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## HYGIENIC ASSESSMENT OF NEW ARCHITECTURAL AND PLANNING SOLUTIONS OF BUILDINGS OF PSYCHIATRIC HEALTH CARE FACILITIES

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**Abstract.** Hygienic assessment of new architectural and planning solutions of buildings of psychiatric health care facilities. Polka N.S., Makhniuk V.M., Chorna V.V., Podolian V.M., Yurchenko S.T. *Aim:* to conduct a hygienic assessment of new architectural and planning solutions of psychiatric health care facility buildings in Ukraine and give a comparative description of the sanitary standards of the latter in the EU. The study was conducted based on the analysis of State Building Norms (SBN) B.2.2-10:2019 "Buildings and structures. Health care facilities" (draft, final revision), scientific sources of domestic and foreign scientists. A survey of the chief physicians of psychiatric hospitals of Ukraine concerning safe sanitary and hygienic, anti-epidemic conditions for the functioning of psychiatric health care facilities was conducted. We consider it necessary to present more carefully architectural and planning solutions in the relevant section of SBN B.2.2-10:2019 (draft, final revision) or to use the opportunity specified in the introduction to these Norms, and to supplement them with the Manual on the design of psychiatric health care facilities, taking into account the experience of the European Union. To create an appropriate "therapeutic environment" in new domestic mental health care facilities, it is necessary to implement European requirements in the design of these facilities with the involvement of multidisciplinary groups: (from architects to nurses, from construction contractors to patients) and supplement SBN B.2.2-10:2019 "Buildings and structures. Health care Facilities" of Ukraine with a guide for designing facilities of a new type of "Mental Health Centers" as in the Republic of Poland. We have developed and sent to the chief physicians of psychiatric hospitals of Ukraine «Questionnaire for scientific sanitary and epidemiological assessment of the conditions of placement of a psychiatric health care facility». Based on the analysis of the block of questions on sanitary and anti-epidemic and sanitary and hygienic parameters that characterize the buildings of domestic psychiatric hospitals, the location of medical structures and auxiliary units on the land plot, i.e. the design of buildings is determined. In particular, 50% of psychiatric hospitals are housed in combined buildings, 25% have a pavilion system (separate buildings), 12.5% each have a centralized system (all in one building) and a block system. The number of stories of psychiatric hospitals up to 2 is 50%, up to 3 – 37.5% and up to 5 stories in those which have been under construction since 1960 – 12.5%. Analysis of the questionnaire block on the conditions of stay, treatment, rehabilitation of the mentally ill revealed the possibility of organizing occupational therapy in 12.5% of psychiatric hospitals, where special workshops are equipped and patients can acquire professional skills. Physiotherapy rooms are equipped in 50% of psychiatric hospitals. Low provision of patients with furniture was revealed: 25% of patients partially have proper desk, 75% do not have it; 50% are provided with proper chairs; 62.8% use proper bedside tables and 25% – closets for storing personal clothes.

**Реферат.** Гігієнічна оцінка нових архітектурно-планувальних рішень будівель психіатричних закладів охорони здоров'я. **Полька Н.С., Махнюк В.М., Чорна В.В., Подолян В.М., Юрченко С.Т.** Мета – провести гігієнічну оцінку нових архітектурно-планувальних рішень будівель психіатричних закладів охорони здоров'я України та дати порівняльну характеристику гігієнічних норм психіатричних закладів охорони здоров'я країн ЄС. Дослідження проведено на підставі аналізу Державної будівельної норми (ДБН) В.2.2-10:2019 «Будинки і споруди. Заклади охорони здоров'я» (проект, остаточна редакція), наукових джерел вітчизняних та зарубіжних вчених. Проведено анкетування головних лікарів психіатричних лікарень України щодо безпечних санітарно-гігієнічних, протиепідемічних умов функціонування психіатричних закладів охорони здоров'я. Вважаємо за потрібне більш ретельно представити архітектурно-планувальні рішення у відповідному розділі ДБН В.2.2-10:2019 (проект, остаточна редакція) або ж скористатися можливістю, зазначеною у вступі до цих Норм, і доповнити їх посібником з проектування психіатричних закладів охорони здоров'я з урахуванням досвіду країн Європейського Союзу. Для створення належного «терапевтичного середовища» в нових вітчизняних закладах охорони психічного здоров'я необхідно імплементувати Європейські вимоги в проектування цих закладів із залученням мультидисциплінарних груп (від архітекторів до медичних сестер, від будівельних підрядників до пацієнтів) та доповнити ДБН В.2.2-10:2019 «Будинки і споруди. Заклади охорони здоров'я» України посібником з проектування закладів нового типу «Центри психічного здоров'я», як у Республіці Польща. Нами розроблена й надіслана головним лікарям психіатричних лікарень України «Анкета наукової санітарно-епідеміологічної оцінки умов розміщення психіатричної лікарні». На основі аналізу блоку запитань щодо санітарно-протиепідемічних та санітарно-гігієнічних параметрів, які характеризують будівлі вітчизняних психіатричних лікарень, визначено розміщення лікувальних корпусів та допоміжних підрозділів на земельній ділянці, тобто дизайн корпусів. Зокрема, 50% психіатричних лікарень розміщені в комбінованих корпусах, 25% мають павільйонну систему (окремі корпуси), по 12,5% – централізовану систему (все в одному корпусі) і блочну систему. Поверховість корпусів психіатричних лікарень до 2-х поверхів становить 50%, до 3-х поверхів – 37,5% і до 5-ти поверхів, які будувались з 1960 року, – 12,5%. Аналіз блоку запитань анкети щодо умов перебування, лікування, реабілітації психічно хворих дозволив констатувати можливість організації трудотерапії у 12,5% психіатричних лікарень, де обладнані спеціальні майстерні і хворі можуть набути професійних навичок. Фізіотерапевтичні кабінети облаштовані в 50% психіатричних лікарень. Виявлено низьку забезпеченість хворих меблями: 25% пацієнтів частково мають власний письмовий стіл, 75% – їх не мають; 50% забезпечені власними стільцями; 62,8% використовують власні тумбочки і 25% – шафи для зберігання особистого одягу.

The World Psychiatric Association in 2020 recommended changes in Ukraine's mental health care system by changing approaches of funding by gradually reducing beds in psychiatric hospitals (deinstitutionalization) and reallocating funds to create new services (following the example of European local mobile teams, home care teams), mental health centers, etc., which was effectively implemented in EU countries [1, 2]. Reforming this area of domestic health care requires not only quantitative changes but also the implementation of significantly new quality design solutions to ensure a comfortable stay of patients and efficient work of staff.

Today, to replace the current regulatory document State Building Norms (SBN) В.2.2-10-2001, «Buildings and structures. Health care facilities» (as amended No. 2, Order of the Ministry of Regional Development, Construction and Housing of Ukraine dated 20.09.2013 No. 454) a new SBN В.2.2-10: 2019 «Buildings and structures. Health Facilities», is being prepared which will define the basic requirements for the design of psychiatric wards (p. 8.2.15) [3].

Aim of the work is to conduct a hygienic assessment of new architectural and planning solutions for buildings of psychiatric health care facilities in Ukraine and give a comparative description of the sanitary standards of psychiatric health care facilities in the EU.

## MATERIALS AND METHODS OF RESEARCH

The study has been conducted based on the analysis of SBN В.2.2-10: 2019 «Buildings and structures. Healthcare facilities» (draft, final edition), scientific sources of domestic and foreign scientists. A survey of the chief physicians of psychiatric hospitals of Ukraine on safe sanitary and hygienic, anti-epidemic conditions for the functioning of psychiatric health care facilities has been conducted [3].

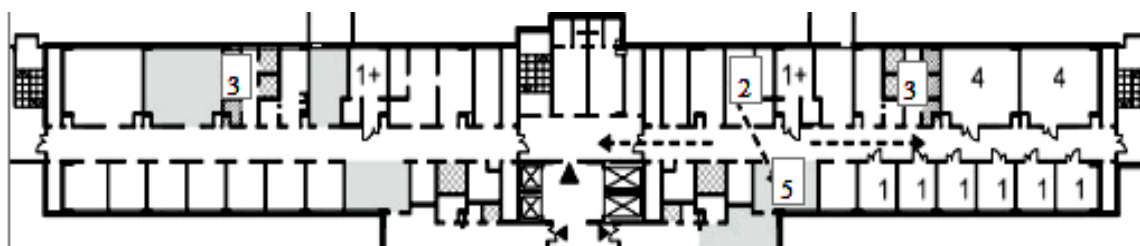
## RESULTS AND DISCUSSION

The design of a new psychiatric facility (hospitals, departments, clinics at the university) should ensure the function work of medical staff, which would motivate and meet their professional needs, namely: to reduce emotional exhaustion; create appropriate conditions for visual supervision of patients during exacerbation of their behavior and to protect against their aggressive actions; to level the manifestations of stigmatization [4]; to create the conditions of a «healing architectural environment», i.e. safe, private, comfortable stay of patients until their full recovery and return to family and society [5, 6].

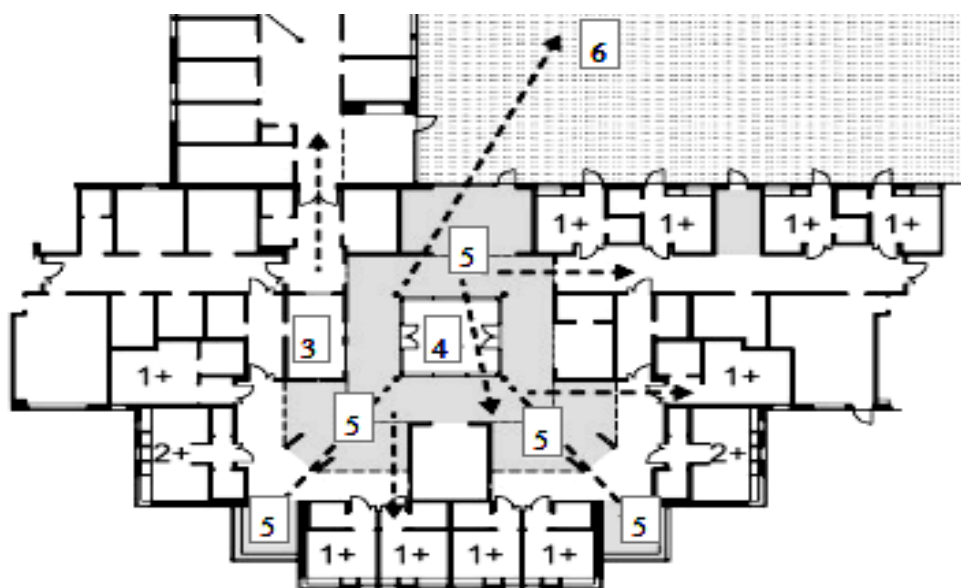
Ulrich R., Bogren L., Gardiner S. [7] monitored the conditions of stay and treatment of patients in psychiatric hospitals in Sweden for the period 2005-2007, which were built in different years and differed in approaches to design, decoration, equipment, which revealed a significant impact of planning

hospital environment on the manifestations of stress and aggression of patients: single ward of sufficient area with separate bathrooms and toilets; common areas, such as kitchens, rooms for active leisure; separate exit to the garden with seating space; thus ensuring the proper privacy of patients and improving their treatment. In Swedish (and other Northern European countries) specialized hospitals, most wards are located around a central work area for medical staff, allowing them to supervise patients, to have constant contact with them, and spend more time

outside medical offices. Additionally, visual supervision is over the doors of bedrooms, shower rooms, toilets, kitchens, garden gazebos. Modern projects of psychiatric hospitals are characterized by a larger area of wards per patient ( $37.7 \text{ m}^2$  vs.  $36.9 \text{ m}^2$ ), recreation areas ( $13.6 \text{ m}^2$  and  $12.1 \text{ m}^2$ ), a smaller area of corridors in the area of medical staff ( $6.9 \text{ m}^2$  and  $10.1 \text{ m}^2$ ), as well as the possibility of centralized monitoring of recreation areas and rooms for active activities (kitchen, gazebo, etc.), with access from the corridor in the old hospitals (Fig. A, B).



A



Б

**Floor plan of the old (A) and new (B) psychiatric hospitals in Sweden**  
 (plan A: 1 – single wards, 1+ – single wards with toilet/shower, 2 – nurse's area,  
 3 – toilet/shower, 4 – four-bed wards, 5 – general area of stay of patients;  
 plan B: 1 – single wards with toilet/shower, 2 – two-bed wards with toilet/shower,  
 3 – nurse's area, 4 – an atrium, 5 – the common territory of stay of patients, 6 – green space, garden)

The new psychiatric wards in Ukraine will localize on the ground floor of the building, isolated from all groups of hospital premises to ensure security and privacy. Entrance to the premises will be controlled by staff. There are at least two single rooms with an

area of  $12 \text{ m}^2$ , the rest – two-bed, with separate rooms for men and women.

In the new State Building Norms (p. 8.2.15.4.) we find requirements for the equipment of toilets and bathrooms taking into account the safety of patients,

but the location of this group of rooms is not clear – in each ward or common area on the floor? In the list of “recommended premises and areas in the psychiatric ward” (paragraph 8.2.15.6), only toilets for staff and visitors are listed. The analysis of this same point allows to state the existence of a large number of rooms, including “public promenade”, which are not focused on creating comfortable and private living conditions for the patient.

SBN B.2.2-10:2019 of Ukraine (draft, final version) does not specify the location of the nurse's area, which suggests that it is located approximately in the middle of the hospital corridor, the configuration of which is also not mentioned. It should be noted that today the corridor system of hospitals is inferior to the “triangular concept” of the architecture of modern medical buildings [9], in which the wards are located equidistant and in plain view from the nurse's area.

In domestic psychiatric wards, the temperature regime of departments should be 20-25°C they should also be equipped with an emergency lighting system, at least a third of sockets for power to each bed, and a call system with acoustic and light signal. At the same time, the draft of new building codes lacks information on the geographical location of windows in the wards to ensure sufficient insolation.

Studies by D'Agostino (2020), Markus Canazei M. (2017), Gregory L. Sahlem (2014) have shown an improvement in the condition of patients in psychiatric clinics under conditions of sufficient natural (insolation for at least 3 hours) and artificial lighting in the departments. According to a survey of patients and health care workers in Italy, the Netherlands and Russia, Hunt J., Sine D. (2015) also noted a reduction in the number of stressful situations, a significant positive impact on the course of the treatment process, reduction of recovery time, reduction of hospital stay, medical treatment due to proper natural and artificial lighting (bedrooms, offices of doctors, and nurses). On the contrary, in the absence of daylight in medical facilities, there were manifestations of visual stress, increased number of errors in work, the spread of certain signs of emotional burnout of health professionals [8]. Therefore, we consider it necessary to expand paragraph 8.3.2.9 of SBN B.2.2-10:2019 of Ukraine with the indication of regulated values of natural light according to DSP No. 173-96, SBN B.2.2-3:2018, and DSTU-N B B.2.2- 27:2010, which currently regulate the insolation of medical institutions in Ukraine.

According to the authors Hsu T. (2012), Jue K. (2017), who studied the negative impact of high noise levels on patients in hospitals, uncontrolled, unforeseen noise in hospitals increases stress in both patients and medical staff, causes or exacerbates

aggressive behavior in patients and, thus, exacerbates the disease, worsens the results of treatment. Therefore, the use of noise-absorbing technologies in the design and construction of psychiatric facilities will improve their acoustic regime [9, 10].

At the design stage of psychiatric facilities in the EU, the “therapeutic landscape” inside the ward in the form of small greenhouses or outside near the departments is not ignoring. It helps to concentrate, reduce stress, improve mood, replenish limited cognitive resources, increase feelings of energy and vitality, faster rehabilitation [11, 12].

When designing specialized departments it is also worth to adopt foreign experience in choosing the color scheme for decorating wards, taking into account the age of patients. World designers use as a basis the work of Rudolf Steiner on the importance of colors in the treatment of patients. He considered blue and pink to be the most favorable for the treatment of patients with mental disorders. In particular, it has been proven that the correct color scheme of the ward and the department, in general, reduces the manifestations of hidden hostility and depression. Pink, for example, soothes and relaxes; colors on the floor help patients navigate in different groups of rooms. Quite often it is practiced to decorate the walls of the facilities with works of art of the patients (art therapy), while the patient not only asserts himself but also receives a therapeutic effect [13, 14].

Observance of the requirements of working conditions of medical personnel and compliance with the needs of the Law of Ukraine “On Technical Regulations and Conformity Assessment” and the State Standards of Ukraine (Table 1) is mandatory.

It is known that the average length of stay of adult patients in psychiatric institutions is up to 53.5 days in Ukraine, up to 20.8 days in Lithuania, up to 29.3 days in Poland, which is probably not least due to the quality of architecture and planning solutions of the therapeutic environment in the institutions of these countries.

New design standards for domestic psychiatric wards will undoubtedly improve the conditions of the in-hospital environment for the mentally ill and medical staff, which will prevent in the future the recurrence of gross violations of patients' rights detected in psychoneurological hospitals of Mykolaiv, Poltava, and Kherson regions in 2015 revealed by Ukrainian Helsinki Human Rights Union and public organizations with the support of the Ministry of Health of Ukraine [15].

At the same time, our research reveals a rather superficial reorganization of psychiatric wards, which does not correspond to the multidisciplinary approach to the design of European mental health facilities with

the involvement of the head of the institution, architect, medical staff, including nurses. The set of premises in the new psychiatric hospitals in the EU must be focused on outpatients, to ensure their maximum comfort in these institutions. At the same

time, there are clear requirements for the design of not only psychiatric hospitals but also psychiatric intensive care units, psychiatric departments for veterans, etc. [5].

Table 1

### Additional regulations governing the requirements that apply to the building of health care facilities

NSU B EN 15251: 2011 “Calculated parameters of the microclimate of the premises for the design and evaluation of energy performance of buildings concerning air quality, thermal comfort, lighting, and acoustics”	State standard of Ukraine
NSU B EN 15459:2014 “Procedure for economic evaluation of building energy systems (EN 15459:2007, IDT)”	State standard of Ukraine
NSU B EN ISO 7730:2011 “Analytical definition and interpretation of thermal comfort based on calculations of PMV I PPD and local thermal comfort criteria (EN ISO 7730:2005, IDT)”	National standard of Ukraine
Normative documents of ecological legislation	
NSU ISO 14024:2002 State standard of Ukraine Ecological labelling and declarations “Ecological labeling, type I. Principles and Methods”	State standard of Ukraine
NSU ISO 14020:2003 State standard of Ukraine “Ecological labelling and declarations. General principles”	State standard of Ukraine
NSU ISO 14021:2002 “Ecologic labelling, type II and declaration”	State standard of Ukraine

We have developed and sent to the chief physicians of psychiatric hospitals of Ukraine “Questionnaire for scientific sanitary and epidemiological assessment of the conditions of placement of a psychiatric hospital”. Based on the analysis of the block of questions on sanitary-anti-epidemic and sanitary-hygienic parameters that characterize the buildings of domestic psychiatric hospitals, the location of medical structures and auxiliary units on the land, ie the design of buildings is determined. In particular, 50% of psychiatric hospitals have been housing in combined buildings, 25% have a pavilion system (separate buildings), 12.5% each have a centralized system (all in one building) and a block system. The number of stories of psychiatric hospitals up to 2 floors is 50%, up to 3 ground – 37.5% and up to 5 floors, which have been under construction since 1960 – 12.5%.

87.5% of hospitals are provided with full-fledged fencing of the territory, 12.5% are partially separated from other facilities. The height of the fence reaches up to 1.5 m in 12.5% of institutions, up to 2 m – in 50%, more than 3 m – in 37.5%. In 37.5% of establishments the fence is concrete, in 37.5% it is combined (concrete and mesh), in 12.5% it is mesh,

in 12.5% – only in green plantations. The average share of the hospital area per 1 patient is 237.4 m<sup>2</sup>.

Assessment of the functional zoning of the hospital area testifies to the arrangement of the sports zone in 50% of psychiatric hospitals, partially equipped in 12.5%, absent – in 37.5%. Public promenades for each department are in 75% of institutions, but these data are not verifiable, in particular, only 9% of departments of the Municipal Non-Profit Enterprise “Vinnytsia Regional Clinical Psychoneurological Hospital named after acad. O.I. Yushchenko Vinnytsia Regional Council” have fenced (up to 3 meters) such public promenades. The area of the green zone of psychiatric hospitals is 83.3%. The recreation area of only 12.5% of psychiatric institutions includes playgrounds for motor games (for table tennis), 25% of hospitals – playgrounds for quiet recreation (chess, dominoes), and 12.5% – for physical culture and health activities. At the same time, 37.5% of the mentioned sites are in satisfactory condition (Table 2).

When asked about the condition of these playgrounds, which have been equipped in psychiatric hospitals of Ukraine, 37.5% of them are in satisfactory condition, and 62.5% are in unsatisfactory condition.



**The share of playgrounds in the recreation area  
of psychiatric health care institutions of Ukraine, %**

Names of playground	Equipped	Missing
1 Zone for active games (for table tennis)	12,5%	87,5%
2 Quiet area (chess, dominoes)	25%	75%
3 Playground for sports and recreation activities (sports simulators)	12,5%	75%

Analysis of the questionnaire block on the conditions of stay, treatment, rehabilitation of the mentally ill revealed the possibility of organizing occupational therapy in 12.5% of psychiatric hospitals, where special workshops are equipped, and patients can acquire professional skills. Physiotherapy rooms have are in 50% of psychiatric hospitals. Low provision of patients with furniture was revealed: 25% – of patients partially have desk, of their own 75% – do not have it; 50% are provided with own chairs; 62.8% – use their bedside tables and 25% – closets for storing personal clothes.

The healing and safe environment of patients in psychiatric institutions is a crucial issue in European countries. To create such conditions in the EU countries, when designing new or renovating old mental health facilities, special attention is paid to the hygienic aspects of the design, construction, and decoration of medical facilities.

Because of all the above, we consider it necessary to more carefully present the architectural and planning decisions in the relevant section of SBN B.2.2-10:2019 (draft, final version) or use the opportunity specified in the introduction to these Standards and to supplement them with the Guide to design of psychiatric health care facilities taking into account the experience of the European Union, as is done in the Republic of Poland.

#### CONCLUSIONS

1. In Ukraine, there are no hygienic requirements for the design of psychiatric institutions, SanPiN 5179-90, which was approved in 1990 and contained general requirements for design of hospitals was ruled out by the Government of Ukraine, the current SBN B.2.2-10-2001 “Health facilities” does not contain of any demands for these institutions, and the new SBN B.2.2-10: 2019 (draft, final version) regulates the conditions of psychiatric wards, their zoning, composition, and area of the premises, requirements for the safe stay of patients in rooms, toilets, and bathrooms. However, there is no clear understanding

of both the location of these facilities and the nurse’s area; there are no zones for a private stay of patients in the department and outside it; most regulations of the life support systems (lighting, noise, air exchange, etc.) are not specified.

2. In Ukraine, the existing base of psychiatric institutions has been built in different periods: 28.6% from 1786 to 1945; 28.6% – after the World War II, 1945-1991; 42.8% – during the independence of Ukraine from 1991-2013, which is 100% of cases operate without taking into account the level of comfort of the internal environment of the premises for both patients and health professionals. Thus, for example, 12.5% have playgrounds for motor games (for table tennis), 25% have playgrounds for quiet recreation (chess, dominoes), and 12.5% have playgrounds for physical culture and health-improving activities; in terms of providing patient with own chairs, it is 50%, some have own desk and closets for storing personal clothing – 25%, only 12.5% of hospitals are equipped with special workshops where patients can acquire professional skills for further socialization.

3. “Therapeutic environment” in European psychiatric clinics provides for the presence of single and double wards, the area of which is almost three times the area of domestic departments per patient, separate bathrooms and toilets, common areas, unconnected access to the garden, which creates conditions for patient privacy; location of most patient rooms around a central work area for medical staff; creation of visual supervision over the doors of bedrooms, showers, toilets, kitchens, garden; observance of the corresponding coloring of walls of chambers and corridors of departments.

4. To create a proper “therapeutic environment” in the new domestic mental health facilities, it is necessary to implement European requirements in the design of these facilities and to supplement SBN B.2.2-10:2019 “Buildings and structures. Health care facilities” is a guide for designing new types of mental health facilities.

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Podolian V.M. – formal analysis, writing – original draft, funding acquisition;

Yurchenko S.T. – resources, visualization, funding acquisition.

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