The Role of Chemical Substances in the Assessment of the Hygienic and Sanitary Conditions from Medical Practices

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The individual medical practice is the form of practicing the profession of physician within which the attending physician is acting alone or together with other physicians and other categories of authorized medical personnel; it has a certificate of registration in the Sole register of medical practices, issued by the Public Health Authority, according to the legal provisions in force; it has a legal status from which it appears that its object of activity is the provision of medical services. The medical practice is established at the request of the attending physician or of the associate physicians of the medical civil society. The act of incorporation of the medical practice or of the medical civil society is the certificate of registration with the Sole register of medical practices. Due to the importance of observing the hygienic and sanitary conditions in the provision of quality dental care the hygienic-sanitary status was assessed in the provision of hygienic sanitary assistance. Given the importance of observing the hygienic and sanitary conditions in providing quality medical care, the hygiene and sanitary condition of 29 medical practices was assessed using an investigation checklist adapted according to the control checklist for medical practices created by the Directorate of Control within the County Public Health Department. Disposal of waste resulting from the medical activity is done in accordance with the regulations in force regarding this category of waste. In the final disinfection (BK eliminators), disinfectants based on formaldehyde may be used; it is preferable to use other disinfectants which the manufacturer recommends as such.

Keywords: medical practice, hygienic-sanitary conditions, life-long medical education.

From the point of view of the structure of the spaces destined to act as medical practices and the functional circuits, the sanitary authorizations issued under previous regulations for the medical practices operating on the date of this order in the respective spaces shall remain valid in compliance with the provisions of the norms.

The spaces destined for the activity of medical and dental practices may undergo structural changes, of circuits and access to utilities in order to ensure the best functional adaptations, observing the legal provisions on construction safety and to the extent of the technical and constructive possibilities offered by the space. The county public health authorities advise the legal representatives of the practices on functional circuits and endorse the draft amendments.

The medical practice will consist of at least: waiting room, a sanitary group, a treatment room, a consultation room and storage facilities.

The waiting room will be arranged in such a way that each place of stay will benefit from a minimum area of 1 / 1.5 sqm / person in the case of practices for adults and 1.5 / 2 sqm / person in the case of practices for children (including accompanying person).

The actual consultation room will have a minimum area of 9 sqm and access to a sink connected to cold and hot running water.

The treatment room, with a minimum area of 9 sqm, will be specially designed and equipped with a sink connected to cold and hot running water.

The dental medicine practice will have at least a waiting room, a sanitary group, a storage room and an actual dental medicine room, where clinical diagnostics and therapeutic activities are carried out; for the waiting room the provisions of Article 6 paragraph 1,2,3,4 lit. shall apply.

The mandatory hygienic and sanitary standards for medical practices, irrespective of their profile, are: drinking water supply, according to the provisions of the Order of the Minister of Health no. 916/2006 regarding the approval of the norms for surveillance and control of nosocomial infections in sanitary units; connection to the sewerage system of the city and treatment of the waste water, so as not to produce water, air and soil pollution; waste resulting from medical activities will be collected, stored, discharged and neutralized in accordance with the legal provisions in force; provide a suitable microclimate; provide the natural and artificial illumination necessary for the optimal development of medical activity; ensure the noise limitation under the permissible standards and / or ensure effective noise protection inside and outside the practices; provide materials for cleanliness; provide disinfectants, antiseptics and decontamination substances approved by the Ministry of Public Health; provide specific protective equipment for all personnel, in accordance with current legislation in force, ensure the permanent training of healthcare professionals on universal precautions [5-7].

Medical practices must acquire, in order to operate and be evaluated as service providers in and out of the health insurance framework, the sanitary authorization for operation.

This draft ordinance brings into line the legal requirements with the dimensional reality of medical practices spaces, which are mandatory minimum standards for all practices in which healthcare providers operate.

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Cleanness is the decontamination method that removes microorganisms from surfaces, objects or teguments, along with the removal of dust and organic substances.

Proper application of the cleaning methods of surfaces, objects and equipment can achieve a decontamination of 95-98%. It does not replace disinfection.

Cleaning and disinfection in rooms should always be associated with ventilation; cleanliness is commonly practiced as a method of prophylactic decontamination; in airborne infectious diseases (eg. rubella, measles, varicella, etc.), ventilation is the only necessary decontamination method necessary in the outbreak.

Cleaning is done using only products that are approved / authorized by the Ministry of Health and Family to be used in the sanitary sector; compliance with all manufacturer's recommendations; compliance with the labour protection rules (wearing gloves, protection glasses, waterproofing equipment etc.).

Disinfection is the process by which most or all of the pathogenic micro-organisms (99.99%) are destroyed except for bacterial spores on objects in the inert environment; it is applied in cases where cleanliness does not eliminate the risk of spreading the infection and sterilization is not necessary. In all disinfection activities, labour protection measures must be applied to prevent accidents and intoxications [8-11].

The physical means of disinfection are: heat disinfection (*dry heat* - flaming and incineration, *wet heat* - pasteurization - 55-95ºC and boiling - 100-110ºC).

Ultraviolet disinfection: the use of disinfecting lamps only. Direct-radiation devices are used for the disinfection of surfaces. The number of lamps required for air disinfection in a closed space shall be calculated according to the disinfected air flow of each device, the volume of the room and the exchange speed of the air in the room.

The use of ultraviolet radiation equipment involves the use of special lamps that have this destination and requires the calculation of the number of devices, the establishment of the conditions of exposure and exposure duration. Ignoring the necessary conditions creates the risk of not performing the disinfection and can cause accidents.

Disinfection by chemical means: it is mainly carried out by the use of chemical disinfectants.

The labelling of these products must be made in accordance with the applicable legislation and must contain the usage concentrations and the associated action times for each. Disinfection is carried out with products labelled as disinfectant.

For a disinfectant it is also important to know the virucidal action against viruses transmitted through blood and blood products.

Disinfection is classified into four levels: chemical sterilization, high level disinfection, intermediate level disinfection, low level disinfection.

Chemical sterilization causes the destruction of all organisms and of a large number of bacterial spores, it is obligatory to observe the recommendations of the manufacturer regarding the contact time and the conditions of realization. The chemical substances performing the chemical sterilization are: glutaraldehyde (2%); stabilized hydrogen peroxide (6%); paracetic acid (different concentrations).

High level disinfection results in the destruction of all microorganisms except for a large number of bacterial spores. The chemical substances and the means by which high level disinfection can be achieved are: glutaraldehyde (2%); stabilized hydrogen peroxide (6%); paracetic acid (various concentrations); sodium hypochlorite (5.25%).

Intermediate level (average) disinfection causes the destruction of Mycobacterium tuberculosis, of vegetative bacteria, of most viruses and fungi, but not of bacterial spores. The chemical substances that perform the intermediate level disinfection are: phenols, iodophors, alcohols, chlorine compounds.

Low level disinfection can destroy several bacteria in vegetative form, some viruses, some fungi, but it does not destroy resistant microorganisms such as Mycobacterium tuberculosis or bacterial spores. The required contact time of the chemical substance with a treated substrate is less than 10 min. Low-level disinfectants are: disinfectants containing phenols, iodophors, quaternary ammonium compounds and foaming agents, alcohols (70ºC, 90ºC), sodium hypochlorite (5.25%).

Chemical classes of disinfectants and chemical disinfection: phenols and methylphenols are found in large amounts in the tars of earth coals from which they are separated by distillation or can be obtained by synthesis; chlorinated fractions and petroleum residues can be added, resulting in phenolic derivatives.

Phenol was the first substance used in disinfection. Currently, it is used only in the form of phenolic derivatives, which have antibacterial properties superior to phenol.

Phenols have bactericidal, including Pseudomonas aeruginosa, fungicide and tuberculoid action; they have no sporicidal action. The presence of the organic material does not influence biocidal activity.

Phenol is a protoplasmic toxin that penetrates the cell by lipid solubilization. It acts on the central nervous system producing hypothermia and paralysis of the vasomotor centre.

It is strongly irritating to the skin, eye, in the form of vapor, in chronic doses, leads to irritation of the airways and causes sclerosis of blood vessels. In case of ingestion, it produces caustic effects on the digestive tract, neurological, cardiovascular, liver, kidney disorders. The lethal dose for a human being is 10g phenol, it has the toxicity symbol, *T* toxic, poisonous [12-16].

The toxic effects of phenolic derivatives are similar to those of phenol, acting on the central nervous system.

Halogens: Chlorine, bromine or iodine-releasing compounds are widely used as chlorine-releasing agents, especially: sodium dichloroisocyanurate (NaDCC) and hypochlorites, are preferred to other chlorine-releasing compounds such as chloramines B and T and chlorine lime. These disinfectants, which act by releasing chlorine, are cheap and effective, are not toxic at low concentrations and have a wide range of use, both in the hospital environment and for household use.

Sodium dichloroisocyanuronate disinfectants based on Na DCC in the form of tablets, powder, granules; present safety and ease of preparation even for inexperienced people. They are stable during storage and are more effective and less corrosive than hypochlorite solubilities.

NaDCC disinfectants have: bactericidal; fungicidal, virucidal and tuberculoid activity and are particularly recommended in cases where there is a risk of viral

contamination. They are rapidly inactivated by organic matter (ex. puss, dirt, blood, etc.), therefore the recommended use concentrations and time interval are based on the degree of loading with organic substance and on the degree of contamination of the treated substrate. It is recommended to use them especially after a preliminary cleaning [17- 20].

Sodium dichloroisocyanurate is a strong oxidant, it is not combustive, but increases the combustion of other substances by reacting violently with them and favouring the production of fire and explosion. The substance decomposes in heat and, in contact with water, causes toxic carbon monoxide vapours. It is irritating to the skin and eyes; Inhalation of the powder causes coughing, soreness, headache, nausea, vomiting. NaDCC has the toxicity symbol "Xn" - moderate toxicity, harmful and *O*-oxidant.

Hypochlorites are the oldest active chlorine compounds used in chemical disinfection. They have deodorizing properties, they are not poisonous to humans, even in high concentrations, they are coloured, but they do not stain and are easy to handle.

The hypochlorites have a broad spectrum and biocidal action, showing bactericidal, fungicidal, virucidal and tuberculoid activity

Chloramines known in disinfection are organic (chloramine B and chloramine T). They are present in the form of white crystalline powders or as tablets.

The germicidal action is influenced by the pH level, the concentration and the temperature of the solutions. In neutral or acidic solutions, chloramines have a strong germicidal action, and in alkaline solutions the bactericidal power is reduced.

Chloramines exhibit bactericidal, fungicidal, virucidal activity. The biocidal effect occurs slowly, but it is lasting because chlorine releases slowly. The biocidal effect is produced at very low concentrations, but in practice concentrated solutions are used because the presence of organic matter reduces their biocidal activity.

Iodine and iodophors - among the many antiseptic and disinfectant substances, iodine has been and continues to be used due to its efficacy, economy and relatively low toxicity.

The germicidal action is explained by the oxidative and free iodine combining strength, followed by the destruction of enzymatic and structural cellular proteins. The iodine is characterized by broad spectrum of bactericidal and virucidal action. Their activity is selective, the effect is quickly installed.

Iodophors have bactericidal, virucidal and mycobactericidal activity; sporicidal activity is poor and fungicidal activity is variable. Iodophors bring together two essential properties in disinfection: detergent activity (due to the surfactant) and germicidal strength (due to iodine). They are mainly used for hand disinfection, disinfection of the environment, recommended for general disinfection in the hospital [21, 22].

Quaternary ammonium salts (QAS) are cationic surfactants with the following properties: they are detergents and emulsifiers, non-toxic use concentrations, soluble in water and alcohol, have stability, have no odour and do not stain. The characteristic for quaternary ammonium salts is the formation of a film after application on a substrate, forming a film of substance that preserves antibacterial activity. Quaternary ammonium compounds are used for disinfection or antisepsis.

Chlorhexidine is part of the biguanide class and appears in the form of salts. The most commonly used chlorhexidine salts are chlorhexidine acetate or chlorhexidine gluconate.

It is recommended for antisepsis and disinfection, but it is especially used for hygienic and surgical hand disinfection because it has a residual activity after application. It is also used for pre-operative disinfection of the skin.

Chlorhexidine disinfectants have bactericidal, fungicidal and virucidal activity on lipophilic viruses. Bactericidal activity is greater on gram-positive germs than on gram-negative ones.

Chlorhexidine is more active at a *p*H = - 8. Its activity is reduced by the presence of organic matter. It is incompatible with anionic compounds: organic and inorganic.

Hexachlorophen*e* is a highly active compound against Gram-positive microorganisms and less effective against Gram-negative.

Although very effective, this product is rarely used in the hospital for disinfecting the skin and should only be used with medical advice.

Other compounds are: triclosan, alcohols, aldehydes, hydrogen peroxide and related compounds, chloroxylenol, and other antimicrobial compounds.

Antiseptics are preparations with limited antimicrobial properties, or that destroy microorganisms, or inactivate viruses on living tissues. Antiseptics are not sterilized but temporarily reduce the number of microorganisms from the skin and mucosa. Antiseptics differ from disinfectants by: the concentration of use of the chemical substance; contact time.

The use of antiseptics to remove, destroy or inactivate microorganisms present on the skin or the mucosa allows: the performance of aseptic care; reducing the transmission of germs, from sick to sick, by hands; treating local skin and mucous infections.

Hand washing is the most important procedure for preventing nosocomial infections; simple handwashing is defined as the vigorous friction of the hands one against the other on all surfaces after previously wetting and soaping them.

Hygienic hand sanitization is done after washing and pre-drying, with the amount of antiseptic required, recommended by the manufacturer; contact time: 30 seconds-1 minute. Only in case of massive contamination with pathogenic germs higher contact times with the antiseptic substance is recommended [23-25].

Many substances are recommended as disinfectants, but it is important to note that they belong to a small number of chemical classes. To achieve effective disinfection, a number of factors that influence disinfection should be taken into account: the spectrum of activity and the germicidal power, the number of microorganisms on the support to be treated; the amount of organic material on the equipment; the nature of the support to be treated; concentration of the disinfectant; contact time and temperature; susceptibility of chemical disinfectants; type of microbial activity, effect of *p*H, corrosivity, toxicity, product cost[26-43].

Prophylactic disinfection complements cleanliness, but does not replace it and cannot replace sterilization. The

effectiveness of prophylactic disinfection is conditioned by previous rigorous cleanliness.

Sterilization is the operation by which microorganisms, including those in vegetative state, are removed or killed from contaminated objects, the result of which is the sterility state.

Obtaining a state of *sterility* as well as maintaining it is a result obligation, health establishments being required to create quality systems based on the rules that relate to the requirements of quality systems.

The terms *sterilized product* or *chemical sterilization* are used for a limited range of chemical compounds (formaldehyde, glutaraldehyde) which under controlled conditions can destroy bacterial pores. All medical devices and materials to be sterilized must be physically cleaned and chemically disinfected before being subjected to a standardized sterilization process. All surgical instruments, textiles and other objects or solutions that enter the sterile tissues or vascular system must be sterile.

In medical care units, sterilization can be accomplished by: physical methods-pressure steam, dry heat, chemical methods-ethylene oxide, chemical *sterilized:* formaldehyde and steam at low temperatures and subatmospheric pressure. In the current state of scientific data, sterilization with pressurized water vapor should be the method of choice if the medical device supports this procedure.

Experimental part

Material and methods

Taking into account the importance of observing the hygienic and sanitary conditions in the provision of quality medical care, the hygienic and sanitary condition of a number of 29 practices was assessed using an investigation checklist adapted from the control checklist for medical practices prepared by the Directorate of Control within the County Public Health Department.

The investigated medical practices presented the following structure, by media: urban area 22 cases (75.86%) urban area, and 7 cases (24.14%) rural area.

All 29 medical practices had a sanitarily authorization, but four of them, all from the rural area, were authorized under clauses, which had to be fulfilled within 6 months of the granting of the sanitary authorization.

Results and discussions

All medical practices had functional circuits, but in 6 practices (20.68%) these were not respected, being modified compared to the initially approved circuits, due to the installation of new equipment in the respective practices, which made it impossible to follow the initial routes.

In all practices under study, cleaning materials and disinfectants are provided, their use being made according to the manufacturer's specifications, respecting working concentrations and operating times.

The sterilization of the sanitary materials required for the therapeutic act in the practice is done at the practice level, in most cases there are no special destination rooms for sterilization. Thus, out of the 29 dental practices investigated, sterilization was carried out in special rooms only in 7 practices (24.13%). In all cases there were separate circuits for both sterile and used instruments, so as to avoid contamination, but the crossing of circuits cannot be ruled out if all the necessary measures and working times are not respected.

Devices used to sterilize instruments and soft materials have been authorized or licensed for use in medical practice. All medical practices were equipped with hot air sterilizers (poupinel), but only 6 practices (20.68%) were equipped with pressure steam sterilizers (autoclave).

In all cases there is a proper record of sterilization of instruments and soft material, using self-control tests for sterilization efficiency. The preparation of instruments for sterilization is done according to the technical norms in force, but there is an interest of some practices to ensure better conditions, by using the ultrasound baths in the preparation of sterilization tools - 18 practices (62.06%).

A problem that arises is the one related to the management of wastes resulting from therapeutic activity. Even if waste pre-selection is done properly, separating waste with septic potential from that which is assimilated to household waste, there is less attention paid to cutting-sharp waste separation.

Only two practices have temporary hazardous waste disposal areas functionally separated from the rest of the construction, the rest having specially designed spaces inside the buildings.

All medical practices were in contact with specialized companies for the transport of waste resulting from the activity for their final disposal, but there were situations where transport companies did not comply with the waste disposal program.

Protective equipment is used in all practices. The only item in the protective equipment that is used by all staff is the gown, but here too there are situations where the efficiency is reduced by inappropriate equipment-short gown that does not completely protect clothing.

Conclusions

It can be said that there are still aspects of the activity in the medical practices that require improvement in terms of the hygienic and sanitary conditions, requiring an activity of continuous medical education, of information of the dentists and, last but not least, of control by competent bodies.

From the point of view of the activity in the medical practices requiring improvement, from the point of view of hygienic and sanitary conditions, it is necessary to carry out an activity of continuous medical education, of information of the dentists and, last but not least, of control of the competent bodies.

The reported deficiencies are mainly related to: management of waste resulting from the medical activity in the practices; the correct use of protective equipment; observing functional circuits.

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