diseases at major risk to be transmitted in dental surgeries are: viral hepatitis B and C, HIV, and the recent viral respiratory disease SARS. The impact these severe diseases

Table 1. Indicators of environmental pollution in dental surgery

Samples	Indicators	Percentage of samples with values above the admitted level		
		Cold season	Warm season	Average
Air	No. organisms	24.1	20.3	22.3
	Haemolytic flora	31.5	59.03	45.4
	Fungi	75.9	100.0	87.9
Surfaces	No. organisms	32.3	56.2	45.4
	Haemolytic flora	25.7	33.3	29.9
	Coliform flora	1.4	5.6	3.7
	Enteroviruses	0	3.5	1.7

has on the general population, assessed on epidemiological data, reflects their potential risk of occupational transmission by exposure to blood, saliva and possible lesions caused by contaminated sharp objects (syringe needle, scalpel etc) (*Table 2*).

The introduction of standards for infection control and the increasing compliance resulting from their demonstrated effectiveness lead to a spectacular decrease in the risk of infection transmission during dental treatments in all directions (doctor-patient, patient-doctor, cross-infection).

Table 2. Risk of viral diseases transmission

Disease	Prevalence in the world population	Transmission contaminated blood
HBV	4% (HBsAg)	30% (1/3)
HCV	1.03%	1.8% (2/100)
HIV4	2 million	0.3% (1/300)

How infection is transmitted

For understanding how an exposure disease occurs, it is essential to be familiar with the “chain” of infection, whose all links have to be operational (*Figure 1*).

- adequate number of pathogenic organisms
- suitably viable pathogenic organism
- susceptible host
- adequate transmission of transfer of organisms from the source
- adequate gate of entry (in the host)

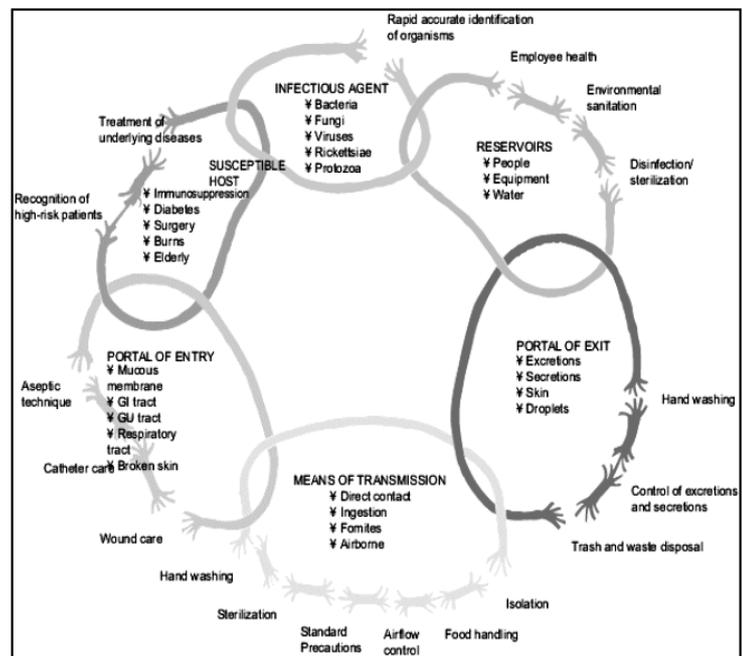
Infection is transmitted by:

- direct contact with blood, secretions, or other body fluids contaminated with blood;
- indirect contact with instruments, medical equipment, or contaminated surfaces;
- contact with air contaminating agents.

Strategies for infection control in dental practice

Infection control requires observing some strict rules of clinical behavior as part of some strategies that include:

Figure 1. “Chain” of infection



- medical history;
- cleaning and sterilization of instruments;
- following the recommendations for devices use;
- surfaces decontamination;
- safety equipment;
- hand hygiene and measures for avoiding sharp instrument-induced injuries;
- immunization of medical staff;
- aspiration and ventilation;
- handling of contaminated material;
- disinfection of the equipment in the dental laboratory;
- training of the medical staff.

The adoption of standard safety measures (universal) - Garner 1996 is aimed at reducing the risk of infection transmission both from known

and unknown sources, being necessary in case of contact with blood or other fluids or secretion contaminated with blood, skin or mucosa lesions. They apply to all patients, being, together with the management of the activity in dental surgery, methods for occupational exposure prevention.

The remarkable progress in infection control resulted in the implementation of new programs, protocols, techniques, and devices, such as:

- disinfectants tested and evaluated in agreement with the requirements of the modern decontamination techniques: glutaraldehyde (Banicid, B Plus, Cidex Plus), phenol (Aseptiphene, Birex), sodium hypochlorite (Dispatch cleaner), iodophors (Biocid), quaternary ammonium derivatives (Cetylclide), new generation alcohol products (Asepticare, Enviroid);

- two-steps decontamination protocol for surfaces in the environment;
- rigorous timetables for recycling the instruments that can be reused;
- ultrasound techniques for cleaning the instruments;
- advanced sterilization techniques and devices adequate to the risk level: humid heat ovens with rapid pre-vacuum cycles; dry heat ovens with static or compressed air, sterilization of thermo-sensitive objects of critical or semi-critical level at low temperatures, hydrogen peroxide, plasma or chemical sterilants (high level disinfection), emergency "flash" disinfection of instruments for immediate use
- water purification devices, microbial filters, antiretraction devices;
- air purification devices and ventilation;
- a complete program of immunization for the dental staff belonging to the A risk group;
- safety devices for preventing injuries by needle or other sharp objects (active, passive, with integrated design, external accessories) or needle-free devices for local anaesthesia;
- use of non-touch technique and observance of "primary clinical area"
- strict protocols for handling the contaminated material (collection, storage, transportation, destruction);
- unconditional use of highly effective safety equipment;
- implementation of emergency protocols in case of accidental exposure to infection.

To these, rigorous training programs for the medical staff are added in view of making them familiar, aware and gaining abilities in applying the standards for infection control in dental practice.

Conclusions

1. Infection control in dental practice has to become a major concern given the risks the medical staff is faced with.
2. In Romania, in the prospect of European Union membership, dental education has the role to form specialists with a complex medical training and good abilities and skills in the field of infection control.
3. For the clinical activities in dental practice to be safe, the used techniques, protocols, devices

and disinfectants should meet the present requirement for the prevention of infection transmission.

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Correspondence to: Dr. Bârlean Lucia, Oral Health Discipline, Faculty of Dentistry, "Gr.T. Popa" University of Medicine and Pharmacy, Iasi, Bd. Independentei nr.25, Iasi, Romania.